1975 - Buena Vista CFPF Resilience Plan

Application Details

Funding Opportunity:	1446-Virginia Community Flood Preparedness Fund - Capacity Building/Planning Grants - CY23 Round 4
Program Area:	Virginia Community Flood Preparedness Fund
Application Status:	Under Review
Stage:	Final Application
Organization:	City of Buena Vista
Applicant:	Thomas Roberts
Internal Status:	
Initial Submit Date:	Nov 10, 2023 4:17 PM
Initially Submitted By:	Thomas Roberts
Last Submit Date:	
Last Submitted By:	

Stacey Farinholt

Review Details

Round:	1
Reviewer:	Stacey Farinholt
Type:	Internal
Role:	Primary
Review Status:	Submitted
Submitted Date:	Nov 21, 2023 2:06 PM
Score:	**0.00**

Capacity Building & Planning Scoring Sheet - Round 4

Eligibility and Scoring

Eligibility

Is the applicant a local government (including counties, cities, towns, municipal corporations, authorities, districts, commissions, or political subdivisions created by the General Assembly or pursuant to the Constitution or laws of the Commonwealth, or any combination of these)?

Yes = Eligible for consideration
No = Not eligible for consideration

Local Government*: Yes

Does the local government have an approved resilience plan and has provided a copy or link to the plan with this application?

Yes = Eligible for consideration under all categories
No = Eligible for consideration for studies, capacity building, and planning only

Resilience Plan*: No

If the applicant is not a town, city, or county, are letters of support from all affected local governments included in this application?

Yes = Eligible for consideration
No = Not eligible for consideration

Letters of Support*: N/A

Has this or any portion of this project been included in any application or program previously funded by the Department?

Yes = Not eligible for consideration
No = Eligible for consideration

Previously Funded*: No

Has the applicant provided evidence of an ability to provide the required matching funds?

Yes = Eligible for consideration
No = Not eligible for consideration

Evidence of Matching Funds*: Yes

Is the project eligible for consideration?

Yes = Eligible for consideration
No = Not eligible for consideration

Project Eligible for Consideration*: Yes

Eligibility Comments:

There is no consultant estimate attached. Numbers are based on contracts / estimates for comparable projects in other localities within their PDC and discussions with an engineer, but they did not include an actual estimate. This application would be approved otherwise.

Their match is partially cash and partially in-kind labor, which they did breakdown at an hourly rate.

Eligible Capacity Building and Planning Activities (Select all that apply) ? Maximum 100 points.

Development of a new resilience plan - 95 points

Revisions to existing resilience plans and modifications to existing comprehensive and hazard mitigation plans - 60 points

Resource assessments, planning, strategies and development - 40 points

Policy management and/or development - 35 points

Stakeholder engagement and strategies - 35 points

Goal planning, implementation and evaluation - 25 points

Long term maintenance strategy - 25 points

Other proposals that will significantly improve protection from flooding on a statewide or regional basis approved by the Department - 15 points

Capacity Building and Planning*: 100.00

Is the project area socially vulnerable? (based on ADAPT Virginia?s Social Vulnerability Index Score)

Social Vulnerability Scoring:

Very High Social Vulnerability (More than 1.5) - 10 Points

High Social Vulnerability (1.0 to 1.5) - 8 Points

Moderate Social Vulnerability (0.0 to 1.0) - 5 Points

Low Social Vulnerability (-1.0 to 0.0) - 0 Points

Very Low Social Vulnerability (Less than -1.0) - 0 Points

Socially Vulnerable*: Moderate Social Vulnerability (0.0 to 1.0)

Is the proposed project part of an effort to join or remedy the community?s probation or suspension from the NFIP?

(If Yes - 5 Points | If No - 0 Points)

NFIP*: No

Is the proposed project in a low-income geographic area as defined below?

"Low-income geographic area" means any locality, or community within a locality, that has a median household income that is not greater than 80 percent of the local median household income, or any area in the Commonwealth designated as a qualified opportunity zone by the U.S. Secretary of the Treasury via his delegation of authority to the Internal Revenue Service. A project of any size within a low-income geographic area will be considered.

(If Yes - 5 points | If no - 0 points)

Low-Income Geographic Area*: Yes

Does this project provide ?community scale? benefits?

More than one census block - 30 points

50-100% of census block - 25 points

25-49% of census block - 20 points

Less than 25% of census block - 0 points

Community Scale Benefits*: More than one census block

Scoring Comments:

Development of a new resilience plan - 95 points
Policy management and/or development - 35 points
category score: 130, capped at 100.

Total score:140

Project Total Score*: 0

Special Conditions:

VIEWPOINTS

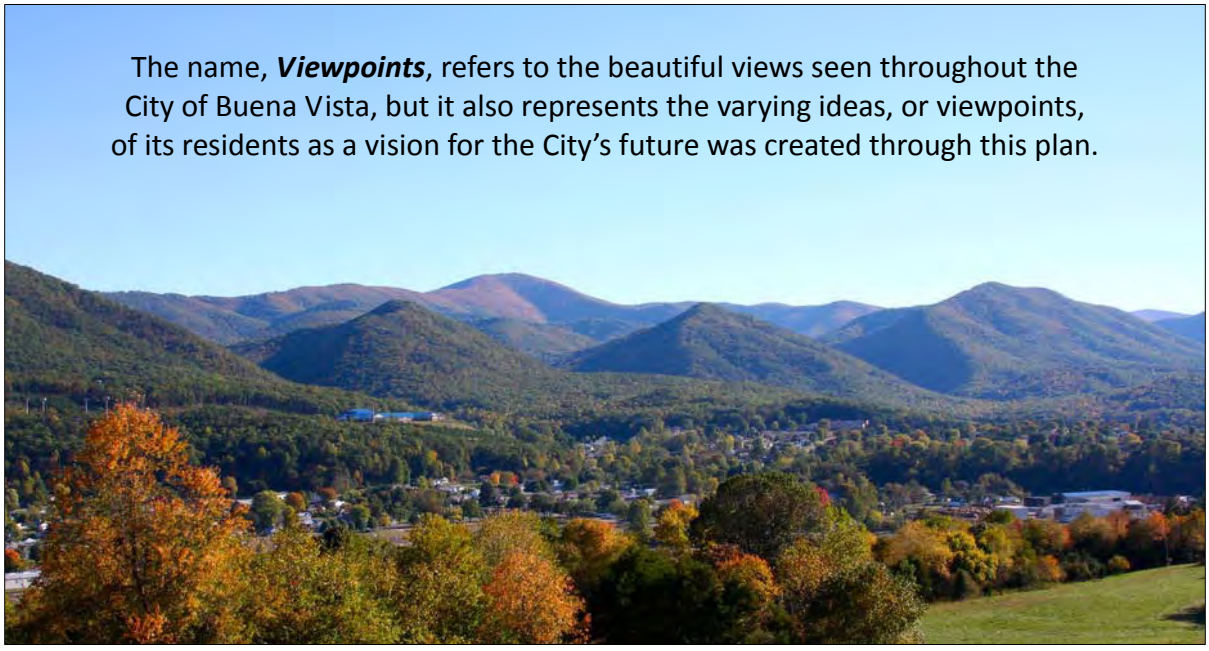
Buena Vista Comprehensive Plan

FINAL DRAFT
November 2011

VIEWPOINTS

Buena Vista Comprehensive Plan

FINAL DRAFT
November 2011



Resources. Information for the 'Relationship to Other Plan Elements' comes from *Under Construction: Tools and Techniques for Local Planning* as prepared by Minnesota Planning, September 2002.

This document was prepared by the Central Shenandoah Planning District Commission (CSPDC) with the assistance of the Buena Vista Comprehensive Plan Committee. The CSPDC was chartered on September 30, 1969 and is comprised of five counties, five cities and eleven towns. For over forty years, the CSPDC has been providing assistance to local governments and their citizens with issues including land use planning and regulation, transportation, disaster mitigation and preparedness, solid waste management, economic development, water and waste water, emergency management, housing, water resource management and human services.

Celebrating 40+ Years
CSPDC
Central Shenandoah Planning District Commission

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Forward

This comprehensive plan, *Viewpoints*, is designed to be a readable, functional document that will guide the City of Buena Vista's development and redevelopment for the next 20 years. The comprehensive plan's function is to serve the people of Buena Vista by providing guidelines for a safe, livable, economically viable community with which they are proud to identify. The comprehensive plan is intended to respond dynamically to the changes that are inevitable over the next 20 years.

The City of Buena Vista, in the heart of Virginia's Shenandoah Valley, is surrounded by natural beauty. The City is situated on the western slopes of the Blue Ridge Mountains and along the Maury River, a major tributary of the James River. It is partially surrounded by the Jefferson and George Washington National Forests which provides numerous opportunities for outdoor recreation. Additional recreational opportunities are available at Glen Maury Park, a 315 acre multi-use park owned and operated by the City.

A major transportation network adds to this beautiful location. Interstates 64 and 81 intersect just a few miles outside of the City and provide local businesses with direct access to the markets of the Midwest and the East Coast. Additionally, Buena Vista is served directly by U.S. Routes 501 and 60 and indirectly by U.S. Route 11. One of the few entrances to the Blue Ridge Parkway is four miles east of the City. The City of Roanoke is within an hour's drive. The state capital of Richmond is 130 miles east and Washington, D.C. is 185 miles northeast.

Buena Vista's neighboring localities include the City of Lexington, six miles to the east, and Rockbridge County. Buena Vista is considered the traditional manufacturing nucleus of the region. There are four universities and colleges within eight miles of the City. Buena Vista itself is home to Southern Virginia University (SVU) and Dabney S. Lancaster Community College (DSLCC) Rockbridge Regional Center.

The name of Buena Vista's comprehensive plan, *Viewpoints*, refers to the captivating views throughout the City but also represents the varying ideas, or viewpoints, of its residents as it relates to Buena Vista's vision for growth and development. The comprehensive planning process provides the opportunity for residents to share their viewpoint and direct the City's future.

Purpose of the Comprehensive Plan

The comprehensive plan is a broad statement of community goals and policies that direct the future physical development of the City. The plan considers current community goals and needs, anticipates change, and provides guidance for future actions. It reflects the results of citizen involvement, technical analysis, and the judgment of decision makers. The value in the comprehensive planning process is that the community is able to answer the following four key questions:

1. Where are we now?
2. Where are we going?
3. Where do we want to be?
4. How will we get there?

Comprehensive plans as required for every locality under Section 15.2-2223 of the *Code of Virginia*. The comprehensive plan is an official public document adopted by the Buena Vista City Council. Specifically, Section 15.2-2223 states the following about the purpose of the comprehensive plan:

> The comprehensive plan shall be made with the purpose of guiding and accomplishing a coordinated, adjusted and harmonious development of the territory which will, in accordance with present and probable future needs and resources, best promote the health, safety, morals, order, convenience, prosperity and general welfare of the inhabitants, including the elderly and persons with disabilities.

By requiring local governments to adopt a comprehensive plan, it is implied that local development issues are best handled at the local level of government and that the comprehensive plan is a means of doing this. Although not required until 1980, Buena Vista adopted it first comprehensive plan in 1967.

<u>History of Buena Vista's Comprehensive Plan</u>

1967 – Buena Vista's first comprehensive plan was prepared by the State Division of Planning.
1980 – The City updated the comprehensive plan with funds from a HUD Comprehensive Planning Assistance 701 Grant.
1989 – The comprehensive plan was revised with the assistance of the Central Shenandoah Planning District Commission.
1995 – The City's Planning Commission was directed to review and modify the 1989 Plan. Census data from 1990 was used to update and analyze current data and trends. The Central Shenandoah Planning District Commission provided technical assistance.

Plan Structure

The comprehensive plan is organized into several chapters, or elements. A glance at the Table of Contents reveals that the elements of the comprehensive plan address every aspect of the community. Each element except for Chapter 1, Population Characteristics, consists of Strategies for Action.

Goals are broad statements of community aspirations related to an element.

Critical success factors are policy statements that guide land use review, development decision, and operational programs that will be pursued in achieving goals.

Implementation strategies are representative approaches to policy implementation aimed at achieving goals.

The Strategies for Action are provided in table format to promote their review. The implementation strategies are a checklist to measure progress in meeting the goals of the plan. They are to be reviewed on an annual basis with the City Manager responsible for completing this process. A status report on the comprehensive plan will be presented to City Council each year.

The elements of the comprehensive plan contain accompanying maps, charts, descriptive information, and strategies for action. Together, this offers an overview of the present and future needs of the locality, but it also does the following:

- It provides a vehicle for local government officials and residents to express their goals for the future of their community.
- It is a means to anticipate and constructively address the inevitable changes occurring within a community.
- It improves the likelihood that decisions affecting a community's development will be based on the desires and needs of its residents.
- It promotes consistency in decision-making by facilitating reasonable and well-informed decisions and removing the potential for discrimination in the decision process against individual landowners.
- It provides a guide with which the City Council, Planning Commission, and staff may reasonably evaluate development proposals.
- It serves as the basis for more detailed ordinances developed to implement the plan.
- It helps to provide direction for allocating community resources to meet identified needs and protect public investments.

Plan Development

At the end of 2008, an eleven-member advisory Comprehensive Plan Committee was appointed to update the City's comprehensive plan. The Central Shenandoah Planning District Commission (CSPDC) assisted the City with the update of the plan. The committee was represented by citizens, City Council members, City Planning Commission members, and City staff. The members of the Comprehensive Plan Committee are listed below.

Comprehensive Plan Committee	
Mr. Lewis Plogger	City Council
Mr. Larry Tolley	City Council
Mr. Tim Petrie	Planning Commission
Mr. Mike Ohleger	Planning Commission
Mr. Richard Roberts	Citizen
Mr. Todd Jones	Citizen
Mr. Robert Huch	Southern Virginia University
Mrs. Lucy Ferrebee	Citizen, Planning Commission
Mr. Tim Dudley	Staff (2008-July 2011)
Mr. Tim Reamer	Staff (2008-April 2010)
Mr. Brian Brown	Staff (May 2010-completion)
Mr. Robert Luke	Staff

The Executive Director of the Lexington-Rockbridge County Chamber of Commerce, Mr. Sammy Moore, also participated with committee. The committee met monthly to direct the planning process, gather information, and draft the comprehensive plan.

Residents and property owners in Buena Vista were contacted about the comprehensive plan process and encouraged to participate. The Comprehensive Plan Committee directed a number of activities to inform residents and businesses about the planning process. Specific outreach activities included the following:

Website. Updates on the comprehensive plan development process were available on the City's website, www.buenavistavirginia.org.

Newsletter. Updates were periodically announced in the City's newsletter to residents.

Survey. A comprehensive survey was mailed with water bills in February 2009. A copy of the survey and its results are included in the Appendix.

Community Meeting. A public input meeting was held at the Parry McClure High School on May 19, 2009. The meeting provided an opportunity for residents and businesses to learn about the planning process and to participate in identifying the strengths of the City and needed changes. Responses from the community meeting are presented in the Appendix.

Display. A poster display was presented at Mountain Days in 2010 and later shown at the Municipal Building. The poster described the benefits of a comprehensive plan, its contents, and ways for residents and businesses to be involved in the planning process.

Plan Implementation

Adopting a comprehensive plan is the first step toward realizing the City's vision. The comprehensive plan contains the policy wording which provides for monitoring, evaluating, and amending the plan as community needs change. The implementation strategies, outlined at the end of the chapters, set forth a plan for implementing Buena Vista's vision for the next 20 years. A priority designation was identified for each strategy.

Action Strategy Implementation Guide

High (H) = Years 1-5
Medium (M) = Years 5-7
Low (L) = Years 7-10
On Going = Strategies with zero to minimal costs associated with implementation. These strategies may be completed at any time throughout the life of the plan.

Policies specified in this comprehensive plan are the foundation for decision making. However, policies are not applied in isolation but weighed in relation to other relevant policies. They are considered in the context of the goal that they are intended to achieve. Finally, the implementation strategies noted in each chapter of the plan are not exhaustive. Other strategies may be used in the future.

Because comprehensive plans are intended to be long-range, they must be flexible enough to change or be revised as the City undergoes change over time. The plan does not provide specific regulations or restrictions. It does, however, provide the framework for implementing appropriate ordinances and policies. It is these that help bring the plan to reality.

The successful implementation of the goals and strategies will depend upon the fiscal climate in any given year and making regular reviews and reprioritization an essential component of the implementation phase. As long-term changes in land uses, regional trends or the economic climate occur, implementation of the City's vision will require re-assessment. The comprehensive plan is part of an ongoing planning process, and as such, the *Code of Virginia* requires that the plan be reviewed at least once every five years to determine whether it is advisable to amend the plan. This requirement assures that the plan reflects current conditions and values.

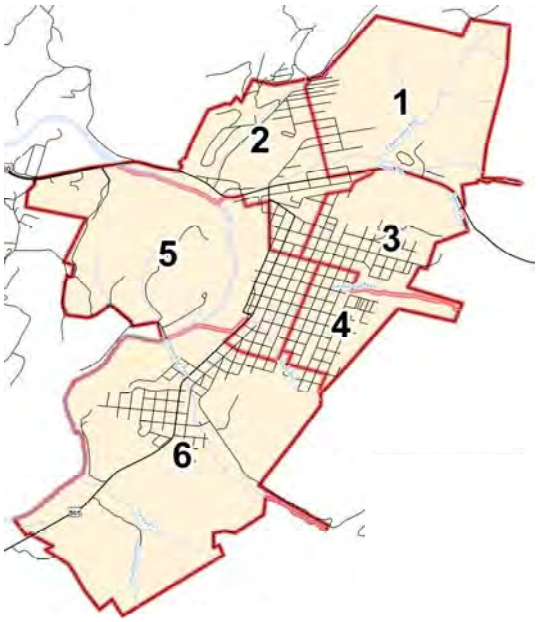
CHAPTER 1
Population Characteristics

Population analysis and projections are fundamental to planning decisions. Past, current, and projected population information is important for understanding the changes that are taking place and providing the ability to act on those changes. Identifying demographic trends is necessary for determining the future demand on public facilities, community services, housing, employment, and land. Policy decisions are based on this information.

The source of the population data varies. Much of the data in this chapter comes from the U.S. Bureau of the Census. Additional data sources for this chapter include the Weldon Cooper Center for Public Service, Virginia Employment Commission, and various state agencies.

To better understand the population characteristics of Buena Vista, comparative data is offered for Virginia and the neighboring localities of Rockbridge County and the City of Lexington. Furthermore, the data for Buena Vista is shown at a couple of different geographic levels, census tract and block group. The City's judicial boundary corresponds to the census tract boundary. The Census tract is divided into six block groups as shown below.

Map 1.1
Census Block Groups, 2010
Buena Vista

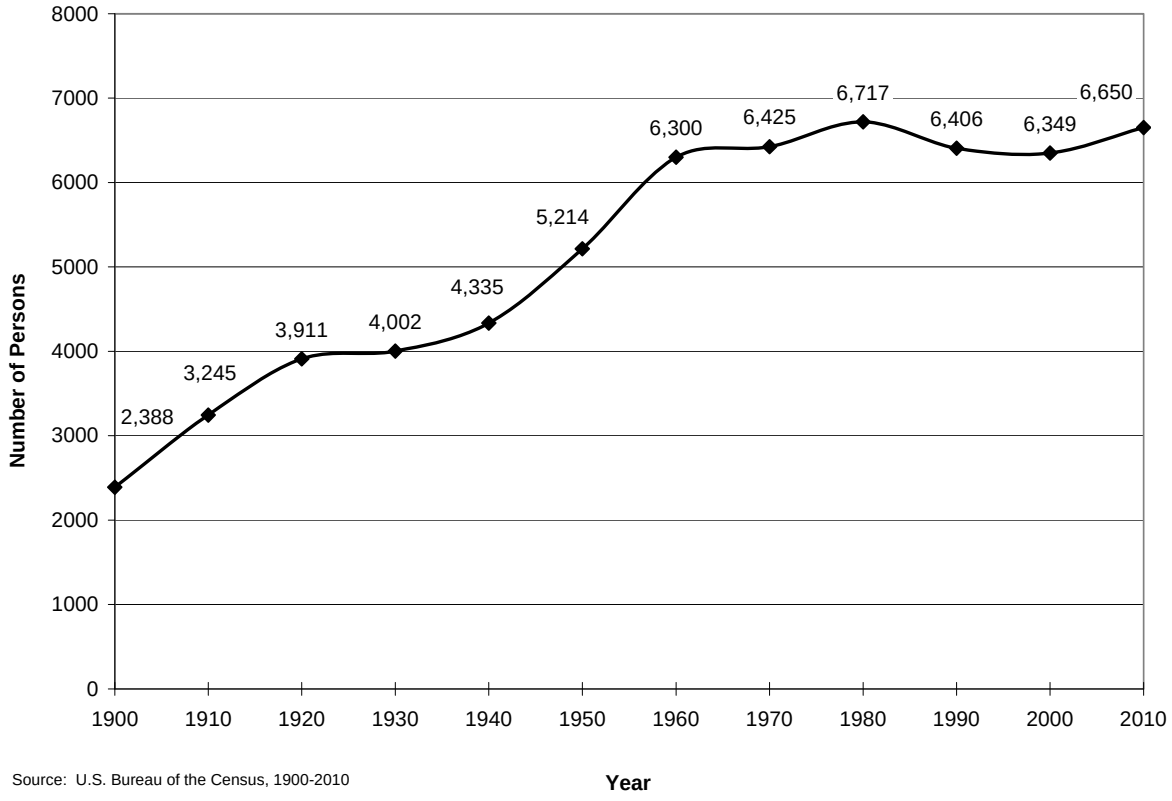


POPULATION TRENDS

Total Population

The City of Buena Vista grew between 1900 and 1980, increasing from 2,388 to its peak population of 6,717 people. The biggest jump in population occurred between 1950 and 1960. During this decade, the population increased by over a 1,000 people, a 20 percent increase.

Figure 1.1
Population 1900-2010
Buena Vista



Source: U.S. Bureau of the Census, 1900-2010

Since 1960, the population of the City has remained fairly constant. Estimates during the 2000s indicate only small fluctuations in the number of residents. Between the 2000 Census and the 2010 Census, the population increased by 4.7 percent (Figure 1.1). Over this same time, the population of Lexington increased by 2.5 percent or 175 people, and the population of Rockbridge County increased by 7.2 percent or 1,499 people.

Table 1.1
Population Estimates, 2000-2010
Buena Vista

Year	Population
2000 Census	6,349
2001	6,297
2002	6,274
2003	6,242
2004	6,474
2005	6,488
2006	6,597
2007	6,406
2008	6,649
2009	6,649
2010 Census	6,650

Source: Weldon Cooper Center for Public Service, Intercensal Estimates, February 2011

This slow growth pattern for Buena Vista is not anticipated to change. According to projections by the Virginia Employment Commission (VEC), the population of Buena Vista is expected to grow only slightly over the next 20 years. The VEC projection is based on historical trends and does not reflect anticipated increased student enrollment at Southern Virginia University. Furthermore, the projections have not been updated since the release of 2010 Census data. The 2010 Census population exceeded the VEC 2010 projected population by about 200 people. Consequently, Buena Vista's population is expected to grow more than shown in Table 1.2.

Table 1.2
Population Change, 1990-2030
Buena Vista

Year	Buena Vista Population	Buena Vista Percent Change (%)	Virginia Percent Change (%)
1990 Census	6,406		
2000 Census	6,349	-0.89	14.40
2010 Projected	6,451	1.61	13.16
2020 Projected	6,569	1.83	11.32
2030 Projected	6,697	1.95	10.18

Source: Virginia Employment Commission, 2009. Please note that projections do not reflect 2010 Census data released by the U.S. Census Bureau.

Population Characteristics

The population of the Buena Vista-Lexington-Rockbridge area is expected to increase modestly between 2010 and 2030 (Table 1.3). The projections released by Woods and Poole Economics reflect a greater population increase than the VEC projections. VEC projections anticipate a 10.1 percent increase in the population from 2000 to 2030 while Woods and Poole projections expect a 16.1 percent increase for the area. Both project most of the growth to be in Rockbridge County. In comparison to the area totals, the growth for the state between 2000 and 2030 is 38.8 percent or 48.8 percent as projected by VEC and Woods and Poole, respectively. As for Buena Vista, the 2010 Census population for the Lexington-Buena Vista-Rockbridge area, 35,999, exceeded the 2010 projection by either source.

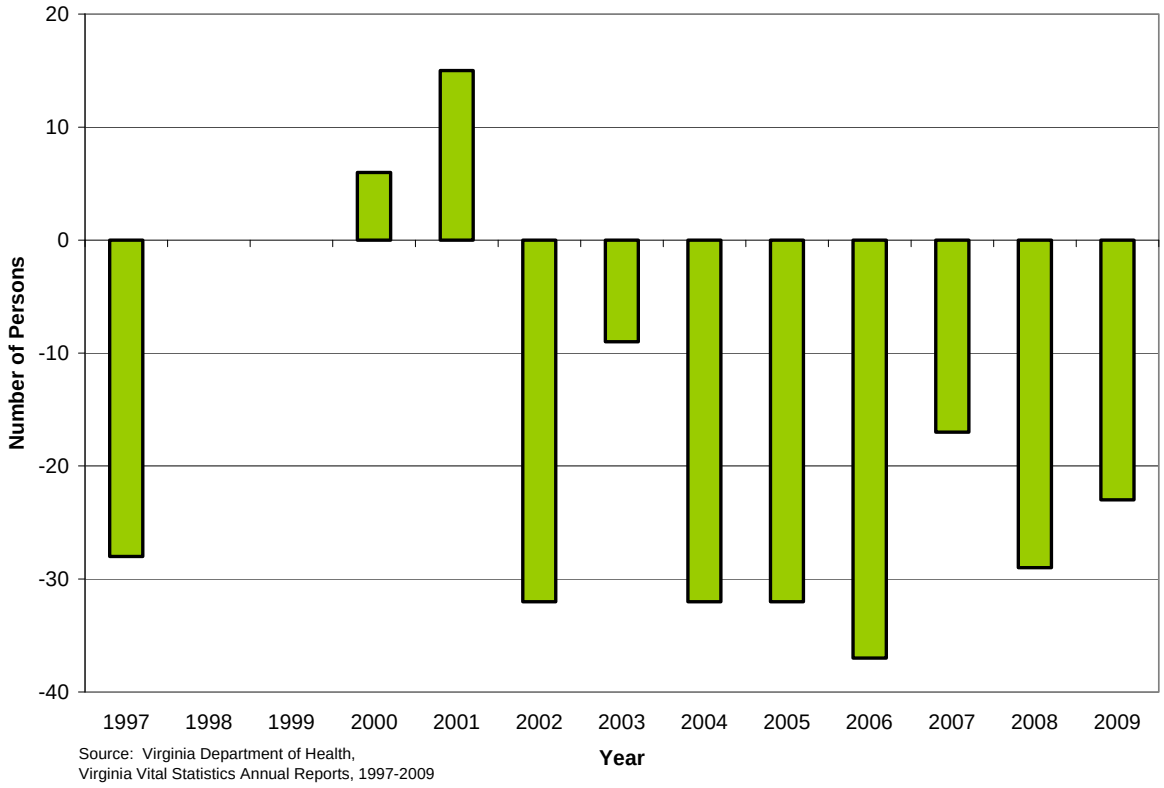
Table 1.3
Population Estimates, 2010-2030
Lexington-Buena Vista-Rockbridge County

Year	VEC Projection	Percent Change (%)	Woods & Poole Projection	Percent Change (%)
2000 Census	34,024		34,016	
2010 Projected	35,020	2.9	35,556	4.5
2020 Projected	36,154	3.2	37,495	5.5
2030 Projected	37,475	3.7	39,485	5.3

Source: Woods & Poole Economics, 2008 State Profile. Please note that projections do not reflect 2010 Census data released by the U.S. Census Bureau.

Although the total population of the City has changed little over the last decade, people are migrating to the City. The total population numbers are influenced by the age of the population. As seen in Figure 1.2, there are more deaths of residents than births. Consequently, the modest population growth is from migration. The change in population between the 2000 Census and 2010 Census was 301 persons. The change due to natural increase (births – deaths) was -197. The net migration during this time was 498.

Figure 1.2
Natural Increase, 1997-2009
Buena Vista

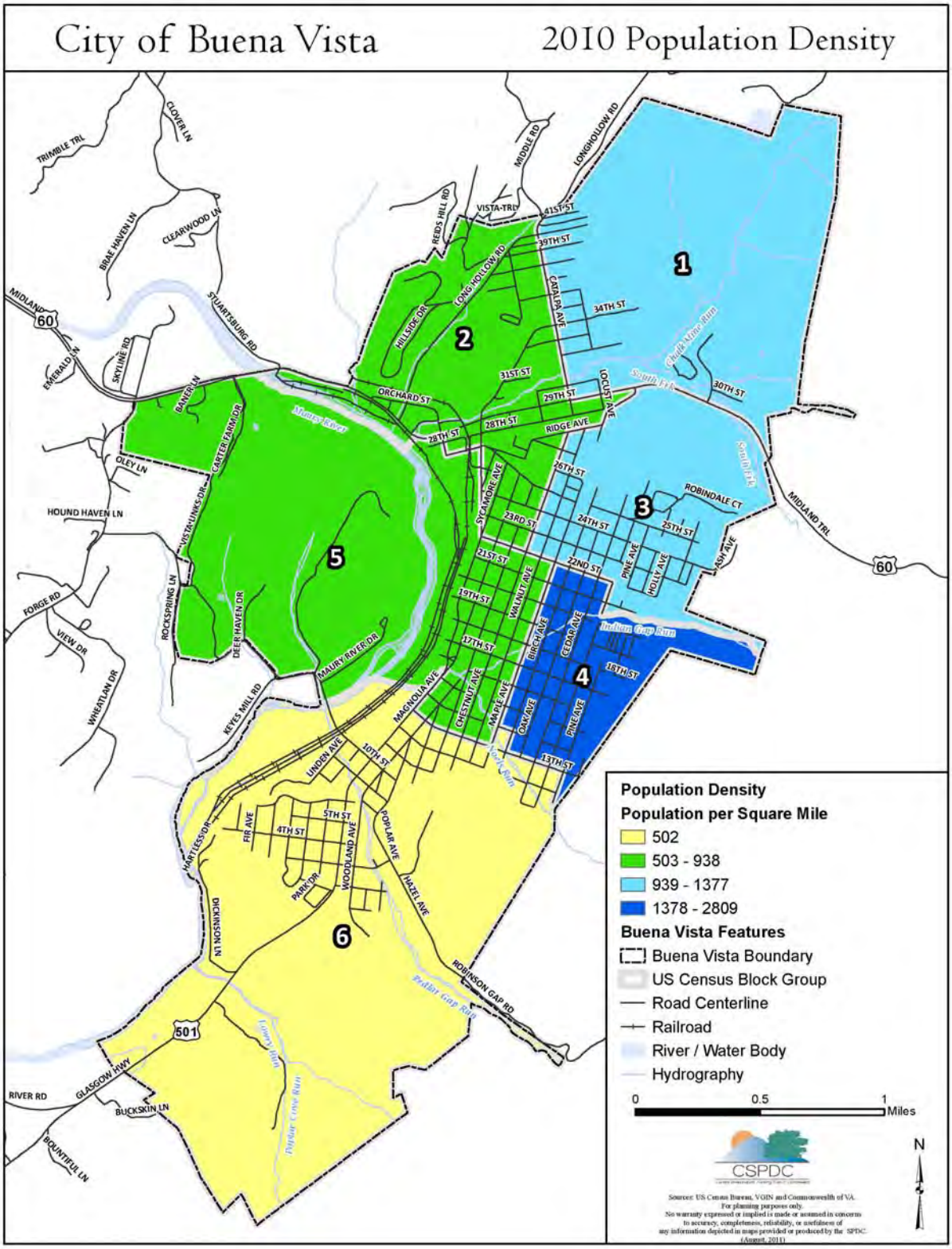


Source: Virginia Department of Health,
Virginia Vital Statistics Annual Reports, 1997-2009

Population Density

Population density is the average number of persons per square mile of land area. The number is derived by dividing the total number of residents by the number of square miles of land area in the specified geographic area. The population density for the City of Buena Vista is 979 persons per square mile. The most densely populated Census block group is Block Group 4 with 2,806 persons per square mile. (Map 1.2)

Map 1.2


City of Buena Vista
2010 Population Density
1
2
3
4
5
6
Population Density
Population per Square Mile
502
503 - 938
939 - 1377
1378 - 2809
Buena Vista Features
Buena Vista Boundary
US Census Block Group
Road Centerline
Railroad
River / Water Body
Hydrography
0
0.5
1
Miles
N
CSPDC
Source: US Census Bureau, VGIN and Commonwealth of VA.
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(August, 2011)
TRIMBLE TRL
CLOVER LN
BRAE HAVEN LN
CLEARWOOD LN
MIDDLE RD
LONGHOLLOW RD
REIDS HILL RD
VISTA TRL
41ST ST
39TH ST
34TH ST
CATALPA AVE
LONG HOLLOW RD
HILLSIDE DR
MIDLAND TRL
60
STUARTSBURG RD
SKYLINE RD
EMERALD LN
BANGER LN
CARTER FARM DR
ORCHARD ST
31ST ST
29TH ST
28TH ST
RIDGE AVE
LOCUST AVE
30TH ST
South Fk
Muddy Mine Run
Maury River
OLEY LN
HOUND HAVEN LN
VISTHUNKS DR
SYCAMORE AVE
26TH ST
23RD ST
24TH ST
25TH ST
ROBINDALE CT
ASH AVE
PINE AVE
HOLLY AVE
22ND ST
21ST ST
19TH ST
WALNUT AVE
FORGE RD
ROCKSPRING LN
DEER HAVEN DR
MAURY RIVER DR
VIEW DR
WHEATLAM DR
17TH ST
BIRCH AVE
CEDAR AVE
Indian Gap Run
14TH ST
KEYES MILL RD
MAGNOLIA AVE
CHESTNUT AVE
MAPLE AVE
OAK AVE
PINE AVE
13TH ST
LINDEN AVE
10TH ST
Toad Run
5TH ST
4TH ST
FIR AVE
HARTLESS DR
PARK DR
WOODLAND AVE
POPLAR AVE
HAZEL AVE
DICKINSON LN
ROBINSON GAP RD
Indian Gap Run
501
Lowry Run
Indian Creek Run
RIVER RD
GLASGOW HWY
BUCKSKIN LN
BOUNTIFUL LN

Age

It is important to look at the age structure of the City. As people progress from one age group to another, their needs change and their role in the community changes. Median age is an initial indicator of changes in a community's age groups (Table 1.4). Buena Vista and Lexington were the only two localities in the Central Shenandoah Planning District that had a lower median age in 2010 than in 2000. From 2000 to 2010, the median age of Buena Vista's population decreased very slightly. The median age of Lexington continues to be low because of the presence of the Virginia Military Institute and Washington and Lee University. Unlike the cities, however, Rockbridge County showed a marked increase in its median age.

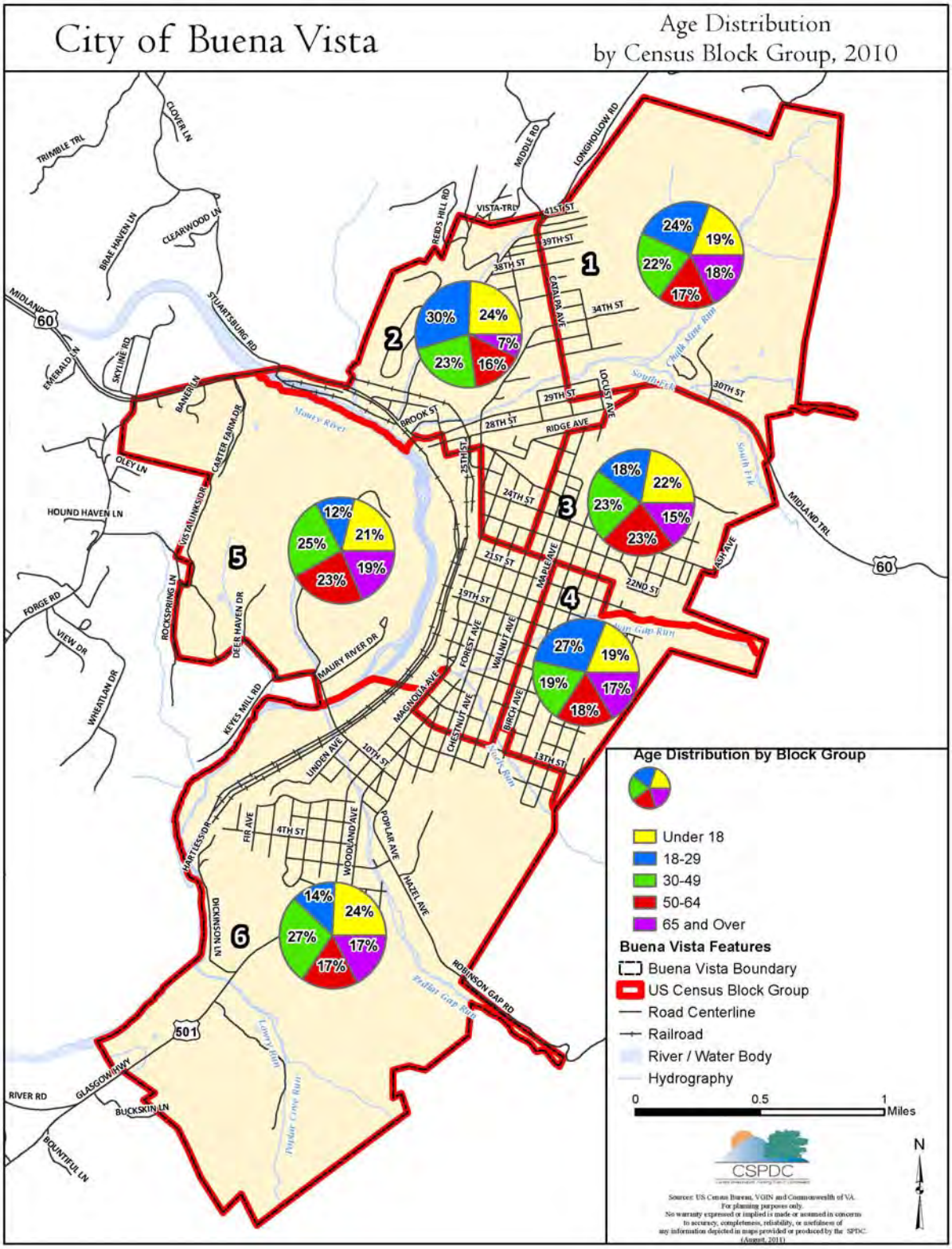
Table 1.4
Median Age

	1990	2000	2010
Buena Vista	36.5	37.9	37.6
Lexington	23.6	23.3	22.8
Rockbridge County	36.7	40.4	46.5
Virginia	32.7	35.7	37.5

Source: U.S. Census Bureau, 1990, 2000, and 2010 Census

Figure 1.3 shows the age structure of Buena Vista over time, from 1990-2030. Additionally, Map 1.3 shows the age distribution by Census block group for 2010.

Map 1.3


City of Buena Vista
Age Distribution
by Census Block Group, 2010
1
24%
19%
22%
18%
17%
2
30%
24%
7%
23%
16%
3
18%
22%
23%
15%
23%
4
27%
19%
19%
17%
18%
5
12%
21%
25%
19%
23%
6
14%
24%
27%
17%
17%
Age Distribution by Block Group
Under 18
18-29
30-49
50-64
65 and Over
Buena Vista Features
Buena Vista Boundary
US Census Block Group
Road Centerline
Railroad
River / Water Body
Hydrography
0
0.5
1
Miles
N
CSPDC
Source: US Census Bureau, VGIN and Commonwealth of VA.
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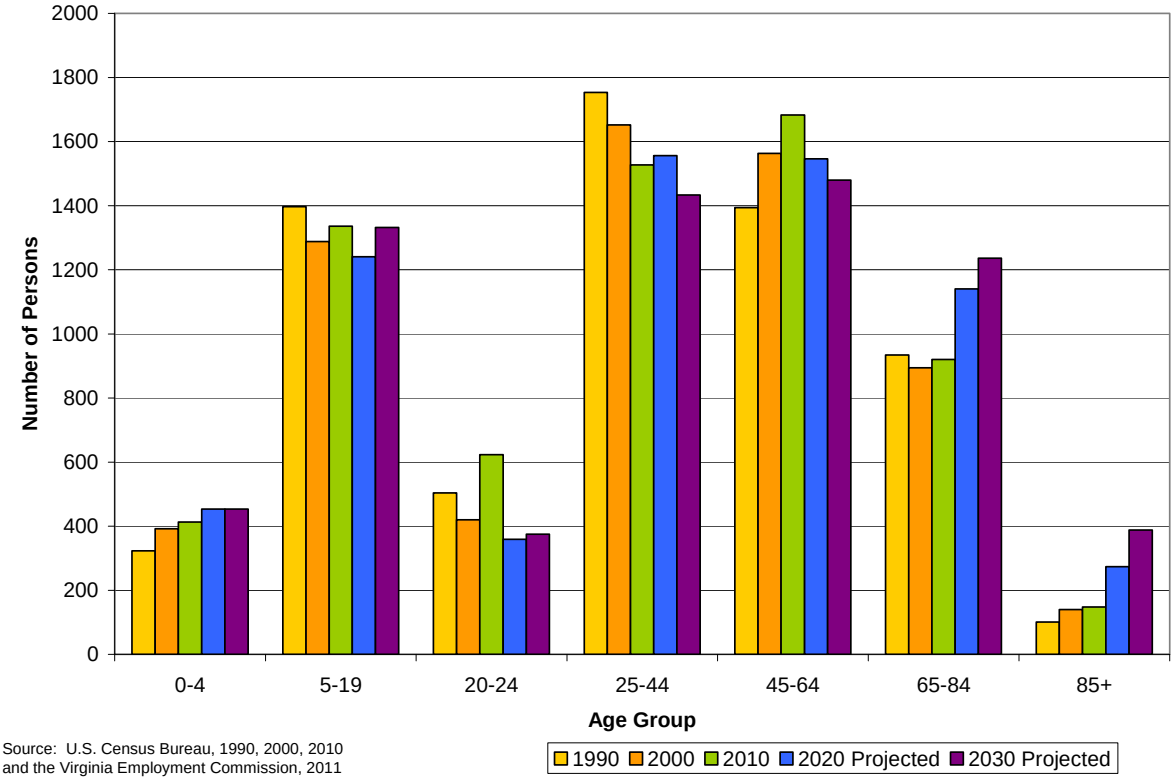
No warranty expressed or implied is made or assumed in concerns
to accuracy, completeness, reliability, or usefulness of
any information depicted in maps provided or produced by the SPDC.
(August, 2011)
MIDLAND TRL
60
501
ROBINSON GAP RD
RIVER RD
GLASGOW HWY
BUCKSKIN LN
BOUNTIFUL LN
DICKINSON LN
HARTLESS DR
FIR AVE
4TH ST
WOODLAND AVE
POPLAR AVE
HAZEL AVE
LINDEN AVE
10TH ST
13TH ST
MAGNOLIA AVE
CHESTNUT AVE
FOREST AVE
WALNUT AVE
BIRCH AVE
MAPLE AVE
ASH AVE
19TH ST
21ST ST
22ND ST
24TH ST
25TH ST
28TH ST
29TH ST
30TH ST
RIDGE AVE
BROOK ST
LOCUST AVE
MAURY RIVER DR
DEER HAVEN DR
ROCKSPRING LN
VISTA FUNKSDR
CARTER FARM DR
BANGER LN
OLEY LN
HOUND HAVEN LN
FORGE RD
VIEW DR
WHEATLAM DR
KEYES MILL RD
SKYLINE RD
EMERALD LN
MIDLAND
STUARTSBURG RD
BRAE HAVEN LN
CLEARWOOD LN
TRIMBLE TRL
CLOVER LN
REIDS HILL RD
VISTA TRL
MIDDLE RD
LONGHOLLOW RD
41ST ST
39TH ST
38TH ST
34TH ST
CATALPA AVE
Mowry River
South Fork
Bulk Mine Run
Gap Run
Poplar Gap Run
Poplar Cove Run
Looney Run

Figure 1.3
Population by Age Group, 1990-2030
Buena Vista



Source: U.S. Census Bureau, 1990, 2000, 2010 and the Virginia Employment Commission, 2011

As seen in Figure 1.3, above, the number of people in the 0-4, 5-19, and 20-24 age groups increased between the decennial censuses. The growth in these three younger age groups is balanced with increases in the older age groups. The only age group with a decline in number of people was the 25-44, a particularly important age group as it relates to the workforce.

Buena Vista has the greatest percentage of younger persons in the area. Buena Vista, Lexington, and Rockbridge County all have a lower percentage of persons under 18 years of age than Virginia (Table 1.5). Understanding the trends within the under 18 population is helpful when planning for school facilities and programs as well as recreational facilities and activities. The distribution of the under 18 years of age population is shown by Census block group on Map 1.4.

Table 1.5
Percentage of Population under 18 Years

	1990	2000	2010
Buena Vista	21.7	22.5	21.4
Lexington	11.7	11.0	10.1
Rockbridge County	22.9	22.2	19.1
Virginia	24.3	24.6	23.2

Source: U.S. Census Bureau, 1990, 2000, and 2010 Census

The 20-24 age group, which includes college-aged persons and younger-aged workers, shows a sharp increase from 2000 to 2010 (Figure 1.3). This reflects increased enrollment at Southern Virginia University (SVU) during the last decade. Because SVU anticipates this trend to continue, this age group likely will exceed current 2020 and 2030 projections.

Looking at the population structure shown in Figure 1.3, the 25-44 age group generally shows a continued decline in its size over the next 20 years. Additionally, the number of persons 45-64 years old is expected to decline between 2010 and 2030 even though this age group has increased in the past. This is noteworthy because the 25-64 age group is a significant segment of the workforce.

In 2010, the percentage of the total population 65 years and older was 16.1 percent (Table 1.6). As a share of its population, the 65 and older age group has changed very little over the last two decades. However, this is expected to change. This age group is projected to comprise nearly a quarter of Buena Vista's population, 24.2 percent, in 2030. The distribution of those 65 years and older may be seen on Map 1.5.

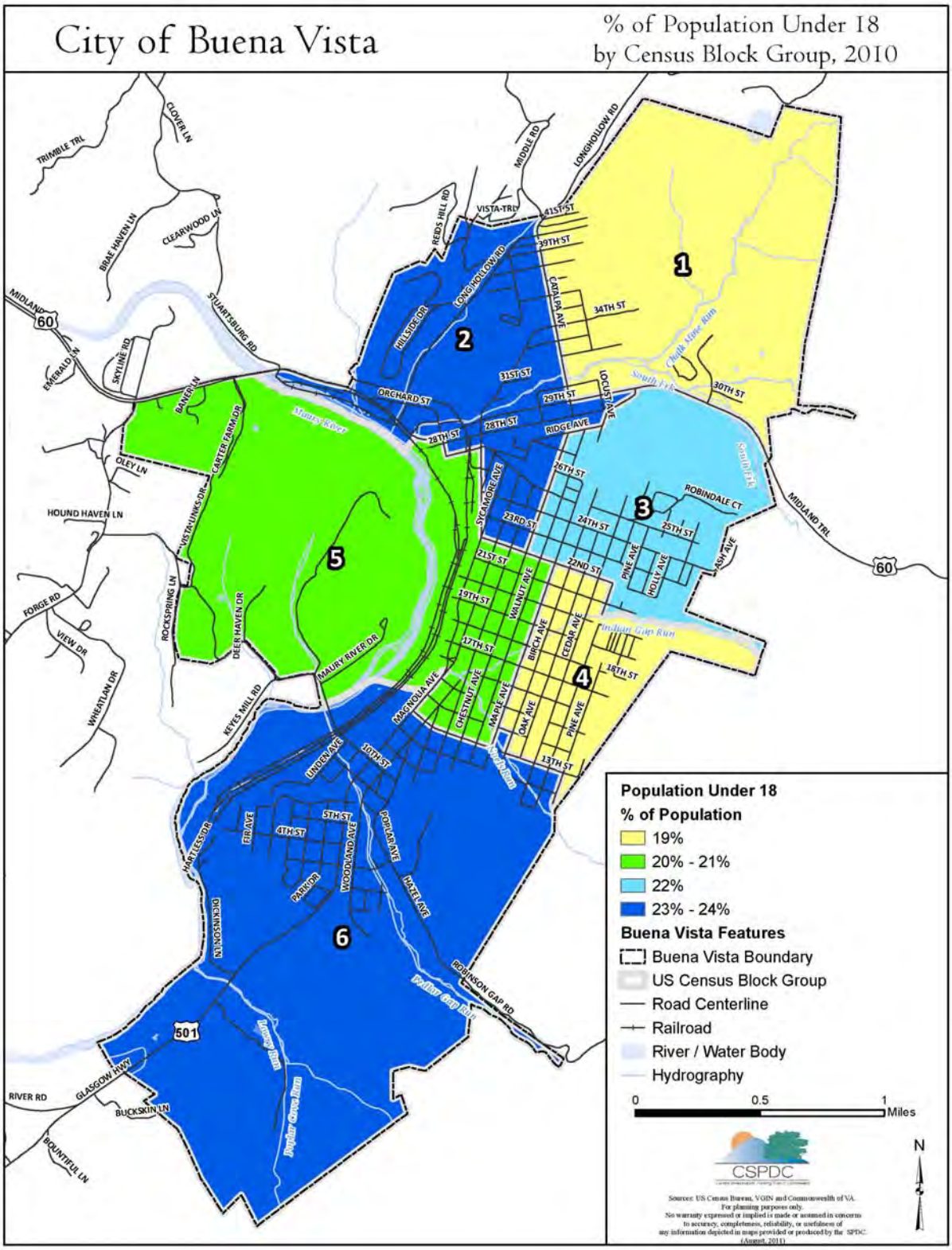
Table 1.6
Percentage of Population 65 Years and Over

	1990	2000	2010
Buena Vista	16.2	16.3	16.1
Lexington	14.9	16.4	15.3
Rockbridge County	13.9	15.7	20.7
Virginia	10.7	11.2	12.2

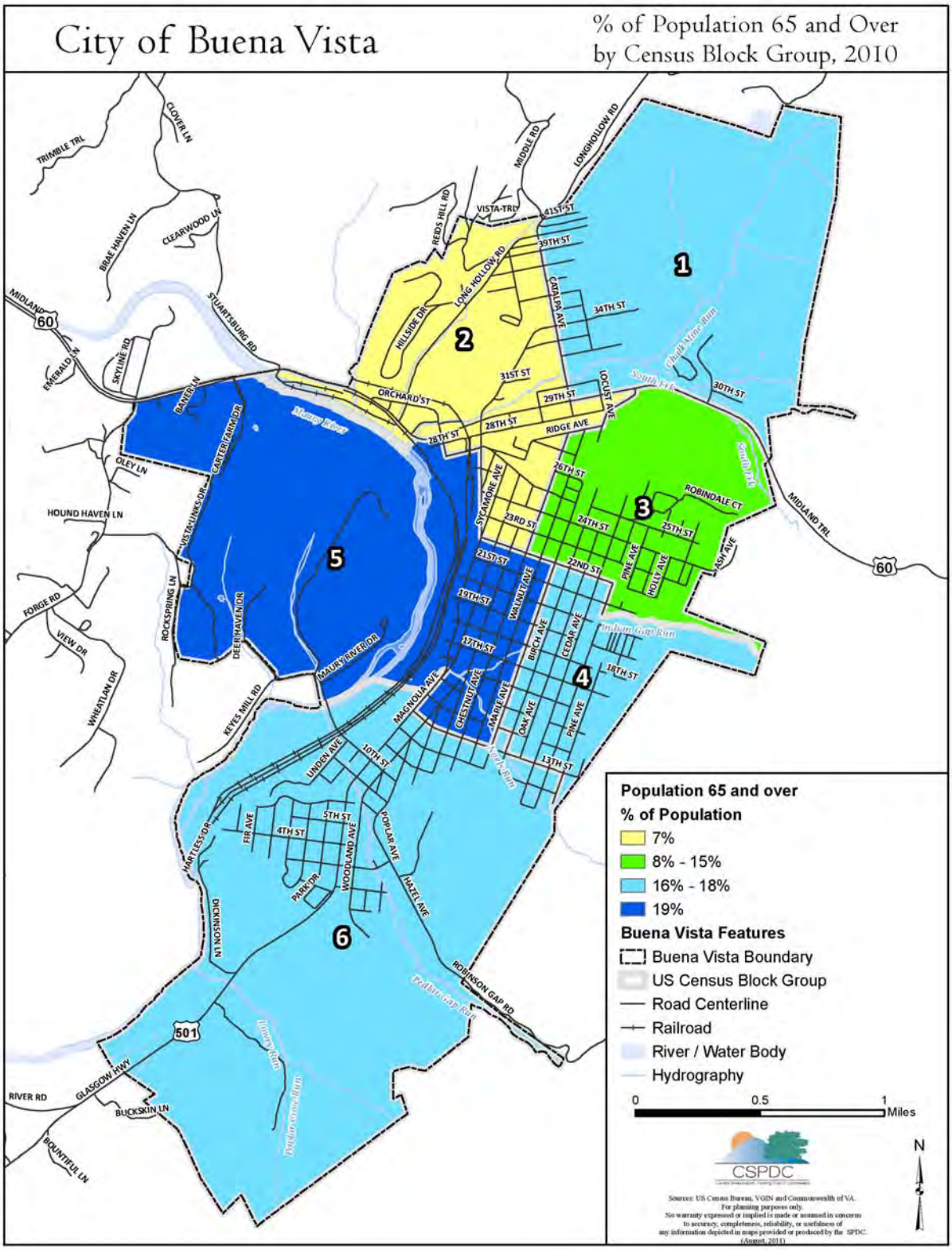
Source: U.S. Census Bureau, 1990, 2000, and 2010 Census

Consideration of the aging trend, sometimes referred to as the "age wave," is important when planning for community services and workforce preparedness. Although the aging trend presents challenges, it may be seen as an opportunity. Examples include economic activities that address the needs and wants of an aging population, recreational and cultural amenities, workforce mentorship, and community volunteerism.

Map 1.4


City of Buena Vista
% of Population Under 18
by Census Block Group, 2010
1
2
3
4
5
6
Population Under 18
% of Population
19%
20% - 21%
22%
23% - 24%
Buena Vista Features
Buena Vista Boundary
US Census Block Group
Road Centerline
Railroad
River / Water Body
Hydrography
0
0.5
1
Miles
N
CSPDC

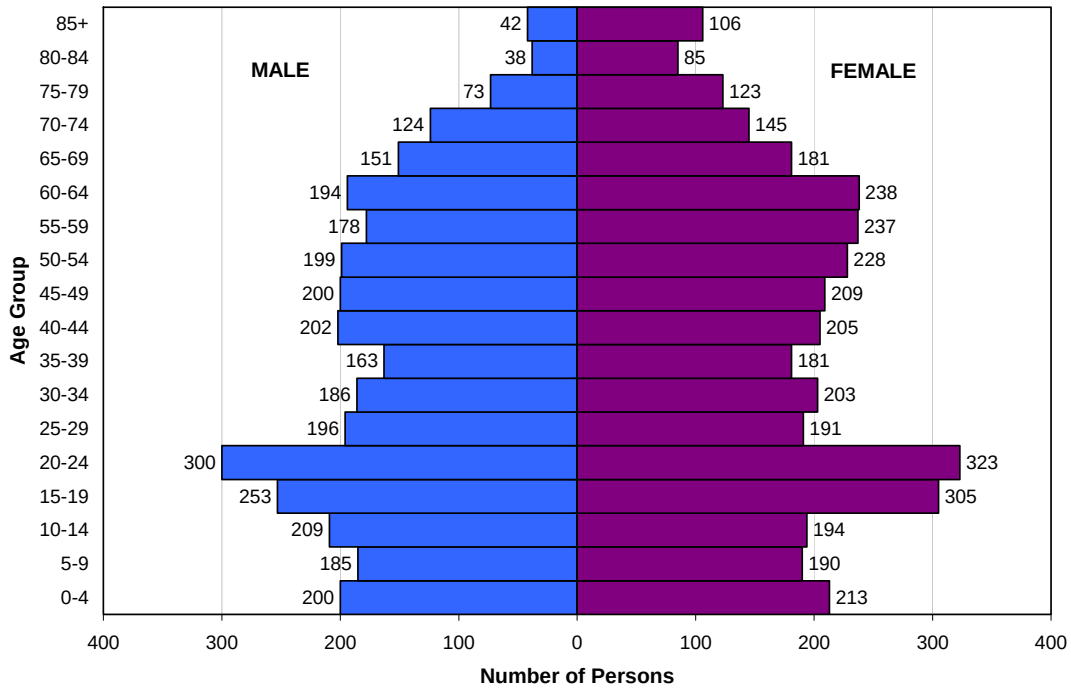
Map 1.5


City of Buena Vista
% of Population 65 and Over
by Census Block Group, 2010
1
2
3
4
5
6
Population 65 and over
% of Population
7%
8% - 15%
16% - 18%
19%
Buena Vista Features
Buena Vista Boundary
US Census Block Group
Road Centerline
Railroad
River / Water Body
Hydrography
0
0.5
1
Miles
N
CSPDC

Male/Female Distribution

The 2010 Census indicated that 46.5 percent of Buena Vista's population is male and 53.5 percent is female. The percentage of females in Buena Vista is higher than that of Virginia (50.9 percent). In Buena Vista, there are more females than males in every age group except for 25-29 years and 10-14 years of age (Figure 1.4). The difference between males and females in these groups is slight. The population pyramid also clearly shows the increase in the number of 15-24 year olds.

Figure 1.4
Population Distribution by Sex and Age, 2010
Buena Vista



Race and Ethnicity

The race and ethnicity of Buena Vista's population is shown in Table 1.7. In 2010, 91 percent of the City's population was White and about 5 percent was Black or African American.

Table 1.7
Race and Ethnicity, 2010
Buena Vista

	2000 Census		2010 Census	
	Number	Percent (%)	Number	Percent (%)
Total Population	6,349	100.0	6,650	100.0
Race				
White	5,940	93.6	6,050	91.0
Black or African American	305	4.8	347	5.2
American Indian and Alaska Native	19	0.3	73	1.1
Asian	27	0.4	29	0.4
Native Hawaiian and Other Pacific Islander	1	0.02	12	0.2
Other and Multi-Race	57	0.9	111	1.7
Ethnicity				
Hispanic or Latino (of any race)	64	1.0	103	1.5

Source: U.S. Census Bureau, 2000 Census and 2010 Census
Notes: Totals may not equal 100 due to rounding. Census data prior to Census 2000 was not used because it cannot be compared to later data. Census 2000 was the first census in which more than one race could be selected.

SUMMARY OF TRENDS

This population analysis has identified the following trends:

- Buena Vista's population growth is expected to be slow but steady.
- Population growth is from net migration.
- The number of 15-24 year olds is increasing primarily due to growth at Southern Virginia University.
- The age group that is declining is the workforce age group.

Comprehensive plans are prepared using a framework of population, household, and economic data. Economic data is provided in Chapter 5, Economy, and additional household information may be found in Chapter 4, Housing. Understanding the dynamics of Buena Vista's population is essential to plan effectively and efficiently for the needs of the City during the next ten to twenty years. Knowing these trends will assist the City's leaders in making better decisions for its residents.

Because of the rapid growth of Southern Virginia University and the increasing 65 and older population, it will be important for the City to follow its population trends. Although these trends were considered in this comprehensive plan, the comprehensive plan will need to periodically be updated to reflect actual population changes and their accompanying implications. This review and update will keep the comprehensive plan relevant.

CHAPTER 2
Historic Resources

The purpose of the historic resources element in the comprehensive plan is to complement land use planning by providing guidance for the identification and protection of Buena Vista's historic resources. The plan recognizes that stewardship of cultural resources is a responsibility of the entire community. Historic resources give Buena Vista its unique character and distinguish it from other localities.

Historic resources include structures and sites, community landmarks, archaeological and cultural sites, and the historic environment in which they exist. They serve as visual reminders of Buena Vista's past, providing a link to its cultural heritage and a better understanding of the people and events which shaped the patterns of its development. Preservation of these resources makes it possible for them to continue to play an integral, vital role in the City and surrounding Rockbridge County.

Because historic resources are irreplaceable, they should be protected from deterioration and the intrusion of incompatible land uses. The reuse of facilities and utilities is often less expensive than demolition and new construction. The preservation and the reuse of historic structures also may attract tourism and promotes a quality of life that industry, new businesses, and residents find attractive in communities.

RELATIONSHIP TO OTHER PLAN ELEMENTS

Housing. Historic buildings can be modified for affordable housing or mixed-use opportunities.

Economy. Rehabilitated historic buildings generate new tax revenues, increase employment and provide improved spaces for retail, offices, housing, lodging and entertainment.

Transportation. The design of road improvements and parking standards should consider the traditional, historic design of the City.

Land Use. Zoning ordinances should be compatible with and promote the protection of historic resources.

BUENA VISTA'S STORY

The land that is now the City of Buena Vista has a history of development dating over 100 years before the beginnings of a formal city. The area's natural resources attracted settlers to the area. The area had abundant wildlife, tall timber, a free-flowing river, and mineral deposits. The bottom lands were shielded by mountains and the climate was moderate.

In 1745, Benjamin Borden received a nearly 100,000 acre land grant from Governor Gooch that included what would become Rockbridge County. Recognizing that the area was rich with potential, Scotch-Irish Presbyterians and Germans from Pennsylvania began settling the area. In 1778, the Virginia House of Burgesses carved a new county, named Rockbridge, from the counties of Augusta and Botetourt. Rockbridge County was named for its most distinguishing feature, the Natural Bridge. Lexington became the county seat.

Iron furnaces dotted the area and were fed by the rich ore that was obtained from nearby mines and fueled by the surrounding timber. The Buena Vista Furnace property was the site of the first iron furnace in the area, built in 1778 by the McCluer family. Additionally, large farming operations with mills, both planing and grist, used the readily available water power of the area's rivers and streams. Log homes and churches were built.

By 1801, the James River Company had built twenty miles of sluices. This linked Rockbridge County to Richmond by way of the James River. As a result, pig iron and produced goods could be transported to eastern markets. Although suitable for hauling freight, the small flat-bottomed bateaux were not fit for passenger travel. The James River & Kanawha Company (JR&KC) built a canal on the James River and replaced the bateau with more stable freighters and packet (passenger) boats that were towed by teams of mules or horses. By 1851, the North River Navigation Company began construction of locks and dams along the North River (now called the Maury River) to connect Lexington to the JR&KC canal. Freight service began in 1852, but passenger service to Richmond did not begin until late in 1860. Boat landings sprang up at the locks necessary for the operation of the canal. Paxton, Laird, and Moomaw all built landings to serve both travelers and residents alike. John "Jockey" Robinson built a tavern on his 400-acre farm, Hart's Bottom, to entertain travelers who were making their way to Lynchburg. Benjamin Moomaw had inherited Green Forest from his father and tried to sell the 600+ acres as farmland. When he determined that the land's value would increase due to the canal construction, he retained the property. Remnants of the canal system are still in place today. Among them is the Moomaw Dam, adjacent to the former Bontex site.

Following the Civil War years, efforts to rebuild began. Damage to the canal was repaired and goods began to flow eastward. Northern capitalists recognized the opportunity presented by investment in devalued properties. Additionally, railroads were now regarded as vital to future economic development. Competition to attract rail companies to invest in the area was fierce. The development of Big Lick into the City of Roanoke, due to the arrival of the Norfolk and Western railways, prompted local businessmen to seek the same development for the Rockbridge area.

Rail systems were intent on expanding to serve growing markets. In 1880, the Shenandoah Valley Railroad (SVR) converged with the Richmond & Allegheny (R&A) alongside the North River. A small station was opened at Green Forest, the land owned by Benjamin Moomaw. Green Forest was also near the confluence of Chalk Mine Rune and the North River. Moomaw was successful in securing several industries for Green Forest. These included a tannery, canning factory, planing mill, and pulp mill. The village was in the northern part of today's City. Its boundaries were the area of present-day Beech Avenue, Factory Street, Brook Street, Canal Street, 29th Street, and Allegheny Avenue.

When the Shenandoah Valley Railroad went into receivership in 1887, it seemed that Moomaw's dream of a larger city would fail. When SVR's assets were acquired by the Norfolk and Western Railway, however, business leaders of Rockbridge were poised to capitalize on the opportunity. Moomaw enlisted Charles F. Jordan (son of Samuel Jordan) and Alexander T. Barclay, Lexington/Rockbridge County business leaders, to support his effort to develop a city. In January 1889, the three men founded the Buena Vista Company to promote the development of iron resources, to use the water power of the North River, and to create an industrial and manufacturing center. A prospectus was published extolling the area's assets. The land had long supported mining, and it was known that there were many mineral deposits in the area. Additionally, the merits of the dense forests, river, mild climate, fertile soil and refined society were touted.

The joint stock company was organized by mid-January 1889. As stock was sold, funds became available for the company to purchase lands for the development of a city. These purchases included Hart's Bottom from W.S. Gurnee of New York who had acquired the property shortly after the Civil War, Green Forest from Moomaw, and the Buena Vista Furnace property which had been acquired by the Jordan family in 1848. By February 1, 1889, all of the stock had been sold for a total of $400,000.

Buena Vista was a planned city. Land was cleared and laid out in lots of either 25 or 50 feet in width based on location and the intended use of the property, business or residential. The lots were 125 feet deep. The streets were 75 feet wide and generally conformed to the cardinal points of the compass. The twenty six north-south avenues were given the names of trees. The east-west streets were numbered from 1st to 41st. The laid out area was approximately 900 acres. The business center was established next to the river along the railroad tracks, while the residential section was established toward the Blue Ridge and

spread somewhat onto some of its lower foothills. Alleys allowed utilities to be delivered to the rear of structures, keeping the streets unobstructed. The new city featured gas and electricity as well as water and sewer services. An electric light company was among the city's first industries.

Building began at a phenomenal rate. The Buena Vista Hotel opened on July 1, 1889, on an elevated site overlooking the town. The primary purpose of the hotel was to house the financiers and speculators visiting the executives of the Buena Vista Company. One year later, the hotel was destroyed by fire. The construction of a new and grander hotel quickly began. The hotel is presently the main building on the campus of Southern Virginia University. In October of 1889, the Buena Vista Company announced that it would construct its office building at 2110 Magnolia Avenue. The building was completed in May 1890. Two blocks east of the Buena Vista Company's building, the Union Depot of the Shenandoah Valley and Richmond and Alleghany railroads was constructed on Sycamore Avenue. The construction of these two important buildings guaranteed that 21st Street and adjacent blocks would become the commercial heart of the city.

Recruiting industry was central to the continued development of the city. A.T. Barclay, president of the Buena Vista Company, offered free land to companies willing to locate in the city. He traveled throughout America and telegraphed reports of his success which were reported by the *Lexington Gazette* and the *Buena Vista Advocate*. At the first annual meeting of the company, a surplus of $1,027,592.25 was reported. The dividends from the first year were not paid to the stockholders. They were used to fund the construction of water and electric facilities. Real estate sales moved briskly. At the beginning of the boom in 1890, lot values escalated 100 percent in two weeks.

Buena Vista was part of a greater land boom. During the 1800s, 'boom towns' sprang up in western Virginia. The 'boom' was the rapid economic development that resulted from the construction of rail lines into Southwest Virginia and West Virginia coal fields and other areas of natural resources. This boom came late to Rockbridge County, the end of the 1800s, but it sparked growth and Northern investment in the existing community of Lexington and in the new communities of Glasgow, Goshen, and Buena Vista.

Buena Vista soon became the center of the land boom in Rockbridge County, and it was during this time that Buena Vista assumed its role as an industrial city. Organized by the Buena Vista Company, the Buena Vista Iron Works Company started operation on December 12, 1890. Approximately 250 men were employed at the furnace and mines that produced about 100 tons of pig iron per day. The Alexander K. Rarig Company manufactured boilers, engines, and furnaces from the pig iron produced by the Buena Vista Furnace. The Virginia Basic Steel Company, which converted pig iron into steel, was also located within the corporate limits.

There were other types of industries besides those connected to the mining and production of iron ore. Probably the most conspicuous was the Buena Vista Paper Mills which manufactured from eight to ten tons of books and news and wrapping paper per day. The Buena Vista Cassimere Mills produced cashmere and woolen cloths. The full capacity of this plant was 650 yards per day of 3 quarter goods. The Marr Egg Crate Company manufactured its owner's patented invention designed for the safe transport of eggs. The Wise Wagon Works, which was capable of producing 1,000 wagons per year, and the Wilbourne Saddle and Harness Factory, were also located in Buena Vista.

Even though the national economy had entered a recession in 1891, Buena Vista continued to grow. Lot sales did decline, but the population increased. In February 1892, the City numbered 5,240 residents, enough for the state legislature to grant a city charter. A second prospectus was published in 1892 that announced all of the advancements made during the first three years of the City's existence. It listed the following:

- 409 houses
- 44 stores
- 3 hotels
- 2 restaurants
- 30 licensed boarding houses
- 3 market houses
- 1 hardware store
- 2 drug stores
- 4 clothing stores
- 27 general merchandise stores
- 2 tin and stove stores
- 3 churches
- 3 banking facilities
- Grade school
- Female academy
- Opera house

The architecture of the City was determined primarily by the investors themselves. People from all over the country came to Buena Vista, and they built homes in styles that were most familiar to them. A variety of architectural styles were constructed including Italianate Revival, Queen Anne, Gothic Revival, I-style farmhouse, and the Second Empire mansard roofed mansions. Examples of all of these may be found in Buena Vista today. It is unusual to find such a diverse collection of house styles that were built in such a short period of time. Within six years, more than 600 buildings were constructed. These ranged from the simplest worker's cottage to the most elaborate commercial structure.

The Panic of 1893 signaled the end of the land boom as the nation headed into a depression. The boom ended after only three years, but in that time, Buena Vista had grown from a sparsely populated rural area to a city of over 5,000 people with 19 industries employing over 1,000 workers. Unlike many other boom towns, Buena Vista weathered the economic downturn relatively well. Prosperity returned to Buena Vista around 1900 and most new commercial development shifted to Magnolia Street.

Buena Vista remained the industrial center of the Rockbridge area. A community profile from 1930 enumerated 1,352 employees at twenty industries. The top industries were the Buena Vista Textile Corporation (330 employees), the South River Lumber Company (250 employees), and the Columbian Paper Company (200 employees). In contrast, the City of Lexington had no large-scale industry during this period.

Source: Patricia Gibson

Key dates in Buena Vista's development are listed below.

Table 2.1
Key Dates in Buena Vista's History and Development

Date	Event
Founding	
1880	Two railroads constructed, forming a junction. Surrounding the junction is the resulting village of Green Forest, population of 100.
1882	Buena Vista's first industry opened, the Tannery.
1885	The first public school is built. It is a one room log building.
December 1888	B.C. Moomaw writes the historic Buena Vista Prospectus.
January 1889	The Buena Vista Company was formed and all shares were sold within 30 days.
1889	Buena Vista's major 'boom' results from the construction of the Norfolk and Western Railroad which provided direct access to the industrial cities to the north. Building begins at an amazing rate.
March 7, 1889	The town is named Buena Vista as opposed to Green Forest.
May 22, 1889	The drawing of lots begins.
January 24, 1890	Town gets its charter. The City's population is 400.
May 9, 1890	The City begins building a new brick school that will host 240 children. It is opened on October 12, 1890. The principal is Mr. McCluer.
February 15, 1892	The Commonwealth issues Buena Vista a charter as a City. The City's population is 5,240.
March 4, 1892	The "boom" time comes to an end.
September 1894	The Female Seminary opened under the name of 'Young Ladies College.' Classes were held in the Hotel Buena Vista which the school would buy in 1901 and then name Southern Seminary and Junior College.

Date	Event
20th Century	
August 10, 1935	Construction begins on Camp Oronoco, a work camp designed to provide jobs during the Great Depression.
1941	Camp Oronoco dismantled.
December 5, 1950	Citizens vote to change charter to be run by a City Manager and a 5 person council. The existing council was composed of 12 men.
September 1, 1962	The number of City Council members increases from 5 to 7, 6 elected as general council and an elected Mayor
Fall 1963	Modine Manufacturing locates its heater manufacturing facilities in Buena Vista.
1969	Disastrous flood after Hurricane Camille.
1971	Glen Maury Park purchased by the City.
1985	Disastrous flood.
1993	Construction of Jim Olin Floodwall begins.
1999	Floodwall dedicated.
21st Century	
January 2001	Buena Vista designated as a Virginia Main Street Start Up Community.
Fall 2001	New Parry McCluer High School opens.
August 2004	Construction of Vista Links, the City's 18-hole golf course, is completed.
October 2009	Buena Vista Historic District designated in the National Register of Historic Places.

HISTORIC PROPERTIES

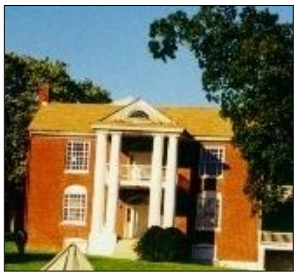
Reminders of the Buena Vista's history remain today, particularly in its street layout and a few key buildings. Five individual buildings in Buena Vista are listed on the National Register of Historic Places. These include the Buena Vista Land Company, Paxton House, Second Buena Vista Hotel, W.N. Seay House, and the Buena Vista Colored School. In 2009, the City designated a historic district in its central business district.

The National Register of Historic Places is administered by the National Park Service, which is part of the U.S. Department of Interior. The National Register is part of a national program to coordinate and support public and private efforts to identify, evaluate, and protect historic and archeological resources. Properties listed in the Register include districts, sites, buildings, structures, and objects that are significant in American history, architecture, archeology, engineering, and culture. Buena Vista's listings are shown on Map 2.1 and described below:

Building: Paxton House (Glen Maury)

Location: Glen Maury Park

Description: The brick, 2 ½ story I-structure was built between 1830 and 1835. It is embellished with provincially interpreted formal detailing to give it more of a sophisticated air than the usual farmhouse of the region. The structure is on land acquired by General Elisha Franklin Paxton from the estate of William Paxton. General Paxton was later killed acting as Commander of the Stonewall Brigade during the battle of Chancellorsville. The property was acquired by the City of Buena Vista in 1971 and is part of Glen Maury Park.



Building: W.N. Seay House

Location: 245 West 26th Street

Description: The house is a relatively large 2-story, weatherboarded balloon-frame Victorian that features an assortment of decorative elements that were popular at the time it was built in 1889. The house is located within close proximity to the Southern Virginia University campus. The house once served the funerary and furniture needs of the City. A c. 1900 garage/utility building, also demonstrating historical integrity, sits northwest of the house.

Building: Buena Vista Land Company (Old Courthouse)

Location: Corner of Magnolia Avenue and Twenty First Street

Description: The modified Second Empire style building was constructed in 1890 as the office of the Buena Vista Land Company. It is a 2 ½ story, mansard roofed brick building executed in five course American bond and set on a brick foundation. In 1892, the office building was sold to the newly incorporated City of Buena Vista. Following the construction of a new municipal building in 1971, the building avoided being razed and currently houses the local public library. The Buena Vista Company building, once considered for demolition, remains a symbol of the economic and physical growth of the City.

Building: Second Buena Vista Hotel
(Main Building, Southern Virginia University)

Location: Southern Virginia University campus

Description: After the original hotel was destroyed by fire in 1890, Pennsylvania architect, S.W. Foulks, was hired to design its replacement. The new hotel was constructed on the same site overlooking the Central Business District. It was in a Romanesque style characterized by great turrets, towers and dormers, multi-angled roof lines, and clustered chimneys. Wood was used in combination with brick and stone, and wide verandas punctuated the various levels. Classified as a 'boom hotel,' its primary purpose was to house the financiers and speculators visiting the executives of the Buena Vista Company.

Building: Buena Vista Colored School

Location: 30th Street and Aspen Avenue

Description: The school is a one story, brick structure with a hipped, standing-seam metal roof. The oldest part, to the west, dates from 1914 and is a four bay, two room section with a brick foundation. In 1926, a second section was added to the east which added one room. The building served as the only local school for African American children in grades 1 through 7 from 1914 to 1957. The two room school was closed in 1957 and the building was then used for community purposes until 1992.

The Buena Vista Downtown Historic District is the historic business center of the City of Buena Vista. The district is an example of the 'boom towns' that sprang up in western Virginia during the late nineteenth century. The historic district remained the City's principal commercial center through the 1950s. Beginning in the late 1940s new businesses began to locate on highways at the periphery of the City. The district covers approximately 11.5 acres and follows two of the City's main commercial arteries, Sycamore and Magnolia Avenues. The district's registration form includes 53 historic resources, 39 are contributing resources and 14 are noncontributing. A challenge of historic preservation and economic development is the number of vacant storefronts along Magnolia Street.

Map 2.1


City of Buena Vista
Historic District and Landmarks
Buena Vista Colored School
W.N. Seay House
Second Buena Vista Hotel
Buena Vista Land Company - Library
Paxton House
ROCKBRIDGE AVE
29TH ST
ASPEN AVE
28TH ST
RIDGE AVE
27TH ST
COLLEGE HILL DR
PARK AVE
26TH ST
25TH ST
24TH ST
23RD ST
22ND ST
21ST ST
19TH ST
17TH ST
16TH ST
ORCHARD ST
CAREY ST
CULVERT ST
BROOK ST
ALLEGHANY AVE
FACTORY ST
TANNERY
25TH ST
IVY AVE
BEECH AVE
SYCAMORE AVE
FOREST AVE
CHESTNUT AVE
MAGNOLIA AVE
GLEN MAURY PARK RD
MAURY RIVER DR
Historic Landmark
Historic District
Road Centerline
Railroad
N
0
0.1
0.2
Miles
CSPDC
Sources: City of Buena Vista and VADHR.
For planning purposes only.
No warranty expressed or implied is made or assumed in concerns to accuracy, completeness, reliability, or usefulness of any information depicted in maps provided or produced by the Central Shenandoah Planning District Commission (December, 2011)

Historic Resources

The listing of the Buena Vista Downtown Historic District in the Virginia Landmarks Register and the National Register of Historic Places acknowledges the importance of the downtown to the history and architectural development of the City. The designation is also an economic development tool. The listing qualifies owners of certain historic properties to participate in the state and federal rehabilitation tax credit programs.

Although listing on the National Register does not protect properties from alteration, its serves as a good way to bring recognition and pride in a community's historic properties. National Register landmarks and districts also serve to pinpoint areas in a community where preservation and local protection may be implemented.

Benefits of preservation include the following:

- Historic resources are top tourist destinations. Revitalized buildings and historic districts attract new business and tourists, stimulating retail sales and increasing sales tax revenue.
- Historic rehabilitation creates new jobs during construction and later in new offices, shops, and restaurants.
- Tax incentives are available for rehabilitation.
- Less energy is required to rehabilitate old buildings than to demolish and replace them with new construction.

As a means to protect historic resources, the City has designated the Seminary Hill Design Overlay District. The zoning overlay district was established to protect and enhance the historic nature of the district and to establish standards to maintain the unique historical, architectural, cultural and archaeological resources in this portion of the city generally surrounding Southern Virginia University. Furthermore, the standards are intended to strengthen the city's economy by promoting and enhancing business and tourism.

CURRENT INITIATIVES

Buena Vista Downtown Historic District. The designation of the Buena Vista Downtown Historic District in 2009 qualifies owners of certain historic properties to participate in the state and federal rehabilitation tax credit programs.

Tourism Zones. The designated Tourism Zone as shown on Map 5.4 in Economy Chapter has some overlap with the Buena Vista Downtown Historic District. This permits the City to grant tax incentives and provide certain regulatory flexibility in a tourism zone.

Historic Resources
STRATEGIES FOR ACTION

Goal 1: Historic Resources

The City of Buena Vista will be a community that supports the preservation and protection of historic resources. Historic resources are vital assets that support economic development, community revitalization, education, and civic pride and contribute to the character of the community.

To achieve this goal, the following critical success factors must be accomplished:

- Preserve older and historic structures, landscapes and features in order to provide a sense of identity.
- Increase awareness of neighborhood and block landmarks that create community character and provide linkages to the past.
- Increase awareness of the social and economic value of historic preservation.

		Priority	Responsibility
5A	Encourage and promote festivals highlighting Buena Vista's heritage.	M	Economic Development, Parks & Rec, Celebrate Buena Vista
5B	Promote historic destinations that provide entertainment and educational opportunities.	M	Economic Development, Parks & Rec, Celebrate Buena Vista
5C	Increase awareness of the Kanawha Canal system by developing an interpretive multi-use trail along the Maury River.	L	Economic Development, Parks & Rec
5D	Increase accessibility to and interpretation of historic places.	L	Economic Development, Parks & Rec
5E	Continue to develop and maintain productive partnerships among various organizations to promote and accomplish historic preservation goals.	On Going	Economic Development
5F	Promote participation in state and federal rehabilitation tax credit program.	On Going	Economic Development
5G	Provide information to support repair, rehabilitation, restoration, and conservation of historic buildings.	On Going	Planning
5H	Support and encourage the productive reuse of unused and underutilized historic buildings in ways that are respectful of their character.	On Going	Planning
5I	Promote a greater inter-relatedness between historic preservation, community revitalization, and tourism development and promotion activities.	On Going	Economic Development, Planning

		Priority	Responsibility
5J	Promote the installation of interpretive signage for historic properties by private owners, historical organizations, and the City of Buena Vista.	M	Planning, Historical Society
5K	Review existing zoning regulations so that preservation of historic structures is encouraged.	On Going	Planning
5L	Favor transportation routes and improvement that do not compromise the historic character of the community.	On Going	Planning

High (H) = Years 1-5
Medium (M) = Years 5-7
Low (L) = Years 7-10
On Going = Strategies with zero to minimal costs associated with implementation. These strategies may be completed at any time throughout the life of the plan.

CHAPTER 3
Natural Resources

Buena Vista is an urban area. The City recognizes, however, that its natural environment needs to be sensibly preserved and enhanced to promote recreational opportunities, to control rainwater, to protect property, and to improve water quality. Furthermore, Buena Vista's surroundings among the mountains and along the Maury River contribute to the overall quality of life of the City. Buena Vista's natural features pose special opportunities and challenges that require consideration in comprehensive planning.

The basic goal is to manage natural resources so that they continue to provide social, economic and environmental benefits to people over time while supporting other important natural functions. The elements of the environment form the foundation for the quality of life that residents often seek when choosing a place to live and work. A quality of life founded on clean and accessible waterways, scenic views, woodlands, and outdoor recreation is particularly important in today's mobile society where people and companies move more frequently than in the past.

The City's natural features are its 'green' infrastructure. Green infrastructure is the interconnected network of land and water that contributes to the health, economic well being and quality of life for communities and people. It requires investment and maintenance just like roads, sewers and utility systems. This chapter identifies environmentally sensitive areas, balances land use and economic development practices with environmental protection, and sets goals and policies for sensible management and protection of sensitive areas.

RELATIONSHIP TO OTHER PLAN ELEMENTS

Economy. Natural resources and environmental quality can be key elements of an economic development program. Natural resources can support local manufacturing in addition to tourism and recreation.

Infrastructure and Utilities. Recycling and reuse programs decrease the waste stream to the landfill/transfer station.

Transportation. Transportation corridors can serve a recreational purpose. Additionally, corridors can be enhanced by preserving viewsheds and buffers.

Land Use. Natural resources affect how land can be used and how the use of land affects the natural resources. Land use, transportation and utility initiatives, policies and impacts need to be integrated with environmental policies.

ENVIRONMENTAL CHARACTERISTICS

Natural landscapes are the result of the interplay of geology, climate, hydrology, slopes, soils, vegetation, and wildlife. Below is a summary of significant physical characteristics of the City of Buena Vista, its land and water features.

Climate

The City of Buena Vista has a generally moderate climate as reflected in the table below, Table 3.1.

Table 3.1
Buena Vista Monthly Climate Summary
June 15, 1937 to July 31, 2010

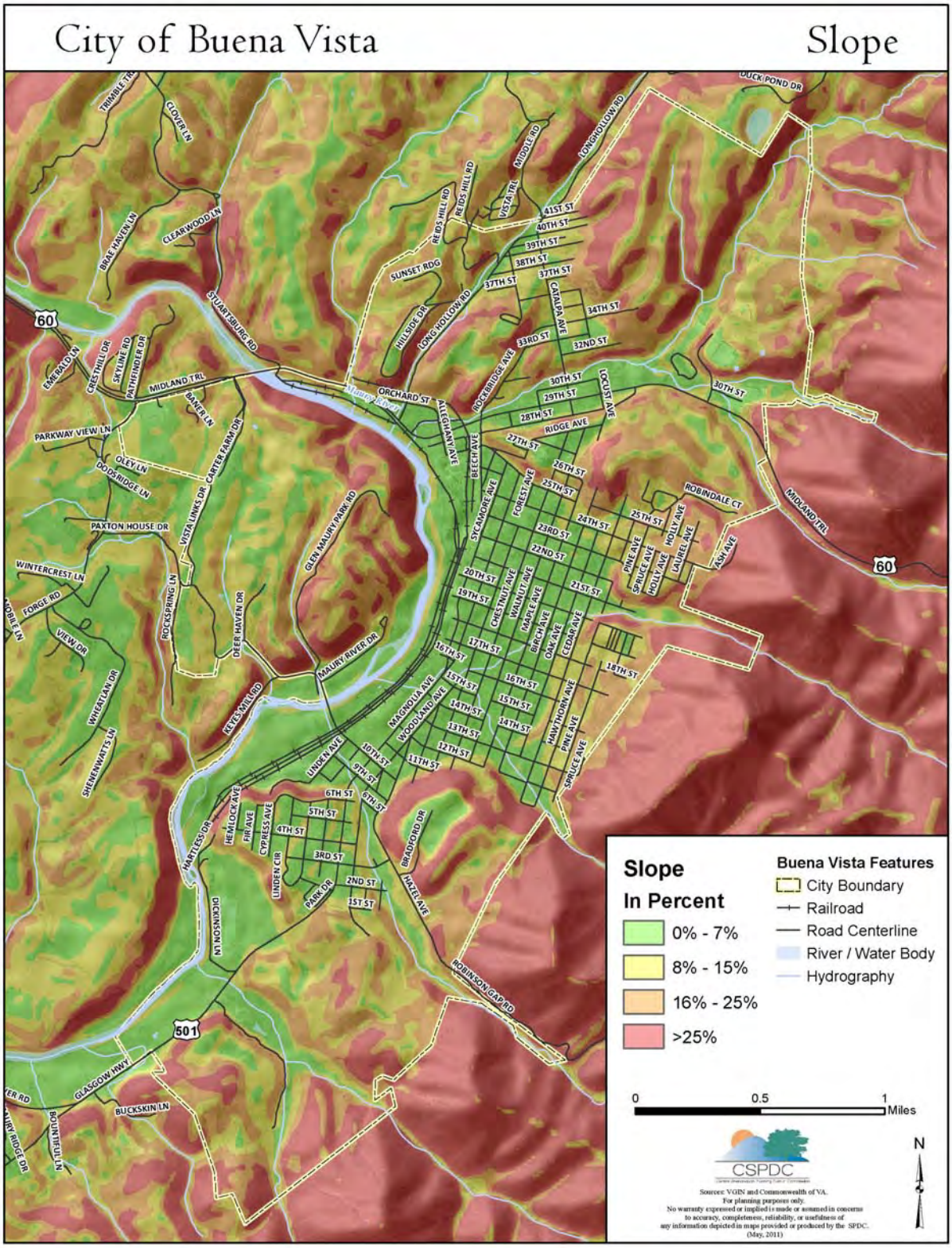
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average Max Temperature (F)	45.0	51.4	60.3	71.4	79.5	84.4	89.5	89.5	83.2	70.4	60.5	48.7	69.5
Average Min Temperature (F)	21.1	24.8	31.3	40.8	51.3	58.3	62.4	60.8	55.1	42.7	32.7	23.8	42.1
Average Total Precipitation (in.)	2.63	2.66	3.25	3.08	3.54	3.42	3.83	3.31	3.38	3.38	3.11	3.09	38.69
Average Total Snowfall (in.)	5.1	3.7	2.0	0.1	0.0	0.0	0.0	0.0	0.1	0.1	0.4	2.5	13.9
Average Snow Depth (in.)	1	0	0	0	0	0	0	0	0	0	0	0	0

Source: Southeast Regional Climate Center

Slope

The topography of the City varies greatly. Steep slopes, a result of geology, hydrology and climate, create dramatic landscapes that define community character but also limit development. Slope in Buena Vista is shown on Map 3.1. Slope affects the use of land as described below:

Map 3.1


City of Buena Vista
Slope
Slope
In Percent
0% - 7%
8% - 15%
16% - 25%
>25%
Buena Vista Features
City Boundary
Railroad
Road Centerline
River / Water Body
Hydrography
0
0.5
1
Miles
N
CSPDC
Source: VGIN and Commonwealth of VA.
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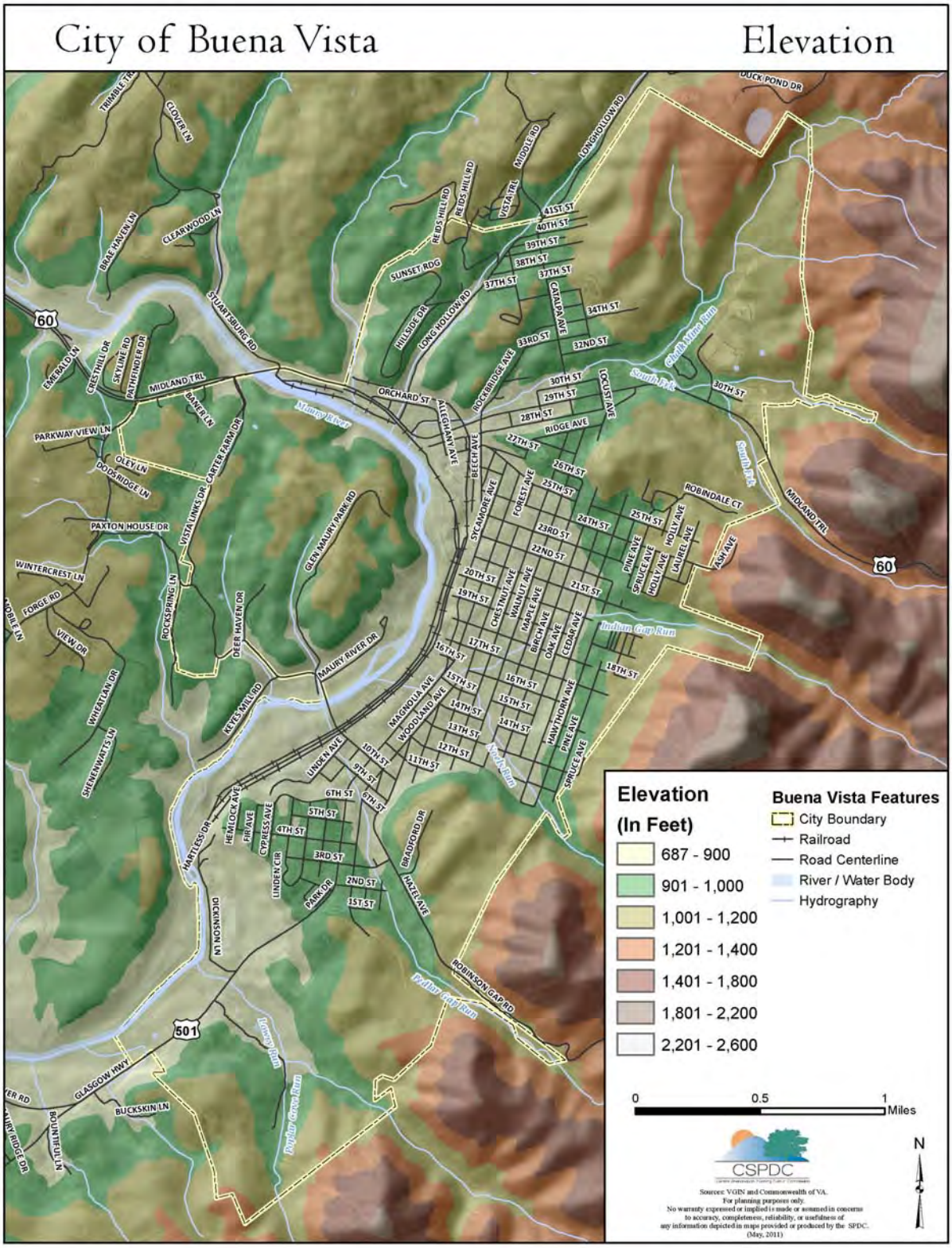
(May, 2011)
60
501
ORCHARD ST
MIDLAND TRL
MAURY RIVER DR
GLEN MAURY PARK RD
STUART'S BURG RD
LONG HOLLOW RD
REIDS HILL RD
SUNSET RDG
HILLSIDE DR
ALLEGHANY AVE
BEECH AVE
SYCAMORE AVE
FOREST AVE
CHESTNUT AVE
WALNUT AVE
MAPLE AVE
BIRCH AVE
OAK AVE
CEDAR AVE
MAGNOLIA AVE
WOODLAND AVE
HAWTHORN AVE
PINE AVE
SPRUCE AVE
LINDEN AVE
HEMLOCK AVE
FIR AVE
CYPRESS AVE
LINDEN CIR
PARK DR
BRADFORD DR
HAZEL AVE
DICKINSON LN
HARTLESS DR
ROBINSON GAP RD
GLASGOW HWY
BUCKSKIN LN
BOUNTIFUL LN
ROCKSPRING LN
DEER HAVEN DR
KEYES MILL RD
PARKWAY VIEW LN
OLEY LN
DOOSBRIDGE LN
CARTER FARM DR
VISTA LINKS DR
PAXTON HOUSE DR
WINTERCREST LN
FORGE RD
VIEW DR
WHEATLAN DR
SHENENWATTS LN
BAKER LN
EMERALD LN
CREST HILL DR
SKYLINE RD
PATHFINDER DR
BRAE HAVEN LN
CLEARWOOD LN
CLOVER LN
TRIMBLE TRL
DUCK POND DR
MIDDLE RD
LONGHOLLOW RD
VISTA TRL
ROBINDALE CT
HOLLY AVE
LAUREL AVE
ASH AVE
PINE AVE
SPRUCE AVE
HOLLY AVE
LOCUST AVE
RIDGE AVE
CHALPA AVE
RIDGEBRIDGE AVE
41ST ST
40TH ST
39TH ST
38TH ST
37TH ST
34TH ST
33RD ST
32ND ST
30TH ST
29TH ST
28TH ST
27TH ST
26TH ST
25TH ST
24TH ST
23RD ST
22ND ST
21ST ST
20TH ST
19TH ST
18TH ST
17TH ST
16TH ST
15TH ST
14TH ST
13TH ST
12TH ST
11TH ST
10TH ST
9TH ST
8TH ST
6TH ST
5TH ST
4TH ST
3RD ST
2ND ST
1ST ST

Map 3.2


City of Buena Vista
Elevation
Elevation
(In Feet)
687 - 900
901 - 1,000
1,001 - 1,200
1,201 - 1,400
1,401 - 1,800
1,801 - 2,200
2,201 - 2,600
Buena Vista Features
City Boundary
Railroad
Road Centerline
River / Water Body
Hydrography
0
0.5
1
Miles
N
CSPDC
Source: VGIN and Commonwealth of VA.
For planning purposes only.
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(May, 2011)
Maury River
South Fork
Indian Gap Run
Reed Run
Taylor Grove Run
Taylor Run
Tolney Run
60
501
ORCHARD ST
MIDLAND TRL
PARKWAY VIEW LN
PAXTON HOUSE DR
WINTERCREST LN
FORGE RD
VIEW DR
WHEATLAN DR
SHENENWATTS LN
KEYES MILL RD
MAURY RIVER DR
DEER HAVEN DR
ROCKSPRING LN
GLEN MAURY PARK RD
VISTA LINKS DR
CARTER FARM DR
DODDSRIDGE LN
OLEY LN
BAKER LN
STUARTSBURG RD
BRAE HAVEN LN
CLEARWOOD LN
CLOVER LN
TRIMBLE TR
EMERALD LN
CRESTHILL DR
SKYLINE RD
PATHFINDER DR
SUNSET RDG
REIDS HILL RD
VISTA TRL
MIDDLE RD
LONGHOLLOW RD
HILLSIDE DR
CAHUPA AVE
ROCKBRIDGE AVE
ALLEGHANY AVE
BEECH AVE
SYCAMORE AVE
FOREST AVE
LOCUST AVE
RIDGE AVE
41ST ST
40TH ST
39TH ST
38TH ST
37TH ST
34TH ST
33RD ST
32ND ST
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29TH ST
28TH ST
27TH ST
25TH ST
24TH ST
23RD ST
22ND ST
21ST ST
20TH ST
19TH ST
18TH ST
17TH ST
16TH ST
15TH ST
14TH ST
13TH ST
12TH ST
11TH ST
10TH ST
9TH ST
6TH ST
5TH ST
4TH ST
3RD ST
2ND ST
1ST ST
CHESTNUT AVE
WALNUT AVE
MAPLE AVE
BIRCH AVE
OAK AVE
CEDAR AVE
MAGNOLIA AVE
WOODLAND AVE
LINDEN AVE
HEMLOCK AVE
FIR AVE
CYPRESS AVE
LINDEN CIR
PARK DR
HARTLESS DR
DICKINSON LN
HAYES AVE
BRADFORD DR
HAWTHORN AVE
PINE AVE
SPRUCE AVE
HOLLY AVE
LAUREL AVE
ASH AVE
PINE AVE
SPRUCE AVE
ROBINDALE CT
DUCK POND DR
LONGHOLLOW RD
ROBINSON GAP RD
GLASGOW HWY
BUCKSKIN LN
BOUNTIFUL LN
ARROWHEAD RIDGE DR

Slope Categories and Development Limitations

0% to 7% - Flat to moderately sloping

- No slope limitation on development
- Some of these areas are subject to flooding and poor drainage

8% to 15% - Rolling land

- Few limitations for residential, commercial and industrial activities not requiring large amounts of level ground
- Development of larger tracts is more limited due to grading costs

16% to 25% - Hilly land

- Suitable for residential development if site planning takes topography into account
- Construction of water and sewer facilities can be quite costly and economically infeasible

Greater than 25%

- Usually considered unsuitable for intensive development
- Can be used for outdoor recreation and watershed protection

There are a number of issues associated with development on steep slopes, hillsides and ridgelines. These include health, safety, and environmental considerations as well as the aesthetic quality of hillsides and ridgelines. Protecting hillsides and steep slopes from development helps to preserve those unique environmental qualities that people value. Furthermore, development on steep slopes can have an adverse effect on water quality as a result of increased erosion and sedimentation.

A logical method for addressing the negative impacts of hillside development is to reduce the intensity of development as the grade of the slope increases. This type of regulation allows for some hillside development. Pairing slope/density regulations with grading regulations helps to ensure that those sites are developed as safely as possible. The City of Buena Vista Land Development Regulations currently does not define steep slopes nor does it regulate hillside development.

Most of the central area of the City is relatively flat, gently sloping down to the Maury River. The area around Southern Virginia University (SVU) has some moderate and steep slopes. The northern and southern ends of the City tend to be more hilly and varied than the rest of the City. North of the City, the land is mostly too steep to be practical for development. Areas south of the City are also very steep.

On the east side of Buena Vista, the City meets the mountains and there is a band of relatively sparse development on moderately sloped areas. Just beyond the City's eastern corporate limits, the land rises dramatically into the Blue Ridge Mountains as shown in red on Map 3.1. West of Glen Maury Park there are steep slopes along the stream, but the land is generally rolling. The elevation map also provides a sense of Buena Vista's landscape (See Map 3.2).

Soils

Soils are a natural assortment of organic materials and mineral fragments. The composition of soils changes slowly over time form weathering of rock and activity of soil organisms. Consequently, soils differ in their color, mineral characteristics, fertility, texture, erodibility, and depth to bedrock and groundwater. Soils are classified into several groups called soil series.

There are three general soil associations in the Buena Vista area. These include the following:

1. Alluvial Soils – Along most of the streams in Rockbridge County are strips of floodplain and terrace soils which are comparatively wide in places. The most commons soils in these areas are soils of the Allegheny Series, the Chagrin Series, the Pope Series, and the Wheeling Series. These soils represent the finer materials washed from the limestone and mountain areas and deposited by the streams at times of overflow. These soils are generally deep and well drained. The topsoils range from silt loams to sandy loams and the subsoils from sand loams to clays. Alluvial soils are generally among the least suitable soils for development and should be protected from encroachment.

2. Colluvial Soils – The soils along the foot slopes of the mountains are derived from colluvial outwash from the sandstone and shale mountains. The most common soils found in this area are of the Allen Series and the Jefferson Series. These soils are generally deep and well drained. Topsoils are fine sandy loams, silt loams or clay loams while the subsoil is generally a fine sandy clay.

3. Valley Carbonate Soils – These soils are derived from limestones and dolomites and make up the major portion of the Shenandoah Valley. The most common soils found in this area are of the Frederick Series, the Hagerstown Series, and the Decatur Series. These soils range from shallow to deep and are generally well to excessively drained. Topsoils are commonly silt loams and silty clay loams while subsoils are mostly clays and silty clay loams.

Most of Buena Vista lies on soils of Wheeling silt loam. This soil generally imposes few limitations for urban development except in areas of steep slopes. There are other soils in and around the City which do present some limitations for urban development. It should be noted that these areas may be developable with appropriate site engineering and construction practices, but it would be better to avoid development.

In the southern end of the City there is a large area of Decatur silt loam which has sever limitations for residential development on slopes greater than 15 percent and severe limitations for commercial development on slopes greater than 8 percent. There are also severe limitations for the construction of local roads and streets due to the low strength of the soil. However, the soil conditions are fairly inconsequential as the area is already developed residentially and is adequately served by existing roads.

On the southern and eastern faces of Mineral Ridge are bands or Porter very stony loam which has sever limitations for residential and commercial development and the construction of roads on slopes greater than 15 percent.

To the northwest of the City are areas of three soils which have severe limitations for urban development, largely due to flooding and low strength. These include Chagrin silt loam, Braddock loam and Allegheny fine sandy loam.

In areas west of Glen Maury Park there are large areas of soils in the Frederick and Hagerstown Series which have severe limitations for urban development on slopes greater than 15 percent and generally have severe restrictions on land sloping greater than 2 percent for the construction of local streets and roads.

Surface Water

Water is a valuable and vital resource. It is consumed by plants, animals, people and industry. Furthermore, it is enjoyed for recreation. Water features are divided into surface and groundwater resources.

The most visible components of the City's hydrology are the streams and creeks that drain the landscape. The City of Buena Vista is located on a bend of the Maury River about 11 miles above the confluence of the Maury and the James Rivers and at the foot of the steep western slopes of the Blue Ridge Mountains. Buena Vista is within the Upper James River watershed. A watershed includes the area of land that is drained by a river and its tributaries. Ridges or divides separate watersheds from each other. The Upper James River Basin has a dense stream network, relatively steep slopes, and highly erodible soils, which lead to a considerable amount of stream bank erosion.

The Maury River is one of the primary forces within the community. Industrial and commercial sectors have followed a traditional urban pattern of locating near the river. Because of their proximity to the river and the floodplain, these sectors along with residential development have been severely impacted by flooding.

Five interior streams – Chalk Mine Run, Long Hollow Run, Pedlar Gap Run, Indian Gap Run, and Noel's Run traverse the City through predominately residential areas. Sudden rainfall on the mountains results in rapid runoff. The floodwaters quickly flow to the City where they slow down and then spread out over the City causing damage. The City has completed several projects to alleviate its flooding problems along the Maury River and the City's interior streams. These are discussed in Chapter 6, Infrastructure and Utilities.

Streams are fed by two natural sources, direct runoff and groundwater. Effluent from sewage treatment plants also contributes to stream flow. For example, water from the Buena Vista Wastewater Treatment plant is discharged to the Maury River after treatment. Each stream has received a water quality designation that relates to the different water uses. The designation indicates the stream's value in protecting and propagating aquatic life. Because each protected use has chemical and biological characteristics and other stream conditions that need to be maintained, the designations also indicate stream quality. The Virginia Department of Environmental Quality (DEQ) develops and submits a Water Quality Assessment report to the U.S. Environmental Protection Agency every even-numbered year. The Maury River is impaired through Buena Vista for fish consumption and swimming (recreation).

Watersheds can be difficult to manage since they are usually covered by a number of separate municipalities with different governments and land use policies. It is important for communities to recognize that flood levels and water quality can be very much affected by land use activities that occur else where in a watershed.

The City of Buena Vista is participating with eleven other communities in developing a regional water supply plan for the Upper James River watershed. Each locality is mandated through the Virginia Department of Environmental Quality (DEQ) to develop a local water supply plan. The purpose of the plan is threefold: (1) ensure that adequate and safe drinking water is available to citizens; (2) encourage, promote, and protect all other beneficial uses of water resources; and (3) encourage, promote, and develop incentives for alternative water sources. As its name indicates, this plan is focused on water supply and does not address water quality.

Floodplains

Floodplains are lands adjoining a stream or other body of water that have been or may be covered with water. Floodplains in Buena Vista have been mapped by the Federal Emergency Management Agency (FEMA). The 100-year and 500-year floodplain is shown on Map 3.3. The 100-year flood designation applies to the area that has a 1 percent chance, on average, of flooding in any given year. The 100-year flood is also referred to as the base flood. It is the basis of the insurance and floodplain management requirements of the National Flood Insurance Program. The 500-year designation is the area that has a 0.2 percent change, on average, of flooding in any given year.

The first major flood for which accurate data is available occurred in March 1936. The Maury River crested at 22 feet. Flood stage is at 17 feet. Since 1969, the City has had eight flood occurrences. They are shown in Table 3.2, below.

Table 3.2
Categorical Floods
Maury River near Buena Vista, VA
Period of Record 1966-2008

Crest Date	Crest (ft)	Remarks
Minor Flood = 17.0 ft – 18.99 ft		
June 21, 1972	17.10	Remnants of Hurricane Agnes
April 22, 1992	18.99	Heavy downpours from thunderstorms
June 23, 1995	17.99	Two weather systems collided
January 19, 1996	18.27	Sudden melting of a record 30-inch snowfall combined with a 24-hour rainfall
September 7, 1996	18.90	Remnants of Hurricane Fran
Moderate Flood = 19.0 ft – 20.99 ft		
June 28, 1995	19.48	Two weather systems collided
Major Flood = 21.0 ft or greater		
August 20, 1969	31.23	Remnants of Hurricane Camille
November 5, 1985	26.30	Remnants of Hurricane Juan followed by a coastal low

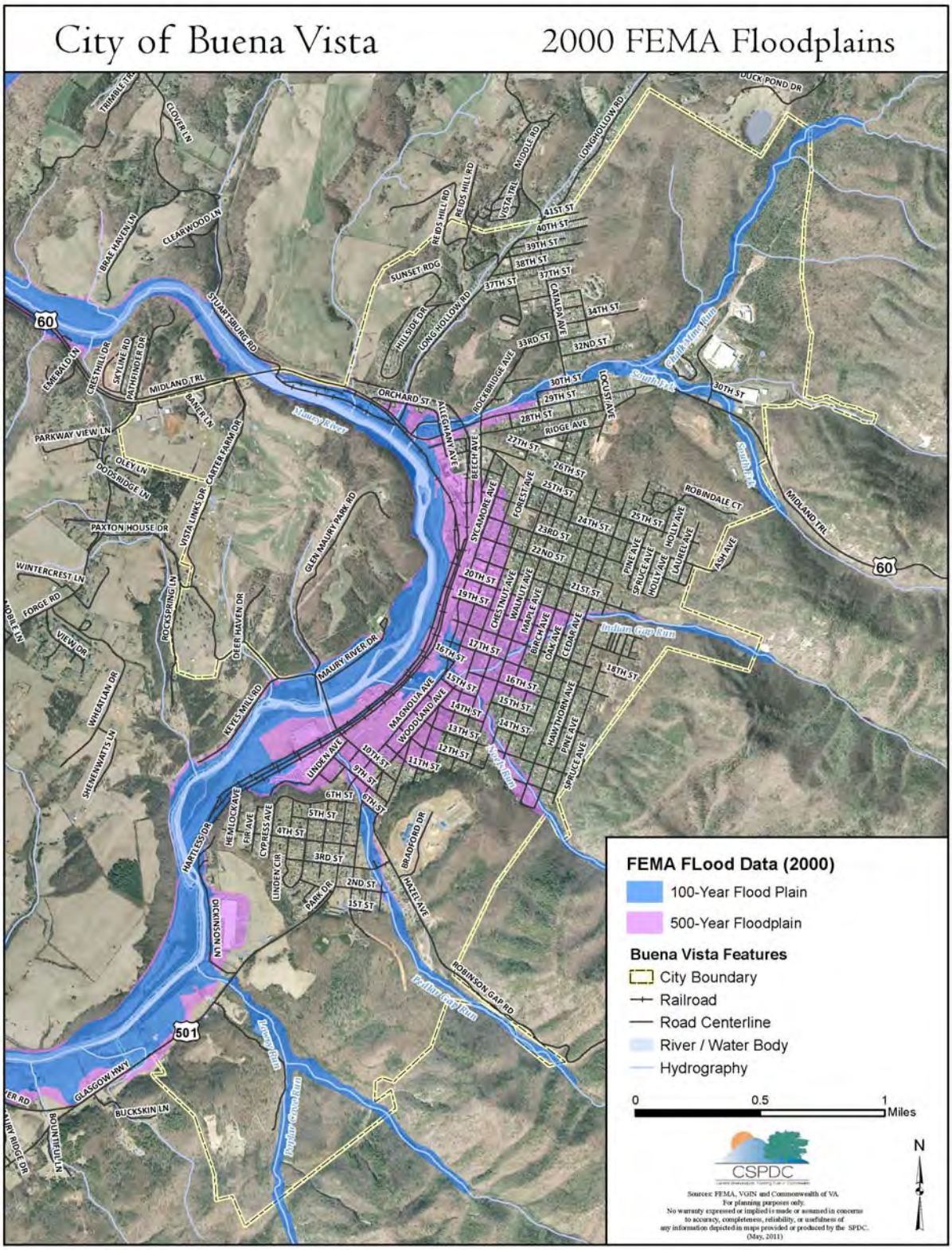
Source: National Weather Service, Eastern Region Headquarters

These floods have hurt the community of Buena Vista economically. After the flood of 1985, the City aggressively pursued assistance from the U.S. Army Corps of Engineers and the Commonwealth of Virginia to reduce flooding, and consequently, damage to the City's businesses, homes, and infrastructure. No floods have been recorded since the completion of the James R. Olin Floodwall which was completed in 1997. This flood protection project was designed to provide protection equivalent to that needed during the greatest flood of record, Hurricane Camille in 1969.

The floodplain, while covering a relatively small area of the City's total land area, contains a substantial portion of its railroad, industrial, public and commercial property (See Map 3.4). Intensive development, whether residential, commercial or industrial, is discouraged within the 100 year floodplain. Floodplains, however, offer few limitations to non-intensive uses such as forestry, recreation and open space. For example, River Walk and portions of Glen Maury Park are located in the 100-year floodplain.

Map 3.5 combines the information for steep slopes, wetlands, and the 100-year floodplain. These areas are best suited for outdoor recreation and environmental protection. Intensive development should be avoided.

Map 3.3


City of Buena Vista
2000 FEMA Floodplains
FEMA FLood Data (2000)
100-Year Flood Plain
500-Year Floodplain
Buena Vista Features
City Boundary
Railroad
Road Centerline
River / Water Body
Hydrography
0
0.5
1
Miles
N
CSPDC
Sources: FEMA, VGIN and Commonwealth of VA
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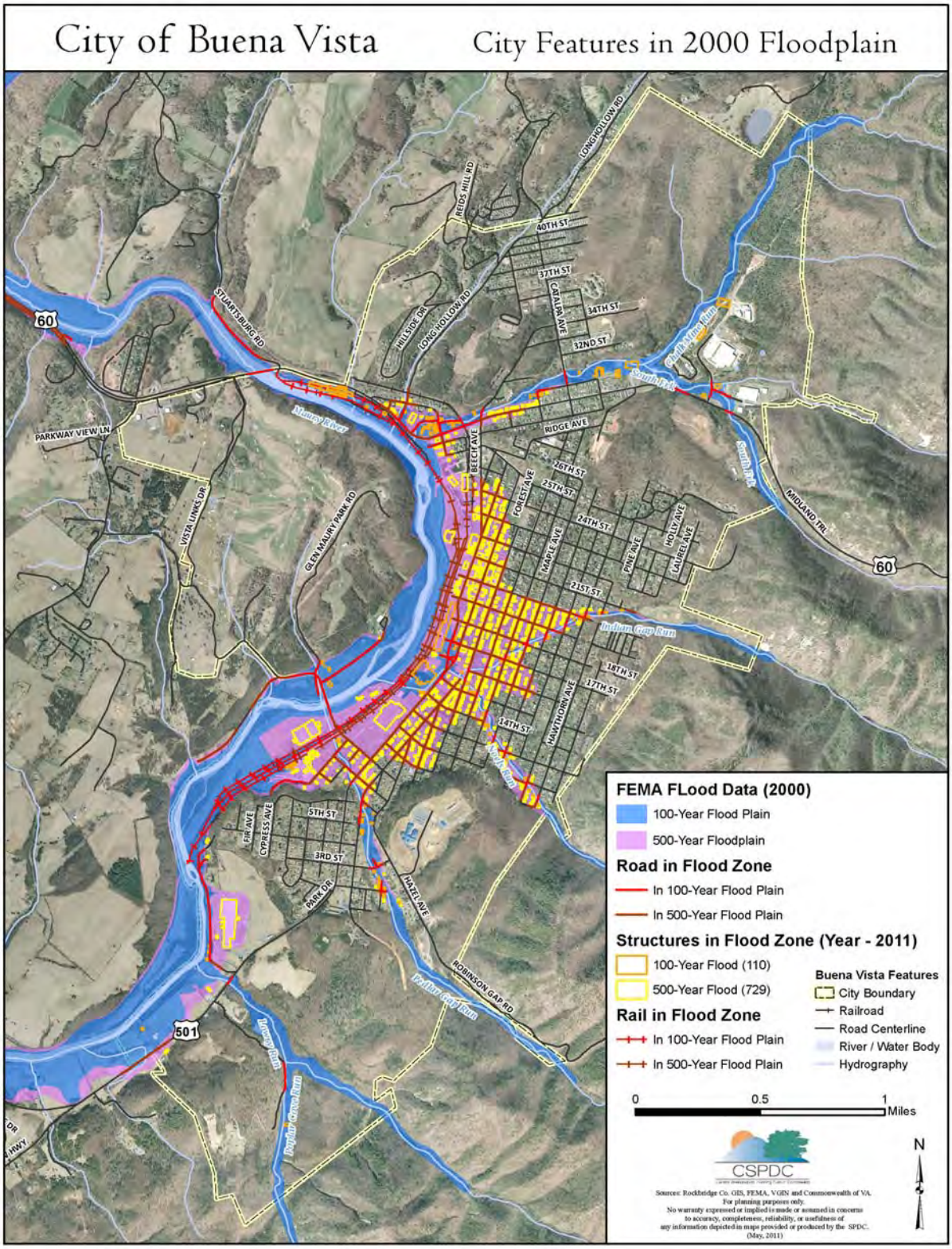
(May, 2011)

Map 3.4


City of Buena Vista
City Features in 2000 Floodplain
FEMA FLood Data (2000)
100-Year Flood Plain
500-Year Floodplain
Road in Flood Zone
In 100-Year Flood Plain
In 500-Year Flood Plain
Structures in Flood Zone (Year - 2011)
100-Year Flood (110)
500-Year Flood (729)
Rail in Flood Zone
In 100-Year Flood Plain
In 500-Year Flood Plain
Buena Vista Features
City Boundary
Railroad
Road Centerline
River / Water Body
Hydrography
0
0.5
1
Miles
N
CSPDC
Source: Rockbridge Co. GIS, FEMA, VGIN and Commonwealth of VA.
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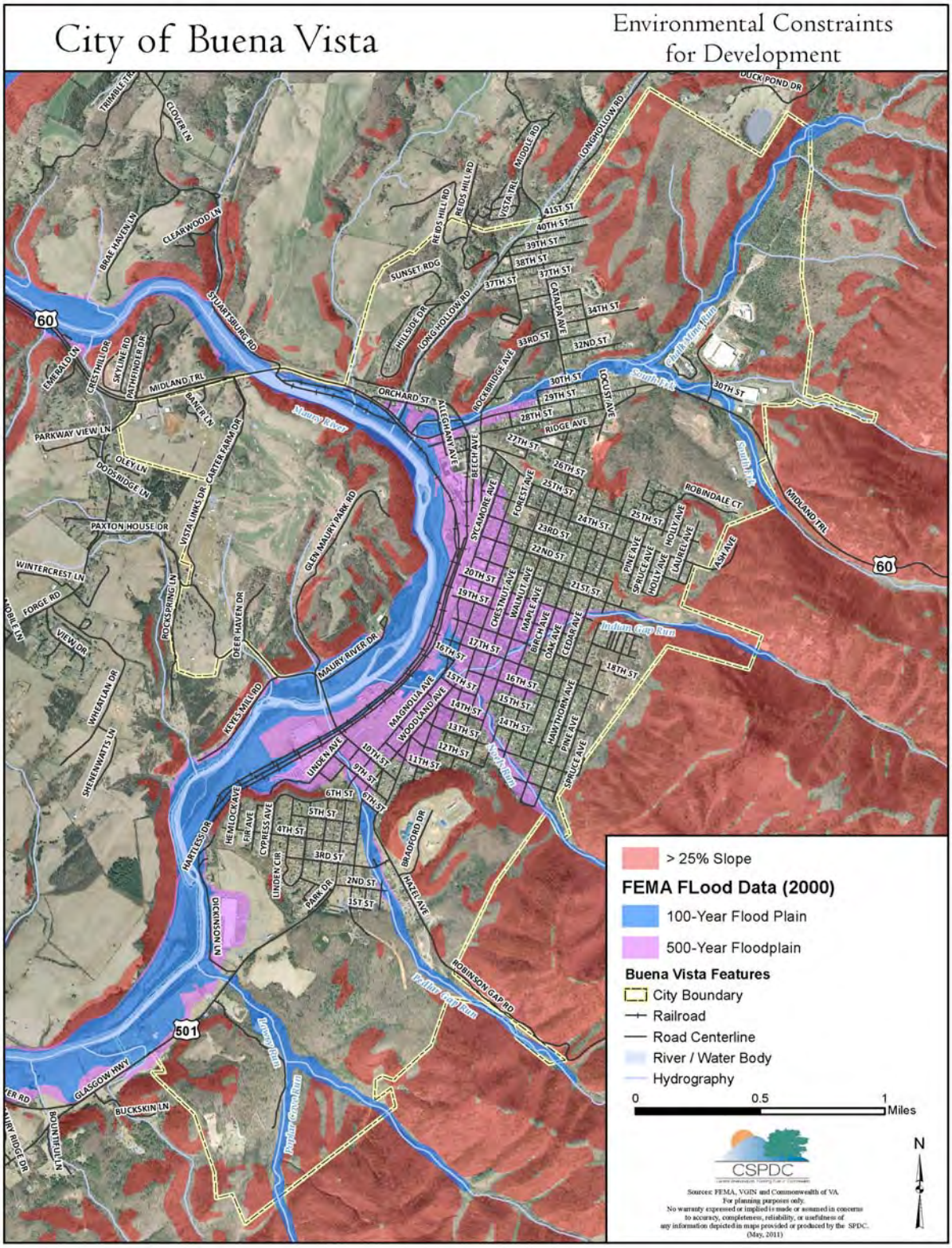
(May, 2011)
60
501
STUARTS BURG RD
PARKWAY VIEW LN
VISTA LINKS DR
GLEN MAURY PARK RD
REIDS HILL RD
LONG HOLLOW RD
HILLSIDE DR
CAMPBELL AVE
40TH ST
37TH ST
34TH ST
32ND ST
RIDGE AVE
BEECH AVE
FOREST AVE
26TH ST
25TH ST
24TH ST
MAPLE AVE
PINE AVE
HOLLY AVE
LAUREL AVE
21ST ST
18TH ST
17TH ST
14TH ST
HAWTHORN AVE
MIDLAND TRL
5TH ST
3RD ST
FIR AVE
CYPRESS AVE
PARK DR
HAYES AVE
ROBINSON GAP RD
Maury River
Indian Gap Run
Brushy Run
Doyles Gap Run

Map 3.5


City of Buena Vista
Environmental Constraints for Development
> 25% Slope
FEMA FLood Data (2000)
100-Year Flood Plain
500-Year Floodplain
Buena Vista Features
City Boundary
Railroad
Road Centerline
River / Water Body
Hydrography
0
0.5
1
Miles
N
CSPDC
Source: FEMA, VGIN and Commonwealth of VA
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(May, 2011)
Maury River
Indian Creek Run
South Fork
60
501

Groundwater

Groundwater behaves much like surface water, flowing like a stream, only much slower. Groundwater is tapped as a source of drinking water and for industrial purposes. Drinking water supplies for Buena Vista are drawn from local groundwater resources. Buena Vista's waterworks consist of five drilled wells and one spring (See Chapter 6, Infrastructure and Utilities). Replenishment of groundwater occurs slowly as precipitation and stream water seep through the soil.

Undeveloped, undisturbed land is essential to groundwater recharge. Vegetation slows runoff and retains precipitation where it falls, allowing it to soak into the soil rather than run off the surface. Impervious surfaces, such as roads, parking lots and buildings, prevent infiltration of precipitation and can reduce the amount of groundwater that replenishes streams during dry weather. Excessive impervious surface also creates flooding hazards because stormwater is concentrated. It can also cause dry wells and insufficient aquifer recharge.

Water supplies for the City of Buena Vista are drawn from local groundwater resources including five drilled wells and one spring. Communities need to be knowledgeable about their drinking water resources for a number of reasons:

- To minimize the potential risks to the health and vitality of the community;
- To avoid the potential costs associated with cleaning up contaminated groundwater and providing alternate supplies of water; and
- To avoid the negative economic impacts on a community that groundwater contamination could cause.

One method to minimize the potential of groundwater contamination is to protect a portion of the land area supplying water to the well as a wellhead protection area. After determining the area to be protected, a community will be able to focus pollution prevention efforts. A community can then create a management plan to control land use within the protection area to minimize the potential for groundwater contamination. Ideally, a wellhead protection area is the entire recharge area for the well. The recharge area is identified as the entire area of land that allows water and other fluids to flow into the subsurface and move toward the well. Wellhead protection is a progressive pollution prevention tool that has the potential to save each community many thousands of dollars and provide a quality drinking water supply for the future.

Large and small remnants of woodlands are scattered throughout Buena Vista as a result of development. Woodlands serve many purposes, both functional and aesthetic. Woodlands prevent soil erosion, particularly in areas of steep slopes and shallow soils. Woodlands provide habitat for wildlife and buffers along creeks. Wooded corridors prevent erosion and provide cover for wildlife movement, shelter and migration. These corridors also offer

recreational and educational opportunities for residents. Additionally, woodlands create a scenic quality that cannot be quantified but yet has an intrinsic value that enhances the character of the region.

Appropriate vegetation along surface water features improves water quality by filtering pollutants in stormwater runoff before they reach the waterbody. In woodlands, the understory and herbaceous cover help to stabilize the soil and significantly slow the rate of runoff, decreasing erosion and sedimentation, especially on steep slopes. Removal of the understory and herbaceous cover from steep slopes will lead to higher rates of runoff and can contribute to increased levels of downstream flooding.

Riparian zones surrounding rivers and streams help filter sediments and nutrients, and mitigate the effects of storms and flooding. Riparian buffers are also aesthetically pleasing and can lend themselves to recreation opportunities in the form of greenways and trails such as the Brush Blue Greenway. Priority should be given to limiting development along waterways, restoring and protecting riparian corridors, and enhancing public access to waterfronts.

Vegetation

Buena Vista is partially surrounded by the Jefferson and George Washington National Forests. The trees covering the surrounding mountains create a place of natural beauty. Added to these forested areas, trees within the City, collectively called the urban forest, are an asset to the community and provide many environmental benefits. Trees provide obvious aesthetic benefits, but they also improve air, protect water, save energy, and improve economic sustainability. Among its value, the urban forest functions to:

- Remove carbon dioxide from the atmosphere.
- Reduce topsoil erosion and slow down water run-off.
- Reduce energy consumption by shading roads, buildings, and other structures.
- Absorb pollutants that then stay out of water bodies where they would otherwise harm fish and other aquatic species.
- Enhance traffic calming measures
- Increase property values by as much as 20 percent

Source: *Value, Benefits, and Costs of Urban Trees*, Virginia Cooperative Extension, May 1, 2009.

As Buena Vista grows, management of its trees will become more important for achieving sustainable development and maintaining and enhancing the quality of life and the environment.

OPEN SPACE AND PARKS

The preservation of open space is a wise investment. Open space can:

- Safeguard drinking water and clean the air
- Naturally store and filter rainwater and runoff
- Help clean the air and support a diversity of animal and plant life
- Control erosion when forested
- Clean the air of pollutants and absorb carbon dioxide
- Allow people to learn about and appreciate nature

Beyond its environmental benefits, open space can:

- Define the look and feel of a community
- Improve property values
- Provide places for recreation, rest and relaxation
- Promote socializing with neighbors
- Facilitate physical health and well-being

The City's environmental features, parks, and surrounding public lands define it. The Maury River and Glen Maury Park are integral to the City's identity; it is the lifeblood of the City. Buena Vista is bordered by the George Washington National Forest. Laurel Park sits beside the Indian Gap Run.

Integrating parks and open space into the comprehensive plan is critical to protecting natural systems and improving quality of life. Emphasis should be given to activities such as hiking and biking trails, water access and blueways, and community parks. Integrating these activities into community planning makes walkable, livable communities a reality. This is especially true where local parks and recreation departments work in concert with economic development, tourism and planning departments to create a community vision that connects open space, land conservation and outdoor recreation opportunities. The City of Buena Vista open space and park resources are discussed in Chapter x, Community Facilities.

A greenway is a linear corridor of open space that is used or designated for recreational use and transportation. A greenway typically includes a trail or path and may accommodate a mix of non-vehicular modes of transportation such as walking, bicycle, equestrian, skiing and roller-blades. Greenways can accomplish many goals for a community including conservation and recreation, economic development, transportation, and education.

The Brushy Blue Greenway Master Plan was completed in 2004. The purpose of the plan is to provide a framework for development of a greenway within the Cities of Buena Vista and Lexington, and Rockbridge County. Currently walking trails exist and are used on a regular basis in each locality. In Buena Vista, this includes the Levee Walk that is along the levee at the Maury River. The Brushy Blue Greenway will interconnect the existing trails and

upgrade these trails to a multi-use greeway trail and the creation of new greenway connections. When completed the Brushy Blue Greenway corridor will be approximately 17 miles in length.

Implementation of the Brushy Blue Greenway will be good for both the watershed (erosion and flood control, bank stabilization) and wildlife (creating and safeguarding habitat and improved opportunities for observing wildlife). The greenway will also improve air quality by promoting alternative transportation to cars and by encouraging planting of trees. The Brushy Blue Greenway will serve as a living classroom for area schools, colleges and universities, and provide an example of community development.

As outlined in the Brushy Blue Greenway Master Plan, it is desirable to maintain the maximum distance possible between environmental resources such as creeks and streams and the trail. This is so that proper biological buffers can be established and so people are not encouraged to walk in areas where they can cause damage.

In addition to environmental benefits of a greenway, greenways can accomplish other community goals. For the City of Buena Vista, a greenway would enhance City life by providing:

- A recreational outlet for hiking, walking, jogging, and biking.
- A safe "off the road" means for children and pedestrian to travel between neighborhoods, downtown areas, recreational areas and educational sites.
- Improved access to downtown businesses creating an enhanced tourist profile.
- Educational opportunities to learn about cultural and natural heritage.
- The opportunity to create a showcase multi jurisdictional greenway to improve residents' quality of life.

BROWNFIELDS

Brownfield refers to real property, the expansion, redevelopment, or reuse of which may be complicated by the presence or potential presence of a hazardous substance, pollutant, or contaminant. Cleaning up and reinvesting in these properties protects the environment, reduces blight, and takes development pressures off greenspaces and working lands.

The former Reeves Brothers site was a brownfield. In 1988 after a disastrous flood, the Reeves Brothers closed its facility in Buena Vista. During the 1990s, the contamination on the site was addressed. The building remained vacant over the next 20 years. Today the site is occupied by Auto Recyclers LLC. Additional vacant properties in the City need to be assessed for redevelopment opportunities.

ZONING PROTECTIONS

Through the City of Buena Vista Land Development Regulations environmental resources are protected. These include the following districts:

Conservation District C-1
The C-1 District covers various open uses such as agriculture, National Forests and Parks, state owned forest and park lands and local government owned lands. The district was established for "the specific purpose of providing recreation and open space uses, conservation of water and other natural resources reducing soil erosion, protecting watersheds, and reducing hazards from flood and fire." (601.01) Such uses as parks and playgrounds, public infrastructure, and agriculture are permitted.

Recreation District REC
This district is similar to the C-1 Conservation District. The intent of the district is identical to the C-1 District. However, the REC District permits cabins and cottages.

Flood Hazard District FH-1
In 1985, Buena Vista adopted a floodplain management ordinance. The purpose of the Flood Hazard District it "to prevent the loss of life and property, the creation of health and safety hazards, the disruption of commerce and governmental services, the extraordinary and unnecessary expenditure of public funds for flood protection and relief, and the impairment of the tax base." (612.01) The FH-1 District is an overlay district that applies to all lands that are identified as being flood prone.

The ordinance requires new residential buildings to be elevated to or above the base flood elevation (BFE). Additional requirements prevent the obstruction of the floodway portion of the floodplain, the primary flow area.

CURRENT INITIATIVES

Brushy Blue Greenway. The Brushy Blue Greenway Master Plan was completed in 2004. The purpose of the plan is to provide a framework for development of a greenway within the Cities of Buena Vista and Lexington, and Rockbridge County. Currently walking trails exist and are used on a regular basis in each locality. In Buena Vista, this includes the Levee Walk that is along the levee at the Maury River. The Brushy Blue Greenway will interconnect the existing trails and upgrade these trails to a multi-use greeway trail and the creation of new greenway connections. When completed the Brushy Blue Greenway corridor will be approximately 17 miles in length.

Gateway Landscaping Plan. The City of Buena Vista received a grant in June 2010 to complete a professional landscape and tree planting plan for the gateway area that connects the Blue Ridge Parkway to the City's central commercial district. The funding was awarded through the Urban and Community Forestry Assistance Program administered through the Virginia Department of Forestry.

SUMMARY OF NATURAL RESOURCES

- The City of Buena Vista is defined by its environmental features – the Maury River, surrounding forest land, steep slopes.
- Its environmental features, particularly the Maury River, create economic opportunities for the City.
- The City needs to protect and invest in its green infrastructure.

RELATED STUDIES AND REPORTS

Draft 2010 305(b)/303(d) Water Quality Assessment Integrated Report, Virginia Department of Environmental Quality, August 23, 2010.

Buena Vista Watershed: Final Plan-Environmental Impact Statement, City of Buena Vista, Rockbridge County, Virginia, United States Department of Agriculture, Natural Resources Conservation Service, January 1999.

Central Shenandoah Valley Regional Flood Mitigation Plan, Central Shenandoah Planning District Commission, 2002

Brushy Blue Greenway Master Plan. LPDA Land Planning & Design Associates, Inc., July 30, 2004.

2007 Virginia Outdoors Plan. Virginia Department of Conservation & Recreation, 2007.

Natural Resources
STRATEGIES FOR ACTION

Goal 1: Natural Resources

The City of Buena Vista will achieve a balanced and sustainable use of natural resources in the community to accommodate the economic and noneconomic needs of residents, industries and visitors.

To achieve this goal, the following critical success factors must be accomplished:

- Adopt regulations that protect sensitive areas including but not limited to steep slopes, floodplains, and stream corridors.
- Educate the public on the importance of protecting environmentally sensitive areas.
- Manage a system of water resources that functions as a healthy, integrated whole, and provides a long-term public benefit from enhanced environmental quality.

		Priority	Responsibility
3A	Partner with organizations to provide educational programs that highlight the environment and use protected spaces as outdoor classrooms.	L	Public Works, Parks & Rec
3B	Review and update existing zoning and subdivision regulations as necessary to ensure the goals of environmental preservation are being achieved.	M	Planning
3C	Require the planting of indigenous tree species.	On Going	Planning
3D	Develop an urban forest management plan.	H	Public Works
3E	Review and update landscaping ordinances.	H	Planning
3F	Develop programs to educate citizens about the effects of stormwater runoff on water quality, wellhead protection area boundaries and related pollution prevention measures.	L	Planning, Public Works
3G	Prepare and adopt a wellhead protection management plan.	H	Planning, Public Works
3H	Sponsor joint cleanup and rehabilitation programs including the City, SVU, community organizations and residents.	On Going	Community Development
3I	Manage floodplains, rivers, groundwater, and other water resources for multiple uses including flood and erosion hazard reduction, fish and wildlife habitat, open space, recreation, and water supply.	M	Planning, Public Works, Parks & Rec
3J	Participate in regional, broad-based watershed studies to achieve effective and long-term flood protection and a healthy riverine environment.	M	Planning, Public Works
3K	Work with local organizations to protect natural habitat areas, particularly along riparian corridors.	On Going	Planning, Public Works
3L	Enhance public access to the riverfront.	H	Community Development, Parks & Rec

		Priority	Responsibility
3M	Develop an inventory of brownfields.	On Going	Community Development
3N	Secure resources to assist with assessment, remediation and redevelopment of brownfields.	M	Community Development
3O	Incorporate green building technologies and construction practices.	On Going	Planning
3P	Implement the recommendations of the Upper James River Basin Water Supply Plan.	H	Planning, Public Works
3Q	Evaluate current wastewater treatment facility and develop a strategic plan to consistently meet discharge limits and compliance with water quality standards.	H	Public Works, Wastewater Treatment

High (H) = Years 1-5
Medium (M) = Years 5-7
Low (L) = Years 7-10
On Going = Strategies with zero to minimal costs associated with implementation. These strategies may be completed at any time throughout the life of the plan.

CHAPTER 4
Housing

Housing is a basic need. Furthermore, housing creates neighborhoods and community. The two, housing and neighborhoods, are intertwined. Good neighborhoods exist and thrive in the context of quality housing and the civic pride of residents.

This plan is intended to guide the City of Buena Vista in maintaining and enhancing its housing stock. Housing is primarily a private system that is influenced by factors beyond which local government plays a part. However, the City plays a role in housing and neighborhoods through the following:

- Education
- Traffic
- Public Safety
- Community Facilities/Recreation
- Taxation
- Zoning

The housing element of the Comprehensive Plan examines housing characteristics and trends. This will provide the background for evaluating implementation strategies necessary to achieve the City's housing goals. Much of the housing data comes from the 2010 Census and the 2005-2009 American Community Survey 5-Year Estimates (ACS).

RELATIONSHIP TO OTHER PLAN ELEMENTS

Historic Resources: Historic buildings such as office buildings, stores, schools, warehouses or homes can be modified, where appropriate, for affordable housing and mixed use opportunities.

Natural Resources and Infrastructure & Utilities. Housing is not just an economic or social issue but an environmental one as well. While making housing more energy- and resource-efficient can increase up-front capital costs, these measures have been shown to dramatically lower lifetime operation and maintenance costs, making housing more affordable in the long run.

Economy. A community's housing policies can have significant impact on economic development efforts. Housing costs should be consistent with prevailing wages, and low levels of housing availability can diminish the ability of local businesses to retain or expand a productive work force.

Infrastructure & Utilities. The amount and location of housing directly affect the pressures on public infrastructure such as roads, water and wastewater systems and electric utilities.

HOUSING PROFILE

This chapter of the Comprehensive Plan discusses housing structures and who lives in them. Related information is included concerning housing age, condition, value, and overall affordability. The housing unit, however, is the building block of a neighborhood. Most neighborhoods are difficult to define geographically, but people relate to an area they call their neighborhood. The City of Buena Vista's neighborhoods are identified broadly in Map 4.1.

The distribution of the City's population, housing units, and households is shown in Map 4.2. According to Census 2010, Buena Vista has 2,936 housing units. In 2000, the number of housing units was 2,716. This is an increase of 220 units or 8.1 percent. During this same time, the population grew by 301 persons or 4.7 percent.

Structural Characteristics

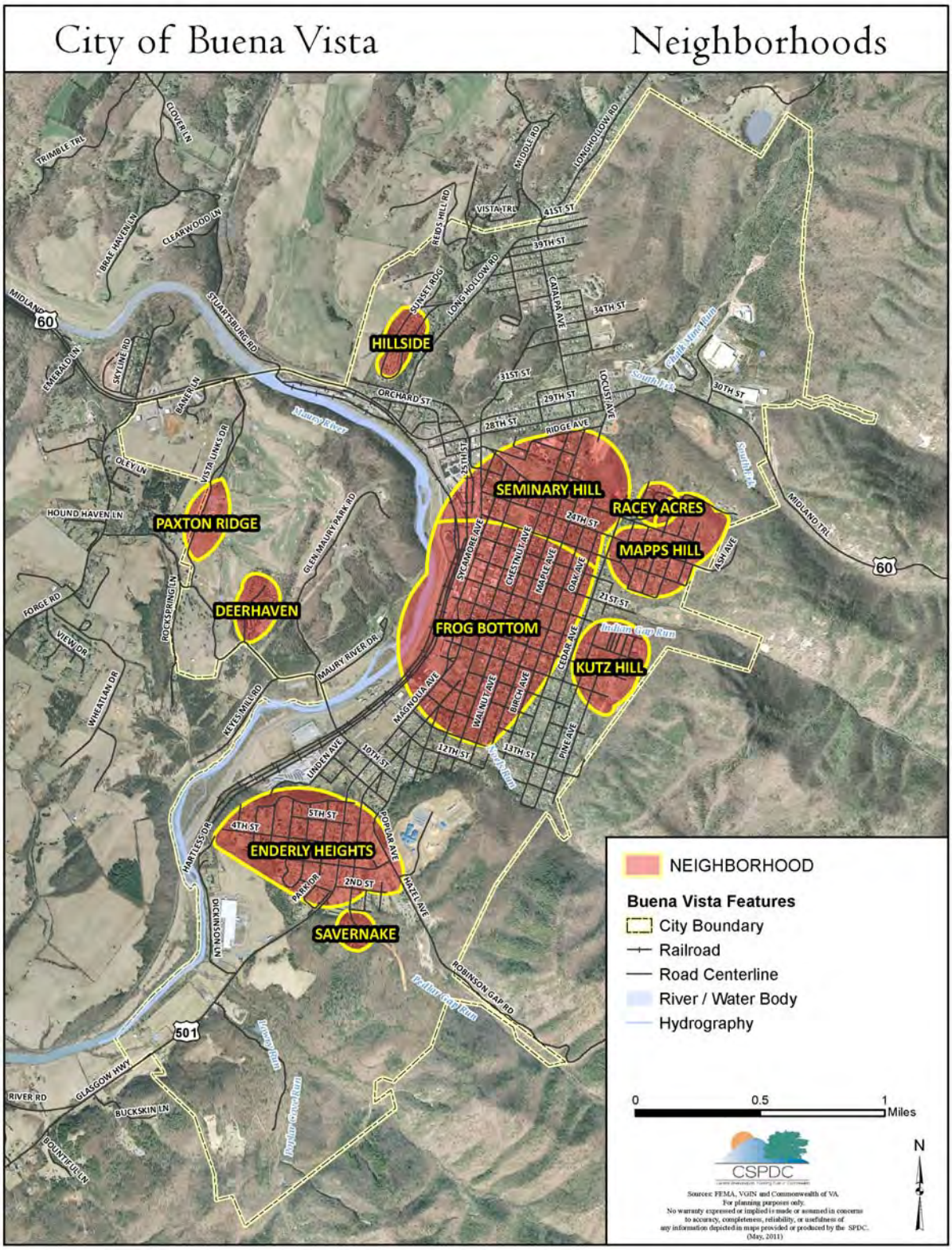
The housing stock of Buena Vista is overwhelmingly comprised of single-family detached housing units as shown in Table 4.1. Furthermore, it has a higher percentage of single-family detached units than its neighboring localities and Virginia.

Table 4.1
Units in Structure
Percent of Total Housing Units

	Buena Vista (%)	Lexington (%)	Rockbridge (%)	Virginia (%)
1-unit, detached	82.8	62.2	80.1	62.6
1-unit, attached	0.4	3.0	0.1	10.1
2 units	1.6	8.6	1.6	1.7
3 or 4 units	2.9	2.7	0.9	2.8
5-9 units	0.0	10.3	2.3	4.7
10-19 units	2.7	1.7	1.7	5.9
20+ units	4.0	9.4	0.5	6.2
Mobile home	5.6	2.2	12.9	5.8

Source: U.S. Census Bureau, 2005-2009 American Community Survey 5-Year Estimates

Map 4.1


City of Buena Vista Neighborhoods
HILLSIDE
SEMINARY HILL
RACEY ACRES
MAPPS HILL
PAXTON RIDGE
DEERHAVEN
FROG BOTTOM
KUTZ HILL
ENDERLY HEIGHTS
SAVERNAKE
NEIGHBORHOOD
Buena Vista Features
City Boundary
Railroad
Road Centerline
River / Water Body
Hydrography
0
0.5
1
Miles
N
CSPDC
Sources: FEMA, VGIN and Commonwealth of VA
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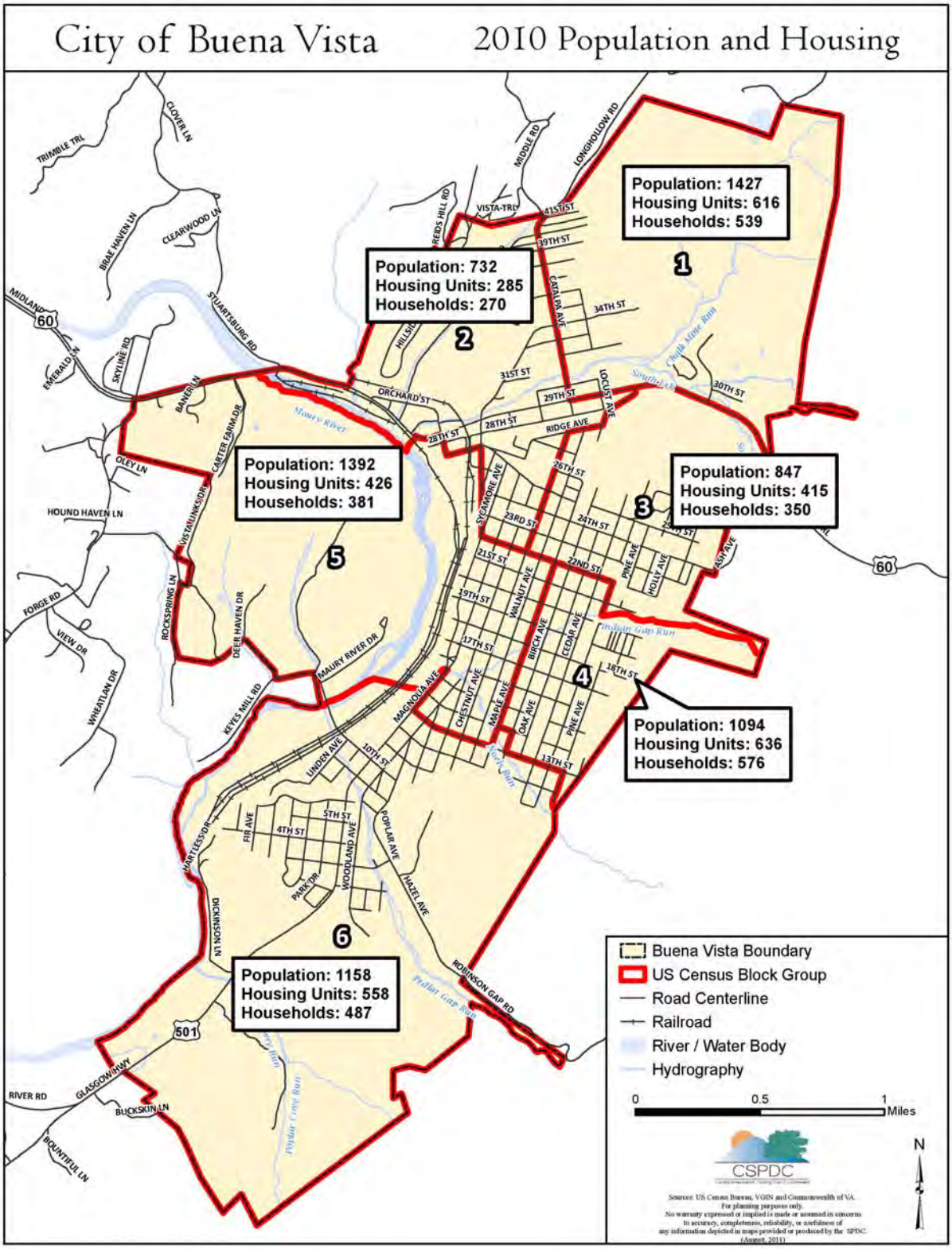
(May, 2011)

Map 4.2


City of Buena Vista
2010 Population and Housing
Population: 1427
Housing Units: 616
Households: 539
1
Population: 732
Housing Units: 285
Households: 270
2
Population: 847
Housing Units: 415
Households: 350
3
Population: 1094
Housing Units: 636
Households: 576
4
Population: 1392
Housing Units: 426
Households: 381
5
Population: 1158
Housing Units: 558
Households: 487
6
Buena Vista Boundary
US Census Block Group
Road Centerline
Railroad
River / Water Body
Hydrography
0
0.5
1
Miles
N
CSPDC
Sources: US Census Bureau, VGIN and Commonwealth of VA.
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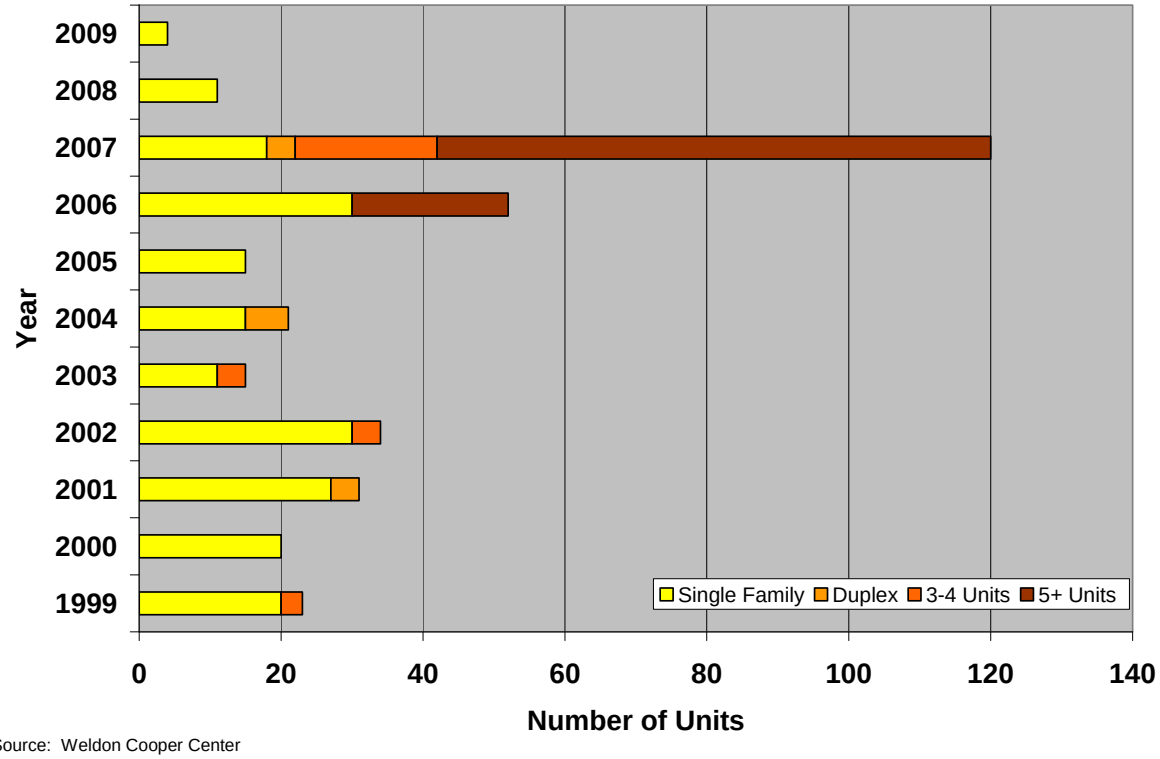
(August, 2011)

Annual building permit data provides a picture of residential construction activity. Over the last decade, most residential construction continues to be single-family detached units. However, as shown in Figure 4.1, construction activity in 2006 and 2007 included multi-unit structures. For multi-unit structures, the data indicates the number of units permitted rather than the number of buildings. The data also reflects the decline in the housing market; there were only four residential building permits in 2009.

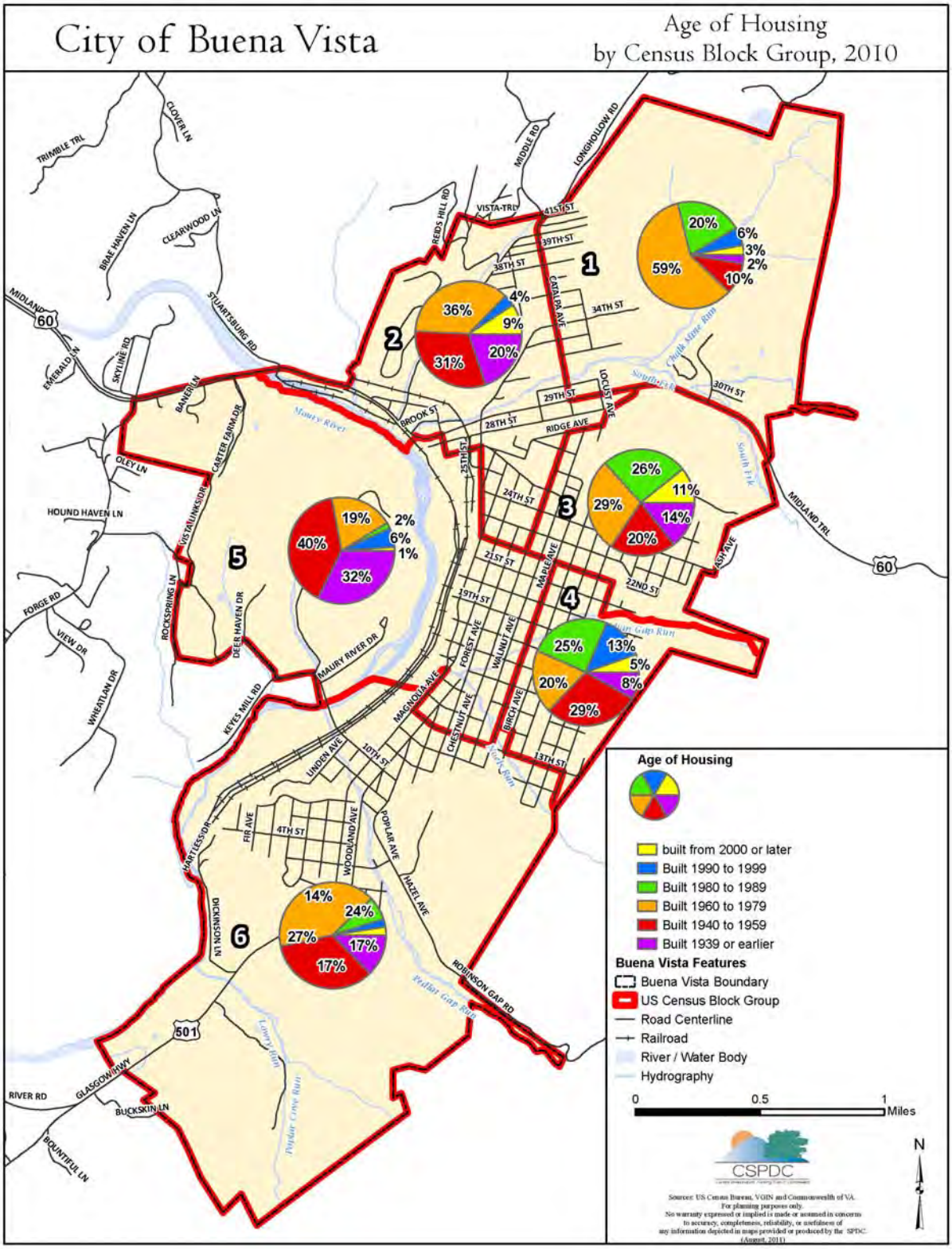
Figure 4.1
Annual Residential Building Permits by Structure
Buena Vista 1999-2009



Source: Weldon Cooper Center
Note: Data excludes permits issued for mobile homes, garages and other out-buildings, additions and renovations, and commercial construction.

Buena Vista has an older housing stock. The median year built is 1964 (2005-2009 American Community Survey 5-Year Estimates). The oldest housing in the City, not surprisingly, is located in downtown and its surrounding neighborhoods. Housing in Block Group 5 has a median year of 1948. The northern portion of the City, Block Group 1, has newer construction with a median year of 1975 (See Map 4.3).

Map 4.3


City of Buena Vista
Age of Housing
by Census Block Group, 2010
1
20%
6%
3%
2%
10%
59%
2
36%
4%
9%
20%
31%
3
26%
11%
14%
20%
29%
4
25%
13%
5%
8%
20%
29%
5
19%
2%
6%
1%
40%
32%
6
14%
24%
27%
17%
17%
Age of Housing
built from 2000 or later
Built 1990 to 1999
Built 1980 to 1989
Built 1960 to 1979
Built 1940 to 1959
Built 1939 or earlier
Buena Vista Features
Buena Vista Boundary
US Census Block Group
Road Centerline
Railroad
River / Water Body
Hydrography
0
0.5
1
Miles
N
CSPDC
Source: US Census Bureau, VGIN and Commonwealth of VA.
For planning purposes only.
No warranty expressed or implied is made or assumed in concern to accuracy, completeness, reliability, or usefulness of any information depicted in maps provided or produced by the SPDC.
(August, 2011)
MIDLAND TRL
60
501
ROBINSON GAP RD
RIVER RD
GLASGOW HWY
BUCKSKIN LN
BOUNTIFUL LN
DICKINSON LN
HARTLESS DR
FIR AVE
4TH ST
WOODLAND AVE
POPLAR AVE
HAZEL AVE
LINDEN AVE
10TH ST
13TH ST
MAGNOLIA AVE
CHESTNUT AVE
FOREST AVE
WALNUT AVE
BIRCH AVE
MAPLE AVE
ASH AVE
19TH ST
21ST ST
22ND ST
24TH ST
25TH ST
28TH ST
29TH ST
30TH ST
RIDGE AVE
LOCUST AVE
BROOK ST
CATALPA AVE
34TH ST
38TH ST
39TH ST
41ST ST
VISTA TRL
REIDS HILL RD
MIDDLE RD
LONGHOLLOW RD
CLOVER LN
TRIMBLE TRL
BRAE HAVEN LN
CLEARWOOD LN
STUARTSBURG RD
MIDLAND
60
EMERALD LN
SKYLINE RD
BANGER LN
CARTER FARM DR
OLEY LN
HOUND HAVEN LN
VISTA UNKNOWN
ROCKSPRING LN
FORGE RD
VIEW DR
WHEATLAM DR
DEER HAVEN DR
MAURY RIVER DR
KEYES MILL RD
Maury River
South Fork
Buffalo Mine Run
Gap Run
Poplar Gap Run
Poplar Cove Run
Looney Run

Approximately half of the housing units in Buena Vista were built from 1950 to 1979. About 15 percent were built during or before 1939. Once a home reaches thirty years in age, maintenance and major component replacement is more likely and desired features in modern housing may be missing. In Buena Vista, only about 1 in 5 homes is less than 30 years old. How the aging of housing is addressed contributes to either neighborhood vitality or decline. The physical condition of housing contributes to a neighborhood being an attractive place to live and it increases housing values. Furthermore, because a good share of Buena Vista's housing stock was built prior to 1940, there are opportunities for the preservation of historic structures.

Household Characteristics

A household includes all the people who occupy a housing unit as their usual place of residence. A household may be a single family, one person living alone, two or more families living together, or any other group of related or unrelated persons who share living arrangements.

The number of households in Buena Vista increased between 1990 and 2010 by 8.3 percent while the population grew by only 3.8 percent. Over this same time, the number of persons per household decreased although the number of persons per household increased very slightly between 2000 and 2010. Persons per household is calculated by dividing the number of persons in households by the number of households. Furthermore, there were changes in the type of households.

The U.S. Census Bureau distinguishes two types of householders, a family householder and a nonfamily householder. A family household is a householder living with one or more people related to him or her by birth, marriage, or adoption. A nonfamily householder is a householder living alone or with nonrelatives only. As seen in Table 4.2, the number of nonfamily households increased between 1990 and 2010 from about one in four in 1990 to about one in three in 2010.

Table 4.2
Households, 1990-2010
Buena Vista

	1990	2000	2010	Number Change 1990-2010	Percent Change 1990-2010 (%)
Total Households	2,404	2,547	2,603	199	8.3
Family Households	1,779	1,749	1,726	-53	-3.0
Percent of Total	74.0	68.7	66.3	-7.7	--
Nonfamily Households	625	798	877	252	40.3
Percent of Total	26.0	31.3	33.7	7.7	--
Persons in Households	6,087	6,058	6,250	163	2.7
Persons per Household	2.53	2.38	2.40	-0.13	-5.1

Source: U.S. Census Bureau, 1990, 2000 and 2010 Census

Occupancy Characteristics

All occupied housing units are classified as either owner occupied or renter occupied. Map 4.4 shows this by Census Block Group. The percentage of owner-occupied units jumped between 1970 and 1980 from 67.6 percent to 75.7 percent. Homeownership increased at the same time that many homes were being constructed in Buena Vista. The total number of housing units increased by over 400 units during the 1970s. Table 4.3 shows the steady decline in homeownership since 1970.

Table 4.3
Owner/Renter Occupied Housing Units
Buena Vista, 1980-2010

	1980		1990		2000		2010	
	Number	Percent (%)	Number	Percent (%)	Number	Percent (%)	Number	Percent (%)
Total Housing Units	2,406	100.0	2,494	100.0	2,716	100.0	2,936	100.0
Occupied Units	2,268	94.3	2,404	96.4	2,547	93.8	2,603	88.7
Owner Occupied	1,717	75.7	1,736	72.2	1,800	70.7	1,720	66.1
Renter Occupied	551	24.3	668	27.8	747	29.3	883	33.9

Source: U.S. Census Bureau, Census 1970, 1980, 1990, and 2000

There was a sharp decline in the number of owner occupied units in Buena Vista between 2000 and 2010. Neighboring localities as well as Virginia also experienced a decline, but it was not as great as Buena Vista's (Table 4.4).

Table 4.4
Owner Occupied Housing Units (%)
1980-2010

	1980	1990	2000	2010
Buena Vista	75.7	72.2	70.7	66.1
Lexington	56.3	54.9	54.9	52.1
Rockbridge	76.1	74.9	77.7	75.0
Virginia	65.6	66.3	68.1	67.2

Source: U.S. Census Bureau, Census 1980, 1990, 2000 and 2010

Unoccupied housing units are considered vacant. According to Census 2010, 333 housing units were vacant and 2,603 were occupied. Map 4.5 shows the number and percentage of occupied and vacant housing by Census Block Group.

Vacancy status is determined by the terms under which the unit may be occupied, e.g., for rent, for sale, or for seasonal use only. The homeowner vacancy rate and rental vacancy rates are shown in Tables 4.5 and 4.6. There were significant increases between the 2000 Census and the 2010 Census.

Table 4.5
Homeowner Vacancy Rates (%)
1980-2010

	1980	1990	2000	2010
Buena Vista	1.4	0.9	1.4	4.1
Lexington	1.7	0.9	2.1	4.2
Rockbridge	1.5	1.2	1.7	2.7
Virginia	3.5	2.1	1.5	2.1

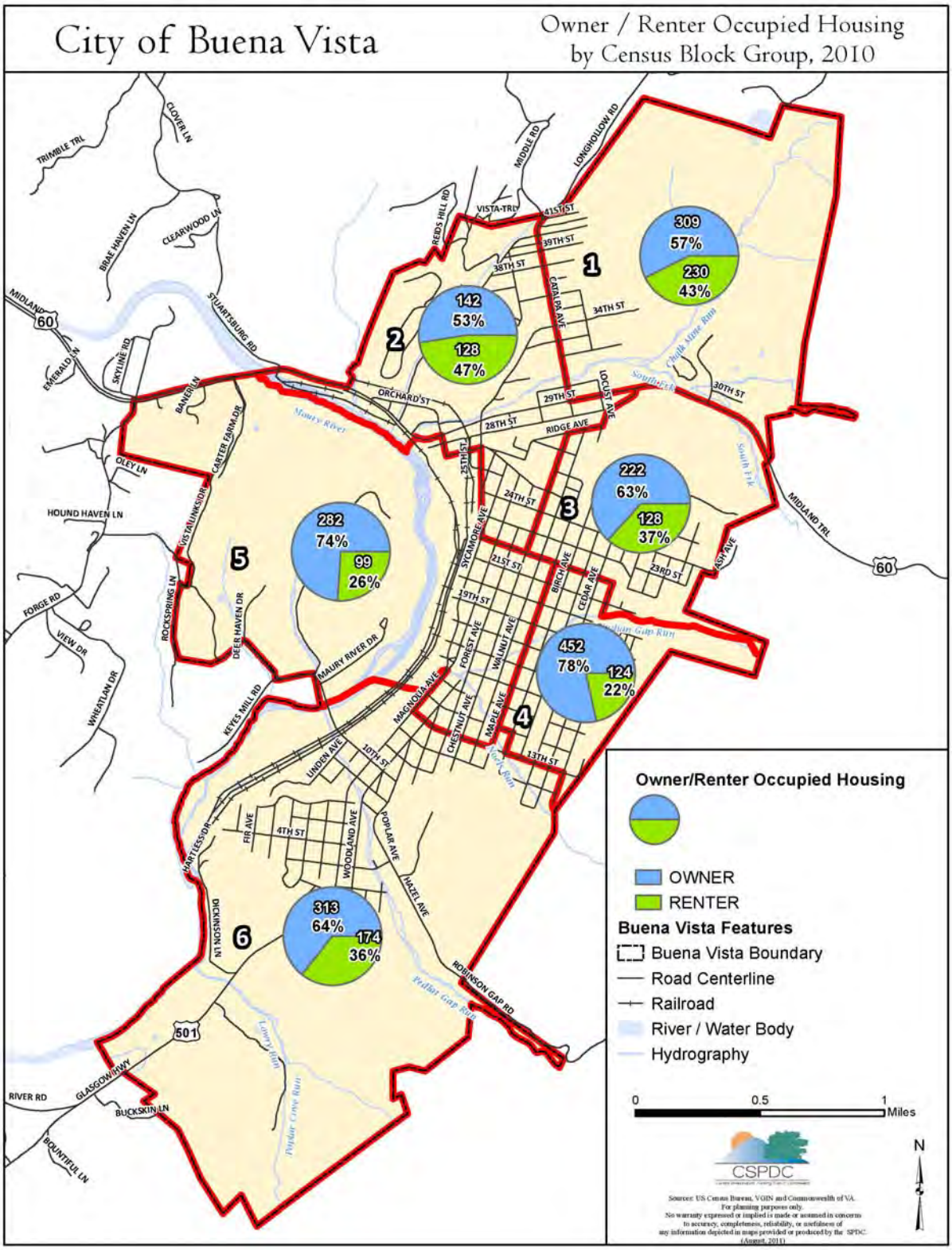
Source: U.S. Census Bureau, Census 1980, 1990, 2000 and 2010

Table 4.6
Rental Vacancy Rates (%)
1980-2010

	1980	1990	2000	2010
Buena Vista	10.0	3.2	4.4	12.5
Lexington	9.0	3.5	3.6	10.5
Rockbridge	1.5	3.6	8.3	8.7
Virginia	3.5	8.1	5.2	7.6

Source: U.S. Census Bureau, Census 1980, 1990, 2000 and 2010

Map 4.4


City of Buena Vista
Owner / Renter Occupied Housing by Census Block Group, 2010
309 57% 230 43%
142 53% 128 47%
222 63% 128 37%
282 74% 99 26%
452 78% 124 22%
313 64% 174 36%
1
2
3
4
5
6
Owner/Renter Occupied Housing
OWNER
RENTER
Buena Vista Features
Buena Vista Boundary
Road Centerline
Railroad
River / Water Body
Hydrography
0 0.5 1 Miles
N
CSPDC
Sources: US Census Bureau, VGIN and Commonwealth of VA.
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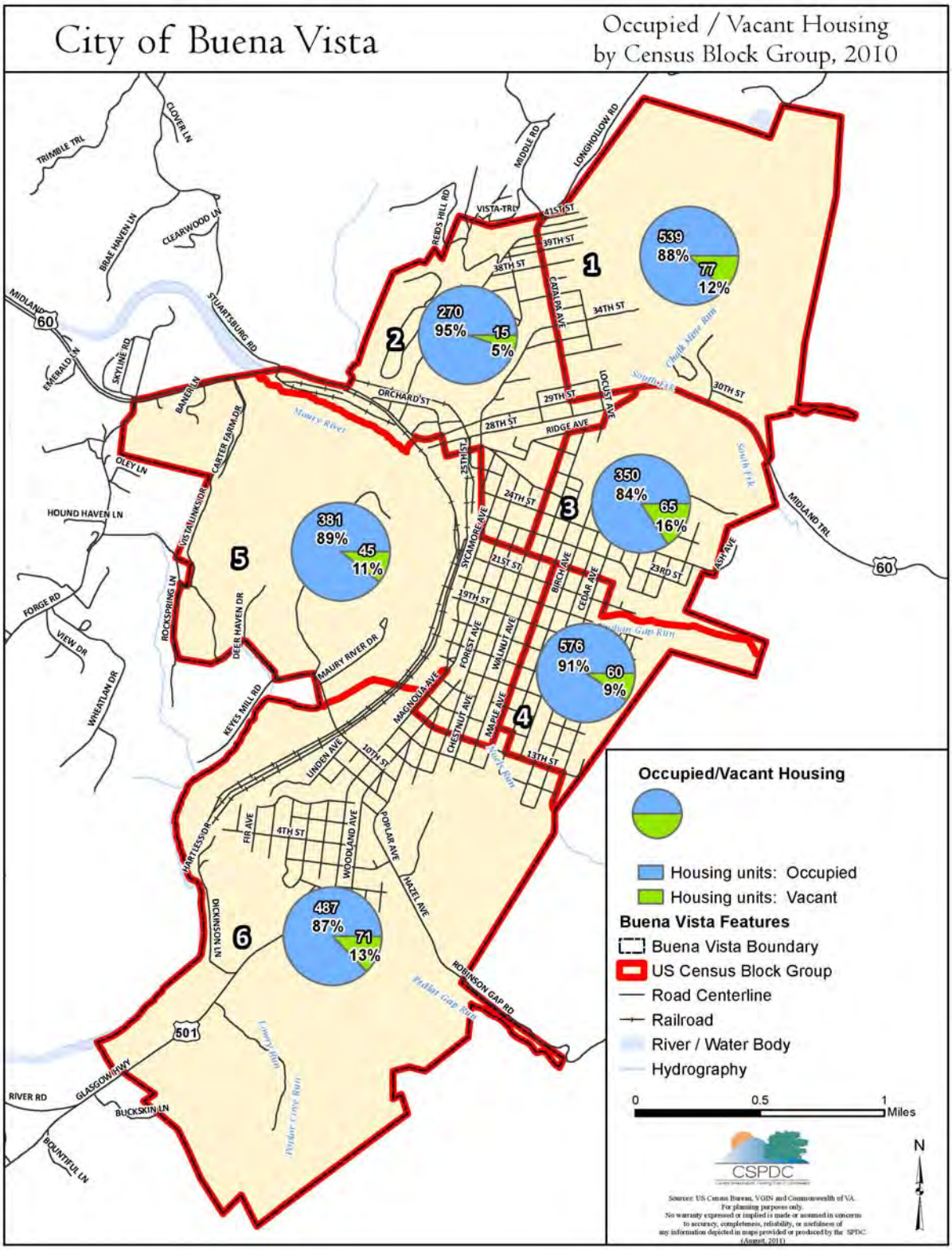
(August, 2011)

Map 4.5


City of Buena Vista
Occupied / Vacant Housing
by Census Block Group, 2010
539
88%
77
12%
270
95%
15
5%
350
84%
65
16%
381
89%
45
11%
576
91%
60
9%
487
87%
71
13%
1
2
3
4
5
6
Occupied/Vacant Housing
Housing units: Occupied
Housing units: Vacant
Buena Vista Features
Buena Vista Boundary
US Census Block Group
Road Centerline
Railroad
River / Water Body
Hydrography
0
0.5
1
Miles
N
CSPDC

Financial Characteristics

Housing value is the estimate of how much a property would sell for if it were for sale. The median value of owner-occupied housing by Census Block is shown on Map 4.6. This includes only 1-family houses on less than 10 acres and without a business or medical office on the property. This does not include mobile homes.

The highest housing values in Buena Vista are located in Block Group 3 which includes Racy Acres and Mapps Hill. The area with the lowest housing values is Block Group 1 which includes part of the Seminary Hill neighborhood as well as undeveloped land. According to the 2005-2009 American Community Survey 5-Year Estimates, the median value of owner-occupied units in Buena Vista was $126,000. For comparison, the median value in Rockbridge County and Lexington were $179,100 and $245,600, respectively.

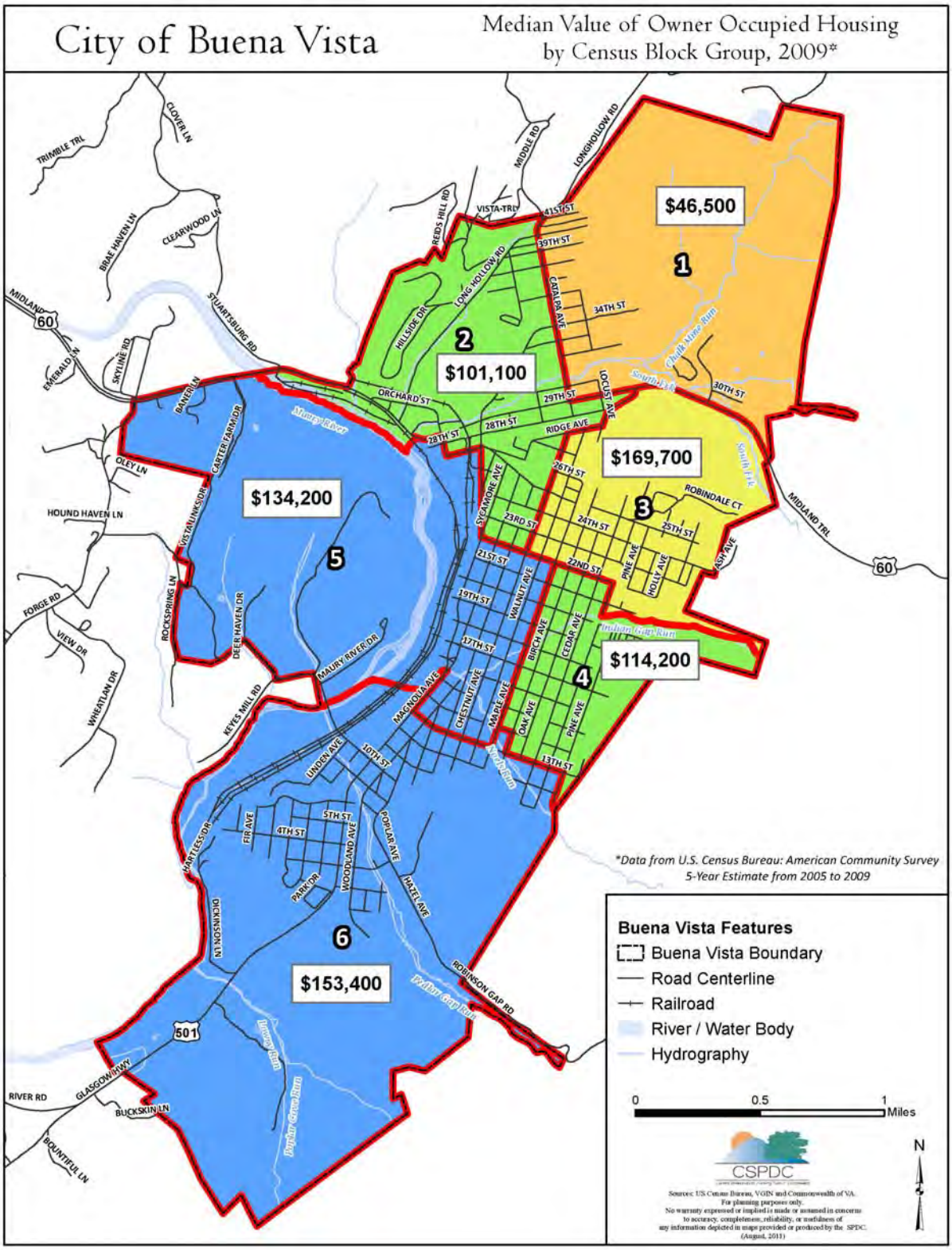
Table 4.7
Value, Owner-Occupied Units
Buena Vista

Value	Number	Percent (%)
Less than $50,000	123	7.3
$50,000 to $99,999	435	25.8
$100,000 to $149,999	579	34.3
$150,000 to $199,999	283	16.8
$200,000 to $299,999	188	11.1
$300,000 to $499,999	38	2.3
$500,000 to $999,999	42	2.5
$1,000,000 or more	0	0.0

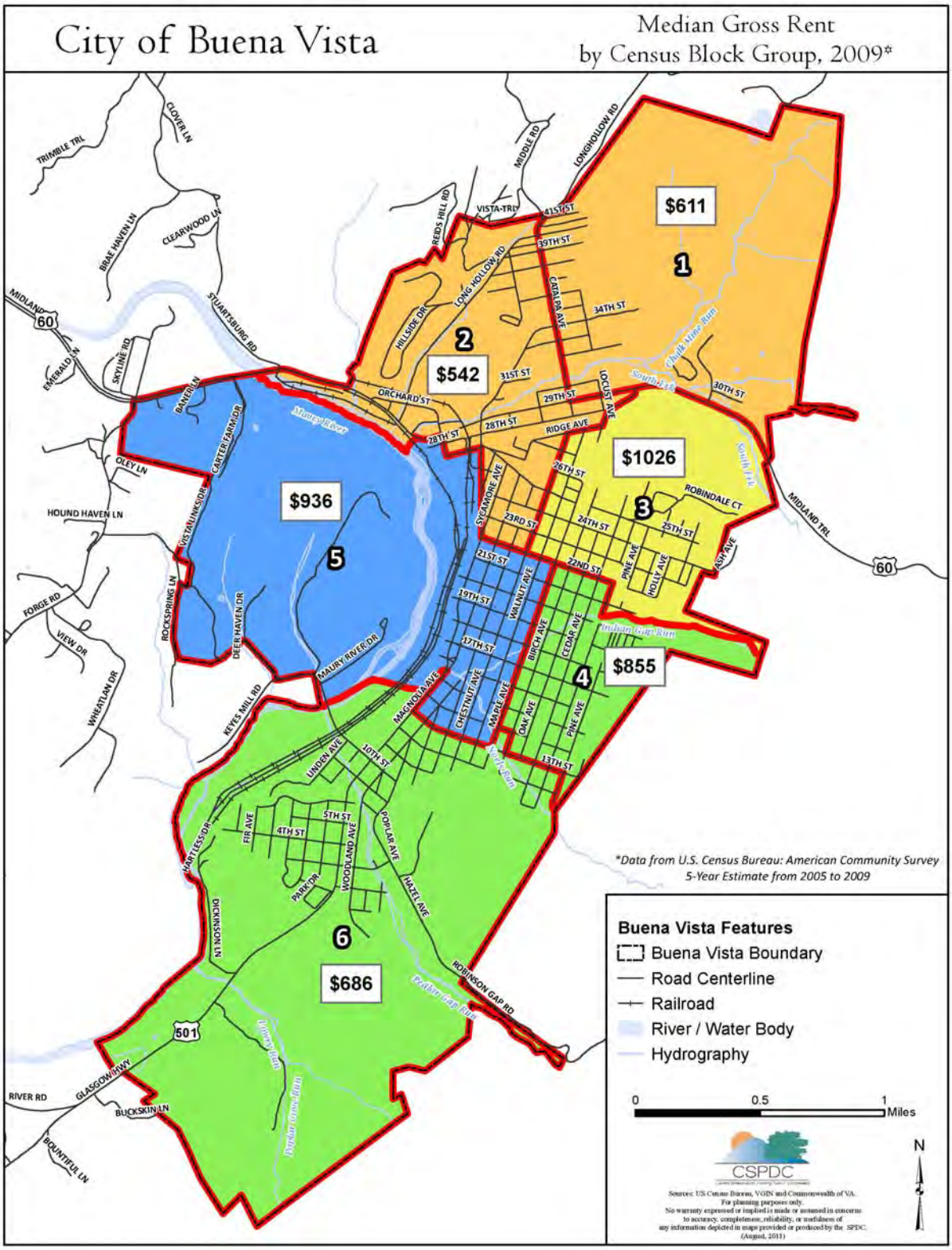
Source: U.S. Census Bureau, 2005-2009 American Community Survey 5-Year Estimates

As mentioned above, nearly 34 percent of housing units in Buena Vista are renter occupied. For occupied units paying rent, the median gross rent is $693. Gross rent is the contract rent plus the estimated average monthly cost of utilities (electricity, gas, and water and sewer) and fuels (oil, coal, kerosene, wood, etc.). Map 4.7 shows median gross rent by Census Block Group. Block Group 1 at the north end of the City has the lowest rents. This area also had the lowest housing values. Conversely, Block Group 3 of the City had the highest gross rents and housing values. Contract rent by Block Group is shown on Map 4.8.

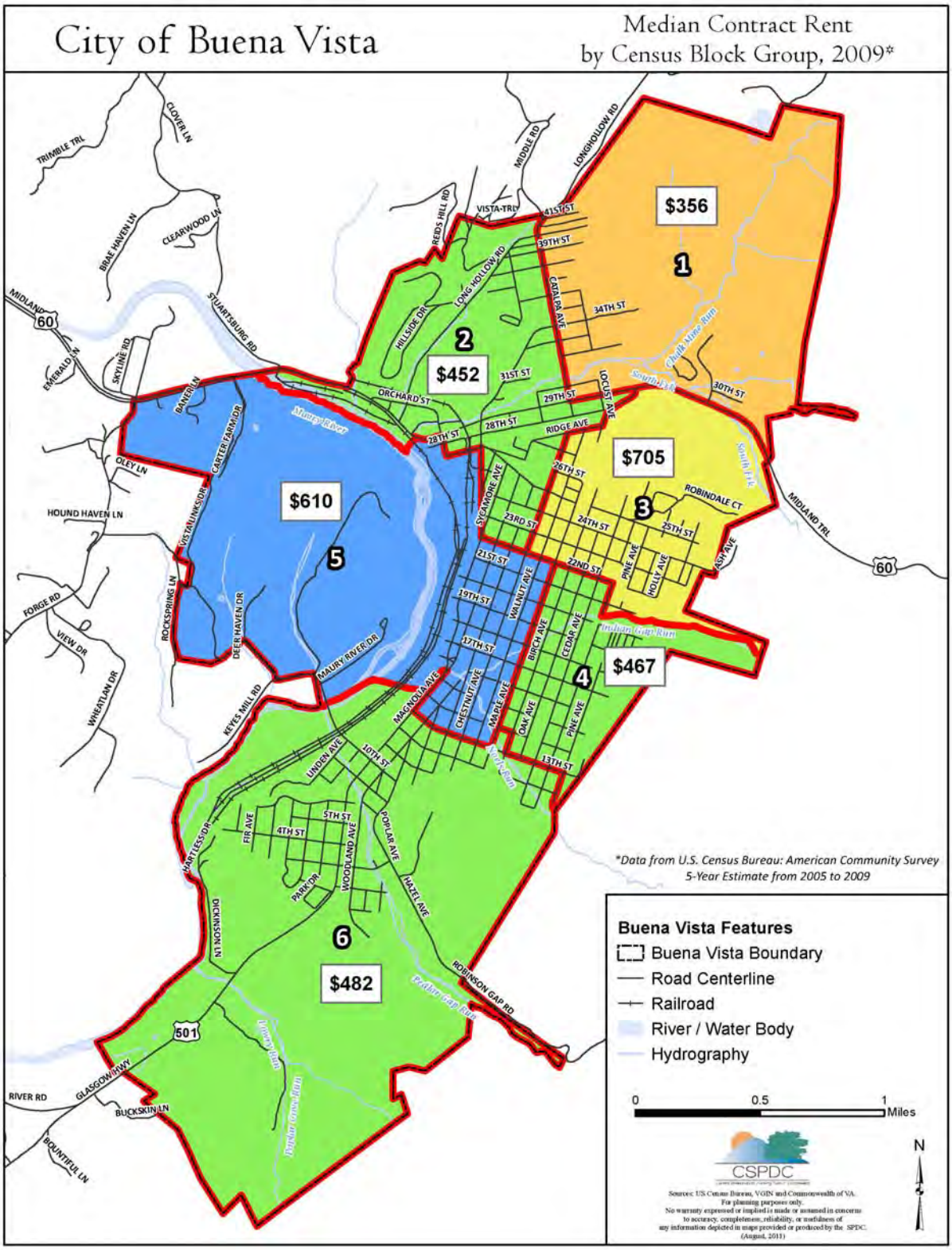
Map 4.6


City of Buena Vista
Median Value of Owner Occupied Housing by Census Block Group, 2009*
$46,500
1
$101,100
2
$169,700
3
$114,200
4
$134,200
5
$153,400
6
*Data from U.S. Census Bureau: American Community Survey 5-Year Estimate from 2005 to 2009
Buena Vista Features
Buena Vista Boundary
Road Centerline
Railroad
River / Water Body
Hydrography
0
0.5
1
Miles
N
CSPDC
Source: US Census Bureau, VGIN and Commonwealth of VA.
For planning purposes only.
No warranty expressed or implied is made or assumed in concerns to accuracy, completeness, reliability, or usefulness of any information depicted in maps provided or produced by the SPDC.
(August, 2011)
TRIMBLE TRL
CLOVER LN
BRAE HAVEN LN
CLEARWOOD LN
MIDLAND 60
EMERALD LN
SKYLINE RD
STUARTSBURG RD
MIDDLE RD
LONGHOLLOW RD
REDS HILL RD
VISTA TRL
41ST ST
39TH ST
LONG HOLLOW RD
HILLSIDE DR
CASA LPA AVE
34TH ST
Chalk Alum Run
30TH ST
ORCHARD ST
29TH ST
28TH ST
RIDGE AVE
LOCUST AVE
BANER LN
CARTER FARM DR
Maury River
OLEY LN
HOUND HAVEN LN
VISTA LINKS DR
SYCAMORE AVE
26TH ST
ROBINDALE CT
South Fork
MIDLAND TRL
60
23RD ST
24TH ST
25TH ST
ASH AVE
21ST ST
22ND ST
PINE AVE
HOLLY AVE
FORGE RD
ROCKSPRING LN
DEER HAVEN DR
19TH ST
WALNUT AVE
VIEW DR
MAURY RIVER DR
17TH ST
BIRCH AVE
CEDAR AVE
Indian Gap Run
WHEATLAN DR
KEYES MILL RD
MAGNOLIA AVE
CHESTNUT AVE
MAPLE AVE
OAK AVE
PINE AVE
13TH ST
LINDEN AVE
10TH ST
South Fork
5TH ST
4TH ST
FIR AVE
POPLAR AVE
HARTLESS DR
WOODLAND AVE
PARK DR
HAZEL AVE
DICKINSON LN
ROBINSON GAP RD
Indian Gap Run
501
Maury River
Indian Creek Run
RIVER RD
GLASGOW HWY
BUCKSKIN LN
BOUNTIFUL LN

Map 4.7


City of Buena Vista
Median Gross Rent
by Census Block Group, 2009*
$611
1
$542
2
$1026
3
$855
4
$936
5
$686
6
*Data from U.S. Census Bureau: American Community Survey
5-Year Estimate from 2005 to 2009
Buena Vista Features
Buena Vista Boundary
Road Centerline
Railroad
River / Water Body
Hydrography
0
0.5
1
Miles
N
CSPDC

Map 4.8


City of Buena Vista
Median Contract Rent
by Census Block Group, 2009*
$356
1
$452
2
$705
3
$467
4
$610
5
$482
6
*Data from U.S. Census Bureau: American Community Survey
5-Year Estimate from 2005 to 2009
Buena Vista Features
Buena Vista Boundary
Road Centerline
Railroad
River / Water Body
Hydrography
0
0.5
1
Miles
N
CSPDC

Affordability

Monthly owner costs are the sum of payments for mortgages, real estate taxes, insurance on the property, utilities and fuels. The 2005-2009 American Community Survey estimated that 50.4 percent of those living in owner-occupied housing units had a mortgage. Their median monthly costs were $1,123. Those without a mortgage had median monthly owner costs of $373. The median gross rent, as reported by the 2005-2009 American Community Survey, was $693. Median monthly costs for owners and renters are shown in Table 4.8.

Table 4.8
Median Monthly Costs

	Owner Costs with Mortgage		Gross Rent	
	2000 Census	2005-2009 ACS	2000 Census	2005-2009 ACS
Buena Vista	$680	$1,123	$403	$693
Lexington	982	1,391	434	686
Rockbridge	780	1,207	442	591
Virginia	1,144	1,668	650	931

Source: U.S. Census Bureau, 2000 Census and 2005-2009 American Community Survey 5-Year Estimates

Besides housing values and rents, it is important to look at costs and the percentage of income that is devoted to housing costs. Housing expenditures that exceed 30 percent of household income have historically been viewed as an indicator of a housing affordability problem. If expenditures exceed 30 percent, the household is considered to be "cost burdened." Tables 4.9 – 4.11 reflect the cost burden for both owners and renters.

Table 4.9
Selected Monthly Owner Costs as a Percentage of Household Income
Housing Units with a Mortgage
Buena Vista

Value	Number	Percent (%)
Less than 20.0 percent	369	43.4
20.0 to 24.9 percent	217	25.5
25.0 to 29.9 percent	50	5.9
30.0 to 34.9 percent	110	12.9
35.0 percent or more	104	12.2

Source: U.S. Census Bureau, 2005-2009 American Community Survey 5-Year Estimates

Table 4.10
Selected Monthly Owner Costs as a Percentage of Household Income
Housing Units without a Mortgage
Buena Vista

Value	Number	Percent (%)
Less than 10.0 percent	319	38.1
10.0 to 14.9 percent	143	17.1
15.0 to 19.9 percent	98	11.7
20.0 to 24.9 percent	39	4.7
25.0 to 29.9 percent	30	3.6
30.0 to 34.9 percent	38	4.5
35.0 percent or more	171	20.4

Source: U.S. Census Bureau, 2005-2009 American Community Survey 5-Year Estimates

Table 4.11
Gross Rent as a Percentage of Household Income
Occupied Units Paying Rent
Buena Vista

Value	Number	Percent (%)
Less than 15.0 percent	83	9.2
15.0 to 19.9 percent	236	26.1
20.0 to 24.9 percent	109	12.1
25.0 to 29.9 percent	26	2.9
30.0 to 34.9 percent	26	2.9
35.0 percent or more	424	46.9
Not computed	100	--

Source: U.S. Census Bureau, 2005-2009 American Community Survey 5-Year Estimates

Residence

About 1 in 7 householders moved into their unit prior to 1970. The greatest number of householders, however, moved into their unit during the second half of the 2000s. Of the 692 households that moved into their unit in 2005 or later, 472 were renter-occupied and 220 were owner-occupied. Of those that moved during the last year, most came from a different locality in Virginia (2005-2009 American Community Survey 5-Year Estimates).

Table 4.12
Year Householder Moved into Unit
Occupied Housing Units
Buena Vista

Value	Number	Percent (%)
Moved in 2005 or later	692	25.7
2000 to 2004	483	17.9
1990 to 1999	456	16.9
1980 to 1989	400	14.9
1970 to 1979	258	9.6
1969 or earlier	403	15.0

Source: U.S. Census Bureau, 2005-2009 American Community Survey 5-Year Estimates

LAND USE IMPLICATIONS

Land Use Links

It makes sense to consider the links between housing locations and daily activities such as jobs, recreation, shopping, and education. Connectivity between these should be promoted to improve transportation options for residents of all ages and incomes, provide recreation opportunities, and reduce pollution. Interconnecting residential areas to amenities and daily needs is particularly important for those that choose or are unable to drive such as older and disabled residents and Southern Virginia University (SVU) students.

Because the City of Buena Vista is based on a grid street network, roadway connectivity is high. However, sidewalks are not provided consistently and other obstacles such as traffic crossings may limit pedestrian and bicycle connections between housing and schools, shopping, and recreation.

Housing Growth Potential

As mentioned at the beginning of this chapter, the number of housing units has increased by 220 units or 8.1 percent between 2000 and 2010. The population during this same time increased by 301 persons (4.7 percent) and 56 households (2.2 percent). Under healthy growth conditions, more homes are built than households are created to live in them.

The slow population growth pattern for Buena Vista is not anticipated to change. According to projections by the Virginia Employment Commission (VEC), the population of Buena Vista is expected to grow only slightly over the next 20 years. However, the VEC projection does not reflect anticipated increased student enrollment and staffing needs at Southern Virginia University. The need for new housing in Buena Vista will be dependent on the University's growth or other activities that interrupt historical trends.

Three areas have been identified for residential growth. The first is the Hill Top District which has remaining lots for residential development. The other two areas include (1) the northern end of the City and (2) the southern end of the City. Each of these two areas consists of approximately 450 acres of undeveloped land. The northern area presently is not served by public sewer and water. Both areas are envisioned to be mixed-use development (See Future Land Use, Map 9.1). The challenge to developing these areas, even for residential use, is the topography. Because there are limited opportunities for new subdivision development in the City, appropriate infill and redevelopment are central housing and neighborhood strategies.

CURRENT INITIATIVES

Ordinances. During the past three years, the Buena Vista City Council has attempted to address housing deterioration and blight through the introduction of a Code Enforcement ordinance and a Rental Property ordinance. Both establish standards equivalent to those in the International Property Maintenance Code published by the International Code Council. The adoption of these ordinances put into place language that permits a greater emphasis on providing a safe and sanitary living environment for all residents.

Green Forest Neighborhood. In June 2009, the City requested CDBG Planning Grant assistance from the Virginia Department of Housing and Community Development for rehabilitation activities intended to assist low and moderate income households in the Green Forest Neighborhood. The Green Forest Neighborhood is primarily located along East Midland Trail (U.S. Route 60) and bordered by Brook Street to the east and Orchard Street to the south. The neighborhood includes approximately 41 homes. The neighborhood location is on the primary western entrance corridor to the City. In many ways, the neighborhood presents the first impression of Buena Vista.

The purpose of the CDBG Planning Grant was to identify housing and other infrastructure needs within the project area. Additionally, residents were to be surveyed to confirm needs and income status. The initial steps of a public meeting, housing assessment, infrastructure assessment, and neighborhood survey were completed as required. The project is currently on hold.

Hill Top-Glen Maury Park Master Plan. Completed in 2002, the Hill Top-Glen Maury Park Master Plan was a vision for Glen Maury Park, a mixed-used development, and a residential area of single-family homes. The zoning ordinance was amended in 2003 to add regulations for the Hill Top District. The regulations were intended to create a pedestrian-scaled neighborhood with a focus on building design elements.

SUMMARY OF TRENDS

This housing analysis has identified the following trends:

- Buena Vista has an older housing stock.
- The number of housing units increased at a greater rate than the population and number of households.
- Over a quarter of housing units are occupied by householders that moved in during 2005 or later.
- The percentage of renters is increasing.
- Neighborhoods need improved walkability to community services.
- Infill and redevelopment are central to housing and neighborhood planning.

Housing STRATEGIES FOR ACTION			
Goal 1: Housing **The City of Buena Vista's neighborhoods will be stable and diverse, providing a wide range of housing options, linking residents to a variety of land uses which meet the needs of the community.**			
To achieve this goal, the following critical success factors must be accomplished: • Promote attractive neighborhoods. • Form strong relationships with neighborhoods. • Build on assets and stabilize existing neighborhoods. • Provide housing choice within neighborhoods. • Provide connectivity. • Promote mixed uses. • Establish systems capable of recognizing neighborhood decline and disinvestment.			
		Priority	**Responsibility**
5A	Organize community forums to address housing strategies and opportunities and education.	L	Community Development
5B	Involve community members to help develop neighborhood plans.	M	City-wide
5C	Market local neighborhood improvement success stories and communicate techniques.	On Going	Community Development
5D	Promote street tree plantings, community gardens, and similar public landscape features.	L	Planning, Parks & Rec, Public Works
5E	Provide a range of incentives to create high quality and affordable housing such as reasonable density increases, development fee waivers, time-limited property tax abatements, expedited development reviews, and other focused incentives.	H	Community Development, Planning
5F	Develop a neighborhood planning process.	H	Community Development
5G	Identify older and abandoned structures in need of preservation, stabilization, repair, or demolition.	H	Planning
5H	Continue to develop public and private partnerships in providing low and moderate-income housing.	H	Community Development
5I	Identify appropriate locations for compatible infill housing that would replace vacant or underutilized sites in existing neighborhoods.	H	Planning
5J	Develop a water policy and plan that ensures that adequate water quality, pressure, and quantity are provided.	H	Public Works
5K	Enforce property codes.	H	Planning

		Priority	Responsibility
5L	Streamline codes to allow maintenance and upgrades with a minimum of permits and regulations.	M	Planning
5M	Annually review and update the existing property maintenance code and enforcement policies and practice evaluate their impacts on neighborhood stabilization and needs.	On Going	Planning
5N	Explore the use of zoning overlay districts to strengthen the integrity of historic neighborhoods.	M	Planning
5O	Develop incentives to encourage investment in older homes, particularly historic homes.	H	Economic Development
5P	Facilitate the development of new downtown housing.	L	Economic Development, Planning
5Q	Favor housing projects that cut long-term costs by incorporating sustainable design elements.	L	Planning
5R	Support residential weatherization, maintenance, and rehabilitations programs.	H	Economic Development
5S	Encourage the location of sidewalks along roadways.	H	Planning
5T	Promote and comprehensively plan for walkways, bikeways, and open spaces that link to and between neighborhoods, schools, shopping and other amenities.	H	Economic Development, Planning, Parks & Rec
5U	Plan with various stakeholder to coordinate the future locations of public facilities such as schools, libraries, and services.	M	Economic Development, Planning, City Council
5V	Provide representation on the Rockbridge Poverty Commission	M	Economic Development
5W	Communicate with SVU to anticipate student, staff and faculty housing needs.	On Going	Economic Development
5X	Review and update the mixed use component of the Hill Top-Glen Maury Park Master Plan.	H	Planning, Economic Development

High (H) = Years 1-5
Medium (M) = Years 5-7
Low (L) = Years 7-10
On Going = Strategies with zero to minimal costs associated with implementation. These strategies may be completed at any time throughout the life of the plan.

CHAPTER 5
Economy

Economic vitality is the measure of the economic health of the City – its people, its businesses, and its government. The purpose of the economic element of the Comprehensive Plan is to set goals and to establish policies which promote economic vitality for the future of the City of Buena Vista. This chapter provides policies that directly affect other elements of this plan.

Economic development is the process to improve the economic well-being of a community. It is a means of providing a balanced, healthy economy. For many local governments, economic development is a means of providing employment opportunities, expanding the local tax base, or expanding economic opportunity. Local economic development is a process that involves a number of activities. These activities include the formation of new institutions, the development of a new or better mix of industries, the nurturing of new and existing enterprises, and the improvement of the capacity of existing employers to produce better goods and services, identify new markets, and successfully transfer new technologies.

Local government can assume a key role in facilitating the actions necessary to develop a solid foundation for successful economic development efforts. Labor force training, provision of infrastructure, coordination of educational institutions, technical and financial assistance, public-private partnerships, and supportive land use policies and regulations are all areas in which local government will continue to play a critical role.

RELATIONSHIP TO OTHER PLAN ELEMENTS

Natural Resources. Natural areas support recreation and tourism, provide economic diversity, and improve the quality of life for residents and the local labor force.

Housing. Economic development depends on housing and creates the need for it. Affordable, quality housing is necessary for maintaining a labor force for employers to access.

Infrastructure & Utilities. Transportation, drinking water, wastewater, stormwater, and telecommunications, are vital to business success.

Land Use. Land use patterns affect business access to markets and customers.

ECONOMIC PROFILE

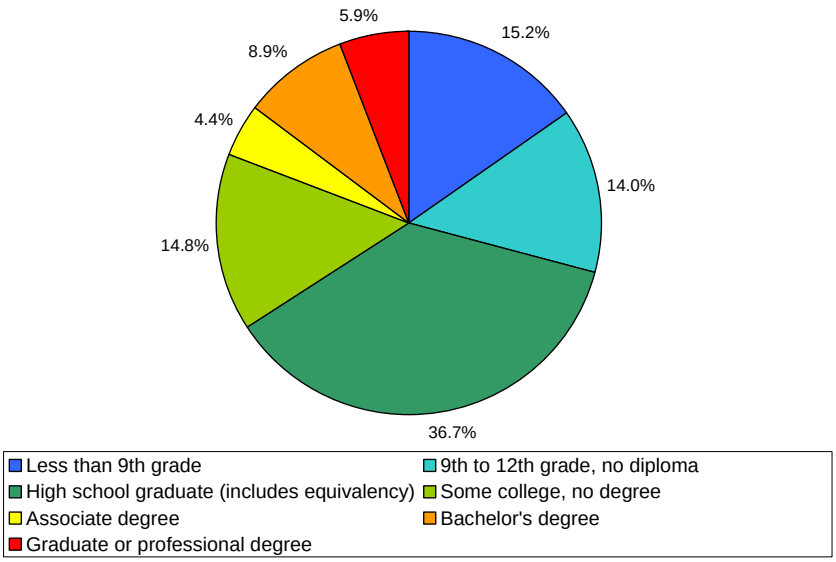
Reviewing the economic structure of an area is an essential component of any existing conditions study. Population trends, land development pressures, the availability of funding for community facilities, and the housing market are all heavily influenced by the structure and health of the economy. In fact, the standard and quality of living are largely determined by economic conditions. An economic profile is, therefore, an invaluable tool in forecasting and planning for the future. The economic profile is based on a variety of sources. Primary sources include the Virginia Employment Commission (VEC), Weldon Cooper Center for Public Service, U.S. Census Bureau, and the Virginia Department of Taxation.

Educational Attainment

For most businesses, the cost of labor accounts for most of their operating costs. Businesses are concerned about the quality of the labor force and prefer locations where the local labor force is known for high productivity, low absenteeism, and loyalty. Businesses need employees with the knowledge, ability, and skill to perform the job.

Figure 5.1, below, shows the educational attainment of Buena Vista's residents. The educational attainment for approximately a third of the City's residents is a high school diploma or equivalency.

Figure 5.1
Educational Attainment
Population 25 Years and Over
Buena Vista



Source: U.S. Census Bureau, 2005-2009 American Community Survey 5-Year Estimates

Table 5.1 compares the educational attainment of Buena Vista's population with that of its neighboring localities and the state. For Virginia, nearly 60 percent of residents have an education that includes college and over 30 percent hold a bachelor's or graduate/professional degree. In sharp contrast, about 15 percent of Buena Vista's residents and 23 percent of Rockbridge County's residents hold such a degree. The City of Lexington exceeds the state's educational attainment percentages because of the influence of two higher education institutions, Washington & Lee University and the Virginia Military Institute. For Buena Vista, the percentage of residents with a bachelor's degree or a graduate or professional degree is increasing, but it still lags behind its neighbors and Virginia.

Table 5.1
Educational Attainment
Population 25 Years and Over

Educational Attainment	Buena Vista (%)	Lexington (%)	Rockbridge (%)	Virginia (%)
Less than 9th grade	15.2	6.9	8.6	5.5
9th to 12th grade, no diploma	14.0	7.0	12.7	8.7
High school graduate (includes equivalency)	36.7	20.6	34.3	26.3
Some college, no degree	14.8	14.8	15.7	19.4
Associate degree	4.4	3.1	5.7	6.6
Bachelor's degree	8.9	22.4	15.1	19.8
Graduate or professional degree	5.9	25.1	7.9	13.6

Source: U.S. Census Bureau, 2005-2009 American Community Survey 5-Year Estimates

Access to ongoing training or continued education through community colleges, technical schools, or local colleges is an important benefit to a company and its labor force. The Buena Vista area is home to three universities, a community college, and workforce training programs. Specifically, these include Southern Virginia University, Washington & Lee University, Virginia Military Institute, and Dabney S. Lancaster Community College Regional Center. These education and training opportunities offer instruction and training courses that assist in creating a successful business environment.

Employment

Residents that completed the Buena Vista Comprehensive Plan Survey distributed in February 2009 indicated that jobs were a high priority. This section will highlight employment trends in Buena Vista. Table 5.2 shows the types of jobs in Buena Vista as well as wages generated.

Table 5.2
Employment and Wages by Sector
Buena Vista, 2nd Quarter 2009

Industry Sector	Average Number of Jobs	Average Weekly Wage ($)	Quarterly Gross Wages ($)
Total, All Industries	2,285	$517	$15,349,780
Agriculture, Forestry, Fishing	D	D	D
Mining	D	D	D
Utilities	D	D	D
Construction	20	433	112,555
Manufacturing	522	730	4,955,881
Wholesale Trade	9	1,104	129,170
Retail Trade	152	410	810,458
Transportation and Warehousing	D	D	D
Information	D	D	D
Finance, Insurance, and Real Estate	45	502	293,569
All Services	990	350	4,503,297
Professional and Technical Services	38	479	236,646
Administrative and Waste Services	106	316	432,020
Educational Services	D	D	D
Health Care and Social Assistance	461	326	D
Arts, Entertainment, and Recreation	D	D	D
Accommodation and Food Services	115	286	D
Other Services. Ex. Public Admin	41	328	D
Government (Local, State, and Federal)	434	607	3,424,256

D=Undisclosed data
Quarterly Gross Wages for Finance and Insurance and Real Estate and Rental and Leasing
Source: Virginia Employment Commission, Quarterly Census of Employment and Wages, 2nd Quarter 2009

Historically, Buena Vista has been the manufacturing center of Rockbridge area. Even though the number of manufacturing jobs is declining in Buena Vista, the manufacturing sector continues as a significant employer in Buena Vista. Of the 2,286 jobs in Buena Vista in 2009, 22.8 percent were in manufacturing. In comparison, manufacturing jobs make up 25.3 percent of Rockbridge County's employment and 0.5 percent of Lexington's employment. Even though about a fifth of Buena Vista's jobs are in manufacturing, it generates about a third of the gross wages. This is because manufacturing wages are higher than many other industry sectors.

Today, many jobs are in the service sector, 43.4 percent. However, 29.3 percent of the City's gross wages are generated by these jobs. Oftentimes, service sector jobs require less skill, pay minimum wages, and offer little or no room for advancement. The growth in service sector jobs may not satisfy the City's need for new employment.

Table 5.3
Percentage of Jobs by Industry Sector
Buena Vista – 1990, 2000, and 2009 (2nd Quarter)

Industry Sector	% of All Jobs in Buena Vista 1990	% of All Jobs in Buena Vista 2000	% of All Jobs in Buena Vista 2009
Construction	1.3	0.9	0.9
Manufacturing	44.6	37.0	22.8
Wholesale Trade	D	0.2	0.4
Retail Trade	11.2	11.9	6.6
Finance and Insurance	1.5	0.9	2.0
Real Estate and Rental and Leasing	0.5	0.7	0.4
All Services	13.5	25.8	43.3
Professional and Technical Services	1.8	2.6	1.7
Administrative and Waste Services	---	11.2	4.6
Educational Services	D	D	D
Health Care and Social Assistance	5.9	6.7	20.2
Arts, Entertainment, and Recreation	---	---	D
Accommodation and Food Services	8.7	4.6	5.0
Other Services, Ex. Public Admin	1.9	1.6	1.8
Government (Local, State, and Federal)	14.9	16.0	19.0

D=Undisclosed data
Source: Virginia Employment Commission, Quarterly Census of Employment and Wages, 2nd Quarter 2009

According to the Virginia Employment Commission, Buena Vista's largest employers are listed below in Table 5.4. In looking at the list, the presence of the manufacturing and service sectors in the City's economy is evident, specifically educational and healthcare services.

Table 5.4
10 Largest Employers
Buena Vista, 2nd Quarter 2009

Employer	Sector	Employee Range
Buena Vista City Public Schools	Educational Services	100-299
Southern Virginia University	Educational Services	100-299
Modine Manufacturing Company	Machinery Manufacturing	100-299
City of Buena Vista	Local Government	100-249
Everbrite LLC	Manufacturing	100-299
Ggnsc Buena Vista LLC	Nursing/Residential	50-99
Fudge Farm Investments LI	Warehousing/Storage	50-99
Fitzgerald Lumber and Logging	Wood Product Manufacturing	50-99
Shenandoah Hardwood Lumber Inc	Wood Product Manufacturing	20-49
Pro Careers	Social Assistance	20-49

Source: Virginia Employment Commission
Quarterly Census of Employment and Wages, 2nd Quarter 2009

Tables 5.5 and 5.6, below, offer a picture of the businesses and industries in Buena Vista by the number of people they employ. Table 5.5 indicates that the total number of establishment in Buena Vista has been fairly constant over the last twenty years. Most of the fluctuation has been in establishments with 10 to 19 employees or 50 to 99 employees. The fluctuation in the latter is also seen in the employment data of Table 5.6 with a drop from 716 employees is 2000 to 272 employees in 2009. Employment in businesses and industries having 20 to 49 employees is growing.

Table 5.5
Establishment by Size Class
Buena Vista, 2nd Quarter 2009

Employment Size of Establishment	Number of Establishments		
	1990	2000	2009
1 to 4	69	68	72
5 to 9	28	25	26
10 to 19	11	17	14
20 to 49	7	9	9
50 to 99	5	10	4
100 to 249	7	4	5
250 to 499	0	1	1
Total Establishments	127	134	131

Source: Virginia Employment Commission
Quarterly Census of Employment and Wages, 2nd Quarter

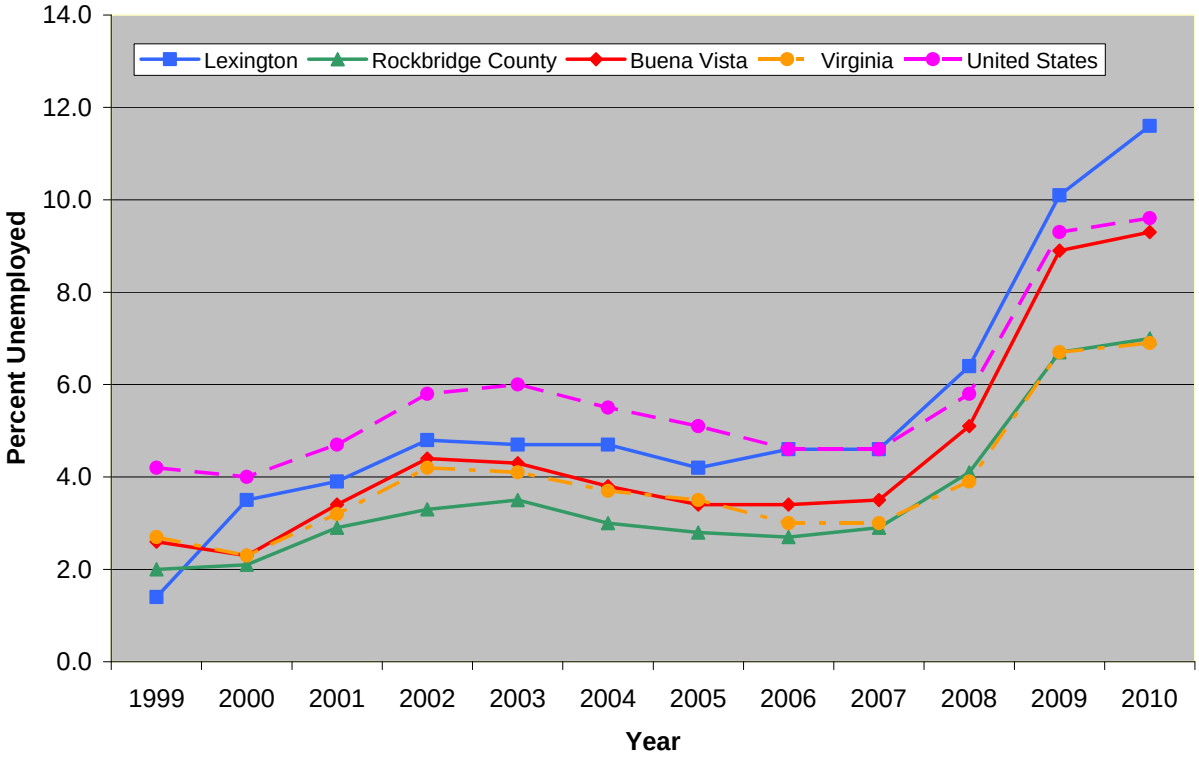
Table 5.6
Employment by Size of Establishment
Buena Vista, 2nd Quarter 2009

Employment Size of Establishment	Number Employed		
	1990	2000	2009
1 to 4	140	122	151
5 to 9	178	160	168
10 to 19	153	218	193
20 to 49	244	266	337
50 to 99	423	716	272
100 to 249	1054	754	844
250 to 499	0	357	320
Total Employment	2193	2583	2285

Source: Virginia Employment Commission
Quarterly Census of Employment and Wages, 2nd Quarter

From 1999 and 2005, the unemployment rate for Buena Vista mirrored that of Virginia. Rockbridge County tended to be slightly below and Lexington tended to be above the state's unemployment rate. All three localities were below the unemployment rate for the United States. As with national trends, unemployment jumped in 2008 and even more so at the beginning of 2010. Buena Vista remains below the national unemployment rate but the gap is minimal. Beginning in January 2010, Buena Vista's monthly unemployment rate was in double digits; it peaked at 10.7 percent in February 2010. In June 2011, the unemployment rate was 7.2 percent.

Figure 5.2
Unemployment Rate, 1999-2010



Source: Virginia Employment Commission

Commuting Patterns

The City of Buena Vista is an exporter of workers as seen in Table 5.7. A good number of residents, 640, live and work in City. However, this has declined substantially from 1,127 reported by the 2000 Census. After Buena Vista, workers are primarily commuting to and from Rockbridge County. Mohawk, located in Rockbridge County, employs over 600 people including many that live in Buena Vista. The places where residents are commuting to or where workers are commuting from are listed in Tables 5.8 and 5.9.

Table 5.7
Commuting Patterns
Buena Vista, 2009

	Count
People who live and work in Buena Vista	640
In-commuters	1,201
Out-commuters	2,056
Net in-commuters (in-commuters minus out-commuters)	-855

Source: U.S. Census Bureau, OnTheMap, 2009

Table 5.8
Top 10 Places Residents are Commuting To, 2009

Area	Count	Share (%)
Buena Vista	640	23.7
Rockbridge County	592	22.0
City of Lexington	348	12.9
City of Roanoke	92	3.4
Augusta County	75	2.8
City of Lynchburg	52	1.9
Fairfax County	49	1.8
Roanoke County	47	1.7
City of Covington	43	1.6
City of Harrisonburg	43	1.6
All Other Locations	715	26.5

Source: U.S. Census Bureau, OnTheMap, 2009

Table 5.9
Top 10 Places Workers are Commuting From, 2009

Area	Count	Share (%)
Buena Vista	640	34.8
Rockbridge County	470	25.5
City of Lexington	64	3.5
City of Lynchburg	42	2.3
Augusta County	36	2.0
Amherst County	34	1.8
Campbell County	34	1.8
City of Staunton	31	1.7
Roanoke County	30	1.6
Tazewell County	28	1.5
All Other Locations	432	23.5

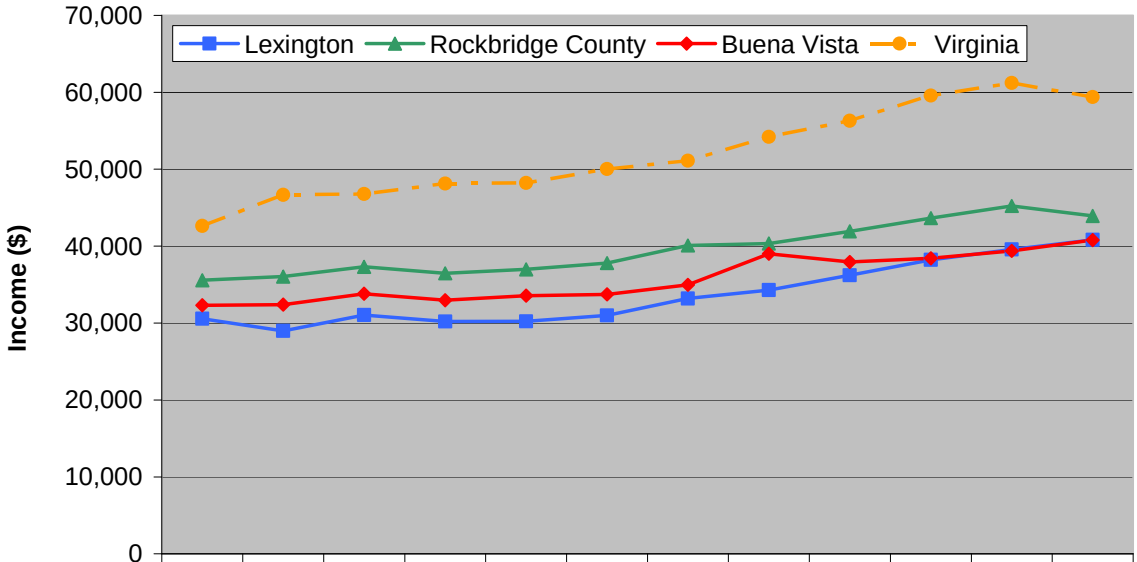
Source: U.S. Census Bureau, OnTheMap, 2009

Income

As the types of jobs in Buena Vista have reshuffled from higher paying manufacturing jobs to service sector jobs, household income levels are affected. Figure 4.12 shows the median household income data for the Rockbridge area as well as Virginia. Median household income is the amount which divides the income distribution into two equal groups, half of households having incomes above the median, half having incomes below the median.

Among Buena Vista, Lexington and Rockbridge County, Buena Vista has the lowest median household income. Up until 2008, Buena Vista had a higher median household income than the City of Lexington. Buena Vista, Lexington, and Rockbridge County all have a lower median household income than Virginia. More significant is that the income disparity between the state and these localities is generally growing. In 2009, however, Virginia's median income declined from the previous year. Rockbridge County's median income also declined, but that of the two cities increased.

Figure 5.3
Median Household Income, 1998-2009

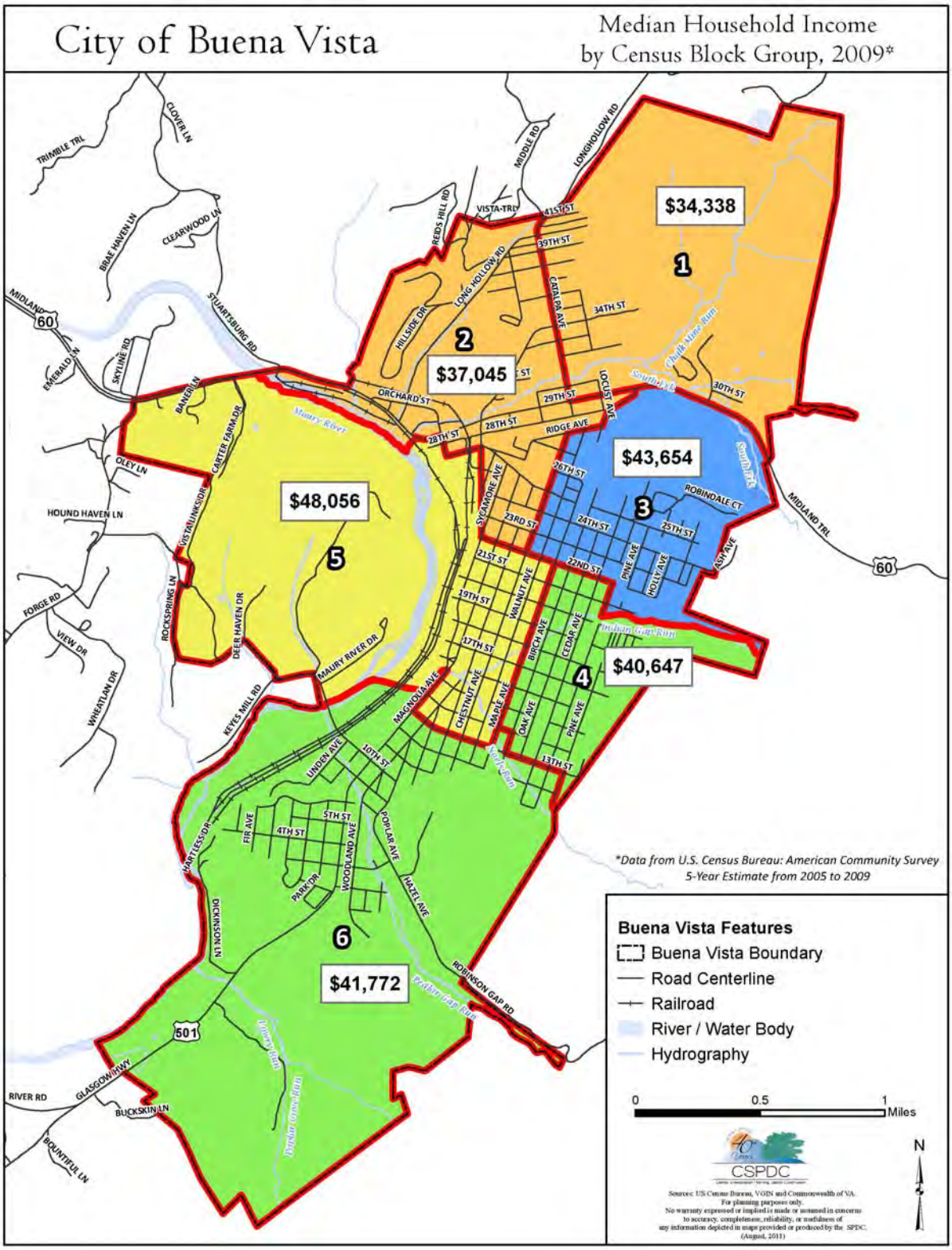


	98	99	00	01	02	03	04	05	06	07	08	09
Lexington	30,574	28,982	31,046	30,199	30,237	30,981	33,190	34,307	36,210	38,217	39,582	40,825
Rockbridge County	35,572	36,035	37,307	36,458	36,970	37,796	40,081	40,335	41,931	43,654	45,236	43,916
Buena Vista	32,328	32,410	33,802	32,965	33,556	33,728	34,982	39,018	37,942	38,418	39,390	40,802
Virginia	42,622	46,677	46,789	48,130	48,224	50,028	51,103	54,207	56,297	59,575	61,210	59,372

Source: U.S. Census Bureau, Small Area Income & Poverty Estimates

Maps 5.1 and 5.2 take a closer look at median household income within the City of Buena Vista. Income is shown at the Census block group level. Block Groups 1 and 2 in the northern part of the City have the lowest median household incomes. Its neighboring block, Block 5, has the highest median household income. Map 5.2 shows household income distribution at the block group level.

Map 5.1


City of Buena Vista
Median Household Income
by Census Block Group, 2009*
$34,338
1
$37,045
2
$43,654
3
$40,647
4
$48,056
5
$41,772
6
*Data from U.S. Census Bureau: American Community Survey
5-Year Estimate from 2005 to 2009
Buena Vista Features
Buena Vista Boundary
Road Centerline
Railroad
River / Water Body
Hydrography
0
0.5
1
Miles
N
CSPDC
Source: US Census Bureau, VGIN and Commonwealth of VA.
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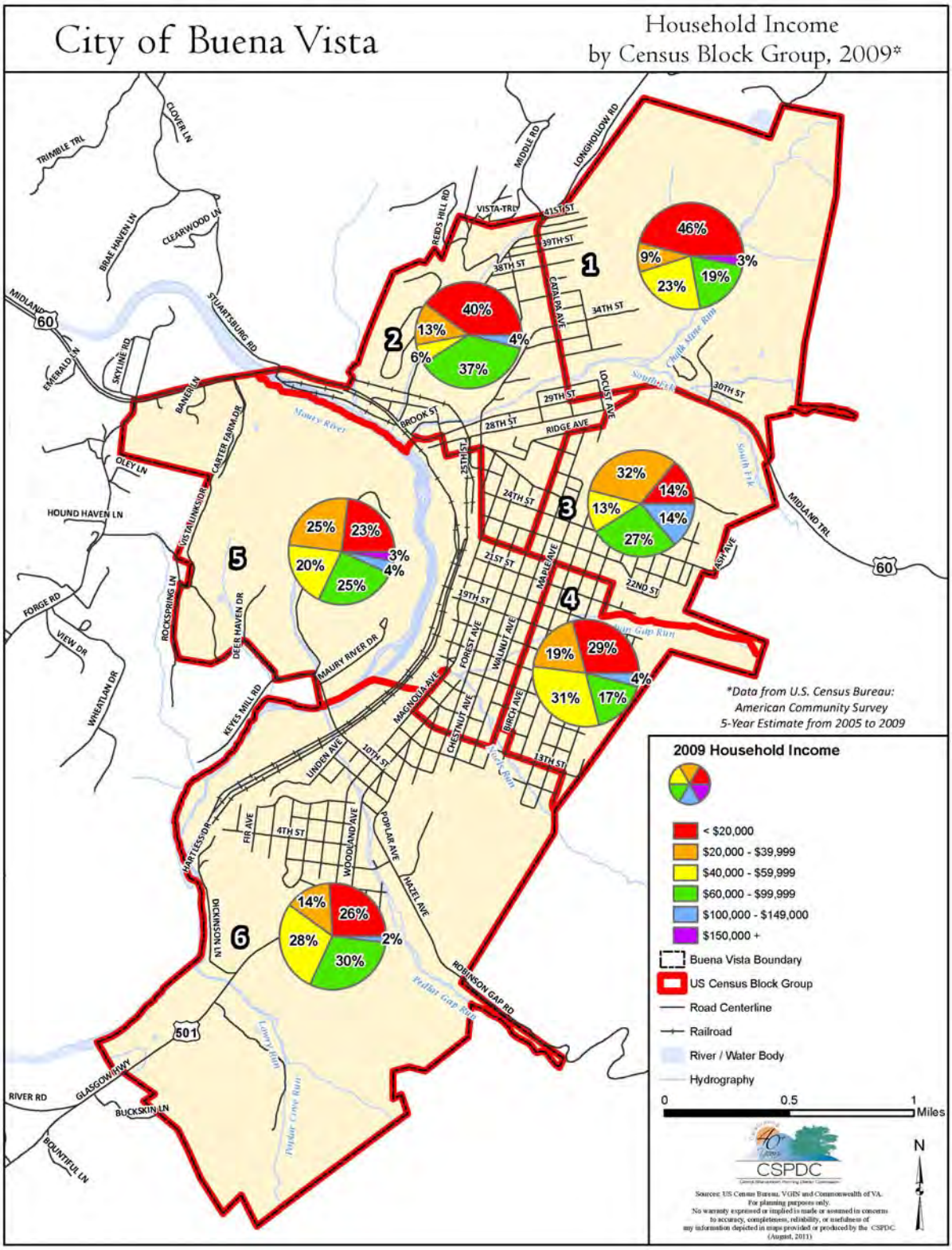
(August, 2011)
TRIMBLE TRL
CLOVER LN
BRAE HAVEN LN
CLEARWOOD LN
MIDLAND 60
STUARTSBURG RD
EMERALD LN
SKYLINE RD
BANGER LN
CARTER FARM DR
OLEY LN
HOUND HAVEN LN
VISTA LINKS DR
ROCKSPRING LN
FORGE RD
VIEW DR
WHEATLAND DR
DEER HAVEN DR
MAURY RIVER DR
KEYES MILL RD
MIDDLE RD
LONGHOLLOW RD
REIDS HILL RD
VISTA TRL
41ST ST
39TH ST
LONG HOLLOW RD
HILLSIDE DR
CATALPA AVE
34TH ST
ORCHARD ST
29TH ST
28TH ST
RIDGE AVE
LOCUST AVE
30TH ST
SYCAMORE AVE
26TH ST
23RD ST
24TH ST
25TH ST
ROBINDALE CT
MIDLAND TRL
ASH AVE
PINE AVE
HOLLY AVE
22ND ST
21ST ST
19TH ST
WALNUT AVE
17TH ST
BIRCH AVE
CEDAR AVE
MAGNOLIA AVE
CHESTNUT AVE
MAPLE AVE
OAK AVE
PINE AVE
13TH ST
10TH ST
LINDEN AVE
5TH ST
4TH ST
FIR AVE
HARTLESS DR
PARK DR
WOODLAND AVE
POPLAR AVE
HAZEL AVE
DICKINSON LN
ROBINSON GAP RD
501
GLASGOW HWY
RIVER RD
BUCKSKIN LN
BOUNTIFUL LN

Map 5.2


City of Buena Vista
Household Income
by Census Block Group, 2009*
1
46%
9%
3%
23%
19%
2
40%
13%
4%
6%
37%
3
32%
14%
13%
14%
27%
4
19%
29%
4%
31%
17%
5
25%
23%
3%
20%
4%
25%
6
14%
26%
2%
28%
30%
*Data from U.S. Census Bureau:
American Community Survey
5-Year Estimate from 2005 to 2009
2009 Household Income
< $20,000
$20,000 - $39,999
$40,000 - $59,999
$60,000 - $99,999
$100,000 - $149,000
$150,000 +
Buena Vista Boundary
US Census Block Group
Road Centerline
Railroad
River / Water Body
Hydrography
0
0.5
1
Miles
N
CSPDC
Source: US Census Bureau, VGIN and Commonwealth of VA.
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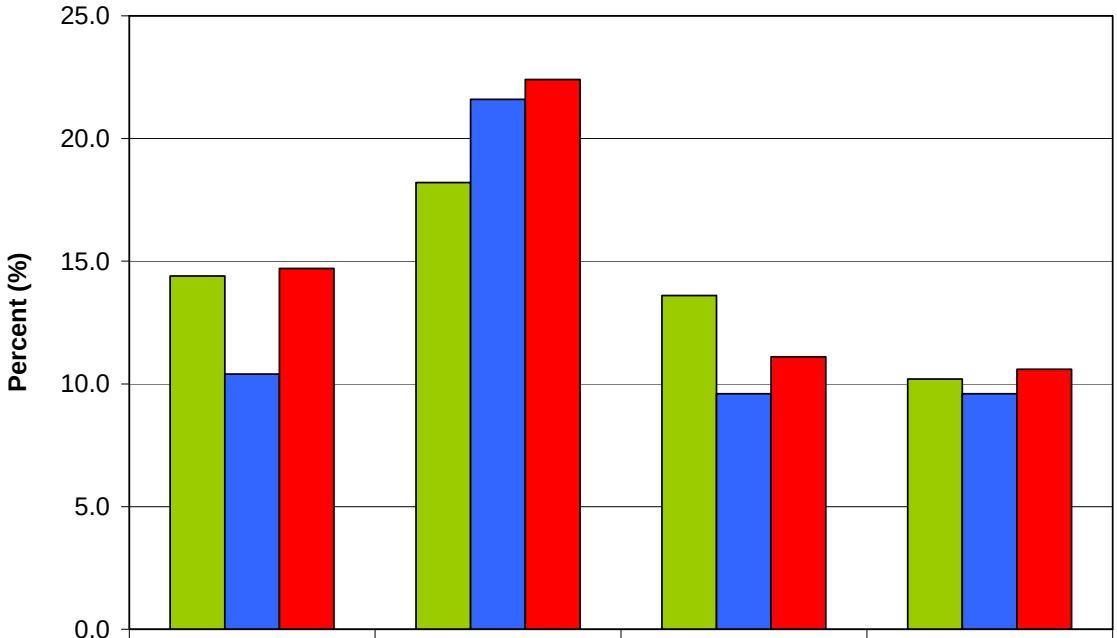
No warranty expressed or implied is made or assumed in concerns
to accuracy, completeness, reliability, or usefulness of
any information depicted in maps provided or produced by the CSPDC.
(August, 2011)
TRIMBLE TRL
CLOVER LN
BRAE HAVEN LN
CLEARWOOD LN
MIDLAND 60
EMERALD LN
SKYLINE RD
STUARTSBURG RD
BANER LN
CARTER FARM DR
OLEY LN
HOUND HAVEN LN
VISTA RUN ESTATES DR
ROCKSPRING LN
FORGE RD
VIEW DR
WHEATLAN DR
DEER HAVEN DR
MAURY RIVER DR
KEYES MILL RD
HARTLESS DR
DICKINSON LN
RIVER RD
GLASGOW HWY
501
BUCKSKIN LN
BOUNTIFUL LN
REDS HILL RD
VISTA TRL
MIDDLE RD
LONGHOLLOW RD
41ST ST
39TH ST
38TH ST
CASA PA AVE
34TH ST
30TH ST
29TH ST
28TH ST
25TH ST
24TH ST
21ST ST
19TH ST
10TH ST
4TH ST
LOCUST AVE
RIDGE AVE
BROOK ST
MAPLE AVE
FOREST AVE
WALNUT AVE
MAGNOLIA AVE
CHESTNUT AVE
BIRCH AVE
LINDEN AVE
FIR AVE
WOODLAND AVE
POPLAR AVE
HAZEL AVE
ROBINSON GAP RD
ASH AVE
22ND ST
13TH ST
MIDLAND TRL
60
Maury River
South Fork
Cloyds Mtn Run
Poplar Gap Run
Laurel Run
Poplar Cove Run

Besides income, poverty levels offer an indication of the economic health of residents. Figure 5.4 shows the percent of people of all ages that are in poverty. The percentage of those living in poverty has increased between the 2000 Census and the 2009 estimated poverty level. In Buena Vista, it is similar to the percentage reported by the 1990 Census.

Figure 5.4
Poverty Level Status
Percent of All Ages in Poverty



	Buena Vista	Lexington	Rockbridge	Virginia
1990 Census	14.4	18.2	13.6	10.2
2000 Census	10.4	21.6	9.6	9.6
2009 Estimate	14.7	22.4	11.1	10.6

Source: U.S. Census Bureau, 1990 and 2000 Census and 2009 Small Area Income & Poverty Estimates

ECONOMIC OPPORTUNITIES

Local economic development is a process that involves a number of activities. As a local government providing infrastructure and land use control, the City of Buena Vista is in a position to play a key role in promoting economic development. The City plays many roles in economic development. Among these roles are the following:

- Adopting a Comprehensive Plan that guides development of the City;
- Adopting supportive land use policies and regulations;
- Setting fees and charges for development;
- Providing and maintaining infrastructure including the transportation system, water system, and wastewater collection system;
- Facilitating economic activity;
- Providing technical and financial assistance;
- Promoting labor force training; and
- Coordinating educational institutions.

Economic development does not grow spontaneously, rather it happens as a result of careful planning. Furthermore, the demand for industrial, commercial, retail, and residential space usually does not grow at the same rate. In an expanding economy, typically jobs attract workers who then seek housing, and finally shop for goods. In older communities such as the City of Buena Vista, office and industrial buildings are generally built/redeveloped first, followed by housing units and finally retail businesses.

Business Attraction and Retention

Attracting new business and growing existing business are both desired economic activities. New business in a community means more jobs and a higher tax base. Generally, new businesses lead to increases in local wage levels and discretionary spending. On the other hand, focusing on business retention and expansion activities results in growth often times without the cost and risk of luring new industry. Buena Vista offers the following qualities to new and existing businesses:

- Location near Interstate 81 and Interstate 64;
- Business incentives;
- Access to ongoing training or continued education through community colleges, technical schools, and local colleges;
- Recreational resources;
- Quality schools; and
- Affordable housing

The City of Buena Vista has developed a number of initiatives to encourage business attraction, retention, and expansion. These include the following incentives and marketing tools:

Buena Vista Business Website. The City offers a website dedicated to business development. The website, buenavistabusiness.com, provides a wealth of information about Buena Vista as a place for business and living.

Technology Zones. In 2004, the City of Buena Vista created two distinct Technology Zones, a Downtown Zone and an Industrial Zone (see Map 5.3). The purpose of the Technology Zones is to attract new and assist current businesses within the City in growing technology related business by providing tax incentives. The Downtown Zone was established primarily for small business. The zone includes most of the traditional downtown as well as a portion of 29th Street. The Industrial Zone includes land within the City limits that is zoned industrial.

Tourism Zones. As established within the Buena Vista Comprehensive Plan, the City has defined two Tourism Zones as shown on Map 5.4. The purpose of the Tourism Zones is to attract travel and tourism related businesses by allowing the City to offer tax incentives and regulatory flexibility in the designated area.

Buena Vista Downtown Historic District. The Buena Vista Downtown Historic District was established in 2009 (See Chapter 2 Historic Resources, Map 2.1) The Downtown Historic District designation means that up to 45 percent of eligible renovation costs may be returned to the owner through a combination of federal and state tax credits.

Low Interest Loan Fund. The purpose of the Low Interest Loan Fund is to provide short term capital at an extremely low interest rate. The program includes improvement loans, working capital loans, and new business seed loans.

Buena Vista Rehabilitation Tax Exemption. A partial tax exemption is available for qualifying rehabilitated, renovated or replaced residential, commercial, or industrial structures.

Press Release Program. New and existing businesses in the City of Buena Vista are offered free press releases any time when they are needed. The Press Release Program provides businesses the opportunity to have a formal press release developed for submission to local media outlets.

Buena Vista Community Guide. The Community Guide, a City initiative, is intended to provide awareness and increased sales for businesses in the City. Every business has the opportunity to be included in the Buena Vista Community Guide which is mailed to every City resident. The most recent guide was printed in 2008. An updated guide is anticipated in 2012.

Business Webpage. The City provides the opportunity for businesses to promote themselves with a free business webpage on the City's economic development website, buenavistabusiness.com.

Visitor Guide & Calendar of Events. The brochure is distributed to visitors from outside the area to promote Buena Vista businesses and events.

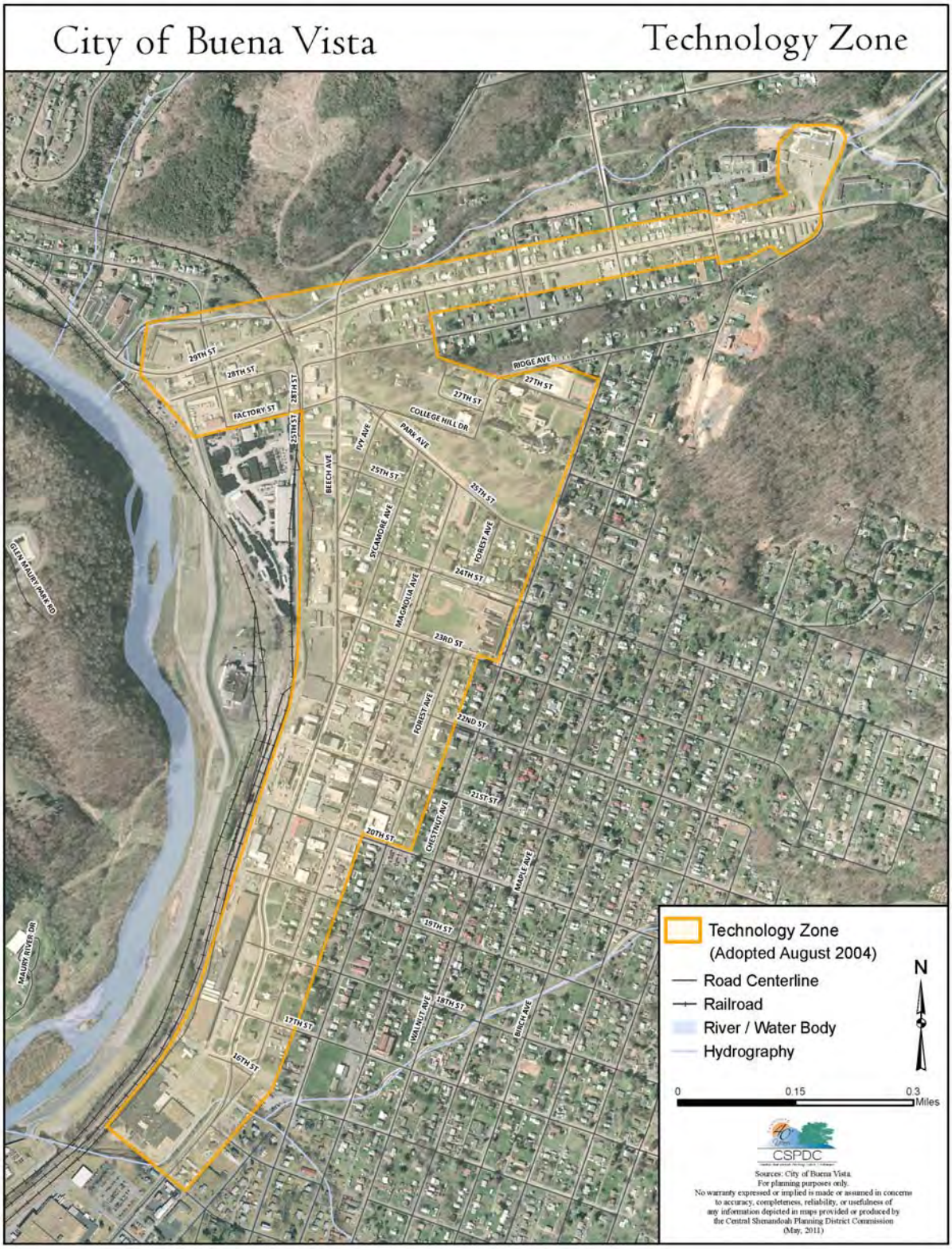
Downtown Events. Community events attract residents and visitors downtown. This provides invaluable exposure for the City's businesses.

The City of Buena Vista is a manufacturing center. Manufacturing employment has declined but it remains a significant employer with some of the highest wages. Helping all businesses, specifically manufacturing, to expand their markets will be key to growing jobs in Buena Vista. Typically, expanding domestic and foreign markets leads to increased investment, additional job creation, and diversification of goods and services. Economic activities should also target small business that is able to grow over time. As listed above, the City has incentives in place to help new businesses locate and grow in Buena Vista.

With either new businesses or existing ones, it is important to encourage locally owned and operated businesses to re-invest profits and wages in the local economy. When local businesses use local banks and other support services, it helps keep dollars cycling through the local economy. This holds true for residents too. Residents must be willing to shop for goods and services within the City limits.

As Buena Vista reinvents itself over the next 20 years, it needs to identify a brand for the City around which businesses and economies can flourish and competition can thrive. Included in the list of the City's strengths are its recreational and cultural qualities, the area's colleges and universities, and its population. All or any of these present opportunities for Buena Vista to build its identity.

Map 5.3


City of Buena Vista
Technology Zone
29TH ST
28TH ST
FACTORY ST
RIDGE AVE
27TH ST
COLLEGE HILL DR
PARK AVE
IVY AVE
BEECH AVE
25TH ST
SYCAMORE AVE
FOREST AVE
24TH ST
MAGNOLIA AVE
23RD ST
22ND ST
21ST ST
20TH ST
CHESTNUT AVE
MAPLE AVE
19TH ST
18TH ST
17TH ST
16TH ST
WALNUT AVE
BIRCH AVE
GLEN MAURY PARK RD
MAURY RIVER DR
Technology Zone
(Adopted August 2004)
Road Centerline
Railroad
River / Water Body
Hydrography
N
0
0.15
0.3
Miles
CSPDC
Sources: City of Buena Vista.
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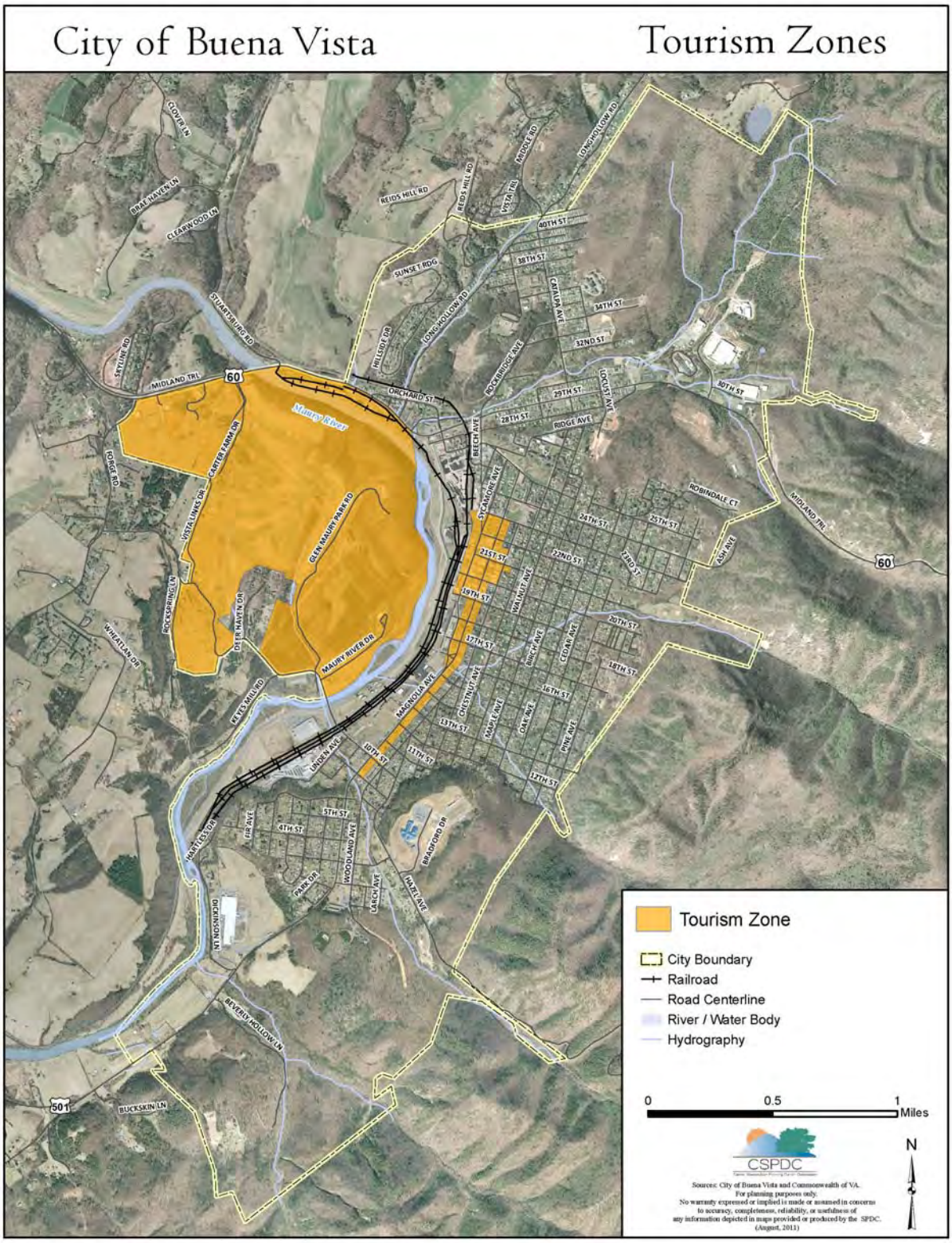
to accuracy, completeness, reliability, or usefulness of
any information depicted in maps provided or produced by
the Central Shenandoah Planning District Commission
(May, 2011)

Map 5.4


City of Buena Vista
Tourism Zones
Tourism Zone
City Boundary
Railroad
Road Centerline
River / Water Body
Hydrography
0
0.5
1
Miles
N
CSPDC
Sources: City of Buena Vista and Commonwealth of VA.
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(August, 2011)
Maury River
MIDLAND TRL
60
ORCHARD ST
MAURY RIVER DR
GLEN MAURY PARK RD
STUARTSBURG RD
SUNSET RDG
REIDS HILL RD
40TH ST
39TH ST
34TH ST
32ND ST
29TH ST
28TH ST
RIDGE AVE
24TH ST
25TH ST
22ND ST
21ST ST
19TH ST
17TH ST
16TH ST
13TH ST
12TH ST
11TH ST
10TH ST
5TH ST
4TH ST
BEECH AVE
SYCAMORE AVE
WALNUT AVE
BIRCH AVE
CEDAR AVE
CHESTNUT AVE
MAPLE AVE
OAK AVE
PINE AVE
MAGNOLIA AVE
LINDEN AVE
LOCUST AVE
ASH AVE
ROBINDALE CT
MIDLAND TRL
60
HARTLESS DR
WOODLAND AVE
HAZEL AVE
BRADFORD DR
PARK DR
DICKINSON LN
BEVERLY HOLLOW LN
501
BUCKSKIN LN
KEYES MILL RD
WHEATLAN DR
ROCKSPRING LN
OTTER HAVEN DR
VISTA LINKS DR
CARTER FARM DR
FORGE RD
SKYLINE RD
CLOVER LN
BRAE HAVEN LN
CLEARWOOD LN
REDS HILL RD
MIDDLE RD
VISTA TRL
LONG HOLLOW RD
HILLSIDE DR
JONES HOLLOW RD
CATALPA AVE
ROCKBRIDGE AVE

Outdoor Recreation

Outdoor recreation is a key component of boosting local tourism. The City can attract investment, revitalize its downtown, and boost tourism while protecting the environment and preserving parks and open space. Economic development and environmental protection are frequently seen as opposites. However, the two are interrelated and are important to a community.

Reasons why parks, recreation, and open space make economic sense:

- Parks and open space often increase the value of nearby properties, along with property tax revenue.
- Parks and open space attract businesses and trained employees in search of a high quality of life.
- Parks and open space attract tourists and boost recreational spending.
- Conserved open space helps safeguard drinking water, clean the air and prevent flooding – services provided much more expensively by other means.

Source: 2007 Virginia Outdoors Plan, Adapted from *The Trust for Public Land*, Spring 2006.

In public meetings and community surveys, Buena Vista's natural resources are repeatedly considered as a strength and an opportunity for the City. The City of Buena Vista has a "natural" identity. These resources include the following:

- Maury River
- Blue Ridge Mountains
- Jefferson and George Washington National Forests
- Glen Maury Park
- Blue Ridge Parkway
- Chessie Trail
- Appalachian Trail

A national trend is for families to favor more frequent weekend trips throughout the year rather than an annual vacation of one to two weeks. This provides an opportunity for communities such as Buena Vista to promote its outdoor resources in addition to its music festivals, parades and celebrations. Furthermore, these special events establish the City as a more attractive site for outside investors. The City opens its doors for additional economic development activity by bringing investment prospects into its own backyard. It is up to the City, its residents and businesses to use these opportunities to showcase the City's assets to visiting prospects.

Glen Maury Park along with The Vista Links is the jewel of Buena Vista. To the outside eye, the park and the golf course are one even though they are operated separately. They are a destination in the City that needs to be highlighted and improved. In May of 2002, a five day design charrette resulted in a vision for the development of the Hill Top - Glen Maury Park area. That vision included of an 18-hole golf course which was later developed as The Vista Links. The recommendations for the park attempted to address connections between the park and downtown, location of entertainment venues, use of field areas, and accessibility to the riverfront. A number of the park recommendations have not been implemented, but they continue to be key elements for improving Glen Maury Park as a destination.

Tourism and recreation based business is not simply an income generating business. It has other benefits as well including providing recreational activities for residents and enhancing the community's image as a great place to live. It not only improves the external image of the community but also the internal image. Local residents take pride in what their community has to offer. The park is certainly one of the benefits of living in the City. It is a positive contributor to the City's quality of life.

To sustain tourism, the City must have an adequate support network of motels, restaurants, shopping, and worthwhile attractions. Although tourism creates many job opportunities, most of these positions pay low wages. This is a criticism of the tourism industry. On the other hand, if tourism and recreational development attract significant numbers of seasonal and permanent residents, it could change the City for the better. Visitors and new residents could spark the demand for more goods and services resulting in a more diversified economy with higher paying jobs. Consequently, tourism and outdoor recreation as a means of fostering economic development needs to be balanced with other economic activities.

Recognizing that tourism is an important component of the City's economy, the City has defined two Tourism Zones as permitted by Code of Virginia. These Tourism Zones are shown on Map 5.4. The purpose of the Tourism Zones is to attract travel and tourism related business to the downtown area and the Glen Maury Park/Hill Top area. The designation as Tourism Zones reflects that these two areas are key opportunities for economic development within the City.

Town & Gown

The Buena Vista area is home to three universities, a community college, and workforce training programs. These include Southern Virginia University, Washington & Lee University, Virginia Military Institute, and Dabney S. Lancaster Community College Rockbridge Regional Center. These education and training opportunities offer instruction and training courses that assist in creating a successful business environment. Businesses

are concerned about the quality of the labor force, and they need employees with the knowledge, ability, and skill to perform the job. The close proximity to education and training opportunities in Buena Vista are an important benefit to both businesses and the labor force.

Located on the edge of Buena Vista's downtown, Southern Virginia University (SVU) has the greatest impact on the City's economy. As shown in Figure 4.3, Southern Virginia University (SVU) is one of the largest employers in the City of Buena Vista. It is also one of the fastest growing because of the overall expansion of the University. During the next five to ten years, SVU expects its enrollment to increase from its current 800 students to approximately 1,000.

About a tenth of workers in Buena Vista are employed by SVU. SVU employees include both non-student and student employees. The average weekly wage of a SVU employee is higher than the average weekly wage of all industries in Buena Vista. As mentioned in the Chapter 1, Population Characteristics, Buena Vista has a negative natural increase. However, the City's population is growing at a slow rate because of its positive net migration. Much of this migration is related to SVU's growth.

With an increase in the University's population, the demand for housing has increased. Approximately 75 percent of SVU employees live with Buena Vista's boundaries. This leads to increased property values and contributes to increased City revenues through property taxes. Additionally, some SVU students rent housing units off campus. Consequently, owners of rentals properties have seen significant increases in rental income.

Southern Virginia University significantly increases visitor traffic and spending in the City. It is estimated that there are more than 1000 visitors to the SVU campus each year. These visitors include prospective students, families of students, competing athletic teams, speakers, conference attendees, alumni, and donors. Additionally, over 1800 high school aged individuals attend weekly summer camps on campus. This brings parents who and spend time and money in the area as they drop-off and pick-up their child.

As with recreation, the university needs a support network of motels, restaurants, and shopping. Presently, many visitors and students tend to spend much of their discretionary income in Lexington or in Rockbridge County stores such as Walmart. Buena Vista has a small number of hotel choices, so visitors choose to stay elsewhere. It is believed that SVU employees, students, and visitors would support stores and services in Buena Vista if they were available. This need presents an opportunity for new businesses in the City.

SVU impacts Buena Vista's economy through its payroll, property taxes, and off-campus student housing rentals. It also provides unmeasured benefits including access to the university's library; music, theater, and other arts programs; athletic events; and community service through its outreach programs. These amenities contribute to the City's quality of life. SVU is an important partner in Buena Vista's future. Consequently, the City and the business community should engage with SVU as it creates economic development plans.

Historic Downtown

Downtown Buena Vista has lots of positive things working in its favor. These include the following:

- Historic buildings
- Wide streets
- Location on the Blue Ridge Parkway
- Views of the Blue Ridge Mountains
- Historic district designation
- Technology zone
- Tax abatement program

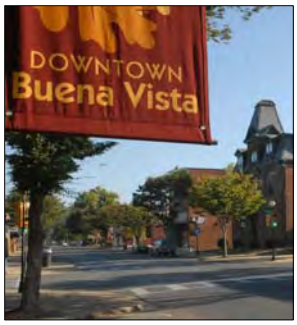
It also faces many challenges which include:

- Relatively high vacancy rate
- Relatively small proportion of retail businesses
- Stiff competition from businesses in other parts of the Rockbridge County and nearby counties
- Legacy of loss from the devastating floods of 1969 and 1985
- Negative public perceptions of the district to overcome

From *Sales Gap Analysis for Buena Vista, Virginia*.

Knowing these strengths and weaknesses of the downtown will help shape the economic development strategies and investments that will be most useful to downtown business and will help the City to grow. *The Sales Gap Analysis for Buena Vista, Virginia* recommends a general process for a downtown development plan as well as specific suggestions. The use of this report should be reviewed for guiding the reinvention of Buena Vista's historic downtown.

A frequent comment in the comprehensive plan survey and the community survey is the lack of shopping in Buena Vista. Currently, downtown has a few destination shops, but it is not generally considered a place to window shop. Downtown is not the economic driver of the City, but it has the potential to grow as other sectors of the economy strengthen. These include businesses that focus on students, faculty and visitors of Southern Virginia University; campers, music goers, and outdoor recreation enthusiasts of Glen Maury Park; travelers along the Blue Ridge Parkway; and an aging City population. Building up the existing farmers' market could encourage shopping and community gatherings downtown while supporting local agricultural activities. A niche market could also be identified as a downtown development plan is formed. As this plan is implemented, the needs of visitors and residents may need to be balanced.



In addition to the downtown, growth towards Interstate 81 needs to be considered. The City has sewer and water infrastructure that could be extended into Rockbridge County. The City needs to partner with neighboring localities to plan growth. This could create revenue for Buena Vista, thereby reducing taxes and providing a funding source for revitalization efforts in the downtown.

CURRENT INITIATIVES

Gems of Rockbridge Geocaching Trail. This is a high-tech game in which participants use online clues and GPS coordinates to locate hidden "caches", which are hidden containers ranging in size from a bottle cap to an ammunition box. The geocaching trail was implemented in Summer 2009 and includes locations in the City of Buena Vista.

Rockbridge Wayfinding Signage Program. This purpose of this regional program is to design, install, and maintain a system of customized directional signage to guide residents and visitors to primary and secondary attractions and destinations throughout the Rockbridge County area, Lexington, and Buena Vista. The first signage is expected to be installed in 2011.

Upper James Outdoor Recreation Plan. The Upper James Outdoor Recreation Steering Committee, comprised of about a dozen partners including the City of Buena Vista, is directing a planning initiative to strategically plan outdoor recreation throughout the Upper James Region. The plan will prioritize projects, promote natural resource recreation, and enhance outdoor recreation opportunities.

Blue Ridge Parkway Gateway Study. In the spring of 2010, a study along U.S. Route 60/Midland Trail/E. 29th Street and U.S. 501 was completed. The purpose of the study was to strengthen the connection between the Blue Ridge Parkway and the City of Buena Vista. The study identified issues and opportunities including, but not limited to, land use, economic development, conservation, tourism, and signage. The study resulted in an illustrative conceptual plan indicating key recommendations for the study area as well as steps for plan implementation. In June 2010, the City was awarded a grant from the Virginia Department of Forestry under its Urban and Community Forestry Assistance Program to complete a professional landscape and tree planting plan for the gateway corridor.

Appalachian Trail Community. In October 2011, the City of Buena Vista was designated an Appalachian Trail Community by the Appalachian Trail Conservancy. Designation and participation in the program is designed to act as a catalyst for enhancing economic development. Preserving and enhancing a charming, memorable community destination is intended to contribute to the long-term economic health of Appalachian Trail (A.T.) communities and make an A.T. hike even more desirable. Additionally the program strives to engage community citizens as trail visitors and stewards, aid localities and regions with conservation planning, and highlight the trail as a resource and asset.

SUMMARY OF TRENDS

- Manufacturing continues as the largest industry sector for employment and gross wages.
- Growing industry sectors include government and services.
- Buena Vista is an exporter of workers.
- The City offers a number of incentives to attract and retain business.
- The City has the opportunity to strengthen and diversify its economy by building on its assets of outdoor recreation, Southern Virginia University, and historic buildings.

RELATED STUDIES AND REPORTS

Sales Gap Analysis for Buena Vista, Virginia. The Community Land Use and Economics Group, LLC, 2009.

Hill Top-Glen Maury Park Master Plan. The Lawrence Group – Town Planners & Architects, 2003.

Brushy Blue Greenway Master Plan. LPDA Land Planning & Design Associates, Inc., July 30, 2004.

2007 Virginia Outdoors Plan. Virginia Department of Conservation & Recreation, 2007.

Blue Ridge Parkway/Skyline Drive Gateway Studies; Study 1: Rockbridge County and the City of Buena Vista. Central Shenandoah Planning District Commission, June 2010.

Economy
STRATEGIES FOR ACTION

Goal 1: Economy

The City of Buena Vista will be a community with a sustainable, diverse economy that can weather national economic fluctuations. The City of Buena Vista will be a regional employment center and a hub for regional economic development.

To achieve this goal, the following critical success factors must be accomplished:

- Provide and retain a high quality workforce.
- Position the City in the new economy with a diverse, expanded economic base (size, type, and age).
- Nurture existing businesses.
- Promote a business climate that nurtures entrepreneurship.
- Encourage development that creates local re-investment funds and provides jobs in the local community.
- Ensure adequate infrastructure to support existing and future business development and evolving technology.
- Coordinate economic development with environmental and other land use and open space policies and measures to enhance the community's overall quality of life.
- Strengthen relationships with local universities and colleges.

		Priority	Responsibility
5.1A	Foster collaborative working relationships among economic development stakeholders at the community, state, and federal levels.	On Going	City staff
5.1B	Ensure an adequate water supply and distribution system to support economic growth.	H	Public Works
5.1C	Maintain a safe and efficient wastewater collection and treatment system that meets the long-term needs of community residents, industries, and visitors.	On Going, H	Wastewater Treatment
5.1D	Encourage the provision of adequate transportation infrastructure including public transit.	On Going	Public Works, Regional Cooperation
5.1E	Support technology and conservation techniques to minimize demands on resources such as water, energy, and other natural and developed resources.	On Going	Economic Development, Public Works
5.1F	Visit local firms to find out what their problems and needs are.	On Going	Economic Development
5.1G	Identify businesses considering expansion and provide technical or other assistance to facilitate expansion.	On Going	Economic Development

		Priority	Responsibility
5.1H	Ensure that local businesses are aware of and kept up to date on City, State, and federal programs, services, and activities that may be of use or assistance to local businesses.	On Going	Economic Development
5.1I	Support existing local businesses as the major contributors of job creation and afford them every opportunity to continue their success in the community.	On Going	Economic Development
5.1J	Encourage investments whose products and services can be marketed beyond the borders of the City of Buena Vista, both domestically and internationally.	On Going	Economic Development
5.1K	Encourage firms to contribute financially as a partner with the public sector in sharing the costs for civic and cultural needs of the community at large.	On Going	Economic Development
5.1L	Develop opportunities to collaborate and reach out to the business community.	On Going	Economic Development
5.1M	Partner with local colleges and universities, particularly SVU and DSLCC, and local business to create student opportunities for workplace experience and entrepreneurship.	On Going	Economic Development, SVU, DSLCC
5.1N	Develop GIS to create a central repository for economic, land use, and business data to support local business needs.	H	Economic Development, Planning, Public Works
5.1O	Simplify development procedures and processes to improve understanding, clarify intent, shorten time requirements, consolidate review methods and agents, and enhance the realization of quality development projects.	L	Economic Development, Planning
5.1P	Promote local citizen support of businesses located in Buena Vista through newsletters, directories, and local events.	On Going	Economic Development
5.1Q	Maintain an updated inventory of available business and industrial properties in the City.	On Going	Economic Development
5.1R	Promote a market brand and image for the Buena Vista business community.	H	Economic Development
5.1S	Organize and market a regular downtown farmers' market.	H	Economic Development, Celebrate Buena Vista
5.1T	Convene a summit of local representatives to identify opportunities for collaboration on responses to the business community's needs.	On Going	Economic Development
5.1U	Identify incubator space for small businesses in the City of Buena Vista.	H	Economic Development

		Priority	Responsibility
5.1V	Seek out opportunities for public and private partnerships to develop community assets that will benefit residents and businesses.	On Going	Economic Development
5.1W	Establish a competitiveness review of policies, taxes/fees, processes and other influences that impact City businesses.	On Going	Economic Development, Planning, Finance
5.1X	Recognize the natural environment as a major asset and manage environmental resources accordingly.	On Going	Public Works, Parks & Rec, Staff Leadership
5.1Y	Develop a detailed strategy for marketing and promoting Buena Vista as a recreation gateway.	H	Economic Development, Parks & Rec
5.1Z	Use the resources of Maury Park and the route to the Blue Ridge Parkway to build tourism and recreation development.	H	Economic Development, Parks & Rec
5.1AA	Publicize the City's parks and recreation amenities to the regional business community to help attract and retain workers.	H	Economic Development
5.1BB	Implement the recommendations of the Park Commission Business Plan.	H	Economic Development, Planning, Parks & Rec
5.1CC	Implement the recommendations of the Blue Ridge Parkway Gateway Study for the City of Buena Vista.	M	Economic Development, Planning, Parks & Rec, Public Works
5.1DD	Restore a pedestrian bridge across the Maury River to connect Glen Maury Park and the Downtown area.	M	Economic Development, Planning, Parks & Rec, Public Works, VDOT
5.1EE	Coordinate regional partners to implement the recommendations of the Brushy Blue Greenway Master Plan.	M	Economic Development, Planning, Parks & Rec, Public Works
5.1FF	Provide a better community balance between housing, shopping and working.	L	Economic Development, Planning

High (H) = Years 1-5
Medium (M) = Years 5-7
Low (L) = Years 7-10
On Going = Strategies with zero to minimal costs associated with implementation. These strategies may be completed at any time throughout the life of the plan.

Economy STRATEGIES FOR ACTION			
Goal 2: Redevelopment **The City of Buena Vista will be a community that provides redevelopment programs and service that facilitate the redevelopment of designated areas and helps rebuild neighborhoods.**			
To achieve this goal, the following critical success factors must be accomplished: • Provide regulations that provide flexibility and incentives for redevelopment. • Focus on development in redevelopable areas of the City. • Promote an atmosphere that is conducive to business expansion.			
		Priority	**Responsibility**
5.2A	Develop policies and incentives to stimulate redevelopment of older, vacant, or blighted non-residential uses. Incentives should include both economic (historic tax credits, technology zone, tourism zone) and policy (ordinance provisions, etc) opportunities.	On Going	Economic Development, Planning
5.2B	Develop an inventory related to the designated redevelopment of areas including vacancy rates, ownership, and duration of leases.	M	Economic Development
5.2C	Work with local businesses to identify retention and expansion road blocks.	On Going	Economic Development
5.2D	Consider the recommendations of the Sales Gap Analysis to produce a downtown development plan.	H	Economic Development

High (H) = Years 1-5
Medium (M) = Years 5-7
Low (L) = Years 7-10
On Going = Strategies with zero to minimal costs associated with implementation. These strategies may be completed at any time throughout the life of the plan.

CHAPTER 6
Infrastructure & Utilities

Infrastructure is the basic physical systems of a community's population. Infrastructure covers a broad array of topics including roads, utilities, water, sewers, power grids, telecommunications. These systems are considered essential for the production of goods and services. They are critical to meeting the community's development goals.

A community makes big investments to provide these basic services, and they require ongoing investment and maintenance. It is important to evaluate the capacity of the City's infrastructure and its ability to meet current and future development needs. Roads are discussed in a separate chapter, Chapter 7, Transportation.

WATER INFRASTRUCTURE

There are three forms of water infrastructure – drinking water, wastewater, and stormwater. These three are addressed locally. Drinking water supplies are drawn from local surface or ground water sources. Wastewater is treated and discharged locally without contaminating local waters. Stormwater is collected and managed to prevent flooding, erosion, and contamination of streams and rivers. Because Buena Vista is not experiencing rapid growth, the focus is on maintaining and improving existing facilities.

Relationship to Other Plan Elements

Natural Resources. Rivers and streams improve the quality of life for residents and provide a basis on which to build tourism. Water quality and habitat need to be maintained.

Housing. Varying housing types have differing demands. Planned and thoughtful choices, extension of systems and routine maintenance, let a community retain a diversity of housing options, minimize inefficient systems, and help keep housing affordable.

Economy. Many communities invest in water/sewer facilities to encourage economic growth by facilitating the expansion of existing businesses as well as attracting new ones. This can mean the creation of jobs and expansion of the tax base. Additionally, some commercial and industrial activity may have special wastewater treatment needs.

Land Use. The cost of sewer and water extensions and new systems can be very high. They open up more land to be developed. Consequently, these projects may significantly change the character of areas not currently served by existing systems. Additionally terrain and topography greatly influence land use.

Drinking Water

Water facilities are built primarily to provide clean, safe drinking water. Investment in water facilities also supports economic development. The water system collects, treats, stores and distributes potable water from the source of supply to the consumer. Buena Vista's public water system serves the residents of the City as well as a small portion of Rockbridge County (See Map 6.1). Buena Vista classifies its water customers as either residential (2480 accounts) or commercial (16 accounts) based upon meter size. All users are charged the same rates.

Water supplies are drawn from local groundwater resources. Buena Vista's waterworks consist of five drilled wells, one spring, seven finished water storage reservoirs, four booster pumping stations, and the distribution system serving the City. The system typically produces approximately 349 million gallons per year or 956,250 gallons per day. The City of Buena Vista's water system capacity is provided by the following sources:

Table 6.1
Drinking Water Sources
Buena Vista

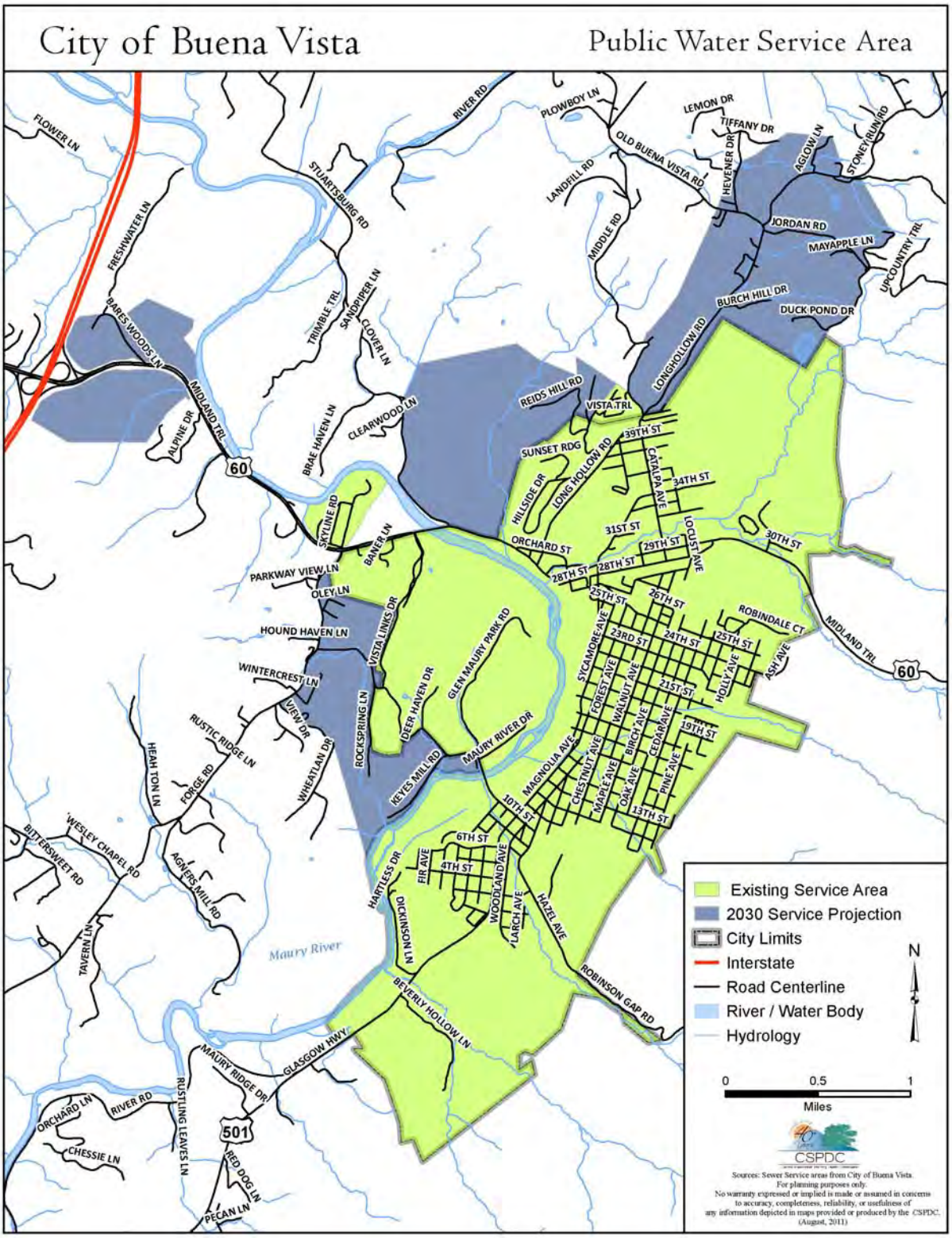
Source	Capacity (gallons per minute)
French Post Well	375
Laurel Park Well	130
Pedlar Gap Well (inoperable)	151
Dickinson Well (UDISW))	950
Park Avenue Well	450
Hall's Spring (UDISW)	233

Source: Draft PER, Dickinson Well Filtration Project

Pedlar Gap Well is currently inoperable due to damage incurred during a flood several years ago. The pump shaft is broken and cannot be retrieved. The City has no expectation of ever returning this source to service. Halls' Spring has been closed for approximately ten years after being determined to be under the direct influence of surface water (UDISW). More recently, Dickinson Well was taken offline due to the influence of surface water.

Following extensive bacteriological tenting during 2009, the City of Buena Vista's most productive water source, Dickinson Well, was determined to be under the influence of surface water by the Virginia Department of Health (VDH). A Preliminary Engineering Report was commissioned by the City following the closure of Dickinson Well. It was determined that the optimal course of action is to install a membrane filtration system at Dickinson Well. Current water supply needs will be met by the installation of this system, and it also will enable the City to treat water from the nearby Hall Spring water source.

Map 6.1


City of Buena Vista
Public Water Service Area
Existing Service Area
2030 Service Projection
City Limits
Interstate
Road Centerline
River / Water Body
Hydrology
N
0
0.5
1
Miles
CSPDC
Sources: Sewer Service areas from City of Buena Vista.
For planning purposes only.
No warranty expressed or implied is made or assumed in concerns to accuracy, completeness, reliability, or usefulness of any information depicted in maps provided or produced by the CSPDC.
(August, 2011)
Maury River
RIVER RD
PLOWBOY LN
LEMON DR
TIFFANY DR
OLD BUENA VISTA RD
HEVENER DR
AGLOW LN
STONEY RUN RD
LANDFILL RD
MIDDLE RD
JORDAN RD
MAYAPPLE LN
UPCOUNTRY TRL
BURCH HILL DR
DUCK POND DR
LONGHOLLOW RD
FLOWER LN
FRESHWATER LN
STUARTSBURG RD
BARES WOODS LN
TRIMBLE TRL
SANDPIPER LN
CLOVER LN
MIDLAND TRL
ALPINE DR
60
BRAE HAVEN LN
CLEARWOOD LN
REIDS HILL RD
VISTA TRL
39TH ST
SUNSET RDG
LONG HOLLOW RD
HILLSIDE DR
CATALPA AVE
34TH ST
31ST ST
ORCHARD ST
29TH ST
28TH ST
LOCUST AVE
30TH ST
SKYLINE RD
BAKER LN
PARKWAY VIEW LN
OLEY LN
HOUND HAVEN LN
VISTA LINKS DR
WINTERCREST LN
VIEW DR
RUSTIC RIDGE LN
HEAH TON LN
FORGE RD
WHEATLAN DR
ROCKSPRING LN
DEER HAVEN DR
GLEN MAURY PARK RD
MAURY RIVER DR
KEYES MILL RD
25TH ST
26TH ST
ROBINDALE CT
23RD ST
24TH ST
25TH ST
ASH AVE
SYCAMORE AVE
FOREST AVE
WALNUT AVE
HOLLY AVE
21ST ST
19TH ST
MAGNOLIA AVE
CHESTNUT AVE
BIRCH AVE
CEDAR AVE
MAPLE AVE
OAK AVE
PINE AVE
10TH ST
13TH ST
6TH ST
4TH ST
FIR AVE
WOODLAND AVE
LARCH AVE
HAZEL AVE
HARTLESS DR
DICKINSON LN
ROBINSON GAP RD
BEVERLY HOLLOW LN
GLASGOW HWY
MAURY RIDGE DR
RUSTLING LEAVES LN
501
RED DOG LN
PECAN LN
ORCHARD LN
RIVER RD
CHESSIE LN
WESLEY CHAPEL RD
BITTERSWEET RD
AGNERS MILL RD
TAVERN LN

At present, the City of Buena Vista's potential water production is limited to approximately 1.35 million gallons per day (mgd). When the Dickinson Well and Hall Spring facilities are returned to service through the proposed treatment improvements they would contribute an additional 1.70 mgd. The PER analyzes the present and future demands on the City's water supply and recommends that the City's total source capacity should be 2.85 mgd. The completion of this project will ensure a long-term water supply that will provide a platform for community growth and development. In June 2011, the City was awarded a grant for the Dickinson Well and Hall Spring project through the Community Development Block Grant (CDBG) program administered by the Virginia Department of Housing and Community Development (DHCD). By the end of the summer, the remainder of the financing was in place and work on the improvements to the well advanced.

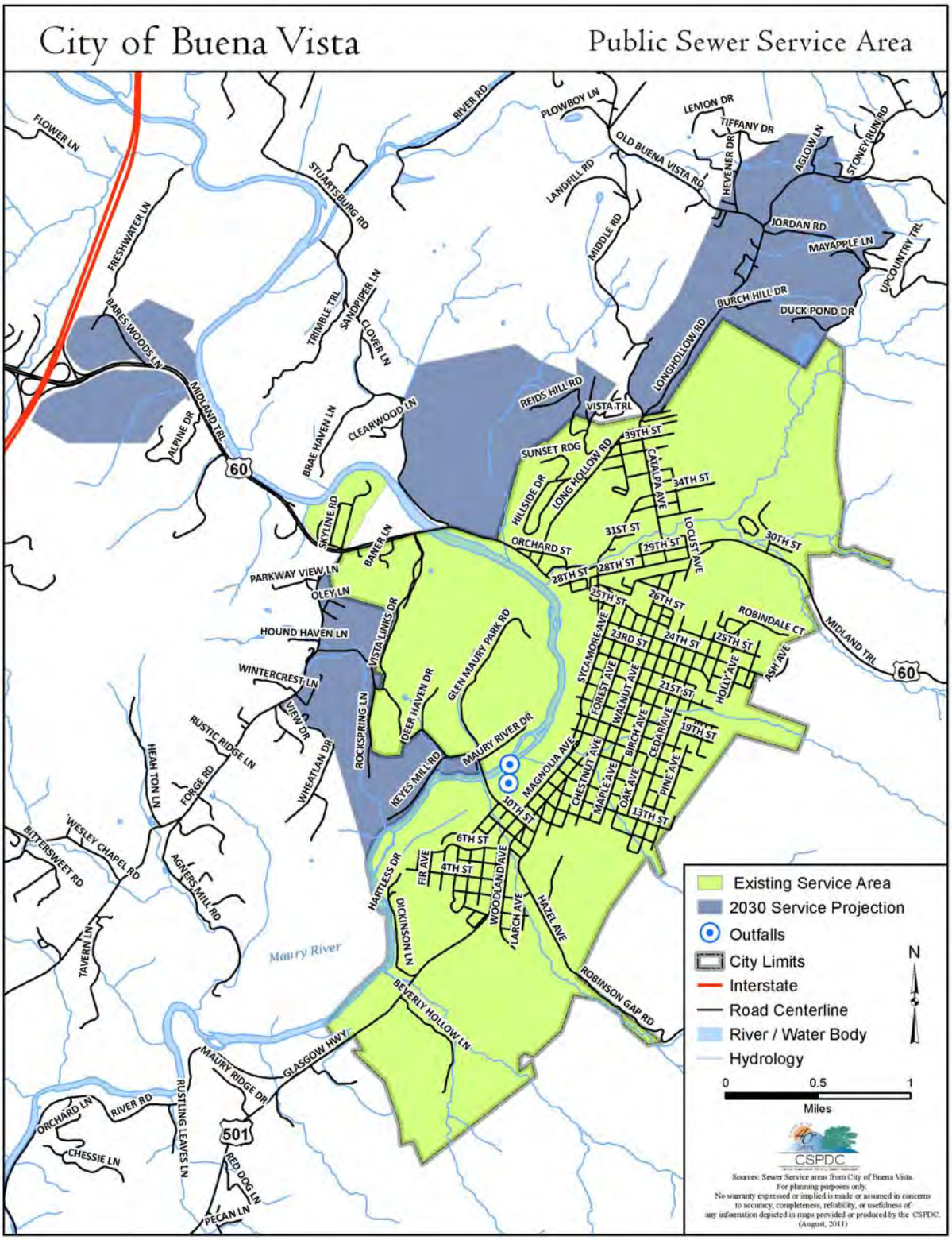
The City has seven water tanks for storage. The total storage capacity is 2.1 million gallons which is approximately equal to two days' system demand. The capacity is considered adequate. The distribution system consists of 6-inch to 10-inch pipe sizes with most being 6-inch lines. Some 3-inch and 4-inch sizes are also incorporated into the system. Portions of the system have been looped to provide better pressure and service.

Wastewater

Water and wastewater facilities are the building blocks of a community's physical infrastructure. The latter is also known as the sewer system. Wastewater is liquid waste that is discharged by residences, commercial properties, industry, or agriculture. The purpose of a wastewater treatment facility is to treat and discharge wastewater locally without contaminating local waters.

The City of Buena Vista's wastewater treatment plant is a public wastewater treatment facility which serves the residents of the City. The City also receives waste from the County of Rockbridge. The service area is shown on Map 6.2. The wastewater treatment plant was last upgraded in 1985 and is a 2.25 million gallons/day facility. It primarily treats waste using rotating biological contactors. The average daily flow of the facility is 1.65 million gallons/day. After treatment, water is discharged to the Maury River.

Map 6.2


City of Buena Vista
Public Sewer Service Area
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LANDFILL RD
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MAYAPPLE LN
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FLOWER LN
FRESHWATER LN
STUARTSBURG RD
BARES WOODS LN
TRIMBLE TRL
SANDPIPER LN
CLOVER LN
MIDLAND TRL
ALPINE DR
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VIEW DR
ROCKSPRING LN
DEER HAVEN DR
GLEN MAURY PARK RD
MAURY RIVER DR
KEYES MILL RD
WHEATLAN DR
RUSTIC RIDGE LN
HEAH TON LN
FORGE RD
WESLEY CHAPEL RD
BITTERSWEET RD
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SYCAMORE AVE
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19TH ST
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CHESSIE LN
Sources: Sewer Service areas from City of Buena Vista.
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(August, 2011)

Stormwater

Stormwater is collected and managed to prevent flooding, erosion, contamination of streams, and destruction of aquatic habitat. Stormwater is rain and snow melt that runs off surfaces such as rooftops, paved streets, highways, and parking lots. As water runs off these surfaces, it can pick up pollution such as oil, fertilizers, pesticides, soil, and trash. From here, the water might flow directly into a local stream or river. Or, it may go into a storm drain and continue through storm pipes until it is released into a local waterway. Stormwater management is a concern for two main reasons. They are (1) the volume and timing of runoff water, and (2) potential contaminants that the water is carrying.

Buena Vista's storm sewer consists of 12-inch to 60 inch storm drainage pipes. The majority of the system is 24-inch pipe. A large portion of the stormwater collected on the eastern portion of the City is directed to the Indian Gap Run which flows through the City. The drainage systems on Magnolia Avenue and Sycamore Avenue discharge directly to the Maury River.

Historically, Buena Vista has been prone to flooding both from the Maury River and interior streams. Economic losses include flood damage to streets, bridges, waterlines, gas lines, homes, businesses, and industries. The Maury River, a major tributary of the James River, runs along the City's western edge. Major floods of record occurred in 1936, 1969, 1972, 1985, 1992, and 1995. In 1972 a total of 420 acres within the city limits of Buena Vista were inundated with flood waters, resulting in major damage to industrial and commercial development. Then in 1985 as a result of Hurricane Juan, 500 full-time manufacturing jobs were lost when the highly industrialized section of the city that lines the Maury River was flooded. More than 100 central business district retail jobs were also lost. The flood of 1995 and the two floods of 1996 caused $2.7 million in combined damages.

Besides being next to a river, Buena Vista is located at the foot of the mountains. The area has been subjected to repetitive flooding from mountain streams. Five interior streams run through the City and include the following:

1. Chalk Mine Run
2. Long Hollow Run
3. Pedlar Gap Run
4. Indian Gap Run
5. Noel's Run

Sudden rainfall on the mountains results in rapid runoff. The floodwaters quickly flow to the City where they slow down and then spread out over the City. Flood damages from the interior streams include the following:

- Residences, industries and businesses
- Overland flow and ponding problems
- Bank scour into yards and near buildings
- Clogged channels, bridges, and culverts
- Threat to life and property throughout the City

The City has expended great effort to alleviate its flooding problems. A listing of projects is below:

James R. Olin Flood Protection Project. During the 1990s a flood wall was constructed along the Maury River, the James R. Olin Flood Protection Project. The project consists of two miles of earthen levee, 1000 feet of reinforced concrete floodwall, an interior drainage canal and channelization of the Maury River. The project also includes a number of closure gates and an enhanced flood warning system. The project is designed to provide protection equivalent to that needed during the greatest flood of record, Hurricane Camille in 1969. The project was completed in October 1997.

Channel Modifications and Interior Drainage Projects. In 1993, local sponsors requested the assistance of the Natural Resources Conservation Service (USDA) to address the flooding from the interior streams. NRCS was asked to determine the extent of the flooding problem in Buena Vista and the potential for reducing this problem. A plan was developed on the four subwatersheds. The overall effect of the planned actions were to increase the water-carrying capacity of the streams by increasing total channel sized, removing rocks and woody material by installing debris basins, enlarging culvert and bridge openings, and increasing channel grade. These procedures decrease flooding from overland flow and decrease the depth of ponded floodwaters.

The City received funding in 1992 and 1995 from the Virginia Department of Housing and Community Development to reduce the flooding along the interior streams. Completed in two phases, the main feature of this project is a reinforced concrete lining designed to increase the carrying capacity of Indian Gap Run. The project also included the replacement or removal of damaged or inadequate culverts and the installation of several debris collectors. All of these activities augmented and maximized the benefits of the James R. Olin Flood Wall Project described above. This channel modification and interior drainage project was completed in 1999.

Residential Elevation and Acquisition Project. Despite the many construction activities designed to prevent flooding in Buena Vista, many residences are still at risk of flooding, particularly those located along the many interior streams that flow through the City. To address this flooding, the City applied for and received funding from the Federal Emergency Management Agency (FEMA) and the Virginia Department of Housing and Community Development to elevate or buy out approximately 28 properties identified as flooding risks. Thirteen of these properties participated in the project; 10 properties were acquired and 3 properties were elevated. This project was completed in 2003.

Current Initiatives

Regional Water Supply Plan. The City of Buena Vista is participating with eleven other communities in developing a regional water supply plan for the Upper James River watershed. Each locality is mandated through the Virginia Department of Environmental Quality (DEQ) to develop a local water supply plan. According to the regulation (9 VAC 25-780), the purpose of the plan is threefold:

1. Ensure that adequate and safe drinking water is available to all citizens of the Commonwealth;
2. Encourage, promote, and protect all other beneficial uses of the Commonwealth's water resources; and
3. Encourage, promote, and develop incentives for alternative water sources.

This plan for the Upper James River watershed is expected to be completed and submitted to DEQ in Fall 2011. The plan, covering a thirty year timeframe, will be the basis for water supply decisions.

Water Model Study. Redundancy within the City's water system is of vital importance for present and future economic development and system sustainability. The current design of the system requires substantial demand from only a few of the City's wells and pumps resulting in higher maintenance and replacement costs. To fully assess this situation, the City of Buena Vista plans to undertake a water and sewer model study.

Dickinson Well Filtration System. The City will return Dickinson Well to service by constructing a membrane filtration plant adjacent to the existing facility. The membrane filtration plant will be sized to accommodate Hall Spring which served as a significant nearby source of water until approximately nine years ago.

Water Utilities Inventory and Mapping. The Central Shenandoah Planning District Commission is providing the City with GIS assistance in mapping a digital inventory of water utilities. The inventory includes the location of water tanks, water lines, hydrants, valves, and other water-related utilities. The project began in 2008 and is on-going.

Buena Vista Wastewater Treatment Plant Upgrade Project. State regulations require that the City complete a nutrient reduction project by 2010 or as soon as possible thereafter to meet new wasteload allocations for Total Nitrogen and Total Phosphorus in discharge.

The City of Buena Vista commissioned a Basis of Design Report that estimated a $30 million cost for a wastewater treatment plant upgrade. These costs prevented the City from undertaking the project. Instead, the City of Buena Vista became a Class A Buyer as a member of Virginia's Nutrient Exchange Association. The City currently purchases pounds of Nitrogen and Phosphorus until adequate funding can be provided to upgrade the waste water treatment plant. The City continues to pursue funding for the upgrade.

Sewer Utilities Inventory and Mapping. The Central Shenandoah Planning District Commission is providing the City with GIS assistance in mapping a digital inventory of sewer utilities. Sewer utilities recorded and measured include manholes, pumps, sewer lines, inverts, invert depth, and flow direction. The project began in 2008 and is on-going.

SOLID WASTE

Relationship to Other Plan Elements

Natural Resources. Careful management of waste streams (water, air, and solid and hazardous waste) is essential to protecting natural environment and continuing to provide the services people expect.

Economic Development. Local governments must bear the cost of solid and hazardous waste disposal and treatment as well as document that appropriate procedures were followed. Reducing a waste stream or identifying how waste can be converted into a product with market value can make a business more prosperous or save the community money.

Regional Solid Waste Plan

Each locality is required to develop a comprehensive and integrated solid waste management plan (Solid Waste Planning Regulations, Amendment 1, 9 VAC 20-130-10 et seq.). The plan must address the following items:

1. Source reduction
2. Reuse
3. Recycling
4. Resource recovery (waste-to-energy)
5. Incineration
6. Landfilling

Buena Vista is a partner in a regional solid waste management plan with Rockbridge County and the City of Lexington. The Rockbridge-Lexington-Buena Vista Regional Solid Waste Management Plan was last revised in November 2008. The purpose of the solid waste management plan is to establish minimum solid waste management standards and planning requirements for the protection of public health, public safety, the environment, and natural resources locally and regionally throughout the Commonwealth of Virginia.

The County of Rockbridge, City of Buena Vista, and City of Lexington presently have a legal agreement to jointly fund and use the Rockbridge County Landfill. The landfill is located on Rockbridge County owned property and is managed by Rockbridge County and supervised by the Rockbridge County Solid Waste Authority, with routine supervision by the Landfill Committee, and day to day supervision by the Rockbridge County Engineer. The Rockbridge County Board of Supervisors serves as the Rockbridge County Solid Waste Authority. The Landfill Committee consists of the following:

- Rockbridge County Engineer
- Rockbridge County Fiscal Director
- One member of the Rockbridge County Board of Supervisors
- Lexington City Manager
- Buena Vista City Manager

The landfill is an unlined HB1205 landfill and is scheduled by DEQ to close no later than December 31, 2012. As a HB1205 landfill, it cannot be expanded laterally. Nevertheless, the active area is approximately 35 acres and at current waste acceptance rates will easily last until the scheduled closure date.

The location of the Rockbridge County Landfill is about two miles north of the northern city limit of Buena Vista, on Landfill Road, off of Middle Road (route 831). It is the only landfill currently operating within Rockbridge-Lexington-Buena Vista region. Only residential, business, and industrial, non-hazardous waste generated within the region is accepted at

the landfill; no hazardous waste and no out-of-region waste is accepted. There is, however, a residential hazardous waste collection once a year with a hope of increasing it to twice a year. All in-region generated hazardous waste is shipped out of State. Currently, no non-hazardous waste from residential, business, or industrial generators is shipped outside of the region.

All of Buena Vista's municipal solid waste enters the Rockbridge County Landfill. However, waste flow could change entirely after 2013, when the existing Rockbridge County Landfill closes. The three jurisdictions intend on using the Rockbridge County Landfill until the 2012 closure date. The three jurisdictions are obligated to close the landfill and provide post closure care for 30 years after the closure date.

The legal agreement between the three jurisdictions required them to begin meeting three years before the closure date to determine how each one intends to handle solid waste after December 31, 2012. Options included obtaining a new landfill permit or transporting waste to a landfill in another county. Current estimates show that unless the County and two Cities agree to accept out-of-region waste, it would be more economical to transfer waste to another county when the existing landfill closes in 2013. The City of Buena Vista has selected to transport its waste following the closure of the Rockbridge County Landfill. The City has entered into a contract to haul waste to a private transfer facility starting in late 2012.

Unlike landfill disposal, collection and transportation of solid waste is performed independently by each of the three jurisdictions. Buena Vista provides residential trash pick up once a week and business pick up twice a week. Bulky items and brush set in rear alleyways are picked up once a month. All waste is transported to the Rockbridge County Landfill.

During 2008, the City of Buena Vista began curbside recycling programs. In Buena Vista, recyclables are set out with the regular trash pickup in blue totes. The following are collected: newspapers, mixed paper, cardboard, plastics 1-7, steel and tin cans, aluminum, and glass bottles and jars. Hamilton Contracting collects the recyclables and takes them to Auto Recyclers, Inc. of Buena Vista where they are sorted and baled. Currently, Buena Vista's curbside program is for residential properties. Recycling for businesses continues at other recycling sites. The curbside program may expand to businesses in the future.

Other efforts also reduce the waste stream. Habitat for Humanity has started a business, ReStore, in Buena Vista collecting used windows, doors, and other building materials and reselling them to the public. Habitat uses the proceeds to build homes in the community for low-income families.

INFORMATION & COMMUNICATIONS

Relationship to Other Plan Elements

Economic Development. For many businesses, high-capacity, high-quality information and communications systems are an essential element of success. To recruit such businesses, the community needs to help provide access to these systems.

Information and Communication Systems

Communication and information technologies are changing rapidly. Access to these technologies is becoming an essential element of a community's economic competitiveness and its quality of life. Just as communities built roads in the early twentieth century, they must now provide digital road systems to remain competitive not only in business but also as a place that people want to live. It provides a competitive edge in economic development, community services, education, and workforce recruitment. More specifically, a network is necessary to accomplish the following:

- Attract new businesses because a high performance, affordable broadband infrastructure lowers the cost of doing business
- Increase effective and efficient delivery of government to services to citizens and businesses
- Support the data and communication needs of first responder public safety, fire and rescue needs
- Distribute a wide variety of community information and community media content to citizens and businesses
- Provide businesses unlimited bandwidth at affordable rates to successfully compete with any other business located anywhere in the global economy
- Provide residents access to unlimited bandwidth at affordable rates to manage personal affairs, obtain access to tele-health and tele-medicine services, and have the same level and quality of access to online goods and services as any other community
- Provide the ability for the workforce to work full time or part time from home using infrastructure that connects them to their office business systems
- Provide students and workers with the ability to study and train from home using infrastructure to attend classes, learn new skills, and reduce commuting time

Buena Vista and the Rockbridge region is underserved. Embarq offers DSL services in Buena Vista. Rockbridge Global Village is a regional provides DSL internet access in the Buena Vista area. EarthLink provides local exchange phone numbers in the area for dial up access.

Recognizing the importance of being connected, steps were taken to advance broadband infrastructure in the region. Supported by funding from the Virginia Department of Housing and Community Development (DHCD), the three neighboring localities of Buena Vista, Lexington, and Rockbridge County hired a consulting firm in 2007 to study the feasibility for countywide broadband development. A telecommunications team was formed that same year with members from the public and private sectors. Work on Phase II, a fiber pilot design project connecting downtown Lexington with downtown Buena Vista, began in early 2009.

In May 2009, Washington and Lee University joined the telecommunications team. The project has grown from a pilot project to a full countywide fiber build-out between Lexington and Buena Vista. The build-out would continue to run fiber backbone out to all schools, libraries, fire department and rescue squad buildings, and other public buildings. The three jurisdictions and Washington and Lee University created the Rockbridge Area Network Authority (RANA) to operate the open access fiber network and to ensure that the fiber build-out reaches all government entities, businesses, and residences in Buena Vista, Lexington, and Rockbridge County.

Current Initiatives

Broadband Expansion. In the summer of 2010, Rockbridge County was awarded nearly $7 million from the National Telecommunications and Information Administration (NTIA) for Connecting the Dots: Rockbridge Broadband Initiative. The project is an open access, community-owned network anchored by a state-of-the-art collocation data center. It is a collaborative effort of Rockbridge County, the Cities of Buena Vista and Lexington, and Washington and Lee University.

ENERGY

Relationship to Other Plan Elements

Community Facilities. Energy is an important consideration in the design and maintenance of any facility. Sustainable design features can cut long-term costs and enhance the livability of a building and the productivity of its occupants.

Economic Development. Energy is an input and a cost to every business whether it is used for electricity, space heating, or transportation. Reducing costs through more productive use of energy can add to a business's profitability. Use of renewable resources also keeps local dollars circulating in the local economy.

Housing and Other Buildings. The cost of energy over the life of a house or commercial building will likely exceed the original constructions costs. The affordability of housing is affected by the energy costs of living in the home.

Infrastructure. Reducing reliance on mechanical systems can cut a community's energy use. Installation of certain renewable energy systems can pay off over time.

Transportation. Transportation is a substantial energy user. Reducing the number of unnecessary trips could reduce air pollution and costs to drivers.

Energy Use

Energy systems are crucial to a community's livelihood. Virtually everything people do requires energy in some form. The City has a clear stake in how energy is generated and delivered to its citizens and businesses. In Buena Vista, electricity is supplied and distributed by Dominion Virginia Power. Natural gas is supplied and distributed by Columbia Gas. As shown in Table 6.2, 9 out of 10 homes are either heated with gas or electricity with gas being the larger share.

Table 6.2
House Heating Fuel
Buena Vista

Fuel Type	Number	Percent (%)
Utility gas	1,710	63.5
Bottled, tank, or LP gas	21	0.8
Electricity	814	30.2
Fuel oil, kerosene, etc.	39	1.4
Wood	108	4.0

Source: U.S. Census Bureau, 2005-2009 American Community Survey 5-Year Estimates

Transportation accounts for a substantial amount of energy use. Three-quarters of all Buena Vista workers drive to work alone (See Table 6.3). However, the mean travel time to work for Buena Vista workers is 15 minutes. For Virginia and the United States, travel times are 27 minutes and 25 minutes, respectively.

Table 6.3
Commuting to Work
Buena Vista

Commuting to Work	Number	Percent (%)
Workers 16 years and over	2,969	100.0
Car, truck, or van – drove alone	2,233	75.2
Car, truck, or van -- carpooled	378	12.7
Public transportation (including taxicab)	0	0.0
Walked	219	7.4
Other means	95	3.2
Worked at home	44	1.5

Source: U.S. Census Bureau, 2005-2009 American Community Survey 5-Year Estimates

Energy Efficiency and Conservation

A commitment to energy efficiency can reduce the negative environmental impacts of energy production and save residents and businesses money on their energy bills and retain dollars to circulate longer in the local economy. According to an article in the American Planning Association's *Public Investment*, 80 to 90 percent of every dollar spent by most communities on nonrenewable energy will leave the community permanently.

For residential customers, energy conservation could include the use of the following:

- Energy audits and checkups with a trained energy consultant
- Rebates on energy-efficient appliances and lighting
- Low-flow showerheads that conserve water and the energy needed to heat the water.
- Weatherization assistance programs to improve the energy performance of the home.

Commercial and industrial customers could shift to energy-efficient lighting, heating, cooling, and water saving technologies. They could also adopt voluntary energy-efficiency standards. To encourage energy efficiency and conservation, the City could offer tax incentives for energy efficient development or redevelopment. These tax incentives could be available in established zones such as the historic district, technology zones, or tourism zones or as prescribed by the Buena Vista City Council.

The City could follow the same efforts as the above customers for its operations. Furthermore, the City could use renewables to generate electricity for local government use. Such projects could include the following:

- Build a small wind or other renewable project at a school or government building.
- Use solar technology in remote locations.
- Use methane from the sewage treatment plant to generate electricity.

Current Initiatives

Public Building Audit. The City is participating in a regional energy grant, *Shenandoah Valley Regional Energy Efficiency Strategy*. The grant includes 20 localities within the Central Shenandoah Planning District. The grant includes (1) energy audits of public buildings and facilities, (2) implementation of an energy project, (3) and education, training and outreach. The grant is funded through the Virginia Department of Mines, Minerals and Energy, and it is administered by the Central Shenandoah Planning District Commission.

SUMMARY OF TRENDS

- Because the City is not growing rapidly, the focus for sewer and water infrastructure will be maintaining, upgrading, and replacing the existing system.

- Flooding, particularly from interior streams, will continue to be a challenge.

- Access to communication technologies is essential for the region to maintain its competitiveness.

- Energy efficiency will play a greater role in residential, community facility, and business decisions.

RELATED STUDIES AND REPORTS

Buena Vista Watershed: Final Plan-Environmental Impact Statement, City of Buena Vista, Rockbridge County, Virginia, United States Department of Agriculture, Natural Resources Conservation Service, January 1999.

Central Shenandoah Valley Regional Flood Mitigation Plan, Central Shenandoah Planning District Commission, 2002.

Preliminary Engineering Report for the Dickinson Well Filtration Project, Civil Consulting Group, P.C., April 2010.

Rockbridge-Lexington-Buena Vista Regional Solid Waste Management Plan, Central Shenandoah Planning District Commission, 2004, revised 2008.

Telecommunications Needs Assessment: Prepared for Rockbridge County, Lexington City, Buena Vista City, Design Nine, October 2008.

Preliminary Broadband Findings, Options, and Strategies, Design Nine, August 2008.

Infrastructure & Utilities
STRATEGIES FOR ACTION

Goal 1: Drinking Water

Maintain an efficient, adequate, and safe drinking water system that meets the long-term needs of community residents, industries, and visitors.

To achieve this goal, the following critical success factors must be accomplished:

- Facilities that keep pace with community needs.
- Proactive in meeting future infrastructure needs.
- Link water system upgrades and expansions with comprehensive plan goals and economic development strategies.

		Priority	Responsibility
6.1A	Complete a long range regional water supply plan and implement its recommendations.	H	City
6.1B	Complete water modeling study.	H	Public Works
6.1C	Map the water system with GIS.	M	Public Works
6.1D	Continue water system leak detection program.	On Going	Public Works
6.1E	Encourage water conservation, including the use of water-efficient appliances and low-flow showerheads and fixtures.	On Going	Public Works
6.1F	Stay familiar with commercial and industrial customer plans and needs, and the plans for public facilities of other local governments.	On Going	Public Works, Economic Development
6.1G	Adopt progressive water use or consumption fees to encourage conservation.	L	City Council
6.1H	Adopt fees, such as connection fees, at a rate designed to ensure that new developments cover the marginal cost of their connection.	M	City Council

High (H) = Years 1-5
Medium (M) = Years 5-7
Low (L) = Years 7-10
On Going = Strategies with zero to minimal costs associated with implementation. These strategies may be completed at any time throughout the life of the plan.

Infrastructure & Utilities
STRATEGIES FOR ACTION

Goal 2: Wastewater

Maintain a safe and efficient wastewater collection and treatment system that meets the long-term needs of community residents, industries, and visitors.

To achieve this goal, the following critical success factors must be accomplished:

- Facilities that keep pace with community needs.
- Proactive in meeting future infrastructure needs.
- Approve wastewater system upgrades and expansions based on comprehensive plan goals.

		Priority	Responsibility
6.2A	Continue the sewer maintenance program to reduce inflow and infiltration within the system.	M	Wastewater Dept, Public Works
6.2B	Establish a multi-year capital improvement program and budget for wastewater treatment infrastructure.	H	City Council
6.2C	Map the sewer system with GIS.	M	Public Works
6.2D	Encourage water conservation, including the use of water-efficient appliances and low-flow showerheads and fixtures.	On Going	Public Works, Wastewater Dept
6.2E	Continue to seek funding for upgrades to the Buena Vista Wastewater Treatment plant.	H	Wastewater Dept
6.2F	Collect connection fees to cover the cost of new hook-ups.	H	City Council

High (H) = Years 1-5
Medium (M) = Years 5-7
Low (L) = Years 7-10
On Going = Strategies with zero to minimal costs associated with implementation. These strategies may be completed at any time throughout the life of the plan.

Infrastructure & Utilities STRATEGIES FOR ACTION			
Goal 3: Stormwater **Manage storm water runoff to protect residents, property, and water resources.**			
To achieve this goal, the following critical success factors must be accomplished: • Facilities that keep pace with community needs. • Proactive in addressing flooding challenges.			
		Priority	**Responsibility**
6.3A	Limit encroachments in watercourses, floodplains, and wetlands.	On Going	Planning
6.3B	Use and protect natural storm water features and resources in the City's stormwater management program.	On Going	Public Works
6.3C	Develop programs to correct or mitigate existing development that is subject to periodic flooding or storm water damage.	M	Economic Development, Public Works
6.3D	Seek funding and continue program to elevate, relocate, floodproof or acquire flood-prone structures.	M	Economic Development
6.3E	Plan public spaces to use flood plains, water courses, natural water basins and wetlands for greenways and passive recreation uses, thereby protecting them.	M	Public Works, Planning, Parks & Rec
6.3F	Set and apply design standards for roads and public investments that assist in storm water management.	M	Planning, Public Works
6.3G	Implement the recommendations for Buena Vista included in the *Central Shenandoah Valley Regional Flood Mitigation Plan*.	H	City Departments

High (H) = Years 1-5
Medium (M) = Years 5-7
Low (L) = Years 7-10
On Going = Strategies with zero to minimal costs associated with implementation. These strategies may be completed at any time throughout the life of the plan.

Infrastructure & Utilities STRATEGIES FOR ACTION			
Goal 4: Solid Waste Maintain a solid waste program that protects public health, public safety, the environment, and natural resources.			
To achieve this goal, the following critical success factors must be accomplished: • Reduce the amount of residential, commercial, and industrial solid waste.			
		Priority	**Responsibility**
6.4A	Increase household participation in the curbside recycling program.	H	Economic Development
6.4B	Establish an internal "Green" team to review waste reduction, monitor proper separation of the waste stream from recyclables, and encourage employee recycling.	On Going	City Manager's Office
6.4C	Work with nearby communities to address solid waste issues and opportunities regionally.	On Going	City Manager's Office
6.4D	Revise solid waste plan.	H	City Manager's Office, Economic Development

Infrastructure & Utilities STRATEGIES FOR ACTION			
Goal 5: Information and Communication Systems **Provide access to technology so that the City has a competitive edge in economic development, community services, education, and workforce recruitment.**			
To achieve this goal, the following critical success factors must be accomplished: • Ensure availability of state of the art technology. • Provide affordable and equal technology access to all.			
		Priority	**Responsibility**
6.5A	Implement Connecting the Dots: Rockbridge Broadband Initiative.	H	Rockbridge Area Network Authority
6.5B	Continue partnerships among business, local governments, and schools to share technology costs, equipment, and training.	On Going	City Manager's Office, Economic Development
6.5C	Develop plan for last mile.	L	

High (H) = Years 1-5
Medium (M) = Years 5-7
Low (L) = Years 7-10
On Going = Strategies with zero to minimal costs associated with implementation. These strategies may be completed at any time throughout the life of the plan.

Infrastructure & Utilities
STRATEGIES FOR ACTION

Goal 6: Energy
Make the City of Buena Vista's energy system reliable, affordable, efficient, and diverse.

To achieve this goal, the following critical success factors must be accomplished:

- Make energy policy a key element of economic development, environmental protection, community design, and building design.
- Help businesses and residents shift to energy-efficient technologies.
- Adopt energy-saving and energy-generating policies to save the City money.

		Priority	Responsibility
6.6A	Encourage individuals and businesses to conduct energy audits of private buildings.	On Going	Economic Development
6.6B	Promote participation in energy utility conservation improvement programs.	On Going	Economic Development
6.6C	Conduct energy audits of community facilities.	M	Public Works
6.6D	Evaluate opportunities to tap local energy resources, such methane from waste management facilities, wind, or solar for distributed energy generation.	L	Wastewater Dept
6.6E	Phase out old equipment with energy efficient motors, fixtures, and other items like LED traffic lights and Energy Star approved copiers, fax machines, computers and windows.	On Going	City Manager's Office
6.6F	Make building energy improvements.	On Going	City Departments
6.6G	Convert fleets to run on alternative fuels.	L	Police Dept
6.6H	Make energy efficiency and renewable energy key factors in the evaluation of any public expenditure or development proposal.	On Going	City Council, Finance Office
6.6I	Plant trees to keep buildings and streets cooler to improve air quality, lower air-conditioning loads and save money.	L	Public Works, Volunteer Organizations
6.6J	Invest in energy efficiency and energy-producing improvements to municipal buildings and facilities	L	City Council

		Priority	Responsibility
6.6K	Consider redesign of City streets and land use regulations to encourage walking and biking.	M	Planning, Economic Development; Public Works
6.6L	Consider tax incentives or rebates for energy efficient re/development or developments in already established zones (historic, technology, tourism) or as prescribed by City Council.	H	Economic Development, City Council

High (H) = Years 1-5
Medium (M) = Years 5-7
Low (L) = Years 7-10
On Going = Strategies with zero to minimal costs associated with implementation. These strategies may be completed at any time throughout the life of the plan.

CHAPTER 7
Transportation

The *Buena Vista Comprehensive Plan* provides guidance for the development and maintenance of the transportation system in Buena Vista that supports existing and projected travel demands to the year 2035. Transportation improvement recommendations were developed to meet current needs and the horizon year, 2035, needs. The transportation plan provides details on the study methodologies and recommendations, including:

- Identification of existing transportation needs,
- Forecasting of future travel demands,
- Identification of future travel demands, and
- Development of transportation improvement recommendations for the City's transportation system.

The *Buena Vista 2035 Transportation Plan* was developed as a cooperative effort between the Central Shenandoah Planning District Commission and the City of Buena Vista. The purpose of the study was to evaluate the transportation system in Buena Vista and to recommend a set of transportation improvements that will best satisfy existing and future transportation needs. The plan will identify multi-modal transportation needs based on capacity, safety, and functional requirements (including the effectiveness and efficiency of the overall transportation system).

Improved transportation systems are vital to continued local and statewide economic growth and development. Providing effective, safe and efficient movement of people and goods is a basic goal of all transportation programs in the Commonwealth of Virginia. This guiding principle, together with consideration of environmental issues and local mobility needs, was the basis for the development of this portion of the Comprehensive Plan. The recommendations of this chapter may be used in the statewide transportation planning process so that the magnitude of local needs can be better quantified.

RELATIONSHIP TO OTHER PLAN ELEMENTS

Natural Resources. Transportation facilities can have a significant impact on the natural environment. Transportation facilities, whether highways, streets, transit lines or railroads, are intended to connect areas together. However, they can also create physical barriers and degrade the natural and built environments. Additionally, roadways and parking lots are frequently the main component of impervious surfaces which creates the need for stormwater facilities causing degradation of waterways and natural area.

Economy. The transportation system is an important consideration in the locational decisions of many businesses. Access to fast and reliable transportation is important.

Land Use. Transportation goals are tied to the intensity and type of land use in a community. Transportation facilities influence where people choose to live and businesses locate.

SUMMARY OF APPROACH AND ANALYSIS METHODS

The transportation plan is developed as part of a structured approach with five basic components:

1. Data collection
2. Forecasting of future traffic demands
3. Development of recommendations to satisfy existing and future transportation needs
4. Coordination with Buena Vista citizens and government
5. Environmental overview and Plan documentation

1. Data Collection
   Data pertaining to all aspects of the Buena Vista transportation system was collected as part of this chapter. Data collection included traffic counts, roadway inventory and conditions, accident data, preliminary identification of environmental and socioeconomic constraints, and information obtained from a review of land use plans and previous transportation planning documents.

2. Forecasting of Future Traffic Demands
   Based on historic trends and expected changes in population and employment in the City, traffic volumes were forecast for the study horizon year of 2035. Any expected changes in demand for other modes of transportation were developed as appropriate.

3. Development of Recommendations to Satisfy Existing and Future Transportation Needs
   Based on an assessment of current and projected traffic operations and safety, recommendations for improvements to the Buena Vista transportation system were developed. Improvements to system connectivity, other modes of travel, and accommodation of tourist traffic and goods movement were developed based on interviews and needs identified as part of the data collection process.

4. Coordination with Buena Vista Citizens and Government Officials
   Through a series of meetings with City officials, existing and future transportation needs were identified and reviewed, and recommendations for transportation improvements were developed.

5. Environmental Overview and Plan Documentation
   Recommended improvements were subjected to an environmental overview to identify potential environmental and socioeconomic constraints that could affect the implementation of the recommendations.

EXISTING TRANSPORTATION NETWORK OPERATING CONDITIONS

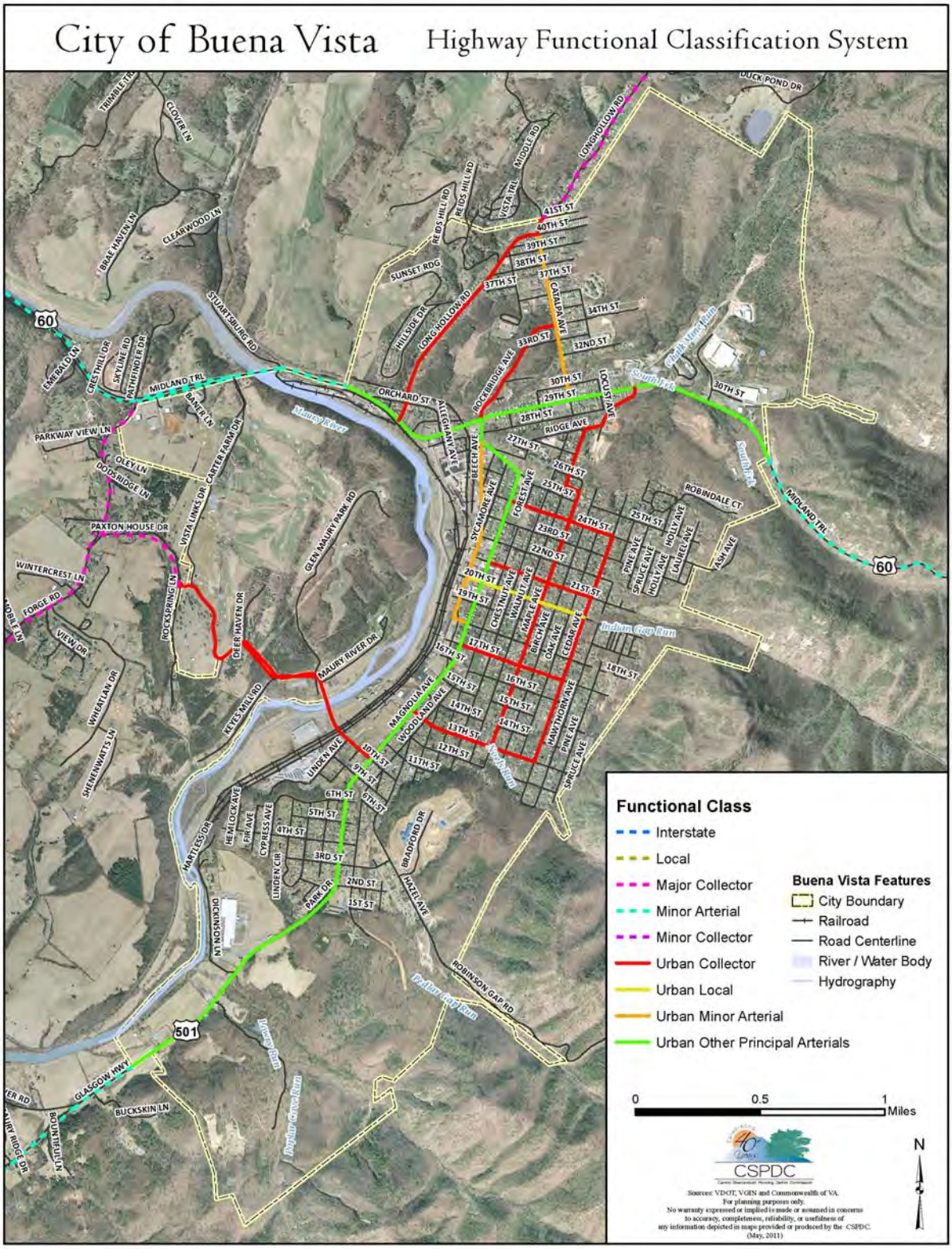
Based on the data collection and existing conditions inventory and assessment, an analysis of operating conditions was conducted for the following items:

- Existing traffic volumes and roadway operations
- Safety conditions
- Pedestrian mobility
- Transit service and facilities
- Current transportation plans and projects

Roadways

The primary focus of the comprehensive plan chapter is the functionally classified urban thoroughfare system, with analysis and recommendations limited to existing thoroughfare improvements and/or recommendations for new thoroughfares. The urban thoroughfare system is a subset of Buena Vista's overall road network that is designated by VDOT, the Federal Highway Administration, and the City of Buena Vista. The thoroughfare system includes roads that are functionally classified as arterials or collectors. Arterials serve as the major traffic-carrying facilities in the area. Collector roads carry a lesser volume of traffic and feed traffic to arterial roadways. Buena Vista's thoroughfare system and functional classifications are shown in Map 7.1.

Map 7.1


City of Buena Vista
Highway Functional Classification System
Functional Class
Interstate
Local
Major Collector
Minor Arterial
Minor Collector
Urban Collector
Urban Local
Urban Minor Arterial
Urban Other Principal Arterials
Buena Vista Features
City Boundary
Railroad
Road Centerline
River / Water Body
Hydrography
0
0.5
1
Miles
N
CSPDC
Sources: VDOT, VGIN and Commonwealth of VA.
For planning purposes only.
No warranty expressed or implied is made or assumed in concerns to accuracy, completeness, reliability, or usefulness of any information depicted in maps provided or produced by the CSPDC.
(May, 2011)

Roadway Network and Inventory

Buena Vista is located at the junction of U.S. Route 60 and U.S. Route 501 and is also located near two major interstates, Interstates 81 and 64. The northern terminus of Route 501 is in Buena Vista at its junction with Route 60. In the City, Route 501 is referred to as Magnolia Avenue, and Route 60 is referred to as both Lexington Avenue and 29th Street. Route 501A (Alternate) is known as Beech Avenue, Sycamore Avenue, and 18th Street, and is parallel to Route 501 one block to the west.

VDOT maintains an inventory of the Buena Vista thoroughfare system and is shown as Table 7.1. Each segment of the road is defined by major intersecting roadways or by significant changes in the geometry of the roadway segment (number of lanes, pavement width, etc.). The inventory contains information about the entire roadway segment.

The inventory contains the following characteristics:

- Pavement Width – the width of pavement from curb to curb measured in feet (total roadway pavement width)
- Number of Through Lanes – the number of lanes available for through traffic in both directions of permitted travel
- Access Control – the type of access control provided on the road (local streets have no access control, freeways and major divided highways usually have full and limited access control respectively).
- Type of Operation – the type of roadway operation (one or two-way travel)
- Median Type – the type of median the road contains (none, raised, depressed, flush, or center turn lane)
- Median Width – the width of the median, from edge to edge, measured in feet
- Left Shoulder Width – the width of the left shoulder of the road measured from the ditch line to the travel lane edge
- Right Shoulder Width – the width of the right shoulder of the road measured from the ditch line to the travel lane edge
- Curb and Gutters – the presence of curb and gutter along the roadway (none, both sides of the street, left side only, or right side only)
- Sidewalks – the presence of sidewalks along the roadway segment (either none, both sides of the street, left side only, or right side only)
- Number of Traffic Signals – the number of traffic signals located on the road, including the beginning and ending intersections of the road segment
- Posted Speed Limit – the speed limit posted along the road segment
- General Terrain – the terrain type of the area, whether level or rolling.
- Number of traffic signals and railroad crossings for this particular road segment.

Table 7.1
Roadway Geometric Inventory
Buena Vista

Route	Name	Segment From	Segment To	Segment Length	Operation Type	Thru Lanes	Pavement Width	Avg. Lane Width	Median Type	Right Shldr. Width	Left Shldr. Width	Gen. Terr.	Access Cntrl.	% No Pass	Num. Sig.	Num. RR	Posted Speed Limit
00060	Lexington Avenue	WCL Buena Vista	Alleghany Avenue	0.44	2W	4	48	12	N	0	0	L	N	0	0	0	35
00060	Lexington Avenue	Alleghany Avenue	Beech Avenue	0.17	2W	3	48	12	L	0	0	R	N	0	1	0	25
00060	29Th Street	Beech Avenue	Ridge Avenue	0.52	2W	2	44	15	N	0	0	R	N	100	1	0	35
00060	29Th Street	Ridge Avenue	ECL Buena Vista	0.79	2W	2	20	10	N	6	6	R	N	100	0	0	35
00501	Magnolia Avenue	SCL Buena Vista	2Nd Street	0.97	2W	2	20	10	N	6	6	R	N	100	0	0	45
00501	Magnolia Avenue	2Nd Street	15Th Street	1.09	2W	2	46	18	N	0	0	R	N	100	1	0	35
00501	Magnolia Avenue	15Th Street	20Th Street	0.43	2W	2	46	12	N	0	0	R	N	100	1	0	25
00501	Magnolia Avenue	20Th Street	25Th Street	0.38	2W	2	46	12	N	0	0	L	N	100	3	0	25
00501	Park Avenue	Magnolia Avenue	Beech Avenue	0.18	2W	2	40	18	N	0	0	L	N	100	1	0	25
00501	Beech Avenue	Park Avenue	29Th Street	0.12	2W	2	44	11	C	0	0	R	N	100	2	0	25
00501	18Th Street	Magnolia Avenue	Sycamore Street	0.07	2W	2	30	12	N	6	0	L	N	100	0	0	25
00501	Sycamore Avenue	18Th Street	20Th Street	0.17	2W	2	39	12	N	10	0	R	N	100	1	0	25
00501	Sycamore Avenue	20Th Street	22Nd Street	0.17	2W	2	42	12	N	0	0	L	N	100	2	0	25
00501	Beech Avenue	22Nd Street	Park Avenue	0.37	2W	2	44	15	N	0	0	R	N	100	1	0	25
00901	24Th Street	Magnolia Avenue	Chestnut Avenue	0.12	2W	2	38	12	N	0	0	R	N	100	0	0	25
00901	24Th Street	Chestnut Avenue	Cedar Avenue	0.31	2W	2	27	11	N	6	0	R	N	100	0	0	25
00902	13Th Street	Magnolia Avenue	Cedar Avenue	0.47	2W	2	23	10	N	6	4	R	N	100	0	0	25
00903	Maple Avenue	13Th Street	17Th Street	0.35	2W	2	21	10	N	6	6	L	N	100	0	0	25
00903	Maple Avenue	17Th Street	25Th Street	0.69	2W	2	29	11	N	0	0	L	N	100	0	0	25
00903	Maple Avenue	25Th Street	25 1/2 Street	0.04	2W	2	20	10	N	6	4	R	N	100	0	0	25
00903	25 1/2 Street	Maple Avenue	Walnut Avenue	0.05	2W	2	30	12	N	0	0	R	N	100	0	0	25
00903	Walnut Avenue	25 1/2 Street	Ridge Road	0.25	2W	2	30	12	N	0	0	R	N	100	0	0	25
00903	Ridge Road	Walnut Avenue	29Th Street	0.28	2W	2	20	10	N	3	3	R	N	100	0	0	25
00904	21St Street	Magnolia Avenue	Maple Avenue	0.25	2W	2	28	10	N	0	0	R	N	100	1	0	25
00904	21St Street	Maple Avenue	Cedar Avenue	0.18	2W	2	28	10	N	0	0	R	N	100	0	0	25
00905	17Th Street	Magnolia Avenue	Forest Avenue	0.06	2W	2	30	12	N	0	0	L	N	100	0	0	25
00905	17Th Street	Forest Avenue	Oak Avenue	0.31	2W	2	20	10	N	6	6	R	N	100	0	0	25
00905	17Th Street	Oak Avenue	Cedar Avenue	0.06	2W	2	30	12	N	6	6	R	N	100	0	0	25
00906	Rockbridge Avenue	29Th Street	Catalpa Avenue	0.49	2W	2	24	12	N	6	6	R	N	100	1	0	35
00907	Catalpa Avenue	29Th Street	Rockbridge Avenue	0.31	2W	2	30	15	N	0	0	R	N	100	0	0	25
00907	Catalpa Avenue	Rockbridge Avenue	Long Hollow Road	0.45	2W	2	26	13	N	6	0	R	N	100	0	0	25
00909	Long Hollow Road	Lexington Avenue	NCL Buena Vista	1.02	2W	2	20	10	N	3	4	R	N	100	0	0	25
00910	Cedar Avenue	13Th Street	24Th Street	0.96	2W	2	24	12	N	3	3	R	N	100	0	0	25
00911	10Th Street	WCL Buena Vista	Maury River Bridge	0.84	2W	2	20	10	N	3	3	R	N	100	0	0	25
00911	10Th Street	Maury River Bridge	C&O Railroad	0.24	2W	2	24	12	N	6	6	R	N	100	0	3	35
00911	10Th Street	C&O Railroad	Magnolia Avenue	0.2	2W	2	50	12	N	0	0	L	N	100	0	2	25
08888	20Th Street	Sycamore Avenue	Cedar Avenue	0.53	2W	2	20	10									

Roadway Structures and Railroad Crossings

There are 15 roadway bridge structures in the VDOT bridge inventory on the Buena Vista road system. None have a sufficiency rating of less than 50 (deficient). There are five railway crossings; these crossings are listed in Table 7.2.

Table 7.2
Railroad Crossings of Public Streets

Location of Crossing	Type of Crossing
10th Street	At-grade
21st Street	At-grade
26th Street	Railway bridge
29th Street	Railway bridge
Long Hollow Road	Railway bridge
Factory Street	At-grade

Existing Traffic Volumes and Roadway Operations

Traffic count data has been obtained for 19 roadway segments and 17 intersections from VDOT and was conducted in the winter, 2008. The count locations are listed in Table 7.3.

Table 7.3
Count Locations

Intersections – Turning Movement Counts – 7am to 9am and 4pm to 6 pm (weekday)
Sycamore Avenue and 21st Street
Beech Avenue and 29th Street
Beech Avenue and Factory Street
Catalpa Avenue and 29th Street
Catalpa Avenue and 40th Street
Catalpa Avenue and Rockbridge Avenue
Magnolia Avenue and 10th Street
Magnolia Avenue and 17th Street
Magnolia Avenue and 18th Street
Magnolia Avenue and 20th Street
Magnolia Avenue and 21st Street
Magnolia Avenue and 22nd Street
Magnolia Avenue and 23rd Street
Magnolia Avenue and 24th Street
Orchard Street and 29th Street
Sycamore Avenue and 20th Street
Alleghany Avenue and 29th Street
Sycamore Avenue and 21st Street

Roadway Segments – Machine Counts – 48 continuous hours (weekday)
29th Street, between Orchard Street and the West Corporate Limit
29th Street, between Rockbridge Avenue and Aspen Avenue
Magnolia Avenue, between 9th Street and 15th Street
Magnolia Avenue, at the Pedlar Gap Run (stream) crossing
Magnolia Avenue, between 19th Street and 20th Street
Park Avenue, between Ivy Avenue to Beech Avenue
Beech Avenue, between Park Avenue and 29th Street
Beech Avenue, between Park Avenue and 25th Street
Rockbridge Avenue, north of 29th Street
Rockbridge Avenue, north of 29th Street
Catalpa Avenue, between 38th Street and 36th Street
Long Hollow Road, between 39th Street and 38th Street
17th Street, between Magnolia Avenue and Forest Avenue Maple Avenue, between 18th Street and 20th Street
Ridge Avenue, between Walnut Avenue and 29th Street
21st Street, between Walnut Avenue and Maple Avenue
13th Street, between Walnut Avenue and Chestnut Avenue
10th Street, west of Magnolia Avenue
Orchard Street, between Long Hollow Road and Lexington Avenue
Cedar Avenue, between 20th Street and 21St Street

Based on these traffic counts, an analysis was performed to quantify traffic congestion using standard traffic engineering level of service analysis. Level of Service (LOS) is a qualitative measure of traffic flow describing operational conditions. Six levels of service are defined by FHWA in the Highway Capacity Manual for use in evaluating roadway operating conditions. They are given letter designations from A to F, with LOS A representing the best operating conditions and F the worst. A facility may operate at a range of levels of service depending on time of day, day or week or period of the year. A qualitative description of the different levels of service is provided below.

- **LOS A** – Drivers perceive little or no delay and easy progress along a corridor.
- **LOS B** – Drivers experience some delay but generally driving conditions are favorable.
- **LOS C** – Travel speeds are slightly lower than the posted speed with noticeable delay in intersection areas.
- **LOS D** – Travel speeds are well below the posted speed with few opportunities to pass and considerable intersection delay.
- **LOS E** – The facility is operating at capacity and there are virtually no useable gaps in the traffic.
- **LOS F** – More traffic desires to use a particular facility than it is designed to handle resulting

The approach used to determine deficient segments in Buena Vista was to analyze the volume of traffic on the roadway segments compared to the capacity of those segments, also known as the V/C ratio. For daily operating conditions, levels of service A, B, or C are acceptable. Levels of service D, E, or F represent deficient operations on those particular segments.

Existing average annual traffic volumes (2008) are shown in Map 7.2. The existing analysis shows that two roadway segments can be expected to operate at or below LOS D under daily conditions. Table 7.4 and Map 7.3 display the level of service analysis for the City of Buena Vista roadway segments. It should be noted that a level of service was not performed for all roadway segments in Buena Vista. A level of service analysis was performed for all roadway segments within the VDOT thoroughfare system for Buena Vista. Traffic count data was only available for these particular roadway segments.

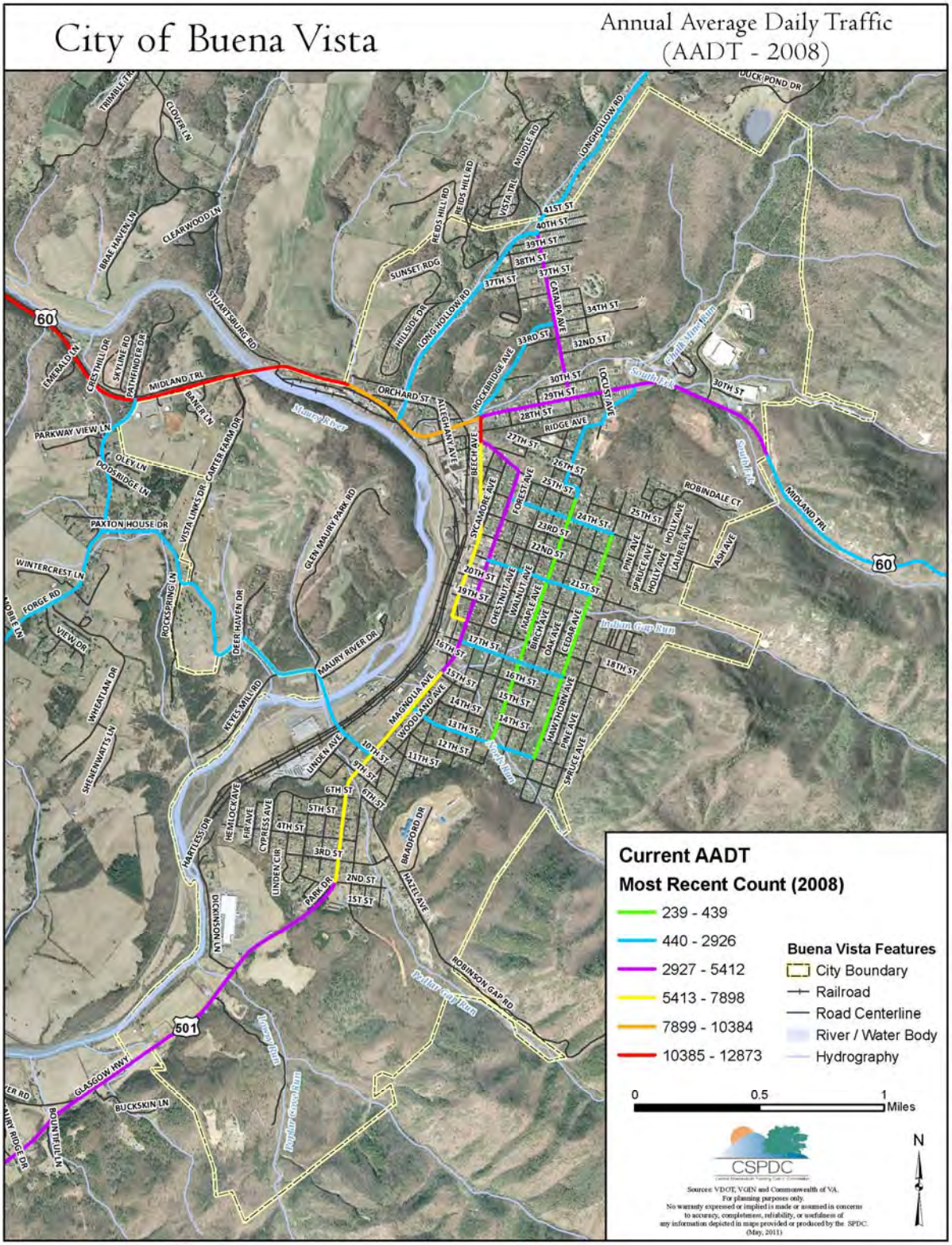
Table 7.4
Existing (2008) Level of Service Analysis

Roadway	From	To	Volume[(1)]	V/C	LOS
Cedar Avenue	13 Street	24th Street	370	0.02	A
Lexington Avenue	WCL Buena Vista	Alleghany Avenue	9949	0.13	A
Rockbridge Avenue	29th Street	Catalpa Avenue	2097	0.08	A
17th Street	Magnolia Avenue	Forest Avenue	1521	0.05	A
Magnolia Avenue	15th Street	20th Street	3834	0.25	A
Ridge Road	Walnut Avenue	29th Street	1093	0.06	A
Walnut Avenue	25 ½ Street	Ridge Road	752	0.04	A
25 ½ Street	Maple Avenue	Walnut Avenue	752	0.04	A
21st Street	Maple Avenue	Cedar Avenue	685	0.04	A
21st Street	Magnolia Avenue	Maple Avenue	685	0.05	A
Maple Avenue	25th Street	25 ½ Street	752	0.04	A
24th Street	Magnolia Avenue	Chestnut Avenue	1062	0.06	B
13th Street	Magnolia Avenue	Cedar Avenue	1707	0.08	B
Maple Avenue	13th Street	17th Street	239	0.1	B
Sycamore Avenue	18th Street	20th Street	6979	0.36	B
17th Street	Oak Avenue	Cedar Avenue	1521	0.07	B

Roadway	From	To	Volume[(1)]	V/C	LOS
24th Street	Chestnut Avenue	Cedar Avenue	1062	0.06	B
Magnolia Avenue	20th Street	25th Street	3834	0.28	B
Maple Avenue	17th Street	25 Street	239	0.1	B
29th Street	Ridge Avenue	ECL Buena Vista	4922	0.13	B
10th Street	C&O Railroad	Magnolia Avenue	2809	0.12	B
Catalpa Avenue	Rockbridge Avenue	Long Hollow Road	3183	0.12	B
29th Street	Beech Avenue	Ridge Avenue	4922	0.15	B
Long Hollow Road	Lexington Avenue	NCL Buena Vista	1324	0.09	B
17th Street	Forest Avenue	Oak Avenue	1521	0.07	B
Sycamore Avenue	20th Street	22nd Street	6979	0.36	B
Park Avenue	Magnolia Avenue	Beech Avenue	4257	0.25	C
10th Street	WCL Buena Vista	Maury River Bridge	2809	0.17	C
Beech Avenue	22nd Street	Park Avenue	7511	0.45	C
Magnolia Avenue	SCL Buena Vista	22nd Street	3947	0.21	C
Lexington Avenue	Alleghany Avenue	Beech Avenue	9949	0.24	C
18th Street	Magnolia Avenue	Sycamore Street	6444	0.19	C
Catalpa Avenue	29th Street	Rockbridge Avenue	4484	0.19	C
10th Street	Maury River Bridge	C&O Railroad	2809	0.17	C
Magnolia Avenue	2nd Street	15th Street	7,518	0.34	D
Beech Avenue	Park Avenue	29th Street	12,135	0.61	D

(1) – Two-way volumes.

Map 7.2


City of Buena Vista
Annual Average Daily Traffic
(AADT - 2008)
Current AADT
Most Recent Count (2008)
239 - 439
440 - 2926
2927 - 5412
5413 - 7898
7899 - 10384
10385 - 12873
Buena Vista Features
City Boundary
Railroad
Road Centerline
River / Water Body
Hydrography
0
0.5
1
Miles
N
CSPDC
Source: VDOT, VGIN and Commonwealth of VA.
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(May, 2011)
60
501
Maury River
Indian Gap Run
Poplar Grove Run
South Fork
Calfee Run

Map 7.3

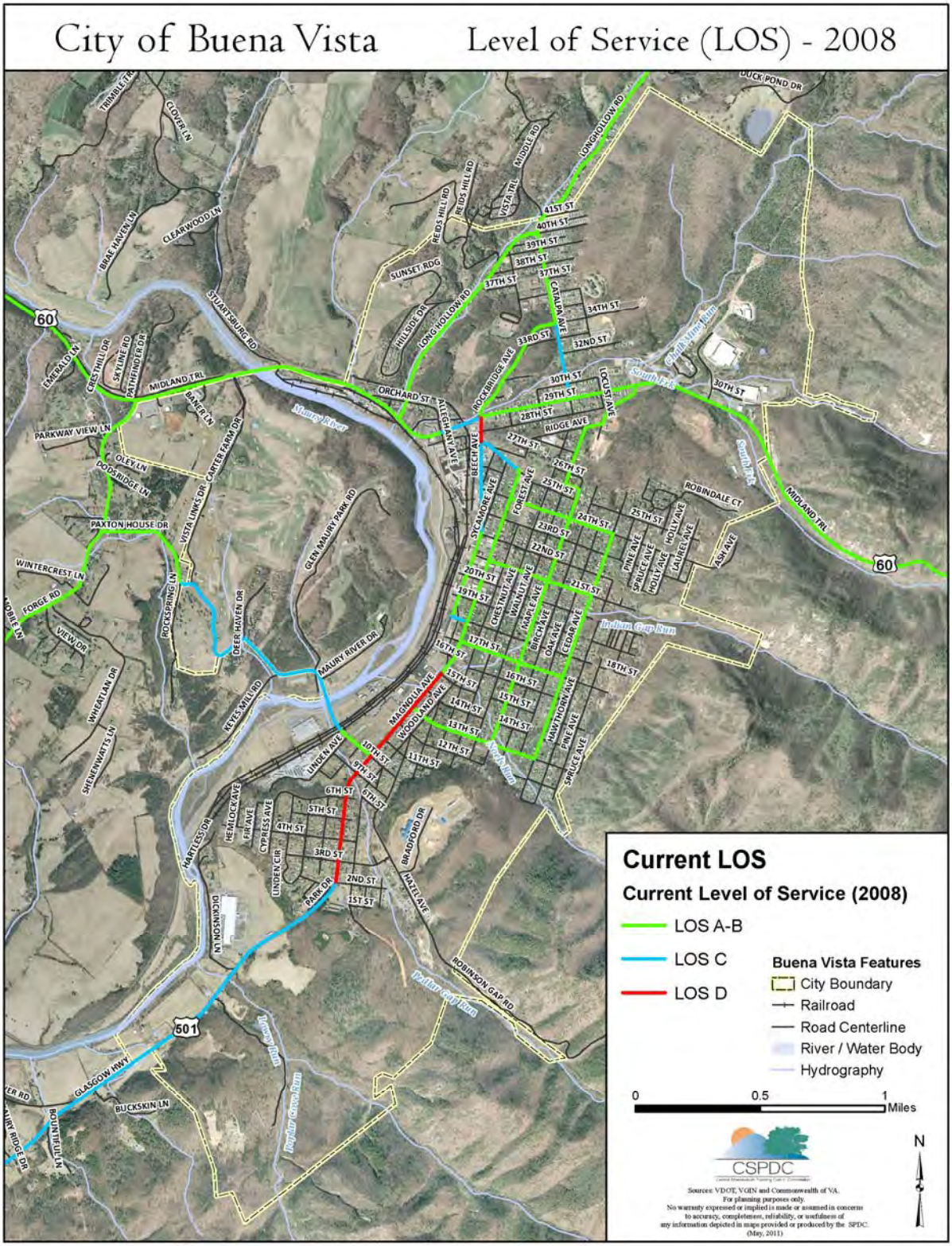

City of Buena Vista
Level of Service (LOS) - 2008
Current LOS
Current Level of Service (2008)
LOS A-B
LOS C
LOS D
Buena Vista Features
City Boundary
Railroad
Road Centerline
River / Water Body
Hydrography
0
0.5
1
Miles
N
CSPDC
Sources: VDOT, VGIN and Commonwealth of VA.
For planning purposes only.
No warranty expressed or implied is made or assumed in concerns to accuracy, completeness, reliability, or usefulness of any information depicted in maps provided or produced by the SPDC.
(May, 2011)
60
501
Maury River
Indian Gap Run
Porter Mtn
Poplar Grove Run
Locust Run
South Fork
MIDLAND TRL
ORCHARD ST
RIDGE AVE
MAURY RIVER DR
MAGNOLIA AVE
WOODLAND AVE
LINDEN AVE
BEECH AVE
ROCKBRIDGE AVE
ALLEGHANY AVE
SYCAMORE AVE
FOREST AVE
CHALPA AVE
LOCUST AVE
LONG HOLLOW RD
SUNSET RDG
REDS HILL RD
MIDDLE RD
VISTA TRL
LONGHOLLOW RD
DUCK POND DR
CLEARWOOD LN
BRAE HAVEN LN
TRIMBLE TRL
CLOVER LN
STUARTSBURG RD
EMERALD LN
CREST HILL DR
SKYLINE RD
PATHFINDER DR
BAKER LN
PARKWAY VIEW LN
OLEY LN
DOE RIDGE LN
CARTER FARM DR
VISTA LINKS DR
PAXTON HOUSE DR
GLEN MAURY PARK RD
WINTERCREST LN
FORGE RD
MOBILE LN
VIEW DR
ROCKSPRING LN
DEER HAVEN DR
WHEATLAN DR
SHENENWATTS LN
KEYES MILL RD
HARTLESS DR
HEMLOCK AVE
FIR AVE
CYPRESS AVE
LINDEN CIR
DICKINSON LN
PARK DR
BRADFORD DR
HAZEL AVE
ROBINSON GAP RD
GLASGOW HWY
BUCKSKIN LN
BOUNTIFUL LN
RIVER RIDGE DR
ROBINDALE CT
HOLLY AVE
CATALPA AVE
ASH AVE
PINE AVE
SPRUCE AVE
HOLLY AVE
CHESTNUT AVE
WALNUT AVE
MAPLE AVE
BIRCH AVE
OAK AVE
CEDAR AVE
HAWTHORN AVE
PINE AVE
SPRUCE AVE
41ST ST
40TH ST
39TH ST
38TH ST
37TH ST
34TH ST
33RD ST
32ND ST
30TH ST
29TH ST
28TH ST
27TH ST
26TH ST
25TH ST
24TH ST
23RD ST
22ND ST
21ST ST
20TH ST
19TH ST
18TH ST
17TH ST
16TH ST
15TH ST
14TH ST
13TH ST
12TH ST
10TH ST
9TH ST
6TH ST
5TH ST
4TH ST
3RD ST
2ND ST
1ST ST

Table 7.5 shows the two deficient roadway segments operating at LOS D during daily operating conditions. All other roadway segments studied in Buena Vista are currently operating at an acceptable LOS, which is defined as LOS A, B or C.

Table 7.5
Existing (2008) Deficient Segments

Roadway	From	To	Volume[(1)]	V/C	LOS
Magnolia Avenue	2nd Street	15th Street	7,518	0.34	D
Beech Avenue	Park Avenue	29th Street	12,135	0.61	D

(1) – Two-way volumes.

Table 7.6 below gives the intersection level of service for the unsignalized and signalized intersections within Buena Vista. It should be noted that Table 7.6 does not list every intersection in the City, only those intersections that are contained in the VDOT thoroughfare system for Buena Vista. Turning movement counts are only available for these particular intersections.

Table 7.6
Existing (2008) Intersection Level of Service Analysis

Road	Intersection	Location Type	LOS* AM/PM
29th Street	@Alleghany Avenue	Unsignalized Int.	A / U
Catalpa Avenue	@Rockbridge Avenue	Unsignalized Int.	A / A
Catalpa Avenue	@29th Street	Unsignalized Int.	A / A
Sycamore Avenue	@20th Street	Unsignalized Int.	A / A
Catalpa Avenue	@20th Street	Unsignalized Int.	A / A
Magnolia Avenue	@10th Street	Unsignalized Int.	A / A
Magnolia Avenue	@17th Street	Unsignalized Int.	A / A
Magnolia Avenue	@18th Street	Unsignalized Int.	A / U
Magnolia Avenue	@23rd Street	Unsignalized Int.	A / A
Magnolia Avenue	@24th Street/High School	Unsignalized Int.	A / A
Sycamore Avenue	@21st Street	Signalized Int.	A / A
Magnolia Avenue	@20th Street	Signalized Int.	A / A
Magnolia Avenue	@21st Street	Signalized Int.	A / A
Magnolia Avenue	@22nd Street	Signalized Int.	A / A

* LOS = Level of Service, A = Acceptable (LOS = A, B, or C); U = Unacceptable (LOS = D, E, or F)

Roadway Safety

The planning-level analysis used for this chapter included identifying potential hazardous locations as well as potential safety concerns that could be mitigated by short; mid; or long-term transportation improvements. This planning-level analysis does not replace detailed traffic engineering safety studies that may be required in the future at particular locations.

The frequency of accidents at various locations within the City was assessed. Three locations were identified in the City as high accident locations having five or more accidents in at least one year of the study period (2004-2006). The three locations identified for safety deficiency are:

- U.S. 60 / U.S. 501
- U.S. 501 / 20th Street
- U.S. 501 south of downtown

Based on the crash analysis performed for the purposes of this study, accidents in Buena Vista were concentrated on U.S. Route 501. About half of all accidents in the City within the study period occurred on U.S. Route 501.

Parking and Rideshare

Parking is allowed on city streets except where indicated. Many businesses in the central business district rely on street parking for their customers. There are no ridesharing programs or park-and-ride lots specific for the City of Buena Vista. However, a regional rideshare was started in 2009 by the Central Shenandoah Planning District Commission. The regional rideshare program services all of Rockbridge County and matches commuters to any other destination within the five county Planning District Commission boundary.

Bicycle and Pedestrian Facilities

Buena Vista has no bicycle lanes on its streets or pathways designed for bicycle use. Typically, families with children ride bicycles in Glen Maury Park, because of its parking lot and open space. Three principal pathways in Buena Vista are used for walking and hiking, summarized as follows:

1. The Chessie Trail. This historic pathway connects Lexington and Buena Vista and is a rail-to-trails designated pedestrian trail. The trail follows the Maury River and is 7 to 8 miles long. The trail is surfaced with wood chips.

2. Glen Maury Park Trail. This is an undesignated quarter-mile trail in Glen Maury Park, which traverses a wooded area. The park is located in the city limits along the western bank of the Maury River.

3. Levee Trail. This trail is a gravel/macadam paved pathway, also undesignated, that runs along the top of a levee that was recently built along the Maury River in Buena Vista. This pathway runs the length of the levee and is approximately 2.5 miles long. The levee was completed in the late 1990s.

Transit, Social Service Transportation, and Taxi

1. Three Community Service agencies (Rockbridge Area Community Services, Rockbridge Area Occupational Center, and the Maury River Senior Center) provide some transportation for their own programs.

2. There is one taxi company and limousine service based in the City of Lexington that serves Buena Vista and the Rockbridge area.

3. There is no fixed-route service but application has been made to begin a service in 2010 linking Buena Vista, Lexington, and points if Rockbridge County.

4. Rockbridge Area Transportation System (RATS) is a demand-response, door-to-door, service available to the public. The mission is to provide safe, affordable transportation to residents of the Rockbridge area, especially those who are elderly, have special needs, or simply have no other transportation. A sliding scale is used to be sure that reduced fares are provided where most needed. RATS operates 14 vehicles (8 with wheelchair capability) during business hours five days per week. Evening and weekend service is available by arrangement. Transportation to regional medical centers in Roanoke, Fishersville, Charlottesville, etc., is part of the service.

5. The Maury Express is a deviated fixed route rural public transportation service operated by RADAR of Roanoke that began service in March, 2011. Two buses circulate hourly using a route connecting the residential areas along primary roadway corridors of Buena Vista and the City of Lexington with necessary community services, such as commercial services, healthcare needs, schools, and employment centers. The Maury Express service operates 8am to 6pm, weekdays and 10am to 2pm, Saturdays.

Intercity Rail and Air Travel

Buena Vista is not served directly by passenger rail, but several stations are located nearby. Two of these stations are in Clifton Forge, about 35 miles to the west, and one in Staunton, about 35 miles to the north. Both stations are served by Amtrak's Cardinal line, which services points east and north to Charlottesville and Washington, D.C., and west into West Virginia. Rail service is also available from Lynchburg, about 35 miles to the southeast and Goshen, about 30 miles to the northwest. This station serves Amtrak's Crescent line, which runs between New York City and New Orleans.

There are no local or regional airports within a 35-mile radius of the city. The closest airport to Buena Vista is located in Lynchburg, about 35 miles to the southeast and is a commercial airport.

Goods Movement

Buena Vista has historically functioned as a manufacturing city that experiences significant truck traffic generated from industries in the City and in the general vicinity, as well as through trucks from outside the area. The City is located along a primary route on Interstate 81 and Interstate 64.

Truck movement through the City generally follows either Route 60 west of the City or Route 501 south of the City. Additionally, there are notable volumes of truck traffic on Route 60 east of the City traveling from Buena Vista to locations east of the Blue Ridge Mountains. Most goods shipments to and from Buena Vista and the immediate area are by truck.

CURRENT TRANSPORTATION PLANS AND PROJECTS

Two transportation projects for the City are also included in the Virginia Transportation Six-Year Program (FY 2010-2015). The Six-Year Program is a listing and six-year funding allocation for projects across Virginia. In addition, being a member of the Central Shenandoah Planning District Commission, planning efforts that encompass the City of Buena Vista are performed by this organization. The two projects are: 1) install a traffic signal at Magnolia Avenue and 10th Street and 2) installation of curb and gutter on sections of Route 60. Both projects are in various stages of preconstruction.

FUTURE TRANSPORTATION CONDITIONS 2035

In order to determine transportation needs for the City of Buena Vista, traffic projections were made to analyze the operations of the transportation system in 2035. Transportation needs through 2035 were identified based on this analysis. These projected needs as well as existing needs formed the basis for the recommendations in this section.

Forecast Methodology

Traffic volumes for 2035 were developed based on an analysis of historic traffic data for Buena Vista roadways. All available traffic data for the period from 1980 to 2008 was collected and summarized. A trend-line analysis was performed and growth rates for major roadways were developed. These growth rates were analyzed and checked against population and employment projections for the City.

Based on this analysis and to ensure that reasonable levels of traffic growth can be accommodated by the Buena Vista transportation system, all roadways in the City were anticipated to incur traffic growth between 2.0 percent and 3.0 percent per year. Growth rates on all roadways were not compounded: for example, a 2 percent non-compounded annual growth rate for 26 years yielded a total assumed growth of 52 percent.

Traffic trend analysis using historic counts for major roads in Buena Vista was used. Population trends and forecasts were used as an additional tool in determining an appropriate growth rate to use for Buena Vista roads.

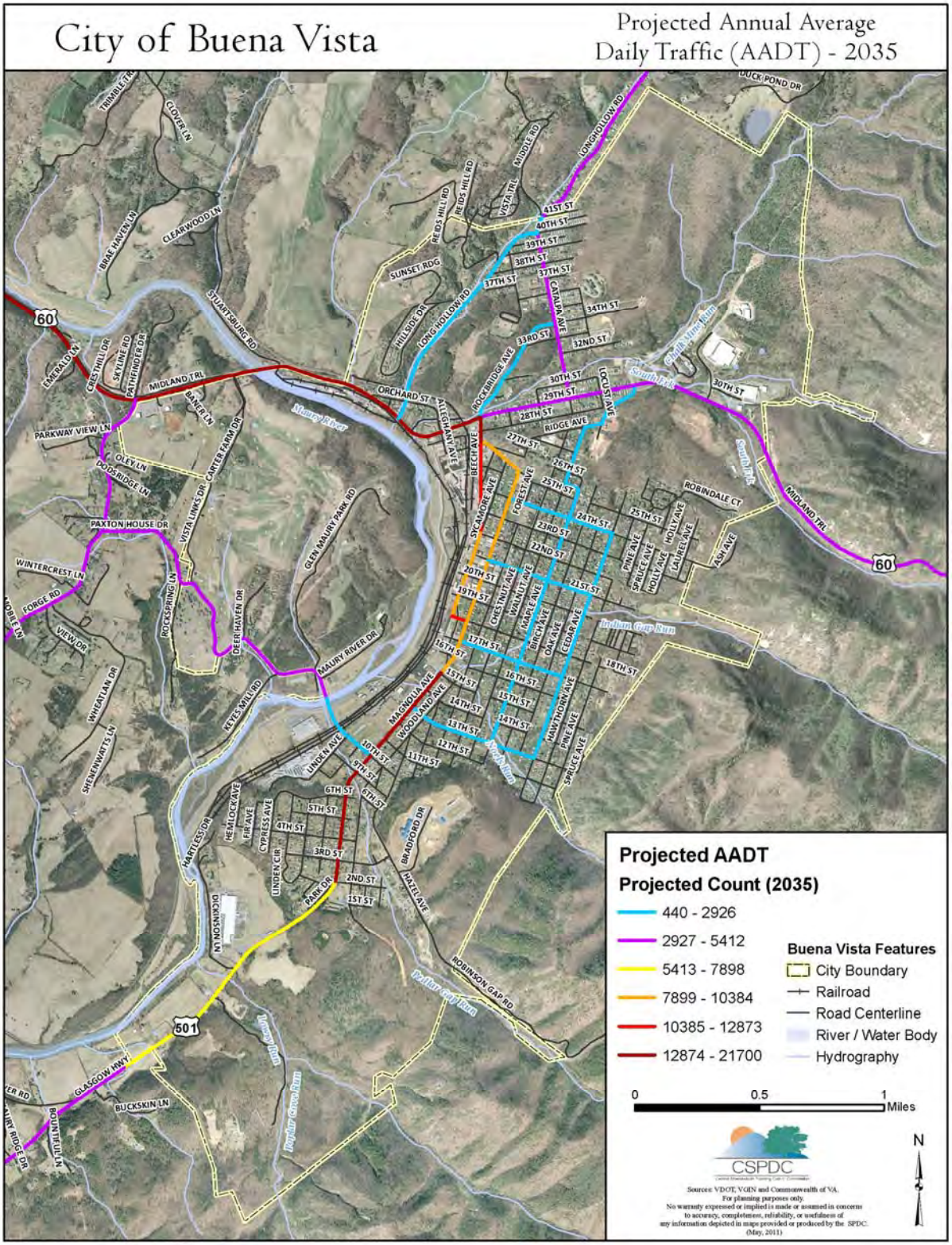
For evaluation of future (2035) traffic conditions, traffic volumes were projected for the 20 year period. All projections of future traffic conditions are based on historic traffic volumes for the roadway network in Buena Vista. Growth factors were determined for the 33 separate road segments by performing a linear trend analysis using traffic data from 1990 to 2008. The results of this analysis were growth factors, one for each roadway section along the route. The 2008 traffic volumes were then multiplied by the respective growth factor to obtain the 2035 traffic projection for that segment of the roadway. Average yearly growth estimates on these segments range from a positive growth of approximately six percent per year to a drop of approximately three percent per year.

In order to evaluate the future (2035) roadway conditions, projected traffic volumes were used to calculate LOS on the roadway corridors in the study area. As with the existing traffic conditions evaluation, capacity analysis was used to determine the LOS in the study area. Based on this analysis, the average traffic growth on the 33 Buena Vista roadways was 2.23 percent per year. It is important to note that this is an average based on all of the analyzed roadways, with equal weight given to roadways regardless of size or volume of traffic carried.

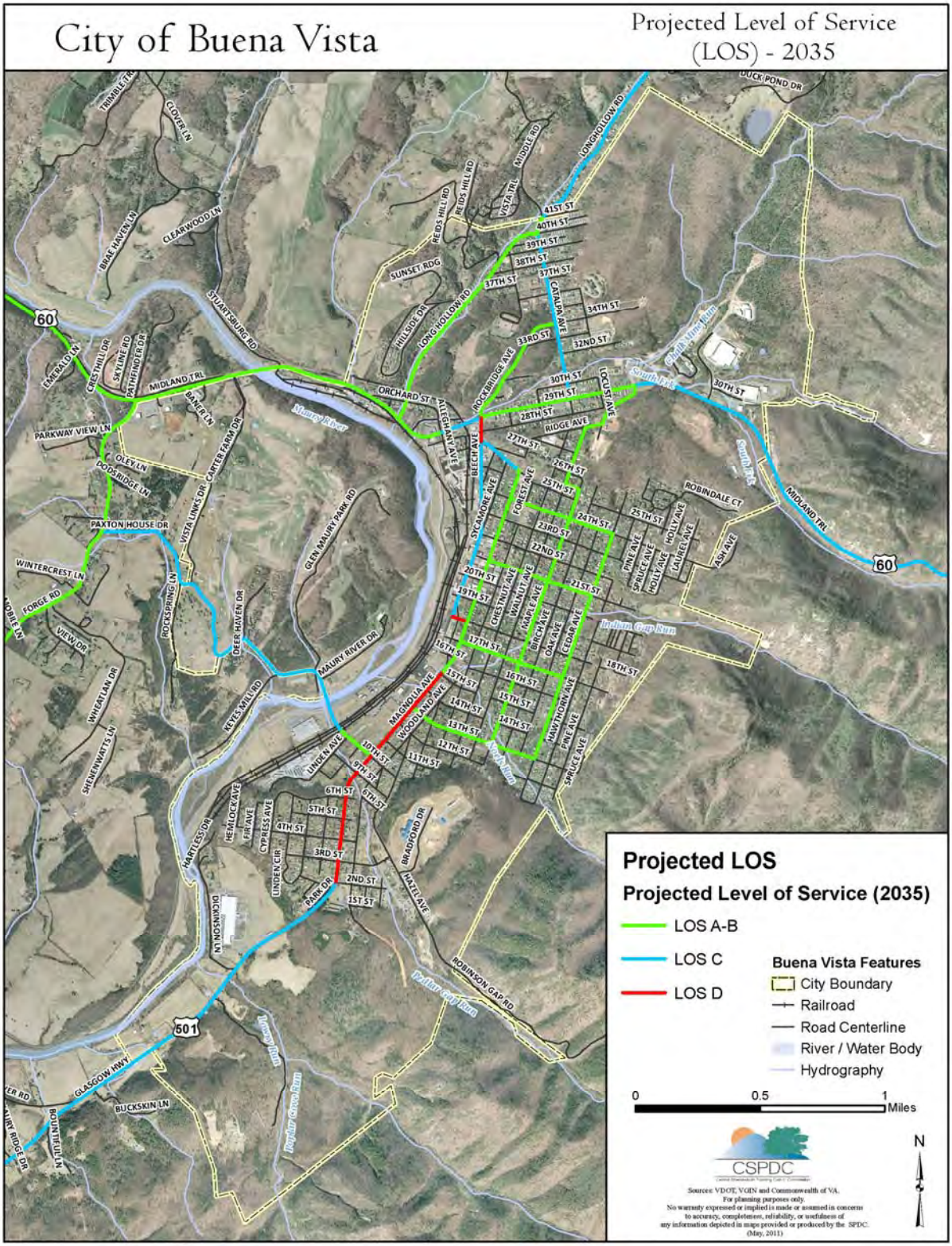
Year 2035 Volumes and Needs

Daily traffic volumes for 2035 are shown in Map 7.4. The forecasted traffic volumes show that three roadway segments are anticipated to operate at a deficient level of service in 2035. Table 7.7 and Map 7.5 display the 2035 level of service for the City of Buena Vista roadway segments. Similar to the existing level of service analysis, traffic volume calculations and LOS determinations were only done for those roadway segments within the VDOT thoroughfare system. The approach used in the capacity analyses for this study was to use the planning-level analysis techniques of the Highway Capacity Software (HCS), Version 5.3. If, by using this planning level analysis, the intersection was identified as operating at either near or over capacity conditions (defined as deficient) the analyst would run HCS "operations" analysis to identify and test improvement recommendations.

Map 7.4


City of Buena Vista
Projected Annual Average Daily Traffic (AADT) - 2035
Projected AADT
Projected Count (2035)
440 - 2926
2927 - 5412
5413 - 7898
7899 - 10384
10385 - 12873
12874 - 21700
Buena Vista Features
City Boundary
Railroad
Road Centerline
River / Water Body
Hydrography
0
0.5
1
Miles
N
CSPDC
Source: VDOT, VGIN and Commonwealth of VA.
For planning purposes only.
No warranty expressed or implied is made or assumed in concerns to accuracy, completeness, reliability, or usefulness of any information depicted in maps provided or produced by the SPDC.
(May, 2011)
Maury River
Indian Gap Run
Poplar Grove Run
South Fork
60
501

Map 7.5


City of Buena Vista
Projected Level of Service (LOS) - 2035
Projected LOS
Projected Level of Service (2035)
LOS A-B
LOS C
LOS D
Buena Vista Features
City Boundary
Railroad
Road Centerline
River / Water Body
Hydrography
0
0.5
1
Miles
N
CSPDC
Source: VDOT, VGIN and Commonwealth of VA.
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(May, 2011)
60
501
Maury River
Indian Gap Run
Porter Mtn
Bradley Gap Run
Dickinson Run
Buffalo Run
Chalk Mines Run
South Fork
MIDLAND TRL
ORCHARD ST
RIDGE AVE
MAURY RIVER DR
GLEN MAURY PARK RD
MAGNOLIA AVE
WOODLAND AVE
LINDEN AVE
BEECH AVE
SYCAMORE AVE
FOREST AVE
CHALPA AVE
LOCUST AVE
ROCKBRIDGE AVE
ALLEGHANY AVE
LONG HOLLOW RD
SUNSET RDG
REDS HILL RD
MIDDLE RD
VISTA TRL
DUCK POND DR
ROBINDALE CT
PAXTON HOUSE DR
WINTERCREST LN
FORGE RD
KEYES MILL RD
HARTLESS DR
BRADFORD DR
HATELAVE
ROBINSON GAP RD
GLASGOW HWY
BUCKSKIN LN
BOUNTIFUL LN
PARKWAY VIEW LN
MOBILE LN
VIEW DR
WHEATLAN DR
SHENENWATTS LN
ROCKSPRING LN
DEER HAVEN DR
VISTA LINKS DR
CARTER FARM DR
OLEY LN
DOE RIDGE LN
BAKER LN
PATHFINDER DR
SKYLINE RD
CRESTHILL DR
EMERALD LN
STUARTSBURG RD
BRAE HAVEN LN
CLEARWOOD LN
CLOVER LN
TRIMBLE TRL
HILLSIDE DR
PARK DR
DICKINSON LN
LINDEN CIR
CYPRESS AVE
FIR AVE
HEMLOCK AVE
1ST ST
2ND ST
3RD ST
4TH ST
5TH ST
6TH ST
9TH ST
10TH ST
11TH ST
12TH ST
13TH ST
14TH ST
15TH ST
16TH ST
17TH ST
18TH ST
19TH ST
20TH ST
21ST ST
22ND ST
23RD ST
24TH ST
25TH ST
26TH ST
27TH ST
28TH ST
29TH ST
30TH ST
32ND ST
33RD ST
34TH ST
37TH ST
38TH ST
39TH ST
40TH ST
41ST ST
CHESTNUT AVE
WALNUT AVE
MAPLE AVE
BIRCH AVE
OAK AVE
CEDAR AVE
HAWTHORN AVE
PINE AVE
SPRUCE AVE
HOLLY AVE
LAUREL AVE
ASH AVE

Table 7.7
Year 2035 Level of Service

Roadway	From	To	Volume[(1)]	V/C	LOS
Cedar Avenue	13th Street	24th Street	600	0.04	A
Maple Avenue	13th Street	17th Street	440	0.02	A
Lexington Avenue	WCL Buena Vista	Alleghany Avenue	15,000	0.2	A
Maple Avenue	17th Street	25th Street	440	0.02	A
Walnut Avenue	25 ½ Street	Ridge Road	900	0.04	A
25 ½ Street	Maple Avenue	Walnut Avenue	900	0.04	A
21st Street	Maple Avenue	Cedar Avenue	1100	0.06	A
21st Street	Magnolia Avenue	Maple Avenue	1100	0.07	A
Maple Avenue	25th Street	25 ½ Street	900	0.04	A
24th Street	Magnolia Avenue	Chestnut Avenue	1800	0.1	B
13th Street	Magnolia Avenue	Cedar Avenue	2400	0.12	B
17th Street	Oak Avenue	Cedar Avenue	2400	0.13	B
24th Street	Chestnut Avenue	Cedar Avenue	1800	0.1	B
Rockbridge Avenue	29th Street	Catalpa Avenue	2100	0.1	B
17th Street	Magnolia Avenue	Forest Avenue	2400	0.9	B
Magnolia Avenue	20th Street	25th Street	9000	0.68	B
Magnolia Avenue	15th Street	20th Street	9500	0.68	B
Ridge Road	Walnut Avenue	29th Street	1400	0.08	B
10th Street	C&O Railroad	Magnolia Avenue	2900	0.12	B
29th Street	Beech Avenue	Ridge Avenue	5000	0.35	B
Long Hollow Road	Lexington Avenue	NCL Buena Vista	2700	0.15	B
17th Street	Forest Avenue	Oak Avenue	2400	0.13	B
Sycamore Avenue	18th Street	20th Street	9,400	0.34	B
Park Avenue	Magnolia Avenue	Beech Avenue	8000	0.52	C
10th Street	WCL Buena Vista	Maury River Bridge	3000	0.17	C
Beech Avenue	22nd Street	Park Avenue	11,000	0.61	C
Magnolia Avenue	SCL Buena Vista	2nd Street	5500	0.22	C
Lexington Avenue	Alleghany Avenue	Beech Avenue	15,000	0.37	C
29th Street	Ridge Avenue	ECL Buena Vista	5,000	0.2	C
Catalpa Avenue	29th Street	Rockbridge Avenue	5,300	0.23	C
Catalpa Avenue	Rockbridge Avenue	Long Hollow Road	4,200	0.17	C
10th Street	Maury River Bridge	C&O Railroad	2,900	0.17	C
Sycamore Avenue	20th Street	22nd Street	10,200	0.55	C
18th Street	Magnolia Avenue	Sycamore Street	11,000	0.34	D
Magnolia Avenue	2nd Street	15th Street	15,000	0.56	D
Beech Avenue	Park Avenue	29th Street	14,100	0.8	D

(1) – Two-way volumes.

Table 7.8 shows the three deficient roadway segments operating at LOS D during daily operating conditions. All other roadway segments studied in Buena Vista are operating at an acceptable LOS, which is defined LOS A, B, or C.

Table 7.8
Year 2035 Deficient Segments

Roadway	From	To	Volume(1)	V/C	LOS
18th Street	Magnolia Avenue	Sycamore Street	11,000	0.65	D
Magnolia Avenue	2nd Street	15th Street	15,000	0.56	D
Beech Avenue	Park Avenue	29th Street	14,100	0.8	D

(1) – Two-way volumes.

Table 7.9 gives the intersection level of service for year 2035 for the unsignalized and signalized intersections within Buena Vista. Similarly to the existing conditions LOS summary table, only those intersections contained in the VDOT thoroughfare system for Buena Vista were analyzed.

Table 7.9
Year 2035 Intersection Level of Service Analysis

Road	Intersection	Location Type	LOS* AM/Mid/PM
29th Street	@Alleghany Avenue	Unsignalized Int.	U / U / U
Catalpa Avenue	@Rockbridge Avenue	Unsignalized Int.	U / A / A
Catalpa Avenue	@29th Street	Unsignalized Int.	U / U / U
Sycamore Avenue	@20th Street	Unsignalized Int.	A / A / A
Catalpa Avenue	@20th Street	Unsignalized Int.	A / A / A
Magnolia Avenue	@10th Street	Unsignalized Int.	U / U / U
Magnolia Avenue	@17th Street	Unsignalized Int.	U / A / U
Magnolia Avenue	@18th Street	Unsignalized Int.	U / A / U
Magnolia Avenue	@23rd Street	Unsignalized Int.	U / U / U
Magnolia Avenue	@24th Street/High School	Unsignalized Int.	U / U / U
Sycamore Avenue	@21st Street	Signalized Int.	A / A / A
Magnolia Avenue	@20th Street	Signalized Int.	A / A / A
Magnolia Avenue	@21st Street	Signalized Int.	A / A / A
Magnolia Avenue	@22nd Street	Signalized Int.	A / A / A

*LOS = Level of Service. A=Acceptable LOS (LOS = A, B, or C), U=Unacceptable LOS (LOS = D, E, or F)

The following intersections in Buena Vista are anticipated to be deficient for 2035, at the peak hours indicated:

- 29th Street and Allegheny Avenue (All Peaks)
- Catalpa Avenue and Rockbridge Avenue (AM Peak)
- Catalpa Avenue and 29th Street (All Peaks)
- Magnolia Avenue and 10th Street (All Peaks)
- Magnolia Avenue and 17th Street (AM and PM Peaks)
- Magnolia Avenue and 18th Street (AM and PM Peaks)
- Magnolia Avenue and 23rd Street (All Peaks)
- Magnolia Avenue and 24th Street/High School (All Peaks)

TRANSPORTATION RECOMMENDATIONS

Based on analysis of the highway capacity, safety, geometry, and other local issues affecting the performance of the transportation system serving the City, recommendations were developed in conjunction with Buena Vista officials. For planning purposes, cost estimates were also developed for each of the recommendations using standard unit costs (generally, per-mile). The transportation plan recommendations are described below.

The recommendations have been developed based on existing and future transportation needs. These include flow and safety conditions, multimodal transportation deficiencies, parking and goods movement. A summary of both existing and future deficiencies is listed in Table 7.10.

Table 7.10
Existing and Future Transportation Deficiencies

Deficiency Type	Description
Intersection – 2010	• Route 60 and Route 501, Safety • Sycamore Avenue and 20th Street, Safety • 29th Street and Allegheny Avenue, Operations • Magnolia Avenue and 10th Street, Operations • Catalpa Avenue and Rockbridge Avenue, Safety
Segment – 2010	None
Intersection – 2035	• 29th Street and Allegheny Avenue • Catalpa Avenue and 29th Street • Magnolia Avenue and 17th Street (AM and PM Peaks) • Magnolia Avenue and 18th Street (AM and PM Peaks)
Segment – 2035	Beech Avenue, between Park Avenue and 29th Street

The transportation system recommendations for Buena Vista are divided into three phases (See Map 7.6). Phase One recommendations relate to the most important needs of the City and, based on relatively low costs and impacts and ease of implementation. Phase Two improvements are midterm improvements intended to correct existing deficiencies but, based on projected costs and/or potential impacts, would require a greater number of years to plan and fund. Phase Three improvements are long-term projects that are intended to correct deficiencies to the year 2035.

Phase One: Base Year (2010) Recommendations

Three projects were identified as short-term, immediate improvements and are described below.

Route 60 (29th Street) at Alleghany Avenue. This intersection has a deficient level of service rating for existing conditions. The recommendation is to install a signal at this intersection to improve intersection capacity.

Route 60 at Route 501 (Beech Avenue). This intersection has the highest accident rate of any other in the City. The recommendation is to reconfigure signal phasing to allow eastbound and westbound left turns as protected only (turns only on a green arrow). This is intended to improve safety by eliminating a vehicle turning conflict.

Sycamore Avenue at 20th Street. This intersection is one targeted for an increase in safety measures. This recommendation is to convert this intersection to all-way stop control and add advance warning signs on Sycamore Avenue to enhance safety.

Phase Two: Interim Year (2020) Recommendations

Five projects were identified as an interim year improvement.

Rockbridge Avenue at Catalpa Avenue. Convert to intersection to all-way stop control and advance warning signs at the intersection to improve safety, particularly speeding. This intersection is anticipated to have a deficient level of service rating by 2020.

Route 501 (Magnolia Avenue) and Second Street. The recommendation is to install left turn lanes and crosswalks at this location to provide a safer pedestrian environment near Enderly Heights Elementary School.

Woodland Avenue and Second Street. The recommendation is to install crosswalks at this location to provide a safer pedestrian environment near Enderly Heights Elementary School.

Factory Street Railroad Crossing. The recommendation is to install railroad crossing gates for increased security at this at-grade crossing. This project was completed in October 2011.

Ridge/Maple Avenue from Route 60 (29th Street) to Walnut Avenue. The recommendation is to install sidewalks on Ridge Avenue and crosswalks at the intersection of Ridge Avenue and 29th Street to provide greater pedestrian connectivity to Southern Virginia University and the residential area north of Route 60.

Phase Three: Future Year (2035) Recommendations

The Phase Three recommendations are intended to support the economic and business needs of the community while enhancing both the appeal and traffic operations of Buena Vista's Main Street areas. Three projects are in this phase.

Alleghany Avenue/Factory Street from Route 60 (E. Midland Trail) to Beech Avenue. The recommendation is to reconstruct these roadways to current VDOT standards and to realign Factory Street with Park Avenue.

21th Street Pedestrian Bridge across the Maury River. The recommendation is to install a pedestrian bridge over the Maury River and the railroad tracks between the Maury River and Sycamore Avenue. This pedestrian bridge is intended to connect to trails within Glen Maury Park.

10th Street from Magnolia to the entrance of Glen Maury Park. The recommendation is to install sidewalks on 10th Street to provide greater pedestrian connectivity to Glen Maury Park.

Further Study/Implementation Recommendations

For consideration in future transportation planning efforts, there are two recommended studies and two points of consideration for implementation of future transportation accommodations. The two study efforts are to:

Complete a Sidewalk Connectivity Study. The purpose of this study is to identify where "gaps" exists in the sidewalk network and to prepare a prioritized list of locations where new sidewalk construction would improve the pedestrian facilities within Buena Vista.

Parking Study for Downtown Buena Vista. The purpose of this study is to determine how to provide an adequate amount of parking to support the land uses in the downtown area and any future downtown economic development efforts.

Additionally, future transportation implementation policies should include, where appropriate, design standards for on-street parking to ensure adequate sight distance, particularly at intersections. As well, all newly constructed curb ramps should be within ADA compliance standards.

Transportation
STRATEGIES FOR ACTION

Goal 1: Transportation Network

The City of Buena Vista will maintain a safe and efficient transportation system that meets the local and regional access needs of residents, businesses, and visitors.

To achieve this goal, the following critical success factors must be accomplished:

- Protect existing public investments in the transportation network.
- Integrate transportation and land use planning.
- Consider public roadways to be public spaces which serve multiple public purposes in addition to carrying motor vehicles.
- Design a transportation network that accesses all modes of transportation easily and safely.

		Priority	Responsibility
7.1A	Coordinate land use commitments with transportation capacity.	On Going	Planning, Planning Commission
7.1B	Define and protect potential future road corridors for long term needs.	M	Planning, City Council
7.1C	Adopt standards for rezonings that include road and bridge capacities as criteria for approval.	On Going	Planning, City Council
7.1D	Require traffic impact studies for major development proposals that identify initial and long-term transportation impacts associated with the proposed development.	H	Community Development
7.1E	Encourage proposed employment centers to locate in close proximity to existing or planned major roads.	On Going	Planning, Planning Commission
7.1F	Control access to arterial roadways by directing the number and location of entrances.	On Going	Planning, Planning Commission
7.1G	Require building setbacks that reflect the right-of-way to ensure that the right-of-way is reserved for future transportation improvements.	On Going	Planning
7.1H	Continue to identify and address transportation mode/user conflicts with the transportation system.	On Going	Planning, Public Works
7.1I	Determine appropriate level of signage to enhance transportation safety conditions.	On Going	Public Works
7.1J	Increase safety awareness of users and providers of transportation systems.	On Going	Public Works
7.1K	Encourage the use of rail by industry, and deference to new industries, to use rail instead of solely trucks.	On Going	Planning, Economic Development

		Priority	Responsibility
7.1L	Encourage the coordination of adjacent land uses to best facilitate the maximum use of the railroads.	On Going	Planning, Economic Development
7.1M	Use traffic calming measures at appropriate locations.	M, On Going	Planning, Public Works
7.1N	Design local streets to give priority to both vehicles and pedestrians.	On Going	Planning, Public Works
7.1O	Promote improvements to the transportation network that are compatible with the aesthetic, historic, and physical characteristics of the City.	On Going	Community Development, Public Works
7.1P	Minimize transportation impacts to the City's historic, cultural, and environmental resources.	On Going	Community Development, Public Works
7.1Q	Develop a set of design criteria including landscaping, setbacks and buffers for the City's roadway that improve mobility and safety.	M	Planning, Public Works
7.1R	Formulate and adopt Context Sensitive Design criteria in transportation planning and project development.	M	Planning, Public Works
7.1S	Promote and establish attractive gateway/entrance corridors.	M	Community Development, Public Works, Community Organizations
7.1T	Coordinate planning and development with governmental transportation agencies at all levels and environmental land use plans and regulations.	On Going	Community Development

High (H) = Years 1-5
Medium (M) = Years 5-7
Low (L) = Years 7-10
On Going = Strategies with zero to minimal costs associated with implementation. These strategies may be completed at any time throughout the life of the plan.

Transportation
STRATEGIES FOR ACTION

Goal 2: Transportation Options

The City of Buena Vista will provide a variety of transportation options for residents, employers, workers, and visitors. The City of Buena Vista will improve connectivity and mobility to enhance its existing grid network of interconnected streets, sidewalks and trails.

To achieve this goal, the following critical success factors must be accomplished:

- Integrate transportation and land use planning.
- Support diverse transportation opportunities.
- Enhance the grid network of interconnected streets, sidewalks, and trails.
- Connect neighborhoods and destination points such as schools, job centers, retail centers, community facilities, and recreational activities.
- Expand the connectivity of the City's transportation network across all modes for both people and freight.

		Priority	Responsibility
7.2A	Require new developments to design and construct transportation improvements to connect with existing and planned street grids and collector and transit systems.	On Going	Planning, Planning Commission, City Council
7.2B	Encourage that mixed use developments provide adequate internal circulation systems to minimize the length and number of vehicular trips and to optimize traffic flow.	On Going	Planning, Planning Commission
7.2C	Amend existing zoning ordinance to strengthen requirements for pedestrian and vehicular connections between and within proposed developments.	H	Planning, Planning Commission, City Council
7.2D	Develop an existing sidewalks map for the City.	H	Planning, Public Works
7.2E	Develop a program and seek funding to complete missing sidewalk connections throughout the City.	L	Planning, Public Works
7.2F	Develop a master bike and pedestrian plan to identify connections between neighborhoods, commercial developments and local destinations that can be safely implemented by both on-road bicycle lanes and off-road bicycle and pedestrian trails.	L	Planning, Parks & Rec
7.2G	Require pedestrian access and circulation in development areas.	H	Planning, Planning Commission, City Council

		Priority	Responsibility
7.2H	Encourage the use of bicycles in the design of new roads and developments.	On Going	Community Development, Public Works
7.2I	Develop individual bicycle and pedestrian trails within the City that have been identified as priorities for tourism and recreation.	L	Parks & Rec, Community Development, Community Groups
7.2J	Support the implementation of the Brushy Blue Greenways Plan.	On Going	Parks & Rec, Community Development, City Council, Community Groups
7.2K	Restore a pedestrian bridge across the Maury River to connect Glen Maury Park and the downtown area.	M	Economic Development, Planning, Parks & Rec, Public Works, VDOT
7.2L	Improve pedestrian facilities such as sidewalks and crosswalks in the downtown area.	M	Community Development, Public Works
7.M	Implement the downtown corridor recommendations of the Blue Ridge Parkway Gateway Study for the City of Buena Vista.	M	Community Development, Public Works
7.2N	Invest in transit improvements that meet the needs of transit-dependent populations such as the elderly, low-income, and youth.	L	Community Development
7.2O	Emphasize commercial rail as an increasingly important means of goods movement.	On Going	Community Development

High (H) = Years 1-5
Medium (M) = Years 5-7
Low (L) = Years 7-10
On Going = Strategies with zero to minimal costs associated with implementation. These strategies may be completed at any time throughout the life of the plan.

Transportation
STRATEGIES FOR ACTION

Goal 3: Regional Transportation

The City of Buena Vista will be a community that works with local, state and federal officials to provide enhanced mobility through transportation projects with regional benefits.

To achieve this goal, the following critical success factors must be accomplished:

- Protect existing public investments in the transportation network.
- Develop a comprehensive funding strategy for maintenance and new capacity improvements.
- Design a transportation network that accesses all modes of transportation easily and safely.
- Provide alternatives to automobile travel.
- Design a flexible and responsive transportation system.
- Support and improve the economic vitality of the region by providing access to economic opportunities, such as industrial access or recreational travel and tourism.

		Priority	Responsibility
7.3A	Annually pursue state and federal funding programs to achieve the City's capital improvements program goals.	H	Community Development, Public Works
7.3B	Encourage regional transportation planning, investment, and projects that support new and/or expanding economic development opportunities.	On Going	Economic Development, Public Works
7.3C	Encourage projects within all modes of transportation that improve the regional competitiveness.	On Going	Community Development
7.3D	Coordinate transportation planning between the City and neighboring jurisdictions to improve mobility.	On Going	Community Development, City Council
7.3E	Share planning and costs with other jurisdictions when City road improvements have mutual benefits.	On Going	City Council
7.3F	Solicit private financial participation in projects.	On Going	Community Development, City Council
7.3G	Work with neighboring localities to extend bus service where practical.	M	Community Development
7.3H	Encourage initiatives for public transportation and transit alternatives initiated by private sector or community groups, including public/private partnerships.	On Going	Community Development

		Priority	Responsibility
7.3I	Engage localities in the region to garner unified support for regionally significant roadway capacity projects.	On Going	City Council

High (H) = Years 1-5
Medium (M) = Years 5-7
Low (L) = Years 7-10
On Going = Strategies with zero to minimal costs associated with implementation. These strategies may be completed at any time throughout the life of the plan.

CHAPTER 8
Community Facilities

A community provides a variety of services to its residents, visitors, and businesses. These services include fire and police protection, justice, park and recreational programs, schools, colleges, libraries, emergency services and health care. These services are carried out in the Municipal Building, courthouse, community center, schools and other public buildings. The City also provides services such as roads, water, and sewer. The latter three are discussed in Chapter 6, Infrastructure & Utilities.

Community services require significant expenditures of public funds and have a tremendous impact on residents' quality of life. Services such as recreation, public safety (including police, fire and emergency services), street maintenance, snow plowing, libraries, waste collection and other general government services represent a significant portion of the budget. Schools are by far the largest category of spending.

This chapter inventories Buena Vista's community facilities and identifies any future needs and/or deficiencies. Map 8.1 indicates the location of community facilities within the City's boundaries.

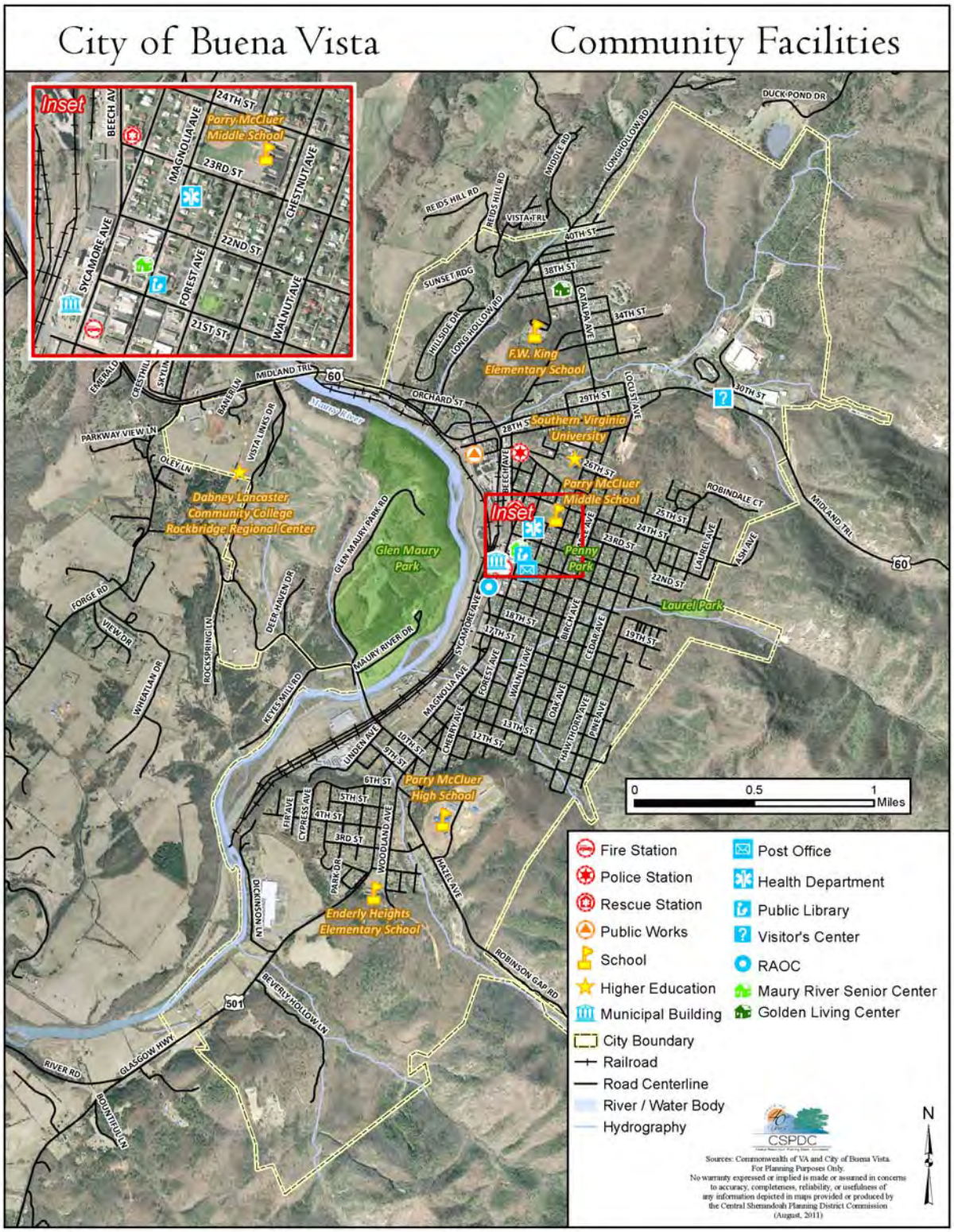
RELATIONSHIP TO OTHER PLAN ELEMENTS

Population Characteristics. Demographic trends are a critical component in service planning. Health care and housing are a growing concern as the median age of residents creeps upward. Nevertheless, as the population of Buena Vista ages, the City is also concerned with keeping and attracting youth and families. Community services respond to the changing needs of people. Recreational and educational services will vary greatly depending on the makeup of the population.

Economy. By providing links between public services and amenities, people are better connected and a sense of community is built. This benefits residents, but these connections also meet business needs and interests.

Transportation. The kind and location of services provided by the City can have a dramatic effect on transportation needs and goals. The location and type of services provided by the community influences the mobility and accessibility of people, particularly elderly and people with disabilities. Transportation access to basic services is a growing concern as communities spread out in less dense patterns and have increasing numbers of people with disabilities.

Map 8.1


City of Buena Vista
Community Facilities
Inset
Parry McCluer Middle School
Southern Virginia University
F.W. King Elementary School
Dabney Lancaster Community College
Rockbridge Regional Center
Glen Maury Park
Penny Park
Laurel Park
Parry McCluer High School
Enderly Heights Elementary School
Maury River
MIDLAND TRL
ORCHARD ST
MAURY RIVER DR
GLEN MAURY PARK RD
DUCK POND DR
ROBINSON GAP RD
BEVERLY HOLLOW LN
GLASGOW HWY
RIVER RD
0
0.5
1
Miles
Fire Station
Police Station
Rescue Station
Public Works
School
Higher Education
Municipal Building
City Boundary
Railroad
Road Centerline
River / Water Body
Hydrography
Post Office
Health Department
Public Library
Visitor's Center
RAOC
Maury River Senior Center
Golden Living Center
CSPDC
Sources: Commonwealth of VA and City of Buena Vista.
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(August, 2011)
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Land Use. The relationship between land use decisions and public services is a close one. The location of facilities, the efficiency with which emergency services can be provided, and the ease of collecting waste are directly linked to land use patterns, policies and regulation. Land use plays a key role in determining where a facility is located. A community facility, in turn, can affect the character of a neighborhood, downtown, or area. The same is true for how a service is provided.

MUNICIPAL SERVICES

Municipal Building

The City of Buena Vista Municipal Building is located at 2039 Sycamore Avenue. The building houses most of the administrative offices for City operations as well as the General District, Juvenile, Domestic Relations, and Circuit Courts.

Public Works

The Buena Vista Public Works Department keeps everything in the City moving. Among its numerous tasks, the Public Works Department is responsible for the City's water system, cemetery, traffic signals, refuse collection, and leaf collection. The Public Works Department is located at Factory and Alleghany Streets.

Wastewater Treatment Plant

The purpose of a wastewater treatment facility is to treat and discharge wastewater locally without contaminating local waters. The City of Buena Vista's wastewater treatment plant is a public wastewater treatment facility which serves the residents of the City. The wastewater treatment plant was last upgraded in 1985 and is a 2.25 million gallons/day facility. Refer to Chapter 6, Infrastructure & Utilities, for additional information.

PUBLIC SAFTEY

Fire Protection

The fire department, Company 10, protects the City of Buena Vista and a portion of Rockbridge County. Fire protection in the City of Buena Vista is provided by over 70 volunteer firefighters. In 2004, the fire department moved into its facility at 2010 Sycamore Avenue. The station also has a community room that is used for meetings, rentals, and other community activities.

The fire department responds to approximately 400 fire calls each year and also provides assistance to the local Rescue Squad with drivers and Emergency Medical Technicians (EMTs). The fire department has seven vehicles. The company received its Advanced Life Support (ALS) transport license in September 2010. Four units run as first response to all Emergency Medical Services (EMS) calls in its first due area. This adds about 1,100 calls per year. The fire department also serves the community by distributing smoke alarms and providing educational programs.

Rescue Squad

Emergency services are provided by the Buena Vista Rescue Squad, home of Rescue 2. Rescue 2 is manned by approximately 30 volunteers; all services are provided by volunteers. They respond to over 1,200 calls for service each year. The rescue squad has seven units which provide Basic Life Support (BLS) and ALS services to the City of Buena Vista and Rockbridge County. The rescue squad operates eight vehicles. In addition to emergency services, volunteers of the rescue squad staff community and school events, provide CPR training, and present educational programs to school students.

Law Enforcement

The Buena Vista Police Department responds to service calls, enforces traffic and criminal laws, investigates crimes, and provides a variety of safety programs. The police department has a staff of 16 including 14 officers, one animal control officer, and one administrative assistant. The police department is headquartered at 306 Park Avenue. Compared to other cities in Virginia, Buena Vista has a low incidence of crime. The incident rate per 100,000 people was 3341.98 in 2009.

The Cities of Buena Vista and Lexington and Rockbridge County operate the Rockbridge Regional Jail which serves all three localities. The jail is located in Rockbridge County just north of Lexington.

The duties of the Buena Vista Sherriff Department are serving civil processes, providing courtroom security, and transporting inmates. Currently, the Sheriff's office has 2 full-time and 5 part-time employees. They are located at the Buena Vista Municipal Building on Sycamore Street. The Sheriff is a State Constitutional Officer that is elected every four years. The City is also served by three magistrates.

Although the police department and the sheriff department have separate and specific duties, they work together to provide law enforcement within the City of Buena Vista. Furthermore, both are active in the City's schools and community outreach.

MEDICAL, HEALTH AND SOCIAL SERVICES

The largest medial facility in the Buena Vista area is Carilion Stonewall Jackson Hospital (CSJH). The hospital is located six miles away in Lexington. Carilion Stonewall Jackson Hospital is an independent, non-profit organization established to meet the primary health care needs of the public. CSJH is a 25-bed critical access facility. It has over 280 employees and admits over 1,500 acute patients each year. The hospital provides a full range of inpatient and outpatient services, specializing in imaging surgical and therapy services.

The Golden LivingCenter – Shenandoah Valley is a private nursing facility located at 3737 Catalpa Avenue in the City of Buena Vista. The 93-bed facility provides long-term skilled nursing as well as short-term rehabilitative care.

The Buena Vista Health Department located within the City at 2270 Magnolia Avenue offers a number of services including medical and dental services, nutrition services and health education. Services may be free or charged on a flat fee or sliding fee basis.

The mission of Rockbridge Area Community Services (RACS) is to help prevent and treat mental illness, developmental disabilities, and substance abuse and to promote integration of those experiencing these conditions into the community. RACS provides programs to those in the Cities of Buena Vista and Lexington and the Counties of Rockbridge and Bath. RACS has two facilities located in Buena Vista. The Eagle's Nest Clubhouse provides a day activity program for adults with mental illness. Magnolia Center provides a day activity program for adults with developmental disabilities.

The Rockbridge Area Occupational Center provides center-based employment to working age people with disabilities. There are presently 45 employees that work and receive training at the Center. The Center is located on Sycamore Avenue.

EDUCATION AND TRAINING

Schools

The City of Buena Vista has four public schools – two elementary, one middle school, and a high school. Student enrollment for each school is shown in Table 8.1. The number of students at the middle school and high school has fluctuated little over the past five years. Enrollment at the elementary schools is on the decline, particularly at F.W. King Elementary School.

Table 8.1
Student Membership by School
2006-2010

School	Number of Students				
	2006	2007	2008	2009	2010
Enderly Heights Elementary	280	264	267	263	255
F.W. King Elementary	212	200	197	181	180
Parry McCluer Middle School	362	349	346	358	365
Parry McCluer High School	335	341	341	340	335

Note: Student membership is as of September 30 of each year.
Source: Virginia Department of Education

Although enrollment levels do not reflect a need for new schools, the middle school is in need of renovation. The high school is a newer facility that was completed in 2001. Enderly Heights and Kling Elementary Schools were constructed in 1963 and 1976, respectively. The middle school is the oldest of the schools. It is a 1950s-era building with some sections dating to 1923.

The City has great opportunity to collaborate with institutions of higher education. Southern Virginia University (SVU) and Dabney S. Lancaster Community College (DSLCC) Rockbridge Regional Center are located in the City of Buena Vista. The DSLCC Rockbridge Regional Center opened in 2008. Approximately 500 students take classes at this facility. The number of students attending SVU is shown in Table 8.2. SVU plans to increase its enrollment to 1,000 students within the next five to ten years.

Table 8.2
SVU Fall Headcount Enrollment
2006-2011

School	2006	2007	2008	2009	2010	2011
Southern Virginia University	749	698	682	643	752	800

Source: State Council of Higher Education for Virginia

SVU, located in the heart of Buena Vista, is critical to the City's economy and both institutions are important to workforce development and business support. SVU's facilities also provide access to the university's library; music, theater and other arts programs as well as athletic events. The University also anticipates having a performing arts building. These facilities serve the community and improve quality of life in Buena Vista.

Library

The Buena Vista Public Library, named the A.B. Modine Memorial Library, is located in the "Old Courthouse" building at 2110 Magnolia Avenue. The Buena Vista facility is a branch of the Rockbridge Regional Library. In addition to Buena Vista, the Rockbridge Regional Library serves Bath and Rockbridge Counties and the City of Lexington. The central office is located in the City of Lexington with additional branches in Warm Springs, Glasgow, and Goshen. The Rockbridge Regional Library has over 180,000 books and audio and video materials with an annual circulation exceeding 275,000 items.

Besides the public library system, residents of Buena Vista are able to use the private library of Southern Virginia University (SVU). The libraries on the campuses of Washington and Lee University and Virginia Military Institute, both located in Lexington, are also open to the public.

The building occupied by the Buena Vista Public Library is listed on the National Register of Historic Places and is a symbol of Buena Vista's growth as a City. The building is also located at a key intersection in the City's downtown, thus it brings important pedestrian activity to the downtown area. Because of these benefits, improvements to the library's physical space and programs are essential to greater quality of life and economic development goals.

Employment Assistance

The Career Café is located at 2141 Sycamore Avenue. The employment center is operated through a contract with the Workforce Investment Board (WIB). Staff of the Career Café provides services and tools to assist job seekers in clarifying their goals, exploring career options, and obtaining employment. More specifically this includes creating resumes and cover letters, learning interviewing and networking skills, accessing labor market information, locating training opportunities, learning and advancing computer skills, preparing for the GED test, and locating child care or transportation services. Services at the Career Café are free to eligible applicants that qualify under the Workforce Investment Act (WIA) Adult or Dislocated Worker Programs contract because of their income and/or employment status.

ADDITIONAL COMMUNITY FACILITIES

Senior Center

The Maury River Senior Center provides social, recreational, educational, health and advocacy activities for Rockbridge area residents age 60 or older. The center hosts speakers addressing a variety of subjects and provides free counseling on Medicare. In addition to activities, lunch is provided daily. Transportation services to and from the center are provided upon request. Services are not income based. In addition to its services to older residents, the facility is used by local civic organizations. The senior center moved to its current location on Magnolia Avenue in 2005.

Visitors Center

The Buena Vista Visitor Center is located along 29th Street (Route 60) in the City. It is approximately four miles from the Blue Ridge Parkway. Maps and brochures of the area, with a particular focus on outdoor recreational activities, are available. Furthermore, the visitor center has restrooms, picnic tables, and a gift shop. The visitor center is operated by the Lexington and the Rockbridge Area Tourism Development.

RECREATION

The City of Buena Vista offers a number of recreational activities throughout the year. On its east, the City borders the Jefferson and George Washington National Forest. The Maury River bisects the City. One side of the river is the central business district; the other side is home to Glen Maury Park, the City's largest park. Additionally, Buena Vista has Laurel Park Youth Sports Complex and Penny Park as well as a number of playgrounds (see Map 8.2).

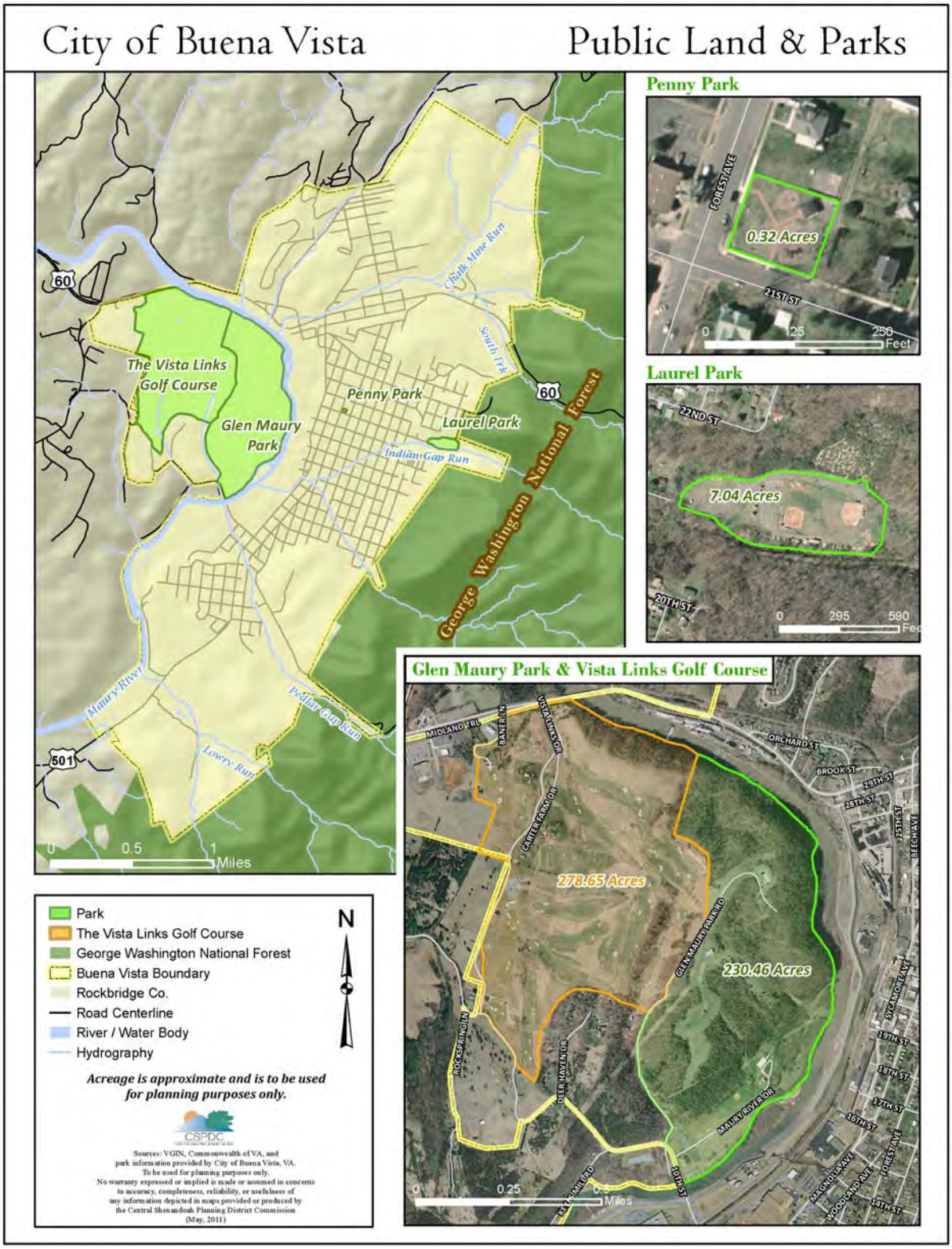
Glen Maury Park

Glen Maury Park is a 315-acre camping/recreational park owned and operated by the City of Buena Vista. By its size, Glen Maury Park would be considered a regional park. A regional park typically serves an area of a 25-mile radius or approximately 45 minutes driving time. The terrain of the park is varied, and it has over a mile of frontage along the Maury River. The Paxton House, a historical landmark, is located in the park. Special events are held at the park throughout the year such as the Maury River Fiddlers' Convention, Nothin' Fancy Bluegrass Festival, Beach Music Festival and Car Show, Labor Day Parade and Friday's in the Park summer concert series.

The facilities at Glen Maury Park include the following:

- 52 site campground that includes water and electricity hookups, dumping station, tables, toilets, showers, and ground camping for up to 250 units
- Boat landing
- River fishing
- Outdoor roller skating rink
- Walking trails
- Ball fields
- Olympic size swimming pool and wading pool
- 9 covered shelters
- 180 picnic tables
- Double Decker Pavilion, seats 1,500 and can accommodate 2,500 people
- Outdoor roller skating rink
- Tennis courts
- 5 playgrounds

Map 8.2


City of Buena Vista
Public Land & Parks
Penny Park
0.32 Acres
FOREST AVE
21ST ST
0
25
250
Feet
Laurel Park
22ND ST
7.04 Acres
20TH ST
0
295
590
Glen Maury Park & Vista Links Golf Course
278.65 Acres
230.46 Acres
MIDLAND TRL
BANFER LN
VISTA LINKS DR
CARTER PARK DR
ORCHARD ST
BROOK ST
29TH ST
28TH ST
25TH ST
BEECH AVE
GLEN MAURY PARK RD
SYCAMORE AVE
19TH ST
18TH ST
17TH ST
16TH ST
FOREST AVE
MAGNOLIA AVE
WOODLAND AVE
14TH ST
ROCKSPRING LN
DEER HAVEN DR
MAURY RIVER DR
10TH ST
0
0.25
Miles
The Vista Links Golf Course
Glen Maury Park
Penny Park
Laurel Park
George Washington National Forest
Chalk Mine Run
South Frk
Indian Gap Run
Maury River
Peddler Gap Run
Lowry Run
60
501
0
0.5
1
Miles
Park
The Vista Links Golf Course
George Washington National Forest
Buena Vista Boundary
Rockbridge Co.
Road Centerline
River / Water Body
Hydrography
N
Acreage is approximate and is to be used for planning purposes only.
CSPDC
Sources: VGIN, Commonwealth of VA, and park information provided by City of Buena Vista, VA.
To be used for planning purposes only.
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(May, 2011)

The Vista Links

The Vista Links is an 18-hole, Par-72 championship golf course located at Glen Maury Park. The public course opened in August 2004 as part of a 600 acre master planned park system. The course, designed by Rick Jacobson, has 5-sets of tees, a deluxe driving range, and a pro-shop. The facility offers clinics, tournaments, outings, and youth programs. The First Tee of the Maury River Basin, a youth initiative of the World Golf Federation, is offered at The Vista Links. The golf course is currently managed by the Buena Vista City Council, City Manager, and a Citizens Golf Advisory Committee.

Neighborhood Parks

Even though the City is home to a regional-sized park, Glen Maury Park should complement other parks in the City rather than substituting for neighborhood parks. The purpose of neighborhood parks is to provide limited types of recreation for the entire family within easy walking distance. In Buena Vista, these parks include the following:

Laurel Park Youth Sports Complex. The sports complex includes two lighted ball fields, concession stands and bleachers.

Penny Park. This pocket park is located at the corner of 21st Street and Forest Avenue. It provides a neighborhood playground.

12th, 16th and 34th Street Playgrounds. These are small playgrounds located throughout Buena Vista.

Camden Field. Camden Field was the former athletic field and track for the high school. Today, the facility is used by athletic programs and for other special events under a lease agreement with Modine.

Parry McCluer High School. Besides use by the high school athletic program, the field and track is available for use by residents for exercise and recreation. Additionally, Southern Virginia University plays its home football games at Parry McCluer High School's Robert E. "Bobby" Williams Field.

Greenways

Greenways are open space corridors that can be managed for conservation, recreation, and/or alternative transportation. Greenways are created primarily through local or regional initiatives and reflect community needs. The Brushy Blue Greenway Master Plan was completed in 2004. The plan provides a framework for development of a greenway within the Cities of Buena Vista and Lexington and Rockbridge County.

The Brushy Blue Greenway will interconnect existing trails and upgrade these trails to a multi-use greenway trail as well as creating new greenway connections. When completed the Brushy Blue Greenway corridor will be approximately 17 miles in length. In Buena Vista, the Levee Walk along the Maury River is an existing link in the Brushy Blue Greenway.

CURRENT INITIATIVES

Upper James Outdoor Recreation Plan. The Upper James Outdoor Recreation Steering Committee, comprised of about a dozen partners including the City of Buena Vista, is directing a planning initiative to strategically plan outdoor recreation throughout the Upper James Region. The plan will prioritize projects, promote natural resource recreation, and enhance outdoor recreation opportunities.

Park Commission. At the end of 2010, the City of Buena Vista created a Park Commission to address the operation and vision of Glen Maury Park. During 2011, the Park Commission developed a business plan for the park.

SUMMARY OF TRENDS

- The availability and accessibility of community facilities has a tremendous impact of quality of life.
- As both the City's older adult population and college-aged population grow, recreational, educational and medical services will change.
- Volunteers and community involvement are critical to the provision of many community services.
- The City provides a variety of essential community services that a carried out within a number of public facilities. The Capital Improvement Plan should include necessary improvements and maintenance of these facilities as well as equipment to accomplish required tasks.

RELATED STUDIES AND REPORTS

Crime in Virginia, 2009, Virginia Uniform Crime Reporting Section, Department of State Police, 2010.

Brushy Blue Greenway Master Plan. Land Planning & Design Associates, Inc., July 30, 2004.

2007 Virginia Outdoors Plan. Virginia Department of Conservation & Recreation, 2007.

Community Facilities
STRATEGIES FOR ACTION

Goal 1: Community Facilities

The City of Buena Vista will meet the facility needs and maintain a high quality service to the community.

To achieve this goal, the following critical success factors must be accomplished:

- Invest in its public facilities and services that bring people and functions of the community together to make the community a more desirable place to live.
- Provide a comprehensive system of interconnected pedestrian sidewalks, trails, and bike paths that link people and neighborhoods to important community facilities.
- Respond to changing demographics and community needs.

		Priority	Responsibility
8A	Plan the location of public facilities so that they do not stress the capacity of roads or other infrastructure.	On Going	Planning, Public Works
8B	Locate public facilities within walking distance of a set percentage of their users.	On Going	Planning
8C	Adopt guidelines for the sustainable design of community facilities including schools.	M	Planning, Community Development
8D	Consider the public services needed to support residential, commercial and industrial developments before they are approved.	On Going	Planning Commission, City Council
8E	Recognize and provide for multiple purposes and functions of all City facilities.	On Going	City Manager's Office
8F	Improve the energy efficiency of public facilities.	H	Public Works
8G	Develop a comprehensive recreation, open space, and greenways plan.	M	Parks & Rec
8H	Perform a detailed analysis of recreation programming to ensure opportunities for all ages and abilities.	H	Parks & Rec
8I	Support the implementation of the Brushy Blue Greenways Plan.	On Going	Parks & Rec, Community Development, City Council, Community Groups
8J	Refine the *Hill Top-Glen Maury Park Master Plan.*	H	Parks & Rec
8K	Seek funding for recreation and greenway facilities.	On Going	Parks & Rec, Community Development

		Priority	Responsibility
8L	Upgrade Parry McCluer Middle School.	M	School District, Public Works
8M	Address ADA accessibility at facilities.	H	Public Works
8N	Develop a maintenance and improvement schedule for the library.	H	Public Works
8O	Support increased programming at the library.	On Going	City Council
8P	Use FEMA lots for recreation and greeways.	M	Parks & Rec

High (H) = Years 1-5
Medium (M) = Years 5-7
Low (L) = Years 7-10
On Going = Strategies with zero to minimal costs associated with implementation. These strategies may be completed at any time throughout the life of the plan.

CHAPTER 9
Land Use

Land use generally refers to the manner in which parcels of land, or the structures on them, are used. Land use planning focuses on making good choices about how growth occurs in the community over a period of time. Land use is the umbrella under which most comprehensive plan issues fall, whether the issue is housing, transportation, natural resources, economic development, or recreation and open space.

Managing land use is a means to achieve the visions and goals of the community. This includes managing the type, quantity, and quality of development and/or redevelopment that occurs. The type is generally expressed in broad land use categories like residential or commercial. The quantity of development considers how much development is appropriate for the community. This is primarily expressed in the future land use map along with the location of development. Quality seeks to make a public statement of the standard of development that is expected in the community including open space, landscaping, and building requirements.

Over the years, it has become commonplace for many places to isolate land uses from each other, separating residential from other different types of land uses. It has also become common to plan for the automobile by separating land uses with connections only available by car. This is less true in the City of Buena Vista where the predominant block pattern provides connectivity and uses are mixed where appropriate. Separations are more likely the result of physical barriers such as the river or steep slopes.

The land use plan's recommendations are sometimes referred to as "the colors on the map" because the various categories of uses appear as different colors on the land use map. The land use plan establishes the overall character, extent and location of various land uses and serves as a guide to communicate the policy of City Council to citizens, the business community, developers, and other involved in the development of the City of Buena Vista. Additionally, the land use plan serves as a guide to the City Council in its decisions concerning future development. This would include reviewing proposed zoning changes, comprehensive plan amendments, and sometimes, conditional use permits. The future land use map is not the same as zoning.

RELATIONSHIP TO OTHER PLAN ELEMENTS

Nearly every issue addressed in a comprehensive plan includes land-related goals, policies, and strategies. The land use element of the comprehensive plan brings them together.

Natural Resources. The quality of the environment is directly affected by land uses and patterns.

Housing. Housing should be connected to jobs, schools, parks and services and should meet the needs of people and families.

Economy. Some parts of the City's economy may need to be clustered and separated from residential areas. Other parts may be neighborhood or central attractions. The land use element can help accommodate conflicting land uses and reduce them.

Transportation. Transportation, transit, and pedestrian and bicycle facilities connect people and businesses to the community. Transportation resources need to be located in a way that makes key connections between land uses while preserving and protecting the City's amenities.

Community Facilities. The location of a community's facilities should be determined by the services to be provided, the location of clients, and accessibility to those locations.

LAND USE CLASSIFICATIONS

As part of the Future Land Use Plan, definitions are provided to express the future expectations for development in the City. The Future Land Use Map (Map 9.1) is a graphic illustration of the community's vision for the future. It defines, in a general sense, the desired development pattern for the City. This is not a zoning map. Rather it provides an overall plan for land use and sets a benchmark for future zoning changes.

Residential

Residential Low Density (3.48 du/ac): Residences are composed of single-family dwellings on lot sizes of approximately 0.3 acres.

Residential Medium Density (4.65-11.15 du/ac): Residential pattern that characterizes most neighborhoods in Buena Vista. Residences are composed of single-family and two- to four dwelling homes.

High Density (4.65-12.9 du/ac): Provides a range of development densities. Residences are composed of single-family, two-family, and multifamily dwellings.

Commercial/Industrial

Mixed Use. A complementary mix of two or more land uses provided within a pedestrian oriented environment. Uses are integrated in both a horizontal (side-by-side) and/or vertical (one use located above another) basis. Mixed use centers can include a broad variety of housing types, civic and educational facilities, offices, and commercial establishments. Mixed-use development can occur at a variety of scales from a large master planned community to a retail shop in a building with office above:

Downtown Center. The traditional downtown with a mix of uses that are pedestrian oriented and offer transit opportunities.

Corridor Commercial. Targeted areas along arterials or major collectors that are intended to provide for a mix of small- to medium-sized retail, office, institutional and residential uses. Convenience goods and services are provided such as ice cream and sandwiches, banking, laundry, video rentals as well as general commercial goods and services such as motels and printing services that serve the larger community and travelers.

Mixed Use Planned Development. Applicable areas are located primarily in the Hill Top District, the undeveloped property at the southern portion of the City, and the undeveloped property at the northern portion of the City. The areas are intended for a mixture of land uses, housing types, and densities within a comprehensive site design concept. The area could possibly include single-family residential with attached commercial and multifamily with neighborhood-oriented retail commercial or intermixed office commercial.

Light Industrial. Areas where the principal use of land is for light manufacturing and assembly facilities, processing, storage, warehousing, wholesaling and distribution. Operations are conducted so that noise, odor, dust and glare are completely confined within an enclosed building and negative impacts to the environment or surrounding area are not created.

Heavy Industrial. Intense and lower-intensity sites that provide a full range of medium to heavy industrial uses and activities such as manufacturing, warehousing, industrial processing, resource and energy production and general service and distribution that can generate substantial impacts on the surrounding area.

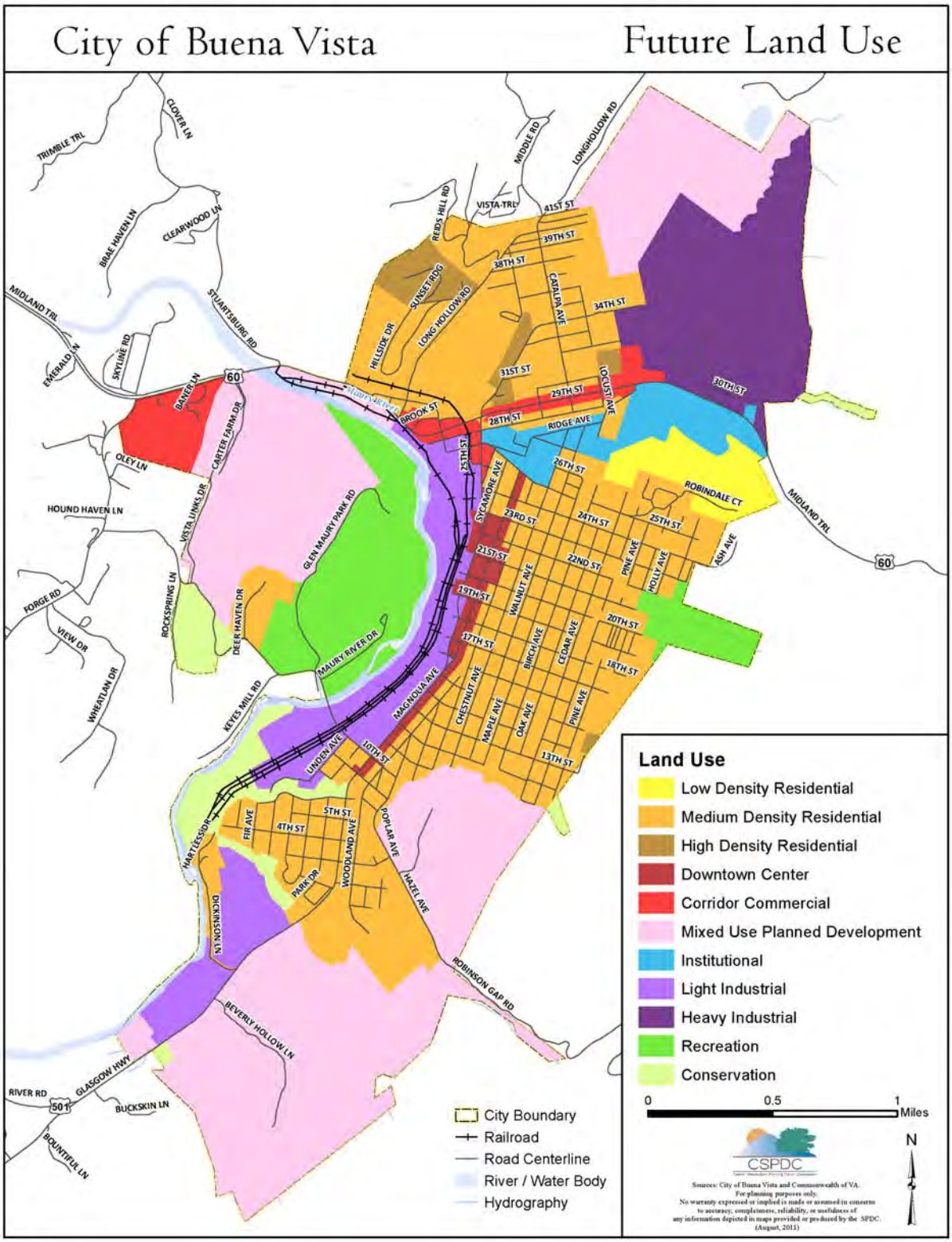
Public/Semi Public

Institutional. Civic uses include public buildings and institutions owned and operated by governmental or other public agencies, not including parks and open space. This classification includes public schools, public cemeteries, government offices and other governmental activities. Private institutions include land and facilities occupied by private uses and organizations such as profit or non-profit facilities providing continuous patient care, religions centers/activities, private schools, private cemeteries, private educational facilities and other similar uses.

Recreation. Lands primarily used for public active recreation activities improved with playfields/grounds or exercise equipment, golf courses, or other similar areas.

Conservation. Lands that support such activities as unorganized public recreational activities, trails, picnic areas, public fishing or preservation of unaltered land in its natural state for environmental or aesthetic purposes.

Map 9.1


City of Buena Vista
Future Land Use
Land Use
Low Density Residential
Medium Density Residential
High Density Residential
Downtown Center
Corridor Commercial
Mixed Use Planned Development
Institutional
Light Industrial
Heavy Industrial
Recreation
Conservation
City Boundary
Railroad
Road Centerline
River / Water Body
Hydrography
0
0.5
1
Miles
N
CSPDC
Sources: City of Buena Vista and Commonwealth of VA.
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(August, 2011)
TRIMBLE TRL
CLOVER LN
BRAE HAVEN LN
CLEARWOOD LN
MIDLAND TRL
EMERALD LN
SKYLINE RD
STUARTSBURG RD
BAKER LN
60
OLEY LN
CARTER FARM DR
HOUND HAVEN LN
VISTA LINKS DR
FORGE RD
VIEW DR
WHEATLAN DR
ROCKSPRING LN
DEER HAVEN DR
GLEN MAURY PARK RD
MAURY RIVER DR
KEYES MILL RD
HARTLESSION
DICKINSON LN
BEVERLY HOLLOW LN
RIVER RD
501
GLASGOW HWY
BUCKSKIN LN
BOUNTIFUL LN
MIDDLE RD
LONGHOLLOW RD
REEDS HILL RD
VISTA TRL
41ST ST
39TH ST
38TH ST
SUNSET RDG
LONG HOLLOW RD
HILLSIDE DR
CATALPA AVE
34TH ST
31ST ST
29TH ST
28TH ST
BROOK ST
RIDGE AVE
LOCUST AVE
30TH ST
25TH ST
26TH ST
SYCAMORE AVE
ROBINDALE CT
MIDLAND TRL
23RD ST
24TH ST
25TH ST
ASH AVE
21ST ST
22ND ST
PINE AVE
HOLLY AVE
19TH ST
WALNUT AVE
20TH ST
17TH ST
BIRCH AVE
CEDAR AVE
18TH ST
MAGNOLIA AVE
CHESTNUT AVE
MAPLE AVE
OAK AVE
PINE AVE
13TH ST
LINDEN AVE
10TH ST
5TH ST
4TH ST
FIR AVE
POPLAR AVE
WOODLAND AVE
PARK DR
HAZEL AVE
ROBINSON GAP RD

LAND USE POLICIES

This section recommends general guidelines for development and redevelopment of the City by land use classification.

Residential. Residential uses should follow the policies below:

- Infill development that complements existing neighborhoods should be encouraged.
- Redevelopment for conversion of residential uses to other uses should only be considered only for large tracts, such as entire blocks, rather than permitted on a piecemeal basis.
- When conversion of single-family houses to multifamily is permitted, appropriate off-street parking should be required. Converting front yard areas to parking lots is not in the best interests of the area.
- The traditional grid street pattern should be retained, along with the alley system that serves as secondary access to many properties.
- Require sidewalks for streets in new developments.
- Install trees along major residential streets.
- Prevent the encroachment of commercial uses into the predominantly residential areas.

Mixed Use

Downtown Center. New development or redevelopment should enhance the positive qualities of downtown. Redevelopment of the downtown should follow the policies below:

- A healthy land-use mix should be retained, including a variety of retail, office, financial, professional, and institutional uses.
- Retail and restaurant uses should be encouraged in the downtown but not to the exclusion of existing office, professional, financial, and institutional uses.
- Residential uses add to the vitality and customer base of downtown and should be encouraged where they do not compete for retail space.
- As uses change or expand, the city should ensure that smooth traffic flow will be maintained and that convenient parking is available.
- The downtown should be pedestrian-oriented.
- Suburban-type uses such as big-box retail stores should not be permitted.
- Drive-through uses should be permitted only when accessory to a primary use and only behind a principal structure.
- Prevent establishment of parking lots that will create gaps in the continuity of downtown buildings. Locate off-street parking behind structures rather than in front of or beside them.
- Retain the urban character by locating buildings close to the street.

Corridor Commercial. Targeted areas along arterials or major collectors that are intended to provide for a mix of small- to medium-sized retail, office, institutional and residential uses.

- Roads should be pedestrian-friendly.
- The impact of signage should be minimized. Signs should not become visual clutter and detract from the area's appearance.
- Shared access between sites for vehicles and pedestrians should be encouraged and driveways should be minimized.
- Sites should be designed to move vehicles, both motorized and non-motorized, and pedestrians efficiently.
- The Corridor Commercial areas serve as the gateway or front door to the City. Therefore, buildings should be unique and well-designed.
- A special gateway streetscape treatment should be installed along Route 60. Consideration should be given to a landscape design, light fixtures, and banners to set the area apart as a high-profile corridor.

Mixed Use Planned Development.

- Provide for a mixture of land uses, housing types, commercial uses, and densities within a comprehensive site design concept.
- Allow and encourage more unique, flexible, creative, and imaginative arrangements and mixes of land uses in site planning and development than are permitted through conventional land use requirements.
- Encourage a broader mix of residential housing types, including detached and attached dwellings, than would not normally be constructed in conventional subdivisions.
- Provide for the more efficient use of land through clustering and other flexible, innovative development arrangements that will result in smaller networks of utilities and streets and thereby lower development and housing costs.
- Provide and maintain a network system of sidewalks, pathways, trails, and crosswalks to strengthen the pedestrian oriented environment and to link together neighborhoods, lots, and uses of the development.
- Preserve the natural amenities of the land such as streams, stream banks, woods, steep slopes, and scenic areas through the maintenance of conservation areas and open spaces within developments.
- The development should be designed to fit the existing contours and landform of the site and to minimize the amount of earthwork. Existing vegetation should be retained to the maximum extent possible.
- The design of structures is reasonably compatible with structures and uses in the area of the proposed project, including but not limited to exterior materials, height and building style.

Industrial. Industrial uses such as manufacturing, assembling, research and development provide tax revenues and jobs for the City of Buena Vista. Industrial land uses should follow the principles below:

- These uses will be continued and expanded upon in a planned manner so as to minimize the impact on the public infrastructure.
- Industrial uses will be located along major highway corridors or in industrial or business parks.
- Wherever possible, these uses will be located away from residential uses.
- When potential conflicts between land uses occur, buffering and landscaping will be provided to minimize the impacts.
- New industrial growth should be located in areas to best preserve the natural environment.

Institutional. Institutional uses need to be integrated into the fabric of the community. Intensity of development will be dependent upon use and location. Institutional uses should follow the principles below:

- Accessibility should be along a major street system.
- They should be conveniently located for the population to be served.
- They should have adequate off-street parking designed in a manner that is suitable to the areas in which they are located.
- They should be located so that they do not stress the capacity of roads or other infrastructure.
- They should be of a scale and design that is suitable to the neighborhood or area in which they are located.
- Accessibility for pedestrians is required.

Recreation. The parks and recreation system and natural environment are an attraction for visitors, which contribute to local tourism and economic development. The parks and recreation system is usually the land guardian for community open space and the responsible party for identification, purchasing, protection and maintenance of the community's natural beauty. The role of parks and recreation in supporting the future land use goals of the City is critical. Recreation uses should follow these principles:

- Parks should be retained.
- They should preserve and enhance the quality and integrity of the natural environment.
- Recreation areas should enhance the enjoyment and quality of residents and visitors.
- Recreational areas should be accessible.
- Public recreation should be highly coordinated among public institutions and private entities to avoid duplication and encourage cooperation.
- Facilities should be well-planned and coordinated to ensure adequate adaptability to future needs and requirements.
- The design of spaces and facilities should encourage an efficient utilization of land and consider the needs, desires, and opinions of the intended users.
- The availability of financial resources should be an ongoing consideration through all phases of planning, acquisition, development, operation, and maintenance of spaces and facilities.
- Existing plans should be routinely considered and integrated into the decision-making of private landowners, civic organizations, the business community, recreational interests and other area agencies to ensure a comprehensive and coordinated system of public areas and preserved natural resources.

Conservation. Open space serves many purposes, such as green space, animal habitats, plant growth zones, production lands, and recreation experiences. Additionally, open space may be a part of the natural beauty of the community that supports quality of life experiences. Open space should be viewed as land that is worthy of protection, preservation or appropriate use and not just unused land. Uses on conservation lands should be guided by the following principles:

- Preserve areas of particular scenic beauty, cultural value, and historic significance.
- Protect and restore ecological functions.
- Protect wildlife diversity and habitat.
- Protect fishing areas, viewsheds, public access and ecotourism potential.
- Mitigate natural hazards, such as flooding, and protection of water supplies.
- Maintain and enhance natural resources such as streams, rivers, and floodplains as open space elements.
- Recognize the Maury River as one of the City's most significant environmental resources and provide for its protection through protective buffers and setbacks.
- Provides areas for outdoor recreation.

Transitional Areas

As the City grows and changes, some lands become better suited for uses other than those originally developed on the site. Over the long term, it is likely that these properties will be redeveloped for other purposes. An example includes commercial uses in areas that were predominantly industrial.

Map 9.2 identifies several older areas of the City that are in need of special attention. These are identified as revitalization areas because of substandard infrastructure, obsolete or inappropriate uses of land, vacant and dilapidated structures, or other similar conditions. The Future Land Use element represents the starting block upon which a revitalization strategy for these areas should be built. The areas identified for revitalization on Map 9.2 are described below.

<u>Green Forest Neighborhood</u>

The Green Forest Neighborhood is located along East Midland Trail (U.S. Route 60) and bordered by Brook Street to the east and Orchard Street to the south. The neighborhood includes approximately 41 homes. The neighborhood location is on the primary western entrance corridor to the City. In many ways, the neighborhood presents the first impression of Buena Vista.

In June 2009, the City requested CDBG Planning Grant assistance from the Virginia Department of Housing and Community Development for rehabilitation activities intended to assist low and moderate income households in the Green Forest Neighborhood. The purpose of the CDBG Planning Grant was to identify housing and other infrastructure needs within the project area. Additionally, residents were to be surveyed to confirm needs and income status. The initial steps of a public meeting, housing assessment, infrastructure assessment, and neighborhood survey were completed as required by the grant. However, the project did not advance to the next step of a rehabilitation plan. A strategy for this area needs to be addressed.

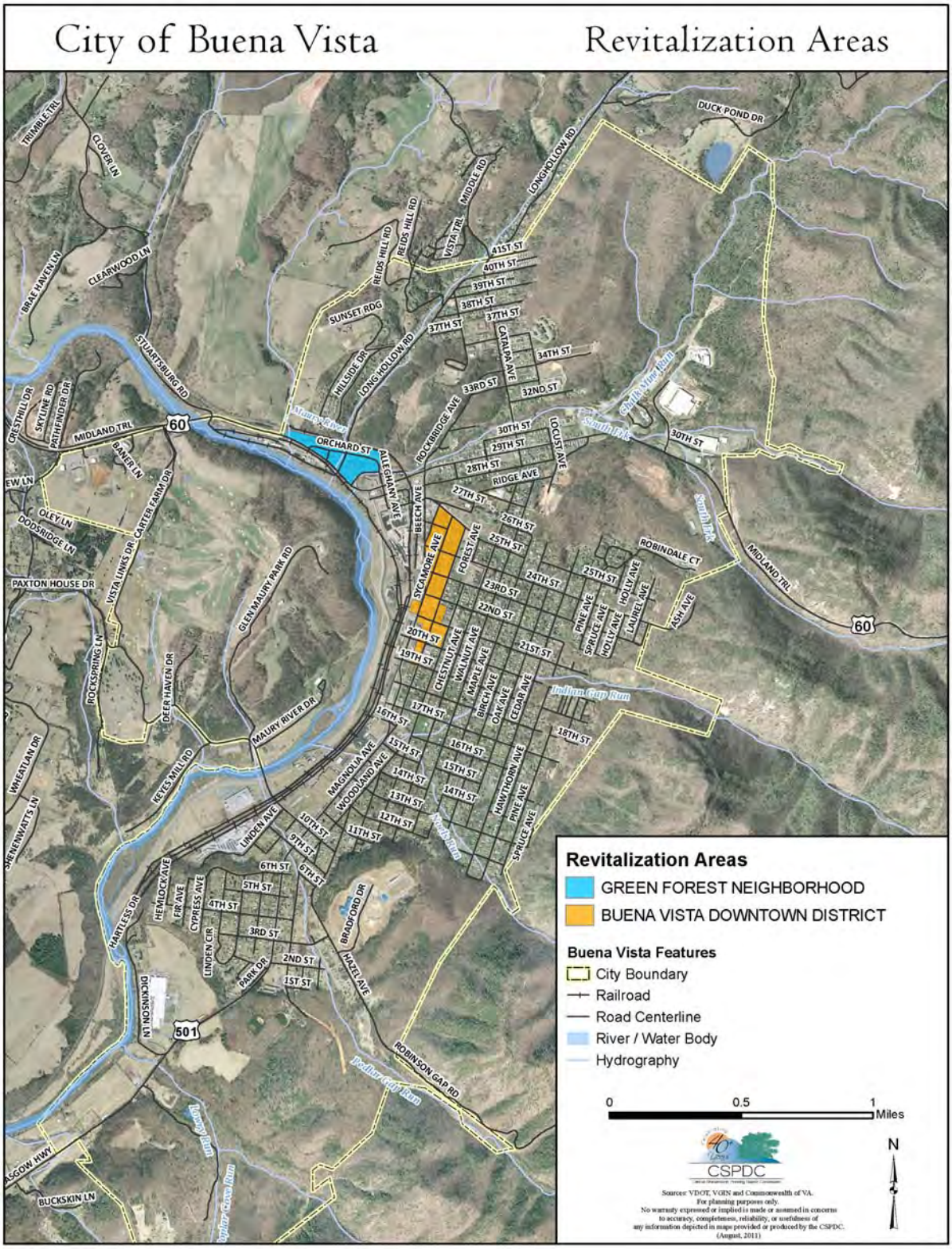
Buena Vista Downtown District

This area shares its boundaries with the Buena Vista Downtown Historic District. The Buena Vista Downtown Historic District is the historic business center of the City of Buena Vista. The district covers approximately 11.5 acres and follows two of the City's main commercial arteries, Sycamore and Magnolia Avenues. As the business center, the area is a mix of retail, office, institutional, and residential uses. A particular challenge of this area is the number of vacant storefronts along Magnolia Street. A revitalization strategy for this area would address building structures, appropriate uses, and streetscape improvements.

Revitalization plans should be completed for each area. The purpose of a revitalization plan or strategy is to identify the specific deficiencies and assets of a designated area, evaluate the existing and potential uses, and identify specific measures for stopping decline, facilitating new development, and enhancing the quality of life for residents of the area. As revitalization plans are formed, they should be guided by the following principles:

- Revitalization should take place on large parcels or a block of adjacent lots, not on a scattering of small individual lots.
- The City should make reasonable accommodation for the expansion of existing uses that may no longer be the ideal uses in their current locations.
- The City should require proper maintenance of buildings and grounds in transitional areas.
- As areas change from one use category to another, the City should ensure that proper buffering is provided to reduce adverse effects on existing uses.

Map 9.2


City of Buena Vista
Revitalization Areas
Revitalization Areas
GREEN FOREST NEIGHBORHOOD
BUENA VISTA DOWNTOWN DISTRICT
Buena Vista Features
City Boundary
Railroad
Road Centerline
River / Water Body
Hydrography
0
0.5
1
Miles
N
CSPDC
Sources: VDOT, VGIN and Commonwealth of VA.
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(August, 2011)
DUCK POND DR
LONG HOLLOW RD
MIDDLE RD
REIDS HILL RD
VISTA TRL
CLEARWOOD LN
BRAE HAVEN LN
TRIMBLE TRL
CLOVER LN
SUNSET RDG
HILLSIDE DR
CATALPA AVE
LOCUST AVE
ROCKBRIDGE AVE
STUARTSBURG RD
MIDLAND TRL
60
ORCHARD ST
ALLEGHANY AVE
BEECH AVE
SYCAMORE AVE
FOREST AVE
RIDGE AVE
ROBINDALE CT
HOLLY AVE
LAUREL AVE
ASH AVE
PINE AVE
SPRUCE AVE
CHESTNUT AVE
WALNUT AVE
MAPLE AVE
BIRCH AVE
OAK AVE
CEDAR AVE
HAWTHORN AVE
MAGNOLIA AVE
WOODLAND AVE
LINDEN AVE
HEMLOCK AVE
FIR AVE
CYPRESS AVE
LINDEN CIR
PARK DR
BRADFORD DR
HAZEL AVE
DICKINSON LN
501
ROBINSON GAP RD
MAURY RIVER DR
GLEN MAURY PARK RD
PAXTON HOUSE DR
VISTA LINKS DR
CARTER FARM DR
OLEY LN
DODSRIDGE LN
BANTER LN
MIDLAND TRL
ROCKSPRING LN
DEER HAVEN DR
KEYES MILL RD
WHEATLAN DR
HARTLESS DR
BUCKSKIN LN
AGGOW HWY
Indian Gap Run
Mowry Run
Lowry Run
Taylor Grove Run
South Fork

Hill Top – Glen Maury Park

In addition to the two transitional areas discussed above, the development of the Hill Top - Glen Maury Park area is significant to the City's future. In May of 2002, planners and designers worked with the residents of the City of Buena Vista to develop a master plan for the 600 acre Hill Top - Glen Maury Park study area, located on the west side of the Maury River (See Map 9.3). The area is generally bound to the northeast, east, and southeast by the Maury River, to the west by Glen Maury Park Road and State Road 608, and to the north by Highway 60. It included the following parcels:

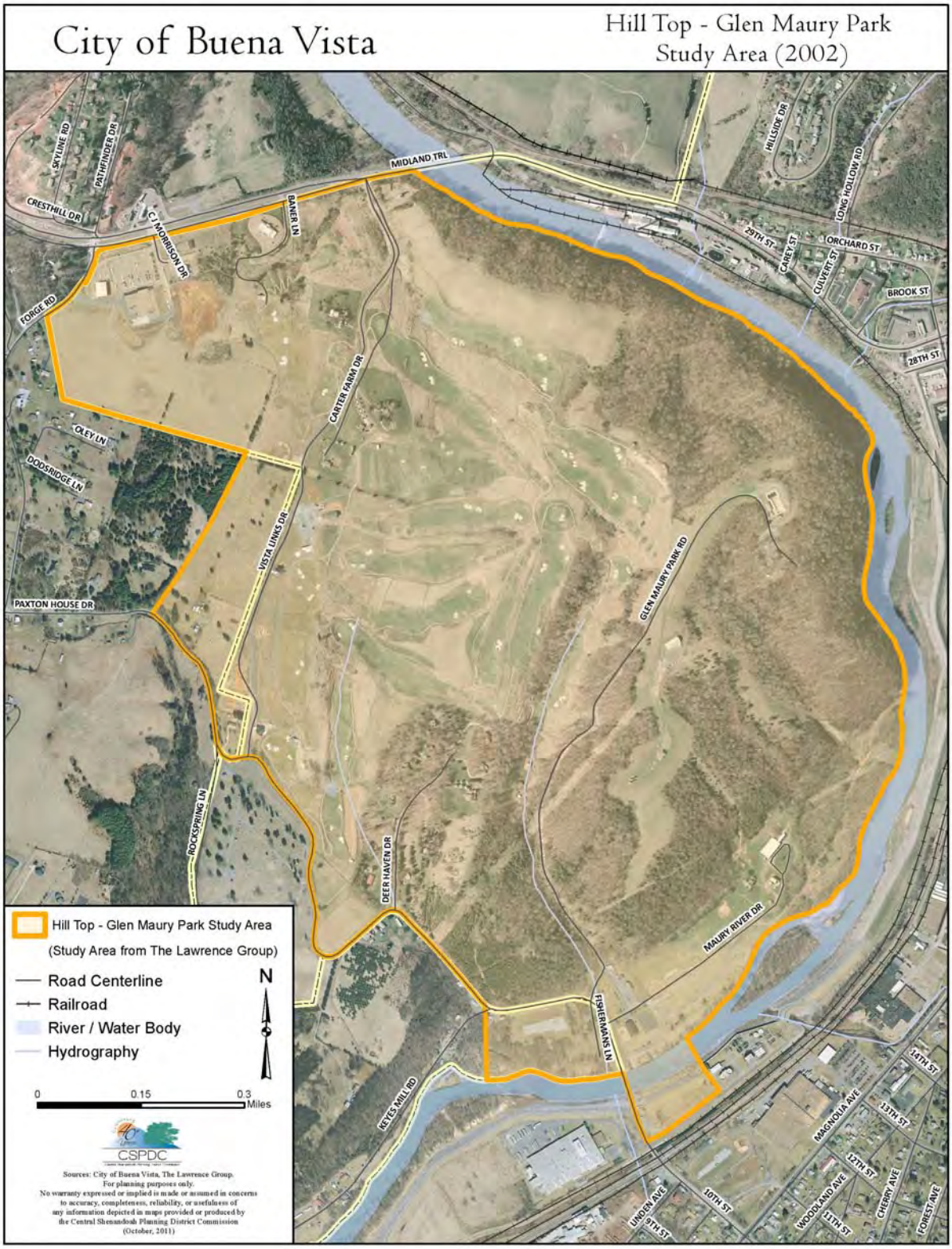
- 345 acre Glen Maury Park (owned by City)
- 100 acre Fitzgerald Tract (owned by City)
- 100 acre Carter Farm
- 26 acre First Pentecostal Holiness Church
- 27 acres in balance of study area

The resultant plan was a vision for the expansion of the 345 acre Glen Maury Park, an 18 hole public golf course, and a mixed use development. The latter included a YMCA/community center, townhomes, live-work units, single-family homes, and public spaces. Additionally, the vision recommended changing the arrangement of the lower park to make it more efficient. It was expected that the full realization of this vision would take many years and would be completed by both public and private partners.

The Vista Links was completed in August 2004. The 180-acre golf course was designed not only to maximize the beautiful views provided by its location but also to permit development opportunities. The clubhouse was located on the top of the hill with a panoramic view of the mountains and was intended to serve as the focal point for surrounding residential and mixed use development.

The national economic downturn that began in 2008 disrupted the plans for Hill Top. However, the area remains important to the future growth of the City. It is anticipated that the area will be developed with a comprehensive design concept although not identical to that envisioned in 2002. Presently, the YMCA does not have plans to locate a facility at Hill Top, but there are plans to improve the golf course's clubhouse. The City needs to reassess in detail the vision for this district and revise its ordinance and marketing plan for the district accordingly. Because of the neighboring park and golf course, this is an opportunity to create an exceptional development in the City and the region.

Map 9.3


City of Buena Vista
Hill Top - Glen Maury Park
Study Area (2002)
MIDLAND TRL
SKYLINE RD
PATHFINDER DR
CRESTHILL DR
C J MORRISON DR
BANER LN
HILLSIDE DR
LONG HOLLOW RD
29TH ST
CAREY ST
CULVERT ST
ORCHARD ST
BROOK ST
28TH ST
FORGE RD
CARTER FARM DR
OKEY LN
DODSRIDGE LN
VISTA LINKS DR
PAXTON HOUSE DR
GLEN MAURY PARK RD
ROCKSPRING LN
DEER HAVEN DR
MAURY RIVER DR
FISHERMANS LN
KEYES MILL RD
14TH ST
13TH ST
12TH ST
11TH ST
10TH ST
9TH ST
MAGNOLIA AVE
WOODLAND AVE
CHERRY AVE
FOREST AVE
UNDEN AVE
Hill Top - Glen Maury Park Study Area
(Study Area from The Lawrence Group)
Road Centerline
Railroad
River / Water Body
Hydrography
N
0
0.15
0.3
Miles
CSPDC
Sources: City of Buena Vista, The Lawrence Group.
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(October, 2011)

Development of Regional Significance

There are several uses of land that may be essential or desirable to the community for which locations cannot be determined in advance. Often these are uses that cannot be anticipated by the community, but may be proposed from time to time. These might include such uses as solid waste disposal facilities, large industrial facilities, education facilities, or entertainment venues. The following principle applies to these uses:

- Establish a process for evaluating proposals for these land uses.
- The process should include a means of determining the information necessary for decision-making on the particular project.
- It also should include a means for acquiring analyses of the impacts of the project on the community, including but not limited to traffic studies, environmental impact assessments, and economic studies.

ADDITIONAL DEVELOPMENT GUIDELINES

Land use planning does not have to be limited to the designation of uses for individual parcels. It can also incorporate other important development guidelines that have major ties to land use. Topics such as walkability, historic preservation, and transportation can be included as integral elements of a land use plan. These common growth management topics in combination with a future land use map create a very effective land use plan that a community can use as a guide for the future development of zoning, subdivision control, and other land development regulations.

Community Identity

Sense of place is the common feeling or attitude people share about a place they identify with and relate to. It naturally brings people tighter as a community. Sense of place is created from the characteristics of a location that make it readily recognizable as being unique and different from its surroundings. An area's sense of place can be enhanced by good planning and excellent design. But above all, sense of place and identity is bound up in the enduring presence of the City's historic environment and physical qualities. For Buena Vista, these qualities include the following:

1) The Maury River
2) Glen Maury Park
3) Surrounding mountains
4) City's collection of historic buildings
5) City's block development pattern

These five attributes make Buena Vista a memorable place. These unique physical qualities, natural setting, parks and buildings, can be used to strategically enhance each and to improve relationships between them.

Landmarks are sites, buildings, structures, or natural features that have visual, historic, or cultural significance. These features are important to its identity and to that of the various neighborhoods in which they are located.

- Ensure that the City's small town characteristics and block system are reinforced in new development and redevelopment.
- Find ways to strengthen the image and character of Buena Vista's distinct areas.
- Continue to develop a riverfront that is accessible, developed and appreciated as a major amenity of the community and region.
- Landmark should be preserved, unless it is clearly in the public interest to do otherwise.
- If the uses for which landmark buildings were designed are discontinued or become obsolete, the City or owner should seek appropriate new uses for these buildings.

Gateways

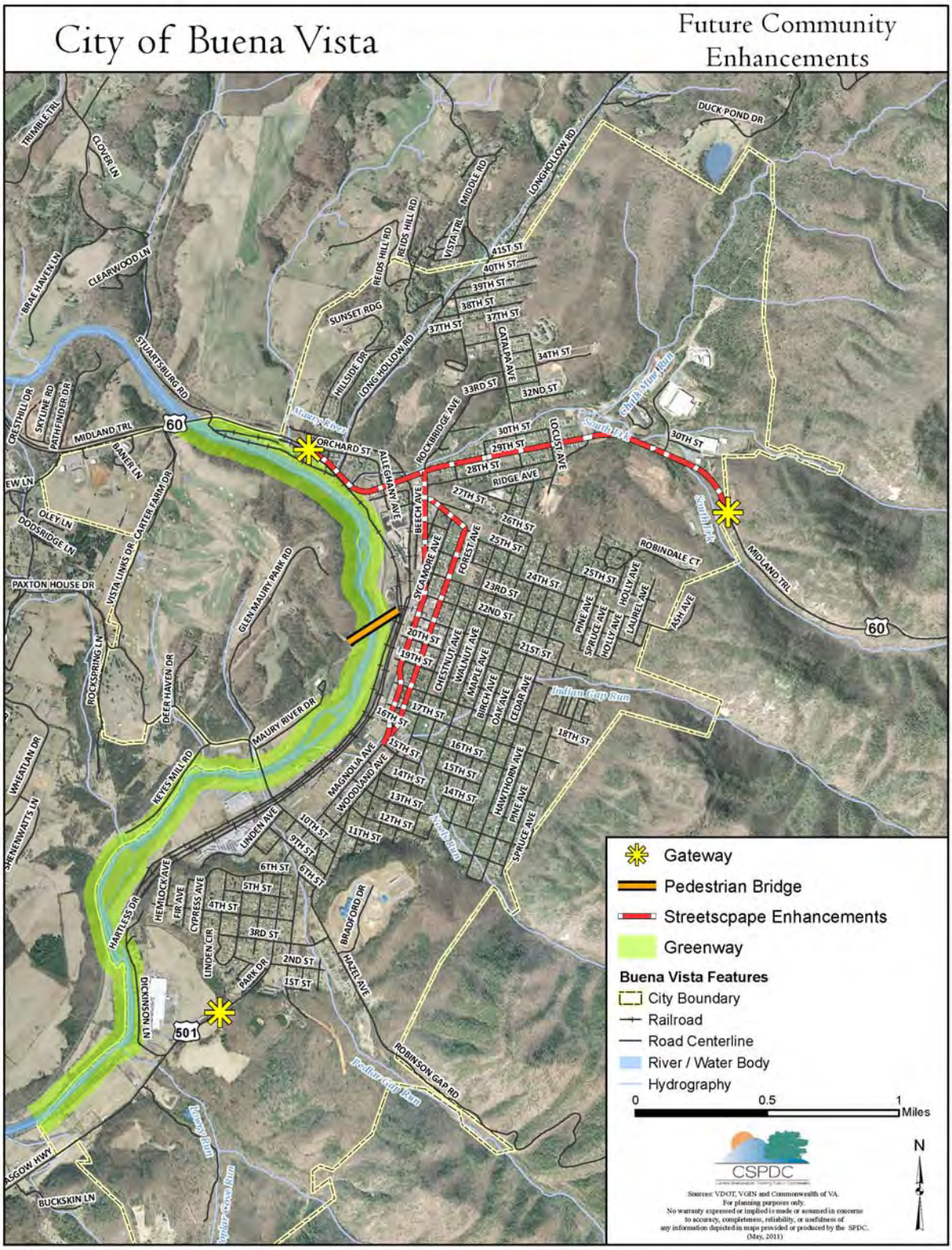
A gateway is the first impression of a community. For Buena Vista, the gateways mark the transition from the countryside into an urban center. It is the feeling that one has arrived at a destination, a place. Three gateways have been identified for Buena Vista. These include the following as shown on Map 9.4, Community Enhancements:

- Western Gateway from Interstate 81: Route 60 at Orchard Street
- Eastern Gateway from the Blue Ridge Parkway: Route 60 at the eastern City boundary
- Southern Gateway: Route 501 at Park Drive

Additionally, gateways can perform an important function. Places have inherent arrival points. When these points also exist physically on the ground, the place becomes more memorable. Furthermore, with appropriate signage, gateways can provide information to tourists by directing them to areas of interest and by providing clues to the historical, cultural, recreational and economic foundation of the City.

A good first impression of a community is invaluable. The entrance into a community can either express the community's pride and sense of place or it can give a community a poor public image. A community's image is fundamental to its economic well being. Consequently, planning at and along the entrance corridors to the City are critically important.

Map 9.4


City of Buena Vista
Future Community Enhancements
Gateway
Pedestrian Bridge
Streetscape Enhancements
Greenway
Buena Vista Features
City Boundary
Railroad
Road Centerline
River / Water Body
Hydrography
0
0.5
1
Miles
N
CSPDC
Sources: VDOT, VGIN and Commonwealth of VA.
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(May, 2011)

In the spring of 2010, the eastern gateway was studied. The purpose of study was to strengthen the connection between the Blue Ridge Parkway and the City of Buena Vista. Two important commercial corridors in the City of Buena Vista served as the focus of this study. U.S. Route 60/Midland Trail/E. 29th Street and the U.S. 501 corridor from U.S. Route 60 to the downtown core of Buena Vista were studied because of their overall impact to the economic development of Buena Vista and the experience of those visiting the region along these gateway corridors. The study's recommendations were guided by the following goals for the revitalization of these two corridors:

- Create a sense of arrival in Buena Vista
- Unify landscaping treatments
- Address land use variations
- Direct traffic to downtown businesses
- Improve wayfinding signage
- Provide a vision and implementation guidelines

The City recognizes that its gateways are important. In addition to the Blue Ridge Gateway Study, the City also participated in a visioning process for the 501 South corridor in Spring 2006. The visioning process was intended to improve the appearance of the corridor and to consider future development patterns along Route 501 South. Finally, an effort to address the western gateway from Interstate 81 was initiated in 2009 through a planning grant for the Green Forest Housing Rehabilitation project. This project, however, did not lead to a gateway implementation plan.

Greenways

A greenway along the Maury River is shown on the Future Land Use map. The greenway is important in connecting open space, protecting natural systems, creating outdoor recreation opportunities which all result in improving quality of life. Implementation of a greenway is good for the watershed in controlling erosion and providing bank stabilization. It also creates and safeguards habitats and improves opportunities for observing wildlife. Furthermore, a greenway provides trail opportunities to be used by residents, workers, and tourists.

In Buena Vista, the Levee Walk along the Maury River is used on a regular basis by residents and visitors. It is one of the existing walking trails that is a part of the framework of the Brushy Blue Greenway Master Plan which will link the Cities of Buena Vista and Lexington and the County of Rockbridge. The Brushy Blue Greenway will interconnect existing trails and upgrade these trails to a multi-use greenway trail as well as create new greenway connections. When completed the Brushy Blue Greenway corridor will be approximately 17 miles in length.

Streetscape Enhancements

Streetscape enhancements along major road corridors improve aesthetics, increase pedestrian accessibility, and enhance the City's identity. Key corridors for streetscape enhancements are shown on Map 9.4. Because the entry corridors have a variety of uses, landscaping along the road is a way to unify this mix. Also as discussed above with the Blue Ridge Gateway concept, streetscape enhancements are encouraged to reinforce a sense of place and to direct travelers to the City's downtown and Glen Maury Park.

Glen Maury Park is convenient to the residents of Buena Vista by vehicle but not by walking or bicycling. The only bridge over the Maury River from Buena Vista is located at 10th Street. Consequently, the park is convenient to only the southernmost residents of the City. To reach the park from the center of town, one must travel one mile south on Magnolia Avenue and 0.3 miles west on 10th Street to the park entrance. The total distance from downtown to the swimming pool located on the upper hills of Glen Maury Park is 2.3 miles, a distance few adults or children are willing to travel on foot or bicycle.

The City has recognized for many years that its greatest asset, Glen Maury Park, is not well connected to its neighborhoods or downtown. A long term goal of the City is to construct a bicycle and pedestrian-only bridge across the Maury River from the 21st Street area to an old bridge abutment in Glen Maury Park, greatly reducing the travel distance (See Map 9.4). This would increase residents' accessibility to use the park, and it would better connect the activity of the park with downtown businesses. The cost of the bridge is the greatest obstacle to its construction.

CURRENT INITIATIVES

Zoning Amendments. In 2011, a revised sign ordinance was drafted.

Identification of Nonconforming Lots. The Planning Department is currently reviewing records to identify lots that do not conform to current zoning regulations.

Blue Ridge Parkway Gateway Study. In the spring of 2010, a study along U.S. Route 60/Midland Trail/E. 29th Street and U.S. 501 was completed. The purpose of the study was to strengthen the connection between the Blue Ridge Parkway and the City of Buena Vista. The study identified issues and opportunities including, but not limited to, land use, economic development, conservation, tourism, and signage. The study resulted in an illustrative conceptual plan indicating key recommendations for the study area as well as steps for plan implementation. In June 2010, the City was awarded a grant from the Virginia Department of Forestry under its Urban and Community Forestry Assistance Program to complete a professional landscape and tree planting plan for the gateway corridor.

Brushy Blue Greenway. The Brushy Blue Greenway Master Plan was completed in 2004. The purpose of the plan is to provide a framework for development of a greenway within the Cities of Buena Vista and Lexington, and Rockbridge County.

Park Commission. At the end of 2010, the City of Buena Vista created a Park Commission to address the operation and vision of Glen Maury Park. A business plan for the park was developed during 2011.

Historic District Designation. The Buena Vista Downtown Historic District was designated in the National Register of Historic Places in October 2009. (See Chapter 2 Historic Resources, Map 2.1)

Seminary Hill Design Overlay District. The zoning overlay district was established to protect and enhance the historic nature of the district and to establish standards to maintain the unique historical, architectural, cultural and archaeological resources in this portion of the city generally surrounding Southern Virginia University.

SUMMARY OF FUTURE LAND USE

- Following adoption of this Comprehensive Plan, the City should initiate a comprehensive review and update of its land use regulations.

- Land use planning should expand beyond zoning of individual parcels to incorporate development guidelines tied to land use. Among these are creating a sense of place, walkability, greenway planning, and transportation enhancements.

RELATED STUDIES AND REPORTS

510 South Corridor Study, 2006.

Blue Ridge Parkway/Skyline Drive Gateway Studies, Study 1: Rockbridge County and the City of Buena Vista, June 2010.

Brushy Blue Greenway Master Plan. LPDA Land Planning & Design Associates, Inc., July 30, 2004.

The Central Shenandoah Valley Greenway Plan: An Inventory and Natural Resource Assessment of the Central Shenandoah Region, Central Shenandoah Planning District Commission, July 2004.

Land Use
STRATEGIES FOR ACTION

Goal: Land Use

The City of Buena Vista will be a community with a mix of land uses that maintains a diverse tax base and supports a high quality of life.

To achieve this goal, the following critical success factors must be accomplished:

- Integrate key land use elements.
- Implement land use policies that provide a balanced tax base.
- Use remaining land resources efficiently.
- Improve attractiveness to existing and prospective businesses and residents.
- Maintain a balance of development and environmental protection.
- Approach making major land use decisions with caution, avoiding those that might have serious, irreversible consequences.
- Ensure that any proposal to develop land or extend public services respects the goals and follows the policies of each plan element.
- Preserve, develop, and enhance a unique sense of place.
- Preserve and enhance the quality of the City's physical environment.

		Priority	Responsibility
9A	Systematically adopt land use policies that implement the elements of the *Buena Vista Comprehensive Plan*.	H	Planning, Planning Commission, City Council
9B	Follow the general guidelines for development and redevelopment as set forth in the *Buena Vista Comprehensive Plan*.	On Going	Community Development, Planning Commission, City Council
9C	Use the City newsletter, website, and other communication tools to regularly distribute information regarding important land use issues in the City.	On Going	Community Development, Planning
9D	Work with adjacent municipalities to ensure abutting land uses are compatible and consider the regional impact of developments.	On Going	Community Development, City Council
9E	Establish transition zones between commercial and low density residential uses.	H	Planning
9F	Encourage corridor trail and park development that links natural and community-centered areas of the river.	On Going	Parks & Rec, Community Development

		Priority	Responsibility
9G	Enhance the downtown as a center of activity and support its connections to surrounding neighborhoods and Glen Maury Park.	H	Community Development, Celebrate Buena Vista
9H	Prepare a revitalization plan for the Green Forest neighborhood.	M	Community Development
9I	Prepare a revitalization plan for the Buena Vista Downtown Historic District area.	H	Community Development
9J	Prepare guidelines for streetscape enhancements.	H	Planning, Public Works
9K	Implement the recommendations of the Blue Ridge Parkway Gateway study.	M	Community Development, Public Works
9L	Develop a gateway plan for the City's southern entrance along Route 501.	L	Community Development, Public Works
9M	Seek funding resources to implement gateway, streetscape, and greenway improvements.	On Going	Community Development
9N	Reassess the vision for the development of the Hill Top district.	High	Planning, Economic Development
9O	Partner with businesses, community organizations, and SVU to implement the land use element of the Comprehensive Plan.	On Going	City Government, Private Sector, Community Organizations, Residents
9P	Develop GIS to create a central repository for land use data including parcel, zoning, and infrastructure data.	H	Community Development, Public Works

High (H) = Years 1-5
Medium (M) = Years 5-7
Low (L) = Years 7-10
On Going = Strategies with zero to minimal costs associated with implementation. These strategies may be completed at any time throughout the life of the plan.

Appendix

Comprehensive Plan Survey
Comprehensive Plan Survey Results
Community Meeting Responses

BUENA VISTA COMPREHENSIVE PLAN SURVEY

Share Your Opinion! *Join us in creating a new vision for the City of Buena Vista. Help shape the direction of Buena Vista's Comprehensive Plan and the future of our community. Please complete this survey and return it to the Municipal Building or mail to the following address by March 31, 2009:*

City of Buena Vista 2039 Sycamore Avenue Buena Vista, VA 24416

Please circle the most appropriate answer(s). All responses are confidential.

Tell us your opinions about the City of Buena Vista

1. Overall, how would you rate the quality of life in Buena Vista? *(Circle 1)*

   a. Excellent c. Good e. Poor

   b. Very good d. Fair f. Very Poor

2. What are the two (2) biggest challenges facing Buena Vista's neighborhoods? *(Circle 2)*

   a. Quality of housing

   b. Variety of housing for all ages and incomes

   c. Neighborhood appearance

   d. Access to parks, recreation and open space

   e. Infrastructure condition (sidewalks, streets, alleys, lighting, etc.)

   f. Other (please print): _____

3. What should be the major focus of our economic development efforts? *(Circle 2)*

   a. Revitalize downtown/existing shopping centers

   b. Attract/develop new business and industry

   c. Attract/develop high paying jobs

   d. Market the City's assets

   e. Promote tourism

   f. Other (please print): _____

4. What is most important to Buena Vista's future? *(Circle 3)*

   a. Improve community appearance

   b. Provide/enhance recreational opportunities

   c. Improve traffic flow

   d. Promote alternatives to automobile transportation (bicycling, walking, public transit)

   e. Retain or bring back youth to live here

   f. Grow in population

   g. Preserve its history

   h. Protect the natural environment

   i. Increase local job opportunities

   j. Manage the location of new development

   k. Provide quality telecommunication and internet services

   l. Provide a variety of housing opportunities

   m. Other (please print): _____

Continued on back

5. What do you like most about Buena Vista? Please list two things.

   1. _____

   2. _____

6. What do you like least about Buena Vista? Please list two things.

   1. _____

   2. _____

Tell us about you:

7. Which area of the City do you live and/or own property? (Circle all that apply)

   a. 1st Street – 13th Street
   b. 14th Street – 26th Street
   c. 27th Street – 41st Street
   d. Other or outlying area

8. How long have you lived in Buena Vista?

   a. Less than a year
   b. 1-5 years
   c. 6-10 years
   d. 11-20 years
   e. Over 20 years
   f. Not a resident, but I own a business, land or other property in Buena Vista

9. What is your age?

   a. 18-24
   b. 25-44
   c. 45-64
   d. 65+

10. Including yourself, how many persons live in your home?

    a. 0
    b. 1
    c. 2
    d. 3
    e. 4
    f. 5
    g. 6
    h. 6+

Please use the space below to share any additional comments about a new vision for Buena Vista.

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

BuenaVista
Good Views Reveal Great Vision

Thank you for your time and opinions!

Visit the City's website www.buenavistavirginia.org or call the Planning Department (540) 261-8607 for more information on the Comprehensive Plan.

BUENA VISTA COMPREHENSIVE PLAN SURVEY
Return Date: March 31, 2009

1. Overall how would you rate the quality of life in Buena Vista? *(Circle 1)*

Response		Number	Percent
c.	Good	42	41.6%
b.	Very Good	17	16.8%
d.	Fair	14	13.9%
e.	Poor	12	11.9%
a.	Excellent	10	9.9%
f.	Very Poor	6	5.9%
	TOTAL	101	100.0%

2. What are the two (2) biggest challenges facing Buena Vista's neighborhoods? (Circle 2)

Response		Number	Percent
e.	Infrastructure condition (sidewalks, streets, alleys, lighting, etc.)	59	32.4%
c.	Neighborhood appearance	46	25.3%
b.	Variety of housing for all ages	23	12.6%
a.	Quality of housing	18	9.9%
d.	Access to parks, recreation and open space	11	6.0%
f. Other	Attracting jobs	6	3.3%
f. Other	Attracting young families	2	1.1%
f. Other	No stores	2	1.1%
f. Other	Glen Maury Park	2	1.1%
f. Other	Economic base	2	1.1%
f. Other	Its identity	1	0.5%
f. Other	Apathy of many residents	1	0.5%
f. Other	Roaming pets	1	0.5%
f. Other	Crime	1	0.5%
f. Other	Debt	1	0.5%
f. Other	Water pressure	1	0.5%
f. Other	Dictatorship	1	0.5%
f. Other	Lack of everything	1	0.5%
f. Other	Curb and gutter	1	0.5%
f. Other	Business incentives	1	0.5%
f. Other	Taxes too high	1	0.5%
	TOTAL	182	99.5%

Note: Total may not equal 100% due to rounding.

3. What should be the major focus of our economic development efforts? *(Circle 2)*

Response		Number	Percent
b.	Attract/develop new business and industry	89	43.8%
a.	Revitalize downtown/existing shopping centers	49	24.1%
c.	Attract/develop high paying jobs	40	19.7%
d.	Market the city's assets	15	7.4%
e.	Promote tourism	3	1.5%
f. Other	Support each other	2	1.0%
f. Other	Local grocery story	2	1.0%
f. Other	Shop here	1	0.5%
f. Other	Clean up city	1	0.5%
f. Other	Better storm water control	1	0.5%
	TOTAL	203	100.0%

4. What is most important to Buena Vista's future? *(Circle 3)*

Response		Number	Percent
i.	Increase the local job opportunities	82	29.0%
a.	Improve community appearance	27	9.5%
e.	Retain or bring back youth to live here	26	9.2%
j.	Manage the location of new development	21	7.4%
f.	Grow in population	18	6.4%
b.	Provide/enhance recreational opportunities	16	5.7%
g.	Preserve its history	14	4.9%
h.	Protect the natural environment	14	4.9%
l.	Provide a variety of housing opportunities	11	3.9%
d.	Promote alternatives to auto transportation	10	3.5%
k.	Provide quality telecommunication and internet services	7	2.5%
m. Other	New business	5	1.8%
c.	Improve traffic flow	4	1.4%
m. Other	Industry	4	1.4%
m. Other	Commerce downtown	3	1.1%
m. Other	Give small business a break	2	0.7%
m. Other	Don't overtax business so they stay	2	0.7%
m. Other	Entertainment	2	0.7%
m. Other	Need stores	2	0.7%
m. Other	Cut taxes	2	0.7%
m. Other	New middle school	2	0.7%
m. Other	Diversify	2	0.7%
m. Other	The park	1	0.4%
m. Other	Paying current and future loans	1	0.4%
m. Other	Restaurants	1	0.4%
m. Other	Keep the people we have	1	0.4%
m. Other	Reduce debt	1	0.4%
m. Other	More educated leaders	1	0.4%
m. Other	SVU	1	0.4%
	TOTAL	283	100.3%

5. What do you like most about Buena Vista? *(List two things)*

Response	Number	Percent
Small town atmosphere	32	17.3%
Small town friendliness	31	16.8%
Beautiful views	19	10.3%
Safety	13	7.0%
Educational opportunities	9	4.9%
Quietness	7	3.8%
Glen Maury Park	7	3.8%
Location	6	3.2%
Wide streets	4	2.2%
Lack of crime	4	2.2%
Nothing	4	2.2%
Historical	4	2.2%
School system	4	2.2%
Not overcrowded	3	1.6%
Stop in/Burger King	3	1.6%
City infrastructure	3	1.6%
Laid back	2	1.1%
Charm	2	1.1%
Good services (fire, police, trash, etc.)	2	1.1%
Kenney's	2	1.1%
It's small	2	1.1%
Its events	2	1.1%
Courteous, helpful city officials	2	1.1%
Free to worship	1	0.5%
Pretty women	1	0.5%
The new truck route	1	0.5%
Parking	1	0.5%
Police Department	1	0.5%
Library	1	0.5%
My home	1	0.5%
Golf course	1	0.5%
Clean	1	0.5%
City maintenance of infrastructure	1	0.5%
Has basics	1	0.5%
Easy access	1	0.5%
SVU	1	0.5%
New city council which is open to the citizen	1	0.5%
Pool	1	0.5%
Youth sports program	1	0.5%
University and cultural arts	1	0.5%
Flood wall for walking	1	0.5%
TOTAL	185	99.6%

Note: Total may not equal 100% due to rounding.

6. What do you like least about Buena Vista? *(List two things)*

Response	Number	Percent
Taxes too high/overtaxed	33	16.5%
No place to shop	21	10.5%
No grocery store	13	6.5%
Not enough jobs	10	5.0%
Junk in the yards	6	3.0%
Negativity of people	6	3.0%
The City Council	6	3.0%
City debt	5	2.5%
Police	5	2.5%
Better budget responsibility	4	2.0%
Very poor management of city finances and public works	4	2.0%
Entrance to city	4	2.0%
Bontex smell	4	2.0%
Lack of excitement for youth and adults	3	1.5%
Run down buildings	3	1.5%
Empty buildings	3	1.5%
Lack of understanding about people	3	1.5%
Churches should pay taxes	3	1.5%
The Mayor	3	1.5%
Dining needs	3	1.5%
Too much of the same	2	1.0%
Gossip	2	1.0%
Maintenance of city owned property	2	1.0%
Lack of sidewalks	2	1.0%
Lack of services	2	1.0%
Vista Links	2	1.0%
City sheriffs	2	1.0%
Vision	2	1.0%
Lack of pride	2	1.0%
More attractions	2	1.0%
Yards not kept neat	2	1.0%
Handling of park	2	1.0%
Poor school system	2	1.0%
Useless city workers and officials	2	1.0%
Citizens live in the past	2	1.0%
Water and sewer	2	1.0%
Parking and you can't see traffic coming	1	0.5%
Merchandise displayed on sidewalks	1	0.5%
Fear of strangers	1	0.5%
Have to buy everything at Walmart	1	0.5%
Speeding	1	0.5%
Choice of trash pickup	1	0.5%
Lack of industrial employment	1	0.5%
Lack of city interest	1	0.5%
Excessive government	1	0.5%
Excessive government employees	1	0.5%
Phone service	1	0.5%
Cost of housing	1	0.5%
No optometrist	1	0.5%

Response	Number	Percent
Rental property upkeep	1	0.5%
Ordinance officer	1	0.5%
High water bills	1	0.5%
Nosy neighbors	1	0.5%
Better animal control	1	0.5%
Loud noises	1	0.5%
Low paying jobs	1	0.5%
Too restrictive for business and industry development	1	0.5%
Dictatorship	1	0.5%
Mean dogs	1	0.5%
Cooperation with area entities	1	0.5%
Seminary Hill (now)	1	0.5%
Ruralness	1	0.5%
TOTAL	200	100.0%

7. What area of the City do you live and/or own property? *(Circle all that apply)*

Response	Number	Percent
b. 14th Street - 26th Street	42	43.3%
a. 1st Street-13th Street	31	32.0%
c. 27th - 41st Street	18	18.6%
d. Other or outlying areas	6	6.2%
TOTAL	97	100.1%

8. How long have you lived in Buena Vista?

Response	Number	Percent
e. Over 20 years	58	59.8%
b. 1-5 years	18	18.6%
d. 11-20 years	12	12.4%
c. 6-10 years	7	7.2%
a. Less than a year	1	1.0%
f. Not a resident, but I own a business, land or other property in Buena Vista	1	1.0%
TOTAL	97	100.0%

9. What is your age?

Response	Number	Percent
c. 45-64	48	50.5%
d. 65+	39	41.1%
b. 25-44	7	7.4%
a. 18-24	1	1.1%
TOTAL	95	100.1%

Note: Total may not equal 100% due to rounding.

10. Including yourself, how many persons live in your home?

Response	Number	Percent
c. 2	43	44.3%
b. 1	32	33.0%
d. 3	10	10.3%
e. 4	6	6.2%
f. 5	3	3.1%
h. 6+	2	2.1%
g. 6	1	1.0%
TOTAL	97	100.0%

Additional Comments

Response	Number	Percent
Taxes too high	11	6.6%
The hope for business growth	8	4.8%
Development of our downtown	7	4.2%
Better management of city money	6	3.6%
Police Department too restrictive/too big	6	3.6%
Upgrade Glen Maury Park	6	3.6%
Overall cleanup of business areas	5	3.0%
Overall cleanup of residential areas	5	3.0%
Jobs	5	3.0%
Listen to citizens	5	3.0%
Grocery store	5	3.0%
Opportunities for our current residents	4	2.4%
Affordable housing	4	2.4%
Events at Glen Maury Park good	3	1.8%
Buena Vista moving in the right direction	3	1.8%
Identify its identity	3	1.8%
Shopping center	3	1.8%
Money wasted on golf course	3	1.8%
Cut down on police cars	3	1.8%
New direction	3	1.8%
School facility improvement	3	1.8%
Glen Maury Park an asset	2	1.2%
Concern over current debt	2	1.2%
Industry for tax base	2	1.2%
Education maintained	2	1.2%
Bring back softball tournaments at Glen Maury Park	2	1.2%
Variety store of bedding, clothing, household items	2	1.2%
Promote cooperation with county	2	1.2%
Consolidate with county regarding schools and	2	1.2%
Family restaurant	2	1.2%
Cut salaries to school superintendent	2	1.2%
More opportunities recreational-wise for our children	2	1.2%
Attract industry	2	1.2%
Public works needs organization	2	1.2%
Bring our youth back home	1	0.6%
Vista Links is good	1	0.6%

Response	Number	Percent
Revitalization of our downtown buildings	1	0.6%
Treat everyone the same	1	0.6%
Young people promoting our city	1	0.6%
Telecommunications plan is a must	1	0.6%
Men's store	1	0.6%
Wonderful place to live and raise family	1	0.6%
Close to interstate	1	0.6%
Water park at Glen Maury Park	1	0.6%
Mini-golf course	1	0.6%
Road repair Glen Maury Park	1	0.6%
Spruce up courthouse	1	0.6%
Don't care	1	0.6%
Will be moving out	1	0.6%
Dollar store	1	0.6%
Accepting citizens who are not born here	1	0.6%
Past decisions now hurting city with no tax base	1	0.6%
Unqualified persons hired because of family	1	0.6%
Don't cut spending to schools	1	0.6%
Cut salaries to Clerk of Courts	1	0.6%
Don't cut salaries of teachers $30,000 or less	1	0.6%
Houses appraised too high the next year	1	0.6%
Eliminate Sheriff's Department	1	0.6%
Open some topless bars	1	0.6%
Bontex odors	1	0.6%
No social life in PM or weekends for adults	1	0.6%
City inspector of yards not needed when you have to	1	0.6%
Too many school administrators	1	0.6%
Illegal aliens	1	0.6%
Education for trades	1	0.6%
More businesses	1	0.6%
The university has taken over	1	0.6%
City entrances	1	0.6%
Keep city pool maintained and opened	1	0.6%
General overhaul of ordinances - regulations too restrictive; can't understand and hard to interpret	1	0.6%
The deer	1	0.6%
Sidewalks	1	0.6%
Medical clinic	1	0.6%
Sell golf course	1	0.6%
TOTAL	167	100.2%

Note: Total may not equal 100% due to rounding.

Buena Vista Comprehensive Plan
Community Meeting
Parry McCluer High School
Tuesday, May 19, 2009

Those in attendance divided into six small groups. The groups were given ten minutes to answer each of three questions. Each small group reported their responses to the whole. The following was recorded:

✓ Indicates the same response by another small group.

1. **Over the next 10 years, what stays the same in Buena Vista?**
   Low population density
   Historic buildings
   City status ✓
   Closeness of people ✓
   SVU stays ✓
   Small shops here
   Recreational facilities ✓
   Small town atmosphere ✓
   Schools remain independent
   Safety of citizens ✓
   Sense of industrial community
   Cost of living; affordable housing
   Entertainment at the park
   Labor Day parade
   Mountain Day
   Debt service
   Churches
   Improvements through code enforcement
   Business friendly attitude of government – government works well with businesses
   Revitalization of downtown
   Accessible city officials
   Good economic development coordinator

2. **Over the next 10 years, what changes in Buena Vista?**
   Keep young people in city ✓✓
   More places to shop/business district ✓✓✓✓
   More jobs ✓✓✓
   More industry/fill industrial park/especially high-tech industry ✓✓✓
   New middle school
   Upgrade present structures
   More doctors/medical facilities ✓
   More interest by citizens in local government
   Expansion of tax base ✓
   Improved aesthetics at entryways to city ✓

Development of senior citizen residences ✓
Regional transportation
More educated workforce
Taxes will continue to increase
Infrastructure should be upgraded and expanded
Passenger rail
Continued improvement of downtown ✓✓
Improve Buena Vista's image internally and externally
Downtown businesses need assistance to survive against large strip malls/superstores
Improve availability of buildable lots
New technology – use to advertise/promote Buena Vista
Embrace technology through infrastructure, i.e. fiber optics
Promote volunteerism
Restaurants downtown
Don't acquire more debt
Promote or sell golf course

3. What is distinctive about Buena Vista?

Close-knit community ✓✓
Economically diverse community – not dependent on industry
Natural beauty with mountains and rivers ✓✓✓
Distinctive history
Park – largest municipal park in state; underutilized ✓✓✓
Smaller shops
Churches
Low crime rate ✓
Maury River Senior Center
Labor Day parade
Some people refuse change
Perception of high taxes versus high taxes
Old grouches sign
Boom town hotel
Old courthouse and the water fountain
Community pride in time of need
Affordable housing
University/new high school/park – amazing for city this size
Quiet neighborhoods
Well designed city (wide streets and sidewalks) ✓
Maury River and potential for recreation
SVU
Good schools
Volunteers, i.e. fire and rescue
Golf course
Flood wall

City of Buena Vista

Office of the City Manager
2039 Sycamore Avenue, Buena Vista, Virginia
(540)261-8601

Virginia Department of Conservation and Recreation
Attn: Virginia Community Flood Preparedness Fund
Division of Dam Safety and Floodplain Management
600 East Main Street, 24th Floor
Richmond, VA 23219

To Whom it May Concern:

On behalf of the City of Buena Vista, it is my pleasure to submit a Community Flood Preparedness Fund (CFPF) Planning and Capacity Building application to develop a Buena Vista Flood Hazard Resiliency Plan. Although the City has experienced multiple flood events, and has constructed multiple flood protection and hazard mitigation structures, the City lacks a comprehensive and forward-looking plan. The plan is essential to identifying action steps, both programmatic and project-based, for the City to undertake in the coming years.

Despite the need for this plan, the City lacks the resources to execute a plan of this quality on its own. The City appreciates the opportunity to apply for this funding.

As City Manager I authorize the application for $72,000 of CFPF grant funds. Additionally, I authorize the use of $6,800 from the Planning Department – Professional Services FY2024 budget for use as matching funds.

Sincerely,

Jason Tyree

United States
Department of
Agriculture

Natural
Resources
Conservation
Service

Richmond,
Virginia

Buena Vista Watershed

Final Plan-Environmental Impact Statement

City of Buena Vista
Rockbridge County, Virginia

January 1999

ADDENDUM

Buena Vista Watershed

Rockbridge County, Virginia

This addendum shows project costs and benefits updated to a December, 1998 price base and includes the change in the discount rate from 7.125% in FY98 to 6.875% for FY99.

1. Project costs currently are estimated to be:
   a) Amortized installation: $409,000
   b) Annual operation and maintenance: $38,000

2. Project benefits are currently estimated to be:
   a) Total annual benefits for 55 years: $670,000

3. The revised estimated project benefit-cost ratio is: 1.50 : 1.00

WATERSHED PLAN and ENVIRONMENTAL IMPACT STATEMENT

BUENA VISTA WATERSHED

City of Buena Vista and Rockbridge County, Virginia

ABSTRACT:

This document describes a plan to reduce flood damages in the Buena Vista Watershed. The recommended plan consists of multiple works of improvement including the following measures: the construction of seven debris basins; replace/enlarge/remove seven culverts and/or bridges; construct 500 feet of concrete floodwall and upgrade 220 feet of earthen berm; improve 5,538 feet of stream channel; realign and improve 120 feet of stream channel; replace two railroad bridges on Indian Gap Run with five box culverts; and replace the railroad culvert on Pedlar Gap with two box culverts. The primary effects of the plan are to reduce damages from flooding caused by four streams (Chalk Mine Run, Indian Gap Run, Noel's Run, which is sometimes referred to as Reservoir Hollow, and Pedlar Gap Run) that run through the City of Buena Vista. This document is intended to meet the requirements of the National Environmental Policy Act and to be considered for authorization of Public Law 83-566 funding. This plan was prepared under the authority of the Watershed Protection and Flood Prevention Act, Public Law 83-566, as amended (16 U.S.C. 1001-1008) and in accordance with Section 102(2)(c) of the National Environmental Policy Act of 1969, Public Law 91-190, as amended (42 U.S.C. 43121 et seq.).

Sponsors

Natural Bridge Soil and Water Conservation District
City of Buena Vista

January 1999

For further information, please contact:

M. DENISE DOETZER
State Conservationist
USDA - Natural Resources Conservation Service
Culpeper Building, Suite 209
1606 Santa Rosa Road
Richmond, Virginia 23229-5014
Telephone: (804) 287-1691

WATERSHED AGREEMENT

between the

Buena Vista Town Council, Virginia
Natural Bridge Soil and Water Conservation District
(Referred to herein as Sponsors)

State of Virginia

and the

Natural Resources Conservation Service
U.S. Department of Agriculture
(Referred to herein as NRCS)

Whereas, application has heretofore been made to the Secretary of Agriculture by Sponsors for assistance in preparing a plan of works of improvement for the Buena Vista Watershed, State of Virginia, under the authority of the Watershed Protection and Flood Prevention Act (16 U.S.C. 1001-1008); and

Whereas, the responsibility for administration of the Watershed Protection and Flood Prevention Act, as amended, has been assigned by the Secretary of Agriculture to NRCS; and

Whereas, there has been developed through the cooperative efforts of the Sponsors and NRCS a plan for works of improvement for the Buena Vista Watershed, State of Virginia, hereinafter referred to as the Plan, which Plan is annexed to and made a part of this agreement:

Now, therefore, in view of the foregoing considerations, the Secretary of Agriculture, through NRCS, and the Sponsors hereby agree on this Plan and that the works of improvement for this project will be installed, operated, and maintained in accordance with the terms, conditions, and stipulations provided for in this Plan and including the following:

1. The Buena Vista Town Council will acquire, with other than Public Law 83-566 funds, such real property as will be needed in connection with the works of improvements. (Estimated cost is $419,000).

2. The Sponsors hereby agree that they will comply with all of the policies and procedures of the Uniform Relocation Assistance and Real Property Acquisition Policies Act (42 U.S.C. 4601 et. seq. as implemented by 7 C.F.R. Part 21) when acquiring real property interests for this federally assisted project. If the Sponsors are legally unable to comply with the real property acquisition requirements of the Act, it agrees that, before any Federal financial assistance is furnished, it will provide a statement to that effect, supported by an opinion of the chief legal officer of the state containing a full discussion of the facts and law involved. This statement may be accepted as constituting compliance. In any event, the Sponsors agree that they will reimburse owners for necessary expenses as specified in 7 C.F.R. 21, 1006 (c) and 21.1007.

The cost of relocation payments in connection with the displacements under the Uniform Act will be shared by the Sponsors and NRCS as follows:

	Sponsors %	NRCS %	Estimated relocation payment costs $
Relocation Payments*	0	100	$0

* Investigation of the watershed project area indicates that no displacements will be involved under present conditions. However, in the event that displacement becomes necessary at a later date, the cost of relocation assistance and payments will be cost shared in accordance with the percentages shown.

3. The Sponsors will acquire or provide assurance that landowners or water users have acquired such water rights pursuant to State law as may be needed in the installation and operation of the works of improvement.

4. The Sponsors will obtain all necessary Federal, State, and local permits required by law, ordinance, or regulation for installation of the works of improvement.

5. The percentages of construction costs to be paid by the Sponsors and by NRCS are as follows:

Works of Improvement	Sponsors 0%	NRCS 100%	Estimated Construction Costs $5,420,000

6. The percentages of the engineering services costs to be borne by the Sponsors and NRCS are as follows:

	Sponsors	NRCS	Estimated engineering services costs
A&E Design Services	0%	100%	$435,000*
NRCS Engineering Design Services	0%	100%	$80,000
NRCS Construction Inspection	0%	100%	$225,000
Construction Inspection**			

* Architectural and Engineering design costs for bridges, culverts and some channel improvements.
** The Sponsors will bear the cost of construction inspection that they incur.

7. The Sponsors and NRCS will each bear the costs of project administration that each incurs, estimated to be $100,000 (includes $60,000 for local technical assistance) and $145,000, respectively.

8. The Sponsors agree to participate in and comply with applicable Federal floodplain management and flood insurance programs before construction begins.

9. The Sponsors will be responsible for the operation, maintenance, and any needed replacement of the works of improvement by actually performing the work or arranging for such work, in accordance with agreements to be entered into before issuing invitations to bid for construction work.

10. The costs shown in this plan are preliminary estimates. Final costs to be borne by the parties hereto, will be the costs incurred in the installation of works of improvement.

11. This agreement is not a fund-obligating document. Financial and other assistance to be furnished by NRCS in carrying out the plan is contingent upon the fulfillment of applicable laws and regulations and the availability of appropriations for this purpose.

12. A separate agreement will be entered into between NRCS and the Sponsors before either party initiates work involving funds of the other party. Such agreements will set forth in detail the financial and working arrangements and other conditions that are applicable to the specific works of improvement.

13. This plan may be amended or revised only by mutual agreement of the parties hereto, except that NRCS may deauthorize or terminate funding at any time it determines that the Sponsors have failed to comply with the conditions of this agreement. In this case, NRCS shall promptly notify the Sponsors in writing of the determination and the reasons for deauthorization of project funding, together with the effective date. Payments made to the Sponsors or recoveries by NRCS shall be in accord with the legal rights and liabilities of the parties when project funding has been deauthorized. An amendment to incorporate changes affecting a specific measure may be made by mutual agreement between NRCS and the Sponsors having specific responsibilities for the measure involved.

14. No member of, or delegate to, Congress, or resident commissioner, shall be admitted to any share or part of this Plan, or to any benefit that may arise therefrom; but this provision shall not be construed to extend to the agreement if made with a corporation for its general benefit.

15. The program conducted will be in compliance with the nondiscrimination provisions as contained in Titles VI and VII of the Civil Rights Act of 1964, as amended, the Civil Rights Restoration Act of 1987 (Public Law 100-259) and other nondiscrimination statutes, namely, Section 504 of the Rehabilitation Act of 1973, Title IX of the Education Amendments of 1972, the Age Discrimination Act of 1975, and in accordance with regulations of the Secretary of Agriculture (7 C.F.R. 15, Subparts A & B),), which provide that no person in the United States shall, on the grounds of race, color, national origin, age, sex, religion, marital status, or handicap be excluded from participating in, be denied the benefits of, or be otherwise subjected to discrimination under any program or activity receiving Federal financial assistance from the Department of Agriculture or any agency thereof.

16. Certification Regarding Drug-Free Workplace Requirements (7 CFR 3017, Subpart F).

By signing this watershed agreement, the sponsors are providing the certification set out below. If it is later determined that the sponsors knowingly rendered a false certification, or otherwise violated the requirements of the Drug Free Workplace Act, the NRCS, in addition to any other remedies available to the Federal Government, may take action authorized under the Drug-Free Workplace Act.

Controlled Substance means a controlled substance in Schedules I through V of the Controlled Substances Act (21 U.S.C. 812) and as further defined by regulation (21 CFR 1308.11 through 1308.15);

Conviction means a finding of (including a plea of nolo contendere) or imposition of sentence, or both, by any judicial body charged with the responsibility to determine violations of the Federal or State criminal drug statues;

Criminal drug statute means a Federal or non-Federal criminal statute involving the manufacturing, distribution, dispensing, use, or possession of any controlled substance;

Employee means the employee of a grantee directly engaged in the performance of work under a grant, including: (i) all direct charge employees; (ii) all indirect charge employees unless their impact or involvement is insignificant to the performance of the grant; and, (iii) temporary personnel and

consultants who are directly engaged in the performance of work under the grant and who are on the grantee's payroll. This definition does not include workers not on the payroll of the grantee (e.g., volunteers, even if used to meet a matching requirement; consultants or independent contractors not on the grantees' payroll; or employees of subrecipients or subcontractors in covered workplaces).

Certification:

A. The sponsors certify that they will or will continue to provide a drug-free workplace by:

(1) Publishing a statement notifying employees that the unlawful manufacture, distribution, dispensing, possession, or use of a controlled substance is prohibited in the grantee's workplace and specifying the actions that will be taken against employees for violation of such prohibition;

(2) Establishing an ongoing drug-free awareness program to inform employees about--
(a) The danger of drug abuse in the workplace;

(b) The grantee's policy of maintaining a drug-free workplace;

(c) Any available drug counseling, rehabilitation, and employee assistance programs; and

(d) The penalties that may be imposed upon employees for drug abuse violation occurring in the workplace

(3) Making it a requirement that each employee to be engaged in the performance of the grant be given a copy of the statement required by paragraph (1);

(4) Notifying the employee in the statement required by paragraph (1) that, as a condition of employment under the grant, the employee will--

(a) Abide by the terms of the statement; and

(b) Notify the employer in writing of his or her conviction for a violation of a criminal drug statute occurring in the workplace no later than five calendar days after such conviction;

(5) Notifying the NRCS in writing, within ten calendar days after receiving notice under paragraph (4)(b) from an employee or otherwise receiving actual notice of such conviction. Employers of convicted employees must provide notice, including position title, to every grant officer or other designee on whose grant activity the convicted employee was working, unless the Federal agency has designated a central point for the receipt of such notices. Notice shall include the identification number(s) of each affected grant;

(6) Taking on of the following actions, within 30 calendar days of receiving notice under paragraph (4) (b), with respect to any employees who is so convicted--

(a) Taking appropriate personnel action against such an employee, up to and including termination, consistent with the requirements of the Rehabilitation Act of 1973, as amended; or

(b) Requiring such employee to participate satisfactorily in drug abuse assistance or rehabilitation program approved for such purposes by a Federal, State, or local health, law enforcement, or other appropriate agency.

(7) Making a good faith effort to continue to maintain a drug-free workplace through implementation of paragraphs (1),(2),(3),(4),(5),and (6)

B. The sponsors may provide a list of the site(s) for the performance of work done in connection with a specific project of other agreement.

C. Agencies shall keep the original of all disclosure reports in the official files of the agency.

17. Certification Regarding Lobbying (7 CFR 3018).

(1) The sponsors certify to the best of their knowledge and belief, that:

(a) No Federal appropriated funds have been paid or will be paid, by or on behalf of the sponsors, to any person for influencing or attempting to influence an officer or employee of an agency, Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.

(b) If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress , an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form - LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions.

(c) The sponsors shall require that the language of this certification be included in the award documents for all subawards at all tiers (including subcontracts, subgrants, and contracts under grants, loans, and cooperative agreements) and that all subrecipients shall certify and disclose accordingly.

(2) This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by Section 1352, Title 31, U.S. Code. Any person who fails to file the required certification shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such failure.

18. Certification Regarding Debarment, Suspension, and Other Responsibility Matters - Primarily Covered Transactions (7 CFR 3017).

(1) The sponsors certify to the best of their knowledge and belief, that they and their principals:

(a) Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded form covered transactions by any Federal department or agency.

(b) Have not within a three-year period preceding this proposal been convicted of or had a civil judgment rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State, or local) transaction or contract under a public transaction; violation of Federal or State antitrust statutes or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property;

(c) Are not presently indicted for or otherwise criminally or civilly charged by a governmental entity (Federal, State, or local) with commission of any of the offenses enumerated in paragraph (1)(b) of this certification; and

(d) Have not within a three-year period preceding this application/proposal had one or more public transactions (Federal, State, or local) terminated for cause or default.

(2) Where the primary sponsors are unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this agreement.

City of Buena Vista

By: _____
Robert D. Collins

2039 Sycamore Ave., Buena Vista, VA 24416
Address Zip Code

Title: City Manager

Date: _____

The signing of this plan was authorized by a resolution of the _____ governing body of the adopted at a meeting held on _____ .

_____
Secretary

_____
Address Zip Code

Date: _____

Natural Bridge Soil and Water Conservation District

By: _____
James A. Carter

30 E. Preston St., Woody Bldg., Lexington, VA 24450
Address Zip Code

Title: Chairman

Date: _____

The signing of this plan was authorized by a resolution of the _____ governing body of the adopted at a meeting held on _____ .

_____
Secretary

30 E. Preston St., Woody Bldg., Lexington, VA 24450
Address Zip Code

Date: _____

Natural Resources Conservation Service
United States Department of Agriculture

Approved by:

_____
M. DENISE DOETZER
State Conservationist

Date: _____

Watershed Plan and Environmental Impact Statement
for
Buena Vista Watershed, Virginia

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Watershed Plan and Environmental Impact Statement
for
Buena Vista Watershed
Virginia

SUMMARY OF WATERSHED PLAN

Project name: Buena Vista Watershed | County: Rockbridge | City: Buena Vista | State: Virginia

Sponsors: City of Buena Vista and the Natural Bridge Soil and Water Conservation District.

Description of recommended plan: This plan reduces flood damages in the Buena Vista Watershed. The recommended plan consists of multiple works of improvement which address stream channel capacity enhancement and debris removal. The primary effects of the plan are to reduce damages from flooding caused by 4 streams (Chalk Mine Run, Indian Gap Run, Noel's Run and Pedlar Gap Run) that run through Buena Vista.

Resource Information:

Size of watershed: 11,850 acres
Land cover- Cropland: None
Grassland: 100 acres
Forest land: 8,900 acres
Urban land: 2,850 acres

Land ownership-Private: 24.2% City: 1.5% Federal: 74.3 %

Number of farms- None

Prime and important farmland: None

Project beneficiary profile: There are approximately 800 individuals (12.5% of Buena Vista's population) who live or work within the 100 year floodplain. However, all of Buena Vista's 6,400 residents are considered direct beneficiaries of the project given that the recommended project will reduce future damages, transportation disruptions and associated costs which affect all of Buena Vista's citizens.

Sixteen percent of the resident population is over the age of 65 as compared to 11% for the state-wide average in 1990. Unemployment in 1993 in Buena Vista was at 6.2%. The state-wide rate of unemployment in 1993 was 4.9%. Forty percent of the population over 18 had not graduated from high school, compared to 20% of the residents of Virginia and 17% of the U.S. as a whole. Over 66% of residents within the floodplain who were interviewed in 1992 were below the low to moderate income limits as defined by the HUD income guidelines. In 1989, Buena Vista's per capita income was 58% of the national average ($10,241 vs. $17,596) Income levels in 15% of the households of Buena Vista were below the poverty line. Almost 89% of all housing structures in the City were built before 1980. Fifty-six percent of all housing was built before 1960. The median value of homes in Buena Vista is 42,900, while the median value of homes in Virginia is $90,400.

Wetlands: 2 acres classified as Palustrine unconsolidated bottom, permanently flooded which were man made ponds.

Floodplains: All the floodplain is within Buena Vista and is classified as urban.

Highly erodible cropland: None present

Threatened and endangered species: None present

Cultural resources: Historic sites on the National Register include: Lock #6 of the North River (Kanawha) Canal adjacent to the Maury River; Toll House at lock #5; Indian Gap Run Aqueduct; Lock # 3; Chalk Mine Run Aqueduct; Canal between Maury River and C&O RR; and 3 standing structures in Buena Vista, including buildings on the campus of the Southern Virginia College, at Glen Maury and the old courthouse, are also listed on the National Register. Three archaeological sites were found near the confluence of South Fork and Washer Hollow streams during previous reconnaissance surveys for development of an industrial park. A late 19th/early 20th century iron ore mining site was also discovered during that survey. Two other archaic period Indian campsites are located between the confluence of Pedlar Gap Run and Lowry Run near the Maury River. Old concrete dam/chute structures were found on U.S. Forest Service land in the upstream portions of Indian Gap Run and Noel's Run.

Problem identification: Flooding from 4 interior streams causes overland flow and ponding problems throughout Buena Vista. Flooding problems in the watershed consist of economic losses to streets, bridges, gaslines, waterlines, homes, businesses and industries. Hydrologic and economic studies indicate that a 100-year storm without project protection would flood 245 residences, 70 commercial properties, and many bridges, streets, roads, and utilities resulting in 9.5 million dollars of urban damages. An additional 1.9 million dollars in economic losses result from costs associated with infrastructure repairs and the cleanup of the debris left from the floods.

Alternative plans considered:

Alternative 1 - Stream Channel Capacity Enhancement and Debris Removal - Level I.
Alternative 2 - Stream Channel Capacity Enhancement and Debris Removal - Level II.
Alternative 3 - Stream Channel Capacity Enhancement and Debris Removal - Level III.
Alternative 4 - No Action

Project purpose: Flood prevention

Principal project measures: The recommended plan consists of multiple works of improvement which address stream channel capacity enhancement and debris removal. The measures are as follows: the construction of 7 debris basins; replace/enlarge/remove 7 culverts and/or bridges; construct 500 feet of concrete floodwall and upgrade 220 feet of earthen berm; improve 5,538 feet of stream channel; realign and improve 120 feet of stream channel; replace 2 railroad bridges on Indian Gap Run with 5 box culverts; and replace the railroad culvert on Pedlar Gap with 2 box culverts.

Total Project Costs:	PL 83-566 Funds		Other Funds		Total Funds	
Flood prevention	$6,305,000;	91.1%	$616,000;	8.9 %	$6,921,000;	100%
Structural Measures:	$5,420,000;	100%	$0;	0%	$5,420,000;	100%
Construction	$5,420,000;	100%	$0;	0%	$5,420,000;	100%
Other	$885,000;	59%	$609,000;	41%	$1,501,000;	100%
Eng. Services	$435,000;	100%	$0;	0%	$435,000;	100%
Technical Assist.	$305,000;	83.6%	$60,000;	16.4%	$365,000;	100%
Utilities Relocation	$0;	0%	$97,000;	100%	$97,000;	100%
Landrights	$0;	0%	$419,000;	100%	$419,000;	100%
Project Admin.	$145,000;	78.4%	$40,000;	21.6%	$185,000;	100%

Project benefits: Identified project benefits include: reduced damages to structures (mainly homes and businesses), reduced damages to the contents contained within existing structures, reduced damage to public infrastructure (mostly culverts, bridges, stream channels, roadways and associated drainage ditches), reduced disruptions to public use of the roads (especially emergency services) and communication lines, reduced public and private clean-up costs, reduced public administration costs associated with flooding, reduced public and private expenditures to deal with anticipated future flood damages, reduced losses in terms of local business income, and enhanced economic development prospects. Quantified estimates in average annual terms were made for the following principal damage reduction benefit categories:

	Average Annual Equivalents ($'s) *
Damage Reductions to Structures:	$295,000
Damage Reductions to Contents:	$122,000
Reduced Private Clean-up Costs:	$28,000
Reduced Private Business Losses:	$116,000
Reduced Public Infrastructure Damages, Clean-up Costs and Repairs:	$96,000
Reduced Public Administration Costs:	$27,000
	$684,000

* February 1998 Price Base. Average annual equivalents based on 7.125% discount rate and a 55 year period of analysis.

Other impacts:

Land use changes: Some residential lots in the City will become vacant and change to miscellaneous lands to get them out of the floodplain, and/or serve as debris basins or channel enlargement areas.

Environmental values changed or lost:

Wooded floodplain: No change
Wetlands: No change
Cultural Resources: No effect
Wildlife Habitat: No change
Fisheries: No change
Prime farmland: No change

Mitigation Issues: If scattered trees along drainageways are destroyed during construction, these areas will be replanted to trees as needed.

Major conclusions: Buena Vista is in need of flood protection from the interior stream drainage. The floodwall constructed by the U.S. Army Corps of Engineers along the Maury River will have no effect on the interior stream flooding problems. The environmental impacts associated with the planned nonstructural and structural measures are minimal. This plan provides an overall approach to addressing the long-standing flood control problems in Buena Vista.

Areas of controversy: Some streets will be closed as the culverts and/or bridges are removed and replaced. This will cause some inconveniences for residents during and after construction.

Issues to be resolved: Much coordination between Federal, State and Local government, private landowners, businesses and industries will be necessary in order to combine available resources and make this long range, comprehensive watershed plan a reality.

A key component of the implementation of this watershed plan will be coordination with the Virginia Department of Transportation (VDOT) for the removal and/or replacement of several bridges and culverts. The successful completion of the Recommended Plan on Indian Gap Run is dependent on some minor changes to the existing VDOT design for the Magnolia Bridge. The changes needed include the installation of larger culverts than are currently planned. The added cost of this improvement is presently not included in this watershed plan and VDOT does not plan to incur additional costs beyond their current design. The added cost of this improvement may need to be borne by someone other than VDOT.

Other: A critical component of this watershed plan is to enlarge the railroad crossings on Indian Gap Run. This is an item that can be funded using PL-566 funds but will require considerable coordination by the City and railroad officials. The railroad officials are willing to cooperate with this project as long as public funds are made available for planning and implementation of the necessary changes.

INTRODUCTION

At the request of the City of Buena Vista and the Natural Bridge Soil and Water Conservation District (SWCD), the USDA, Natural Resources Conservation Service (NRCS) conducted a flood study of the Buena Vista Watershed. This request was prompted by the occurrence of several flooding events, primarily the flood of 1985. Buena Vista and the Natural Bridge SWCD will herein be referred to as the Sponsors.

The Sponsors made a request to the NRCS and the U.S. Army Corps of Engineers for assistance to address their flooding problems. The floods that affected Buena Vista resulted from two distinctly different sources: (1) the Maury River, and (2), the streams that drain from the steep mountains and flow down through the City. The Army Corps developed a flood control plan to address the flooding caused by the Maury River. The NRCS was requested to develop a flood control plan to address the interstream flooding problems.

An Application for Federal Assistance was submitted by the Sponsors to the Virginia Soil and Water Conservation Board in May 1993. The application was given a priority 1 rating and was approved in July 1993. The application was then referred to NRCS for response.

The purpose of this study is to determine the extent of the interstream flooding problem in the Buena Vista Watershed and the potential for reducing this problem.

This study was performed under the authorization provided in the Watershed Protection and Flood Prevention Act of the 83rd Congress (Public Law 83-566, as amended). That legislation authorizes the Secretary of Agriculture to cooperate with other federal, state, and local agencies in the investigation of watersheds and river basins to develop coordinated programs.

PROJECT SETTING

The Buena Vista Watershed is located in Rockbridge County and contains the City of Buena Vista, Virginia. The watershed is comprised of six tributaries to the Maury River. The Maury River flows in a southeasterly direction to its confluence with the James River near Glasgow, Virginia. The USGS 8-digit hydrologic unit number established by the U.S. Water Resources Council is 02080202. The Virginia 3-digit hydrologic unit code is I37.

This watershed includes the tributaries of Long Hollow (1,000 acres), Chalk Mine Run (3,800 acres), Indian Gap Run (1,420 acres), Noel's Run (1,630 acres), Pedlar Gap Run (1,650 acres), and Lowry Run (2,350 acres), for a total of 11,850 acres. Approximately 2,830 acres of these tributaries are located within the City of Buena Vista. The additional 9,020 acres is located in eastern Rockbridge County, mostly within the boundaries of the George Washington and Jefferson National Forests, Pedlar Ranger District. These tributaries flow down the steep western slopes of the Blue Ridge Mountains through the hill and floodplain of Buena Vista before entering the Maury River. The upland areas are in woodland. The floodplain is being used by residences and commercial enterprises with some scattered industries within Buena Vista.

The watershed includes the following mountains, pinnacles or peaks; Lowry Peak, Little Pinnacle, Paxton Peak, Elephant Mountain, Garnet Peak, Silver Peak, Chimney Rock Mountain and McClure Peak. The natural topography of the upland watershed area is very steep and will remain as forest. No significant change in landuse is expected within the watershed.

Topography of the watershed varies widely, with steep slopes in the upper reaches ranging up to and exceeding 50 percent, typical of the East and Central Farming and Forest Region and the foothills of the Blue Ridge Major Land Resource Area (MLRA) 130. The western end of the watershed has topography ranging from gently sloping to moderately steep, typical of the rolling hills of the Southern Appalachian

Ridges and Valleys MLRA 128, with an average slope of 6-12 percent. The floodplains range from narrow to broad along the streams where water that flows out of banks tends to spread out and run erratically due to the manipulation of the floodplain for City streets and residential areas.

The Blue Ridge Parkway and the county line between Rockbridge and Amherst counties, Virginia, form the eastern watershed boundary. The Maury River forms the western watershed boundary. The elevation ranges from 900 feet at the Maury River to 2,500 feet near the Blue Ridge Parkway.

Soils within the watershed vary greatly in depth ranging from Dekalb-Hazleton-Rock Outcrop Complex on a 55-70 percent slope, hydrologic group C, to Alonemill-Clubcaf Complex on 0 to 3 percent slope, hydrologic group B. The upland slopes consist of Dekalb, Hazleton and Oriskany, steep and rocky, which help accelerate the runoff. The flat slopes along the floodplain in the City are predominantly deep, well drained soils of the Alonemill Series. However, these soils are highly urbanized and generally covered with artificial impervious surfaces.

Table A - Landuse in Acres

Forestland	8,900	(8,800 acres in George Washington and Jefferson National Forests)
Pasture/Hayland	100	
Cropland	0	
Urban	2,850	
TOTAL	11,850	

Federally owned land = 8,800 acres
City owned land = 180 acres
Private = 2,870 acres

PROJECT SPONSORS' OBJECTIVES

The sponsors have the following objectives for the Buena Vista Project:

1. Reduce the flood frequency from the City's interior streams;
2. Reduce upstream flood damages to houses, yards, culverts, bridges, gaslines, waterlines, and streets;
3. Catch the debris in structures before it clogs and constricts the City's culverts, bridges, and stream channels, and reduces their capacity to carry flood waters;
4. Reduce the City's maintenance time and cost for culverts, roads, bridges and stream channels;
5. Reduce the risk of hazardous materials spills, such as natural gas and heating oil, that can occur during flooding;
6. Improve the visual quality of the watershed through improved vegetative cover.

WATERSHED PROBLEMS AND OPPORTUNITIES

The major water and related land resource problems that were identified during planning are floodwater damages, unstable and eroding streambanks, debris transport, sediment in channels, and water pollution.

Floodwater Damages

Sudden and intense rainfalls occur frequently along the western slopes of the Blue Ridge Mountains. The extremely steep slopes of this watershed cause the runoff to rush down the mountain streams into the Buena Vista City limits. The floodwaters carry a full bedload of debris which consists of soil, gravel, cobbles, boulders and woody materials. The bedload is moved along the stream channel during

high flows and is quickly deposited as the topography changes suddenly from the steep uplands to the floodplains of the Maury River. The bedload fills stream channels, restricts the flow under bridges, clogs road culverts, and contributes to flooding throughout the watershed.

Following the deposition of the debris, the floodwaters flow out-of-bank and into streets, yards, homes, and businesses. The floodwaters continue to travel downgrade, scouring the floodplains and streambanks until reaching the floodplains of the Maury River. The floodplains become ponded between the railroad tracks and the hillside, causing severe flood damages in this area. The debris that flows on through the City streams becomes deposited as small islands in the main channel of the Maury River.

Floodwater damages occur frequently in the 11,850 acre watershed. The flooding damages occur predominantly in Buena Vista with minor flooding along sections of Long Hollow in Rockbridge County. Flooding problems in the watershed consist of economic losses to streets, bridges, gaslines, waterlines, homes, businesses and industries. Hydrologic and economic studies indicate that a 100-year storm without project protection would flood 246 residences, 71 businesses, 17 public buildings, 5 churches, 2 professional/social buildings and numerous bridges, streets, roads, and utilities resulting in $9.5 million dollars of urban damages. An additional $1.9 million dollars in economic losses result from costs associated with infrastructure repairs and the cleanup of the debris left from the floods. These losses are due to the following:

- Debris clogging stream channels and bridge and culvert openings;
- Stream channels, bridges and culverts too small to carry flood flows;
- Operation and maintenance problems due to lack of access to stream for cleanout and culverts and bridges so small that hand labor is required to clean them out;
- Water quality degradation resulting from streambank erosion and hazardous materials spills, such as natural gas and heating oil, that occur during flooding;
- An 8 percent increase in runoff from forestland due to 9 acres of forest fires in 1986 and recent insect damages which killed 870 acres of trees;
- Extensive rock slides in the upland areas which have provided rock and boulder debris for easy transport downstream into Buena Vista.
- Excessive downcutting of the stream channel adjacent to the ball field on Indian Gap which provides sediment and debris materials.

The unpleasant task of clean-up begins after every flood. Sediment and debris block the streams, bridges and culverts and enter homes, businesses and industries. This adversely affects the lives of those who must endure these frequent events. It also has a tremendous impact on the City's Public Works operating budget due to extensive operation and maintenance costs. The Flood of 1985 clean-up and repair costs were approximately $1,064,000, not including Emergency Watershed Protection Program expenditures. Following the flood of 1995, over $376,000 was spent by the NRCS on stream clean-up and channel stabilization through the Emergency Watershed Protection Program.

A forest fire in 1986 resulted in a loss of approximately 9 acres in the watershed. Since the area is extremely steep and rough, the U.S. Forest Service manages the area under the "Remote Highlands" classification in order to provide older vegetation where recreationists can obtain a degree of solitude and where the environment can be maintained in a near-natural state. Only light on-the-land management activities occur. The Forest Service does not plan to replant the burned area. The area is revegetating naturally. Meanwhile, there is a slight increase in runoff.

The watershed also experienced an infestation of forest insects in the last few years. The Southern Pine Bark beetle has infested approximately 870 acres of forest in this watershed. This has resulted in less vegetation and subsequent water uptake. The runoff has increased approximately 8 percent as a result. Table B displays the watershed analysis of the additional runoff.

Table B - Subwatershed Water Yields (acre-feet)

Subwatershed	Baseline Water Yield	Maximum Water Yield	Percent Increase
Indian Gap Run	1,000	1,120	12
Chalk Mine Run	1,817	2,007	10
Pedlar Run	1,198	1,258	5
Poplar Cove Run	1,327	1,363	3
Noel's Run	1,658	1,725	4
South Fork	1,047	1,132	8
Washer Hollow	1,267	1,443	14
Wilmouth Hollow	1,278	1,339	5
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	10,592	11,387	8

The gypsy moth is expected to reach this area during the next five years. This will cause additional tree mortality and result in added runoff.

An 8 percent increase in runoff (annual water yield) does not necessarily translate into a comparable increase in peak flows or storm flows. Most of the increase in water yield will be summer base flow, since that is when there will be the most difference in evapotranspiration resulting from the loss of live trees. Research has shown some increase in storm flows for smaller storms after timber harvests, but little increase for the major flood-producing storms. In the larger storms, the soils are already saturated, so there is little difference between a harvested and an unharvested watershed. However, there could be small incremental increases in storm flows resulting from the fire damage and insect infestation.

Based on aerial observations, there are approximately 11.2 acres of boulder fields in the watershed, of which 5.1 acres occurs in the Indian Gap Run subwatershed. These boulder fields, the down cutting of the stream channel near the ball field and the cobbled stream banks provide a ready supply of debris material to the streams. These materials move downstream, clog culverts, and create stream blockages at most road crossings during storm events.

In addition to the obvious floodwater damage and losses, there is the toll of mental anguish from the loss of possessions and fear of impending flooding from every rain. In the City, there is also the threat of businesses who close down and never reopen following these frequent floods. Businesses become discouraged and move away, or never locate in the area, taking away valuable jobs. In a City with limited resources and a declining job market, financial recovery is more difficult following each flood.

Sediment Transport and Damages

The deposition of the bedload sediment and debris reduces the stream channel capacity and fills in culverts and bridges. The floodwaters then flow out of banks. The floodwaters travel downgrade, cutting into the cobble streambanks and scouring the floodplains. Using this process repeatedly, the floodwaters pick up additional bedload and suspended sediment. Part of the suspended sediment is deposited in buildings, on highways, on streets and on sidewalks. The rest is transported downstream into the Maury and James Rivers.

The upper reaches of Noel's Run and Pedlar Gap Run support native trout and the streams are perennial. In the lower sections of the stream, the deposited sediment bedload creates a porous channel bottom in which the stream flow moves under and through the sediment material, causing the perennial streams to become intermittent.

Scouring of stream channel on Pedlar Gap Run after April 1992 flooding.

Indian Gap Run after April 1992 flood. Reeves Brothers Plant in background.

Destruction of street and blockage of street culvert with debris and sediment on Pedlar Gap Run from April 1992 flood.

Debris and sediment blocking street culvert near confluence of Noels and Indian Gap Runs after April 1992 flooding.

Destruction of 12th Street from Noels Run in April 1992.

Destruction of culvert on Hawthorne Avenue from April 1992 flood.

Sediment and debris blocking street culvert on Noels Run after April 1992 flooding.

Destruction of Hawthorne Avenue from Noels Run during the April 1992 flood.

Debris deposited along Chalk Mine Run during the April 1992 flood.

Unstable and Eroding Streambanks

The eroding streambanks encroach on and threaten the adjacent properties. The damages include lost yards, landscaping, buildings, driveways, homes and businesses. The private landowners are left with either scoured out holes in their properties or huge piles of cobbles and debris. The scoured out banks provide additional bedload to the floodwaters which ultimately is deposited elsewhere causing further damages downstream.

Water Quality

Soil particles are scoured from the streambanks and floodplains, go into suspension, and are transported into streams and rivers, thereby, degrading downstream water quality. The floodwaters pass through urban and residential areas which contain oils, greases, fertilizers, gas, chemicals and other contaminants. These contaminants are picked up and transported into receiving waters. This process adds to the degradation of the water quality in the watershed and downstream.

SCOPE OF THE BUENA VISTA WATERSHED PLAN

The need for treatment of the Buena Vista Watershed was first recognized and promoted by the Sponsors following the 1985 flood. The sponsors contacted both the U.S. Army Corps of Engineers and the NRCS after 1985. The Corps took the lead and developed a flood control plan for the control of the Maury River. The Corps has constructed a flood wall which will protect most of the City from Maury River flooding. The flood wall starts downstream of the confluence of the Maury River and Chalk Mine Run and extends to a point downstream of the original confluence of the Maury River and Pedlar Gap Run. Chalk Mine Run flows into the Maury River unobstructed by the flood wall. Noel's Run joins with Indian Gap Run before they get to the flood wall. Indian Gap Run then passes through the flood wall via culverts with flap gates. If the Maury River stage is too high, an alternate route is provided through an interior drainage canal. Pedlar Gap Run is diverted through a lower portion of the flood wall by an interior drainage canal via culverts with flap gates and then drains into the Maury River.

Early in the development stages of the Corps flood wall project, it was unclear which agency would address the interior streams flooding problem. The NRCS effort was begun by the joint NC/VA Water Resources Planning Staff headquartered in Raleigh, NC. The project was turned over to the Virginia NRCS Planning Team in October 1991. In November 1991, the NRCS Planning Team, accompanied by the planning specialists from the Northeast National Technical Center in Chester, Pennsylvania, conducted a field reconnaissance of the watershed. Coordination among agencies to scope issues to be addressed during planning was initiated during this general time period.

In May 1993, following the flood of 1992, the Sponsors submitted an Application For Federal Assistance requesting that NRCS address the interior streams flooding problem.

A meeting was held in Buena Vista on September 15, 1993 to discuss future planning strategies. A follow-up field visit was conducted in October 1994.

In June 1994, a public meeting was held at the Buena Vista City Hall. The meeting was attended by approximately 30 people who were landowners and/or government agency representatives. The project was discussed with people voicing their issues and concerns about the watershed. Almost all in attendance were supportive of the project and were in favor of pursuing the development of a flood control plan for the Buena Vista Watershed.

The project was discussed at a scoping meeting held on February 28, 1995. The meeting was attended by NRCS, U.S. Forest Service, Virginia Department of Conservation and Recreation, City of Buena Vista, Army Corps of Engineers, Central Shenandoah Planning District Commission and local

landowners. Forty other groups and individuals that were on a U.S. Forest Service scoping list were also contacted by letter.

A second scoping meeting was held on September 3, 1998 in Lexington following the decision to prepare an EIS on the watershed. Due to a lack of interest and the feeling that the watershed had already been adequately assessed and the impacts properly evaluated, the only attendance at the meeting was by NRCS employees responsible for planning the watershed.

The following table is a summary of the concerns identified through the scoping process listed above. The issue that was most often discussed and of highest significance was flooding.

Table C - Evaluation of Identified Concerns

Economic, Social, Cultural, and Environmental Concerns	Degree of Concern 1/	Degree of Significance to Decision Making 2/
Human Health and Safety	High	High
Flooding	High	High
Sheet, rill, ephemeral and gully erosion	Medium	Medium
Sedimentation	Low	High
Streambank Erosion	High	High
Socio-Economic	Medium	Medium
Water Quality	Medium	Low
Recreation	Low	Low
Fish and Wildlife Habitat	Medium	Medium-High
Land Use Conversion	Low	Low
Endan., Threat., and Rare species	High	High
Prime and Important Farmland	Low	Low
Visual Resources	Medium	High
Wetlands	High	High
Cultural Resources	High	High
Air Quality	High	Low

1/ High degree of concern - may not be significant to decisions.
2/ Three levels of significance are used:
a. High - Must be considered in analysis of alternatives if significant to decision.
b. Medium - May be affected by some alternative solutions.
c. Low - Need not be considered in the analysis.

In August 1995, following the severe flooding in June 1995, NRCS met with FEMA and the Virginia Department of Conservation and Recreation, Division of Soil and Water Conservation, Floodplain Management Section, to discuss the need to have the hydrology and hydraulics models run for the Buena Vista Watershed interior streams. This led to a contract being awarded to Woodward Clyde Federal Services, who subcontracted to Dewberry and Davis, for the modeling work. Several meetings occurred between NRCS, Dewberry and Davis, and the local sponsors. A public meeting was held on October 24, 1996, at City Hall where the watershed model results were presented and accepted by those in attendance.

INVENTORY OF EXISTING RESOURCES

Socioeconomic Resources

Population

Buena Vista experienced its greatest population growth in the 1940s and 1950s. This population growth was attributed primarily to increased industrial activity. This increase is reflected in the housing stock of the City, of which 56% was built before 1960. Prior to this growth period, Buena Vista initially grew as an industrial city as part of the Shenandoah land "boom" in the 1890s. The population of Buena Vista reached 1,044 in 1890, then more than doubled to 2,388 by 1900. This "boom' was initiated by several land development companies, one of which was the Buena Vista Company. In less than three years, Buena Vista grew from a sparsely populated rural area to a town with 19 industries, employing in excess of 1,000 workers.

The Population of Buena Vista was 6,406 in 1990 (1992 U.S. Census, U.S. Dept. of Commerce). This represents a 7.2% loss in population from 1980. The population is expected to decrease by another 7% by the year 2010 (Virginia Employment Commission 1993). Minorities comprise approximately 4.9% of the population, with 4.4% being African-American.

The age distribution of the City residents, which indicates potential for economic growth through demand for goods and services, is somewhat older than the state as a whole, reflecting the decline in population and out-migration of young people. The percentage of Buena Vista residents over the age of 65 is 16% compared to 11% for Virginia. The median age for Buena Vista residents is 36.4, compared to 32.7 for Virginia.

Employment

The number of employed persons in the City was approximately 2,095 working at 131 establishments. Manufacturing is the largest employment sector in the City. The retail and educational services sector provide a majority of the remaining employment. Although manufacturing is the most important sector of Buena Vista's economy, actual manufacturing employment has declined since 1970. Some of this decline may be due to an overall trend in the manufacturing industry toward automation and consolidation of existing plants. However, the 1985 flood was a major factor in the closing of two factories (Rea Magnet Wire and Reeves Brothers) and is most likely a deterrent to expansion by existing plants or the location of new factories to Buena Vista.

Periodically, unemployment has been a problem in Buena Vista. For example, in 1975, the rate exceeded 15%, compared to a national rate of between 8% and 10%. More recently, the rate has fluctuated between 7.5% (1990 annual average) and 11.5% (July 1993). Unemployment rates in Buena Vista are affected much more by fluctuations in regional and national demands for manufactured goods than the rates for the state and the nation as a whole. The following table shows unemployment rates of Buena Vista compared to that of Virginia and the entire country:

Table D - Unemployment Rates in Buena Vista

	1992	1993	1994
Buena Vista	10.3%	10.9%	6.2%
Virginia	6.4%	5.0%	4.9%
U.S.	7.4%	6.8%	6.1%

Source: U.S. Census Bureau and the U.S. Department of Labor Statistics

By 1994, unemployment in Buena Vista was down to 6.2% from 10.9% in 1993, while the state-wide average rate of unemployment was at 4.9%. In 1993, there were 1,545 Social Security beneficiaries in

Buena Vista, 885 retired workers, 320 survivors of retirees and 175 individuals receiving disability income. Of the remaining workforce, 48% of Buena Vista's working residents were employed outside of their locality of residence.

Education

Like many communities where manufacturing is the dominant employer, educational attainment levels are lower than that of the Commonwealth and nation. In Buena Vista, 40% of the residents over the age of 18 have not graduated from high school, compared to 20% of the residents of Virginia, and 17% of the U.S. as a whole. (Figure does not reflect number of persons who received their GED). However, the school department has an active program of recruiting people back to obtain their GED and the dropout rate has been lower than Virginia's over the last twenty years. The Buena Vista High School is Virginia's only nationally recognized year-round high school program. The City supports an elementary school and a small two-year college, The Southern Virginia College. In addition, the City of Lexington is home to two schools of higher education, the Virginia Military Institute and Washington and Lee University. These schools and their economic spin-off effects provide jobs for some of Buena Vista's residents.

Income

The Buena Vista Storm Drainage/Flood Control Survey was part of a survey conducted to identify the income status of persons in the floodplain who were adversely affected by the April 1992 flooding. The survey found that 337 persons (178 households), or 66.2% of those interviewed, had incomes below the low-to-moderate income limits as defined by the latest HUD Section 8 income guidelines for the City. Average household income for Buena Vista residents in 1989 was $26,827, while per capita income (PCI) was only $10,241. PCI for the U.S. during the same year was $17,596, making Buena Vista's PCI only 58% of the national per capita income level. However, the per capita income for Buena Vista had improved to 72% of the Virginia average and 74% of the national average by 1995 ($17,410, $24,282 and $23,359 respectively). Median household income for Virginia in 1995 was $40,203, while Buena Vista's was $29,994 (74% of the statewide median). Fourteen percent (870) of Buena Vista's total population lived below the poverty level in 1989, as compared to ten percent for all of Virginia. By 1993 this figure had not changed for Buena Vista as 14 percent (876) of the resident population of Buena Vista still lived below the poverty level. Over 21 percent of all Buena Vista residents under 17 lived below the poverty level in 1993. With respect to household data, over 15 percent of Buena Vista's households (371) were considered to have residents living below the poverty level in 1989, as compared to 10.5 percent for the state as a whole.

Housing

Housing in Buena Vista is made up of predominantly single-family, owner occupied units. Almost 89% percent of all existing structures in Buena Vista were built before 1980. Fifty-six percent were built before 1960, and 22% were built before 1940. A high percentage of rented houses exist in the floodplain area, however. The City is populated with a variety of dwellings. Many of the higher valued dwellings are located at higher elevations. Houses in the floodplain are primarily small to medium sized frame dwellings. The median house value in the City in 1990 was $43,300, while the median value of a house in Virginia was $91,000. Therefore, houses in Buena Vista are only 48% of the median house value in Virginia.

As of 1993, 130 National Flood Insurance policies were in effect in Buena Vista. Total premiums paid amounted to $63,390 providing coverage of $12,778,000. Total claims paid out since 1978 were $2,980,000 (FEMA data, July 1993).

Transportation

Proximity to major transportation routes is an important determinant of economic development in an area. Buena Vista is located four miles from Interstate 81 and a short distance from the junction of Interstate 81 and Interstate 64. Two state highways run through the City as well as an operating railroad. Route 60 and Route 501, which run through the City, are considered by the State of Virginia to have potential for Scenic Byway status.

Recreation

On the western side of the Maury River is the City's major recreational area, Glen Maury Park, encompassing 315 acres. Recreation occurs along the Maury River primarily in the form of boating, fishing and hiking. The floodplain also contains small neighborhood parks which have sustained limited damage in past floods. There are several trails along the hollows of the interstream tributaries that connect hikers and hunters to both the Blue Ridge Parkway and the Appalachian Trail.

Fishing utilization in the watershed is confined primarily to the Maury River and to two trout streams which are located in the headwaters of Noel's Run and Pedlar Gap Run. The sections of these two streams where the trout are located, are on U.S. Forest Service land which is upstream of the proposed project for Buena Vista. Recreation use of the four wild trout streams in the area is considered low to moderate by VDGIF. Little to no fishery use is made of the other tributary streams except for occasional use by children.

Hunting use within the George Washington and Jefferson National Forests and adjacent privately owned woodland is moderate for big game species and low to moderate for small game, principally squirrel. Some limited trapping occurs, especially along streams within the watershed.

Soils

Soils within the watershed vary greatly in depth ranging from Dekalb-Hazleton-Rock Outcrop Complex on a 55-70 percent slope, hydrologic group C, to Alonemill-Clubcaf Complex on 0 to 3 percent slope, hydrologic group B. The upland slopes consist of Dekalb, Hazleton and Oriskany, steep and rocky, which help accelerate the runoff. The flat slopes along the floodplain in the City are predominantly deep, well drained soils of the Alonemill Series. However, most of these soils are located in the urbanized area of the watershed and are covered either with asphalt, concrete or roof.

Geology

The proposed project location is located on the eastern edge of the Valley and Ridge physiographic province with the upper portion of the watershed located in the Blue Ridge. Bedrock in the area is predominantly the Chilhowee Group, composed of the Antietam Formation, a medium to very thick-bedded, very resistant quartzite; Harpers formation, a dark colored, fine-grained, very resistant quartzitic sandstone; and the Weaverton Formation, an interbedded quartzite, metasandstone and phyllite, all of which are moderately to very resistant. It is this material, along with granite and granitic-gneiss from the Blue Ridge that is transported in volume downslope during major storm events, that cause the debris blockage on the stream channels in the City and the resultant flooding.

A literature survey was conducted on the proposed project area southeast of Buena Vista. The Corps of Engineers and the Buena Vista City Engineer were also contacted as to location and content of already identified suitable borrow areas. These borrow areas were used by the Corps for the construction of the Maury River flood wall.

Indian Gap Run, Pedlar Gap Run, Noel's Run, and Chalk Mine Run are located approximately 1 to 2.5 miles from the fine grained borrow area at Cedar Ridge. Bedrock at the Cedar Ridge borrow site appears to be at the Waynesboro Formation, a predominantly gray dolomite and limestone interbedded with mudstone and grayish-red sandstone. Buena Vista owns the land, there appears ample reserves, and the material grades from a (CL) sandy clay to a (SC) clayey sand with gravel. There are also sources of riprap in the general area located at Glasgow, Lynchburg, Piney River, Blue Ridge, Lexington, and Staunton.

Climate

The climate in Buena Vista is moderate with an average annual temperature of 54 degrees F and average annual precipitation of 38 inches. The highest average monthly precipitation occurs in July, October and May, respectively.

Buena Vista is susceptible to extreme precipitation events due to its geographic location within the valley. Buena Vista is most susceptible during hurricane season from hurricanes and tropical storms moving from the Gulf of Mexico northward across the United States and up through the Shenandoah Valley. The result can be heavy flooding of the Maury River. The floods of 1969 and 1985 are the most severe floods in Buena Vista's history that resulted from tropical storm remnants.

Buena Vista is also susceptible to quick peaking floods from the tributaries that flow through the City. These quick peaking floods occur when a storm front slows as it moves across the Blue Ridge Mountains and releases rainfall onto the shallow soiled, steep watershed terrain. Flooding is most likely to occur when the antecedent moisture condition is high from long duration precipitation followed by a short duration, high intensity storm. This was the case for the April 1992 flood that caused severe flooding on these tributaries flowing through Buena Vista.

Climatic summary data for Buena Vista is provided in the following table. This table includes temperature and precipitation averages and probabilities based upon 47 years of record (1948-1995).

Table E - Climatic Data

	Temperature (Degrees F.)						Precipitation (Inches)				
				2 yrs in 10 will have				2 yrs in 10 will have		avg # of	
Month	avg daily max	avg daily min	avg	max temp. >than	min temp. <than	avg # of grow deg days*	avg	less than	more than	days w/.1 or more	avg total snow fall
January	39.3	16.6	28.0	65	-18	12	2.65	1.08	3.98	5	5.0
February	49.4	22.3	35.8	79	6	86	2.85	1.40	4.11	5	3.7
March	60.7	31.7	46.2	83	12	246	3.37	1.71	4.82	6	2.0
April	72.6	39.9	56.2	93	22	478	3.09	1.51	4.46	6	0.1
May	77.8	46.5	62.1	93	30	640	3.39	2.22	4.45	7	0.0
June	82.1	54.5	68.3	94	34	779	3.19	1.56	4.60	5	0.0
July	89.7	60.1	74.9	101	43	956	3.82	2.25	5.22	7	0.0
August	88.2	57.1	72.6	99	39	996	3.13	1.42	4.60	5	0.0
September	83.6	54.5	69.0	97	35	804	2.87	1.13	4.33	5	0.0
October	64.5	41.6	53.0	80	21	404	3.54	1.34	5.38	5	0.1
November	56.3	31.4	43.9	76	2	163	3.05	1.54	4.36	5	0.4
December	47.7	22.0	34.8	68	8	37	3.13	1.54	4.51	5	1.8
Yearly :											
Average	67.7	39.9	53.8	---	---	---	----	----	----	---	---
Extreme	102	-18	---	103	-9	---	----	----	----	---	---
Total	---	---	---	---	---	5600	38.08	27.90	40.62	66	13.1

Average # of days per year with at least 1 inch of snow on the ground: 6

Hydrography

The watersheds for the interior streams are primarily steep, shallow-soil, forestland with a considerable number of rock outcrops. The streams begin in the ravines of the Blue Ridge Mountains that are adjacent to the City. They begin as steep, rock-bottomed rapids that gradually taper off in slope as they approach the foothills of the mountains. The stream channels gradually increase in size and rock debris content as the slope decreases over distance. The slope flattens significantly as each channel reaches the floodplain of the Maury River, located within the City limits of Buena Vista. The rock debris carried out of the steep mountainous watersheds are deposited as a result of the water velocity decreasing with slope decline. The rock is deposited along the stream banks and areas of constriction such as bridges and culverts. It is this rounded rock debris that clogs the bridge openings and culverts during heavy flows. As these blockages form, water can no longer flow within the natural stream banks. The storm water flows out of bank and across the residential and commercial properties within the City. This sheet flow takes the path of least resistance and eventually makes its way back into the channel at some lower elevation. The out-of-bank flow is the primary cause of flood damages within the upper parts of the City's residential area.

Pedlar Gap Run, Noel's Run, and Indian Gap Run were surveyed to determine their hydrogeomorphic characteristics. These streams are relatively confined, with narrow floodplains and low sinuosity. Stream bottoms are predominately cobble, but boulders and bedrock are common in some reaches. Channel gradients in the narrow gaps are relatively steep (3 to 5 percent). These watersheds are dominated by the Antietam formation composed of quartzose sandstone, which forms the series of peaks on the edge of the City. On the steep side slopes where the streams cut through this formation, boulder fields are common, providing a ready source of rock material to the streams. Smaller streambed material shows evidence of frequent movement. This rock debris has formed a broad outwash plain where the streams leave the mountains, lose their steep gradient, and drop the debris. Much of Buena Vista is built on this outwash plain. It is the natural tendency of the stream channels to move back and forth across the plain.

Short reaches were surveyed for large woody debris in or along the channel. On Indian Gap Run, there are approximately 189 pieces per mile; on Noel's Run, 117 pieces per mile. The pieces measured were at least 4 inches in diameter and 5 feet long. The desired future condition, according to the George Washington and Jefferson National Forests Management Plan, is 125-300 pieces per mile on cold water streams. This optimum level provides good aquatic habitat from one perspective. On the other hand, this amount provides a debris source and could be contributing to stream blockages during storm events.

Flooding

Floods from the Maury River and streams which flow down from the Blue Ridge mountains and through the City cause widespread damage and destruction over large areas affecting many Buena Vista residents. The flood wall constructed by the Army Corps of Engineers will deal directly with the Maury River flooding and should significantly reduce future damages in Buena Vista associated with the Maury. Flooding from the intercity streams will continue to occur. One of the major reasons that flood waters pond at the lower end of each stream is that the slope of the stream flattens out when the channel reaches the floodplain of the Maury River. This flatter grade causes the water to slow down and spread out over a greater area. Several locally led efforts to re-size culverts, remove obstructions, expand channel capacities, and relocate houses that experience repetitive flood losses, are underway. These efforts will diminish future damages from the intercity streams, but will not eliminate them.

Contingency planning can reduce future damages and alleviate suffering and hardship. This planning involves the cooperation and coordination of Federal, State and local governments along with private citizens. Activities include enacting land-use restrictions in flood-prone areas, issuing severe weather warnings, floodproofing, and constructing flood mitigation structures.

Floodplain Management

The State of Virginia has established floodplain zoning as the floodplain management technique to control use of land in flood-prone areas. The responsibility and authority for zoning are the function of local governments. The Virginia Flood Reduction Act was enacted to guide the development of floodplains. The Act provides State coordination and assistance in floodplain management by encouraging local governments to adopt, administer, and enforce floodplain management ordinances; by providing the authority necessary to conduct a floodplain management program; and by coordinating Federal, State and local floodplain management activities. After compliance, areas subject to recurrent flooding can qualify for protection in the National Flood Insurance Program. Thus, citizens living in these areas can insure themselves against flood losses through the purchase of flood insurance.

Both Buena Vista and Rockbridge County participate in the National Flood Insurance Program. Buena Vista entered the National Flood Insurance Program on August 1, 1978. Rockbridge County entered on January 3, 1979.

Flood Warning Systems

The dissemination of warnings of potential flooding in the Commonwealth is the responsibility of the Virginia Department of Emergency Services. They inform local governments of flood information passed to them from the National Weather Service. Local governments are warned of predicted floods and, in turn, issue official warnings to the general public in the areas affected. The flash flood warning system, the Integrated Flood Observing and Warning System (IFLOWS), is a cooperative system developed and operated by the National Weather Service and the Virginia Department of Emergency Services. The system consists of computer software and hardware designed to assist in the management of flash floods caused by localized, intense rainfall. Buena Vista and Rockbridge County both utilize IFLOWS to warn their residents of impending flooding and the anticipated extent of the floodwaters on the Maury River.

Due to the small size and very quick response times of the Buena Vista subwatersheds, there are no warnings for the interior streams. All of the IFLOWS monitoring stations in Rockbridge County are located on Maury River, South River and Irish Creek, which have much larger drainage areas.

Wetlands

Review of the Department of Interior's National Wetland Inventory and the NRCS's Wetland Inventory and field evaluations indicated no wetlands along any of the principal tributary streams evaluated for possible action. The only wetlands of any type known to occur in the Buena Vista Watershed are 3 or 4 small man made ponds classified as PUBHh, Palustrine unconsolidated bottom permanently flooded, in USDI "Classification of Wetlands and Deepwater Habitats of the United States".

Cultural Resources

Review of the Virginia Department of Historic Resources' (DHR) records of known archaeological and historical sites and discussion with representatives of the State Historic Preservation Officer (SHPO) revealed the following sites in the Buena Vista Watershed:

Table F - Historic Sites on the National Register

Site No.	Description of the Site
178	Lock #6 of the North River (Kanawha) Canal adjacent to the Maury River
233	Toll House at lock #5 (canal)
234	Indian Gap Run Aqueduct (confluence of Indian Gap Run and canal)
235	Lock # 3 (canal)
236	Chalk Mine Run Aqueduct (confluence of Chalk Mine Run & canal)
336	Canal between Maury River and C&O RR (immediately upstream of Long Hollow Road)

Three standing structures in Buena Vista, including buildings on the campus of the Southern Virginia College, at Glen Maury and the old courthouse, are also listed on the National Register.

Three archaeological sites (including prehistoric, archaic and historic Indian camps) were found near the confluence of South Fork and Washer Hollow streams during previous reconnaissance surveys for development of an industrial park. In addition, an area about 50 acres in size containing a late 19th/early 20th century iron ore mining site was also discovered during that survey. Much of these areas were impacted or lost during construction of the park.

Two other archaic period Indian campsites have been identified on the Maury River floodplain between the confluence of Pedlar Gap Run and Lowry Run.

During the field evaluation of the principal tributary streams, old concrete dam/chute structures were found on U.S. Forest Service land in the upstream portions of Indian Gap Run and Noel's Run. These structures may have been built during the Civilian Conservation Corps (CCC) era.

In formal comments provided by DHR, they stated that no further identification efforts are needed for archeological properties. However, historic structures (four railroad bridges and one small road bridge) will be surveyed and consultation with the State Historic Preservation Officer will be conducted prior to construction. No formal archaeological survey will be required within the construction limits of the proposed project.

Threatened, Endangered and Rare Species

The U.S. Fish and Wildlife Service, the Virginia Department of Game and Inland Fisheries, the Virginia Department of Agriculture and Consumer Services, and the Virginia Division of Natural Heritage (DNH) were consulted to determine if any listed or proposed threatened or endangered (T&E) species are known to occur in the watershed. Results of the inquiry indicated that no T&E species are present.

DNH indicated that other 'non listed' (not legally protected under the Endangered Species Act but considered significant by DNH) Natural Heritage Resources do occur in the watershed including the following:

Geologic Features:
- A 'significant cave'

Invertebrates:
- Price's Cave Isopod, Caecidotea pricei (State special concern)
- Yellow Lance, Elliptio lanceolata (State special concern & Fed. candidate category 2)
- A Pusio Group, Pseudanophthalmus sp. 11 (Extremely rare state & globally)
- Rockbridge County cave planarian, Sphalloplana virginiana (Extremely rare state & globally, federal candidate category 2)
- Rockbridge County Cave Amphipod, Stygobromus baroodyi, (State special concern)

Plants:
- Tall Larkspur, Delphinium exaltatum (Fed. candidate category 2)
- Slender Spikerush, Eleochirus elliptica (State very to extremely rare)
- Three-Flowered Melic Grass, Melica nitens (State extremely rare)
- Canby's Mountain-Lover, Paxistima canbyi (State candidate & Fed. candidate category 2)
- Lance-Leaved Buckthorn, Rhamnus lanceolata (State very rare)
- Wild Black Currant, Ribes americanum (Historically known from the state)
- Northern Prickly-Ash, Zanthoxylum americanum (State rare to very rare)

Consultation with DNH and onsite review indicated that none of these natural resources are present within the limits of any proposed construction areas.

Scenic Rivers

No streams within the limits of the watershed have been designated state scenic rivers or listed by the National Park Service's Nationwide Rivers Inventory as meeting minimum criteria for further study and/or potential inclusion into the National Wild and Scenic Rivers System.

Aquatic Resources

The Buena Vista Watershed contains six major tributary streams feeding the Maury River and the portion of the Maury River flowing through Buena Vista. The Virginia Department of Game and Inland Fisheries (VDGIF) classifies portions of two tributary streams (Noel's Run and Pedlar Gap Run) as wild brook trout streams based on their sampling. The other tributary streams in the watershed have been classified as mixtures of warm water/intermittent flow streams. Associated fish species in all these tributary streams include Torrent sucker, Moxostoma rhothoecum; Bluehead chub, Nocomis leptocephalus; Mottled sculpin, Cottus bairdi; and various dace species including the Blacknose dace, Rhinicthys atratulus, according to VDGIF. No sport fish species, except trout as noted below, are known to occur in any of the tributaries, except immediately adjacent to the Maury River. The Maury is a

typical mountain/valley smallmouth bass stream. Streams present, their lengths and VDGIF classifications are shown below.

Table G - Stream Classifications of the Buena Vista Watershed

	Length (Ft)	Intermittent (I) Perennial (P)	Warm (W) Cold (C)	Trout Stream
Maury River	13,000	P	W	No
Long Hollow	5,400	P	W	No
	6,000	I	W	No
Chalk Mine Run	20,400	P	W	No
	20,000	I	W	No
South Fork	7,200	P	W	No
Trib. of Chalk Mine	3,000	I	W	No
Indian Gap Run	11,000	P	W	No
	3,600	I	W	No
Noel's Run	9,600	P	C	9,000'
	11,000	I	C/W	No
Pedlar Gap Run	18,000	P	C/W	13,300'

VDGIF classifies Noel's Run as a class II wild trout stream and Pedlar Gap Run as a class III wild trout stream. Pedlar Gap Run, where sampled by VDGIF, averages from 4 to 12 feet wide while Noel's Run ranges from 7-12' wide. These streams are high gradient, averaging from 320-380 feet of fall per mile. Shading averages from 80-100% throughout the trout and mountainous stream sections of the watershed. The sections of Noel's Run and Pedlar Gap Run where the trout are located are on U.S. Forest Service land, which is upstream of the proposed project for Buena Vista. Lack of shading and other urban impacts limits habitat for fish and other aquatic species in the downstream sections of all the tributaries.

Wildlife

Within the City limits of Buena Vista, wildlife habitat and biodiversity is limited to species commonly adapted to urban conditions. Biodiversity is high in the largely wooded areas of the watershed. This high diversity is due mostly to isolation caused by steep terrain and the high percentage of public ownership within the watershed. Most of this area is covered with hardwood forest and scattered clumps of pine trees. Large expanses of boulder fields are common along the steep stream bluffs.

Large animal species including black bear, wild turkey, deer and bobcat are common throughout the wooded portions of the watershed. Small animals including gray squirrel, raccoon, opossum, gray fox, various amphibians, and reptiles also occur in the watershed. Rabbits, quail, and other openland game species are rare due to the lack of non-urban herbaceous cover. Neotropical migrants as well as other birds common to mountainous areas of Virginia occur in the area. Forest habitat fragmentation is limited primarily to boulder fields within the extensive, relatively unbroken, hardwood tree cover of the George Washington and Jefferson National Forests. Riparian woody vegetation, although incomplete and scattered, does provide limited habitat for wildlife within the City limits.

Water Quality

Even though there are no water quality monitoring stations in the watershed, the water quality is considered to be good. Flooding degrades water quality due to additional sediment loading, sewer overflows and broken sewer and gas pipes. Floodwaters wash oils and gas from parking lots, streets and driveways into the streams. This causes a reduction in water quality in the watershed and downstream.

Forestry Resources

Forested land in the watershed is predominately in the George Washington and Jefferson National Forests under U.S. Forest Service ownership. Much of the timber is of low quality on steep inaccessible land.

On Forest Service land in these watersheds, 34% of the timber is classified as chestnut oak and scarlet oak, 14% is yellow (pitch and table mountain) pine, 30% is mixed yellow pine and oak, 13% is white oak/northern red oak/hickory, and 9% is yellow poplar/white oak/northern red oak. Refer to the figure on the next page for a display of timber types.

Only 4% of the timber on Forest Service land is classified as mature sawtimber and another 25% is mature poletimber. Eighteen percent is immature sawtimber and 2% is immature poletimber. Thirty-eight percent is classified as low quality. Refer to the figure on the next page for a chart on the timber stand class condition.

Seventy-two percent of the timber is 70 to 100 years old. Only one percent has been harvested in the past twenty years, and another 10% was harvested 20 to 30 years ago.

The National Forest Management Plan allocates most of this area (80%) to Management Area 9 (remote highlands) and Management Area 7 (scenic corridors along U.S. 60 and the Blue Ridge Parkway). Both of these management areas are designated as unsuitable for timber management.

Twenty percent of the area is in Management Area 14 (remote habitat for wildlife). This area, which is limited to the upper portions of the Pedlar Gap Run, Lowry Run, and Poplar Cove Run watersheds, is managed to maintain or enhance habitat for wildlife species that favor a mature forest environment, areas of dense vegetation cover, and freedom from continued disturbance. Within this area, 86% (1,221 acres) is designated as suitable for timber management. Timber in most of this area is better quality hardwoods. However, one-third of the Poplar Cove Run watershed is in young stands due to salvage harvests in the mid 1960's following the Hellgate Fire. Timber in Management Area 14 is harvested on long rotations. Harvest areas average about 20 acres, with a maximum size of 25 acres.

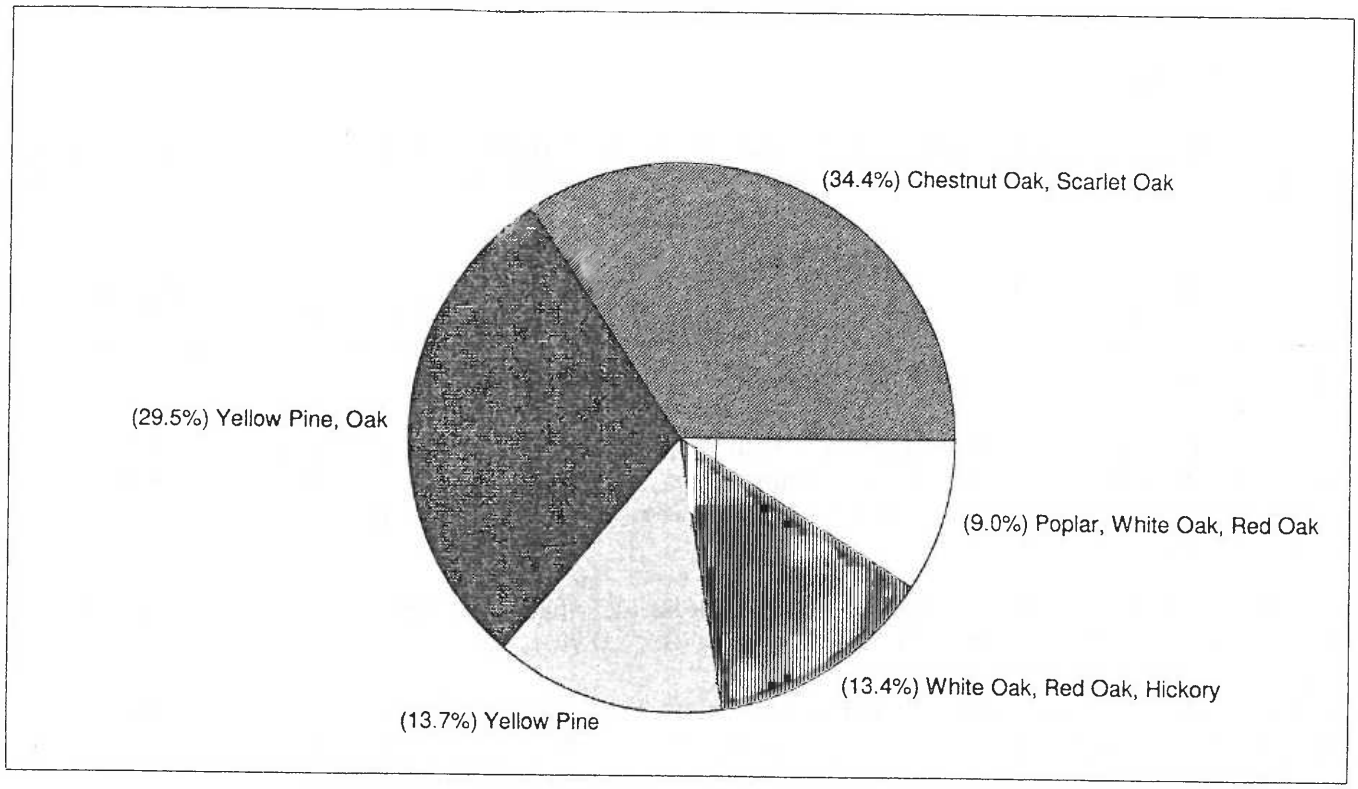

Figure 1. Timber Types

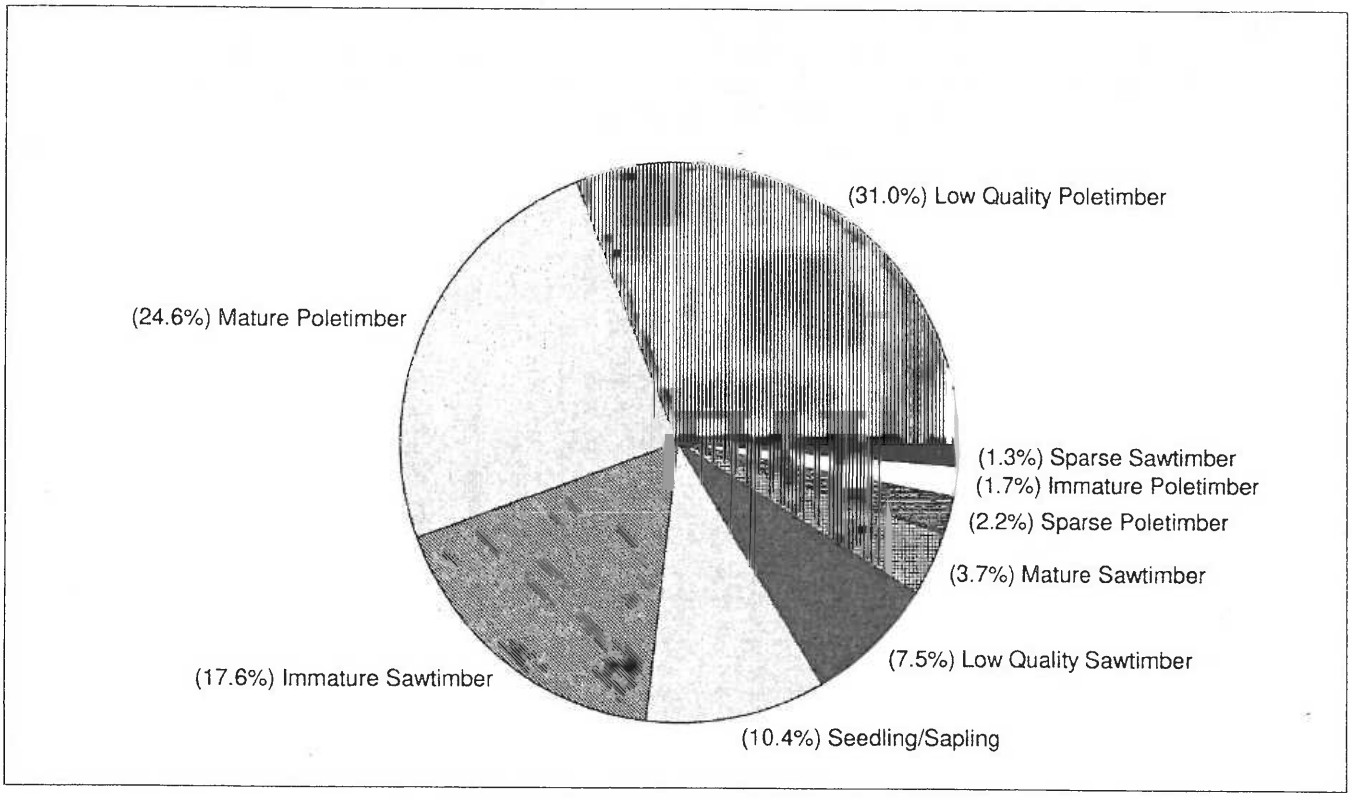

Figure 2. Timber Stand Condition Class

ANALYSIS OF THE RESOURCE DATA

The planning effort began with an assessment of damages from past storm events, along with careful analysis of the hydrology of the area and stream channel hydraulics. In order to assess the economic damages within Buena Vista, it was necessary to determine the level of current damages sustained by properties within the floodplain or that could possibly occur as a result of future storms. This is a two-part effort since both water levels and building elevations must be known.

The water level at any given location is determined by the volume of water for a given flood frequency, the slope and roughness of the channel, and the shape of the channel. A HEC-1 analysis done by the engineering firm of Dewberry & Davis was used to determine the flow discharges for nine subwatersheds within the drainage areas of Indian Gap Run and Noel's Run. An additional five subwatersheds were used to determine discharges within Pedlar Gap. Three subwatersheds were used on Chalk Mine Run. The flood frequencies used were 5, 25, and 100 years.

In order to expedite the planning effort, NRCS teamed up with the Federal Emergency Management Agency (FEMA) to hire a contractor to do the water surface profile analysis. Dewberry & Davis performed the work during the summer of 1996 under a contract with Woodward Clyde Federal Services. Dewberry & Davis used the HEC-2 computer program to determine the water surface elevations at 17 cross-sections on Chalk Mine Run, 37 cross-sections on Indian Gap Run, 20 cross-sections on Noel's Run, and 22 cross-sections on Pedlar Gap Run. Water surface profiles were determined for both the "without project" and the "with project" conditions.

In May of 1995, NRCS survey crews determined the first floor elevation and point of water entry elevation for every building in approximately 114 City blocks. An additional 12 blocks were surveyed in June of 1996. Approximately 900 buildings were surveyed.

For buildings without basements, the water elevations for the three storm frequencies were compared to the first floor elevation of the building. For structures with basements, the point of water entry was used as the point where damage began to occur. Water depth and damage relationships were based on functions provided by the Federal Insurance Administration of FEMA. Personal interviews with selected homeowners and private businesses were used to supplement elevation survey data. These interviews confirmed and quantified damages experienced during previous storm events, e.g., in 1995, 1992, 1985, and 1969.

Of the approximately 900 buildings surveyed, the analysis indicates that approximately 341 are subject to damages from interior stream flooding should a 100 year storm event occur. A 100 year storm event is a major storm and is considered to have a one percent chance of occurrence in any given year. About 277 buildings are projected to be damaged by 25 year storm events (4% chance of occurrence in any given year), and 39 buildings are estimated to be damaged by 5 year storm events (20% chance of occurrence in any given year). The two storms which occurred within a few days of one another in June of 1995 were of a 25 year storm event magnitude.

The properties identified as possibly being subject to future damages represent an approximation based on the data collected and computer simulations of potential storms in the future. Such approximations are estimates based on the best data and analysis tools available. The number of properties and actual damages incurred as a result of future storm events may be more or less than the damages estimated and reported here. This is especially true given the complex and dynamic set of relationships which exist

within the drainageways of these streams. Multiple culverts of varied capacities are typical, as are variations in the channel capacities. In addition, the nature of the upper watershed includes an essentially inexhaustible supply of rock cobbles and other bedload materials such as trees and sediment. Thus, where stream blockages occur is a function of the volume and type of materials which are transported by the storms and where they are deposited. In-stream obstructions cause the water to spill out on to adjacent public and private properties, and damages result.

Of the 341 properties projected to receive damages from 100 year storm events, 34 are within the Chalk Mine Run subwatershed, 223 are within the influence of Indian Gap Run, 23 are associated with Noel's Run, and 60 are expected to be impacted by Pedlar Gap Run. These properties and associated grounds include 246 private residences, 71 businesses, 17 public facilities, 5 churches, 1 professional association, and 1 veterans organization.

The evaluated damage categories for which monetary estimates were made are:

a) damages to public and private buildings;
b) building content damages;
c) private clean-up/debris removal costs;
d) public infrastructure damage, clean-up/debris removal and repair;
e) administrative costs borne by Buena Vista and state and federal agencies to respond to emergency circumstances brought about by flooding (overtime, report and grant proposal preparation, processing of flood insurance policy claims, travel and per diem, etc.);
f) lost business income; and
g) flood damage cost avoidance expenditures.

In addition, substantial disruption to emergency services is expected to occur with the larger storm events. However, emergency service disruption damages were not quantified and monetized. They weren't quantified because they were presumed to be relatively small in monetary terms, but could potentially cause loss of life. Disruptions of transportation in general, communication lines, and sewer and water services are also potential damages categories for which monetized estimates were not made.

A few explanations follow regarding the flood analysis. The number of properties flooded and the associated dollar value of damages which follow are based on "future without project" (FWOP) assumptions. The key assumption for the FWOP scenario is associated with the hydrologic and hydraulic effects anticipated from known efforts, or soon to be undertaken efforts to expand the intercity stream channel capacities. Buena Vista has already undertaken numerous works of improvement which will affect the intercity stream channel capacities via removal of some culverts, enlargement of others, etc. In addition, State and FEMA funded efforts will likely remove some properties from receiving damages via channel capacity expansion, concrete lining of portions of the channel on Indian Gap Run, and relocation or elevation of some homes. All of these efforts were already known to be underway or planned for implementation and were used in this analysis in order to establish current conditions and trends.

Future without project damages were calculated based on interviews and analysis of the expected physical condition of the channels and their ability to contain drainage volumes during flood stages. The analysis indicates that substantial damages in the City will likely occur in the future primarily due to insufficient interior drainage channel capacity. Damages for the 100 year storm event are estimated to total around $11,423,000. Damages from 25 and 5 year storm events are estimated around $7,423,000

and $484,000 respectively. These are estimated damages due to intercity stream floods only. Damages would be much higher if the Army Corps of Engineer's flood wall were not in place and if the City's concrete lining of Indian Gap Run did not get implemented. Some storm events could conceivably cause simultaneous flooding on both the river and the intercity streams, and the combined waters could exacerbate the depth of flooding and ponding which would occur from intercity stream flooding only.

The FWOP damage estimates for 100 year storm events include approximately $5.34 million dollars in structure damages (47% of total damages), $2.41 million dollars in content damages (21%), $1.87 million dollars in public infrastructure damages (16%), and $1.14 million dollars in lost business income (10%). The FWOP damage estimates for 25 year storm events include $3.72 million dollars in structure damages (50% of total damages), $1.69 million dollars in content damages (23%), $1.30 million dollars in public infrastructure damages (18%), and $454,000 in lost business income (6%). FWOP damage estimates for 5 year storm events are estimated around $484,000 with damages to structures and their contents representing 54% and 22% of total damages respectively. Private clean-up costs and public administrative costs for the 5 year event were less than 2% of total damages in each case. The table below provides a complete breakdown of the estimated damages for all evaluated damage categories and storm events.

Table H - Buena Vista Intercity Stream Flood Damages[1] for the Existing Conditions and Trends (FWOP) ($ Millions)

Storm Event (years)	Structure Damages	Content Damages	Debris Removal/ Infra-structure Repair	Lost Business Income	Adminis-trative Costs	Private Clean-up Costs	Totals
100	$5.34	$2.41	$1.87	$1.14	$0.361	$0.305	$11.42
25	$3.72	$1.69	$1.30	$0.454	$0.168	$0.089	$7.42
5	$0.262	$.106	$0.91	$0.083	$0.093	$0.071	$0.484

The above damages are single event estimations, not annual damages based on annualized projections. However, the single event damage estimates are crucial for building average annual damage projections. These damages form the basis for the construction of a damage frequency curve which relates percent chance of occurrence with specific event level damage estimates. The resulting functional relationship allows the analyst to predict damages for lesser or greater storm events and to annualize damages from all storm events. The average annual damage estimate from all storm events and resulting intercity stream flooding is $1,356,000. This figure includes $1,042,000 in average annual damages derived from the damage categories listed above in Table H, and $314,000 in additional costs estimated to be accruing to private business in Buena Vista as flood damage avoidance costs. The private industry flood damage avoidance costs are costs which occur given past flooding experience and are due to the very real threat of future flooding regardless of the magnitude of predicted future storm events.

[1] Damages evaluated and reported here are the cumulative damages from flooding on the four internal drainageways studied: Chalk Mine Run, Indian Gap Run, Noel's Run, and Pedlar Gap Run.

The estimated damages vary considerably not only by storm event, but also with respect to the different intercity stream subwatersheds. The overwhelming majority of damages from all categories occur within the Indian Gap Run subwatershed. Structural damages within Indian Gap Run constitute 72% of the total structural damages for the 100 year storm event ($3,866,000 of $5,337,000). Predicted structural damages from the 100 year storm event in the Chalk Mine Run and Pedlar Gap Run subwatersheds amount to 8% and 7% of total structural damages respectively ($803,000 combined). Structural damage estimates for the 100 year storm event within the Noel's Run subwatershed are more substantial and make-up the remaining 12.5% ($669,000) of total structural damages.

Damages to public infrastructure and the costs for clean-up and repair of roads, culverts, ditches, etc. were greatest in the Pedlar Gap and Noel's Run subwatersheds ($1,154,000 combined). These two types of damages represent 62 percent of the total projected damages to public infrastructure. Damages and associated repair costs to public infrastructure for the 100, 25 and 5 year storm events are projected around $1,867,000, $1,303,000, and $91,000 respectively. Actual experience from the June 1995 floods resulted in a documented $1,415,000 in public infrastructure damages, clean-up and repair costs. Damages in the future from comparable storms would be less because of the expected benefits from the City's project to line much of Indian Gap Run with concrete. In addition, numerous culverts and bridges on all four of the intercity streams have been removed and will not be replaced. Therefore, they will no longer receive damages and require clean-up and repairs.

The largest losses in foregone business income occur within the Indian Gap Run subwatershed (approximately $806,000 or 71% of the losses for the 100 year storm event). Business income losses in the Pedlar Gap Run subwatershed represented about 21% ($242,000) of the total estimated losses in this category resulting from the 100 year storm event. Noel's Run ($7,500 business income losses) and Chalk Mine Run ($83,000) are projected to receive substantially less business income losses because they are predominantly residential areas.

In summary, for the FWOP condition, damages from 100 year storm events are largest for the building structures damage category ($5.34 million), and proceed in descending order to building contents ($2.41 million), private business income loss ($1.14 million) and public infrastructure ($1.87 million). With respect to the subwatersheds, overall damages are greatest within Indian Gap Run (62% of total damages), with Pedlar Gap Run (14%) a distant second place, and Noel's Run (13%) and Chalk Mine Run (9%) with far less damages. Other damages within the City which are unassigned to these four subwatersheds would account for the remaining 2 percent of total damages.

FORMULATION AND COMPARISON OF ALTERNATIVES

Formulation Process

The alternatives for each subwatershed, as well as the overall watershed wide alternatives were formulated based on several criteria. The criteria were: a) an analysis of the hydraulics and hydrology data for the future without project condition and each alternative, b) practical interpretations regarding which actions made sense from an engineering perspective, c) economic feasibility and common sense observations, d) local acceptability, e) environmental issues and considerations, f) cultural resource (archeological and historic) concerns, and g) whether or not a given action was complementary to existing and planned investments in works of improvements by the Army Corps of Engineers (Maury River Floodwall), Buena Vista (Indian Gap Run channel improvements through installation of a concrete lining and bridge and culvert improvements throughout the four subwatersheds), and the City, FEMA, Virginia Department of Emergency Services and the Central Shenandoah Regional Planning District Commission plans to buyout, relocate and or floodproof selected homeowners. Practical effectiveness, complementarity to other investments, economic feasibility and local acceptability were the final test in determining whether or not an individual action was included or excluded from an alternative. These same criteria were also used to determine when to stop adding increments of treatment to a given alternative.

The following alternatives were considered during the initial planning period:

1. No action

2. Possible structural measures such as:

- Debris basins (earth and concrete)
- Debris diverters
- Channel improvements
- Channel crossing improvements (culverts and bridges)
- Remove crossing (close road)
- Low flow crossing
- Enlarge opening
- Floodwater retarding structures
- Berms/floodwalls

3. Possible nonstructural measures such as:

- Relocation/zoning
- Floodproofing
- Land treatment
- Stormwater management

<u>Formulation and Evaluation of Non-Structural Alternatives</u>

The formulation and evaluation of possible actions and sets of actions (alternatives) included an assessment of the use of non-structural measures to mitigate flood damages. The non-structural measures that we investigated included: a) buy-out, b) relocation, c) elevation, d) flood-proofing, e) flood barriers (walls and dikes), and f) early warning/evacuation systems. All of these measures, except for flood-proofing and early warning systems, are very expensive and proved to not be feasible from an

economic benefit/cost perspective on a wholesale basis because the properties in Buena Vista tend to be valued at levels far below national, state and even county-wide averages. This is especially true for properties within Chalk Mine Run, Reservoir Hollow and Pedlar Gap Run. In addition, these alternatives have other considerations which disfavor widespread use of them to reduce future damages.

Buy-out requires that suitable and affordable alternative housing be found by the bought-out property owner in the market of their choice, which isn't always the case in small towns like Buena Vista. Relocation requires movement of the property to a site (open lot) outside of the floodplain. Relocation also involves expenses for temporary housing (usually in motels) and can very quickly escalate to significant amounts. Buy-out and relocation both can have a substantial social cost associated with moving people from their homes. This can be especially true if the involved are long-term residents and elderly. Many residents within the Buena Vista floodplain are elderly, low income individuals and long time residents for whom relocation could be quite traumatic, especially if public condemnation was used to force them to move. Voluntary participation in buy-out/relocation is absolutely preferable, but is unlikely to be adopted on a widespread basis simply because most people prefer the known to the unknown.

Elevation of properties makes sense when the amount of elevation isn't extreme and when the act of elevating the property doesn't cause structural damage to the property. Older homes tend to receive greater structural impacts and need more repairs as a result of elevation. Elevation can also be quite expensive when brick, stucco or slab-on-grade structures are involved. Brick and stucco veneers may need to be removed and disposed of, then replaced after elevation. Frame houses over a crawl space tend to be the easiest and least expensive to elevate. Homes with basements tend to be more expensive to elevate because their utilities are usually in the basement. Many of the homes in Buena Vista have basements or cellars and stucco facades, most tend to be fairly old, low valued, are not in the best of physical conditions and consequently would not make good candidates for elevating.

There are two types of floodproofing, wet and dry. Wet floodproofing allows internal flooding to continue occurring, but increases the property's ability to resist damages. Wet floodproofing can work well for unfinished basements and garages, but isn't commonly thought of as useful for the main living areas of a property. Dry floodproofing involves a series of measures which are aimed at keeping flood waters out. Dry floodproofing can work well and be cost effective when the buildings involved are not subject to extensive hydrostatic pressure and other forces (e.g. subsurface soil pressure, and debris and cobble moved by floodwaters) against the foundation and exterior walls and when extensive strengthening measures are not required. Unfortunately, the foundations of properties within floodplains commonly are subject to significant hydrostatic and soil pressures from subsurface flows during minor storm events, and surface as well as subsurface pressures during larger storm events. Thus, this alternative offers limited potential for use on the large number of potential properties in Buena Vista.

Early warning systems are designed to function with automated stream gauges and local emergency preparedness planning for organizing and carrying out evacuations. They work best in situations where the type flooding that usually occurs involves time lags between the early indications of rising waters and when flooding will occur so as to allow for emergency response. The fact that the upper watersheds of the four intercity streams above Buena Vista are extremely steep, and the distance between the City and the upper watersheds is relatively short excludes an early warning system from being considered as a viable option. In addition, evacuation would be difficult for Buena Vista's elderly floodplain residents.

Flood barriers (masonry walls and earthen dikes) can be very effective at preventing inundation, as a defense against unequal hydrostatic pressure situations and as a means for deflecting debris away from an individual or group of structures. Earthen dikes are often infeasible due to the large surface area which is typically required for their installation. Typical costs for flood barriers range in between the least and most expensive non-structural alternatives. Generally speaking, floodproofing is the least expensive and buyout or relocation tend to be the most expensive non-structural alternatives.

Non-structural measures were judged in the case of Buena Vista to not make sense on a widespread basis because of the above discussed treatment characteristics and site conditions in Buena Vista. The large number of properties involved, the varied levels of risk for future damages from one property to the next, and the potentially very high costs associated with the most effective nonstructural measures (buy-out, relocation, and/or elevation), lead our team to conclude that these measures make the most practical and economic sense when evaluated on a case by case and site specific basis. Assuming a very conservative average cost of $35,000 per home would have resulted in an estimated project cost for non-structural measures of over $9,625,000, just to protect the 275 properties affected by the 25 year storm event. This alternative would likely cost much more because the average cost for commercial properties would be much more than the $35,000 per structure assumed here. Using the same conservative $35,000 per home cost for non-structural alternatives, 100 year storm event protection would cost over $11,900,000. Buena Vista is a relatively small City both in terms of it's physical area occupied and with respect to it's population. Thus, finding sufficient sites for new residences and relocations for every structure located in the floodplain would prove to be completely impractical.

Therefore, in collaboration with the City of Buena Vista, the Central Shenandoah Planning District Commission (PDC), Virginia Department of Emergency Services and Federal Emergency Management Agency (FEMA), a strategic approach was initiated to address the nonstructural alternatives. A pool of potential candidates for voluntary implementation of nonstructural measures was targeted. The houses selected were deemed at greatest risk for future flood damages based on past history and a review of the hydrology and hydraulics models. By using NRCS planning analysis and data, a total of 39 potential properties were identified as good candidates to meet the economic defensibility criteria for evaluation and inclusion in the hazard mitigation grant project. This effort is intended to complement the broader watershed-wide NRCS project proposal from a smaller scale strategic properties focus whereby the properties at greatest risk from recurrent flooding are targeted for buy-out, relocation and/or elevation.

The non-structural hazard mitigation project was an outgrowth of the coordinated whole-watershed planning process. This approach was judged by our Planning Team, the local sponsors and the Virginia Department of Emergency Services, to make the most sense to utilize non-structural alternatives to the maximum extent practical. These investments are considered non-project actions from the PL-566 perspective and thus the associated benefits and costs have been excluded from the proposed Plan-EIS.

The PDC, Virginia Department of Emergency Services and FEMA are moving forward with implementation of this nonstructural measures strategy. NRCS subsequently limited the scope of additional treatment alternatives to structural measures which would address future flooding on a widespread scale and complement the non-structural actions.

Formulation of Structural Alternatives

This report refers to structures that remove sediment, cobbles and woody debris from the flood flow as debris basins. A typical debris basin will be an off-stream structure that is designed to slow the velocity of storm flows and allow the debris to drop out of the water. The water would then rejoin the channel without the debris. The base flow, up to a 1-1.8 return interval event (bankfull), would always be carried within the main channel. A concrete cutoff wall would be used to force storm flows to exit the main channel and pass through the debris basin. The base flow will pass through a trash rack into a concrete pipe through the cutoff wall. A bench, or sill, will be placed at the bankfull elevation at the inlet of the debris basin. Scale modeling will be used to determine the final design(s) of these structures. All of the proposed debris basins allow easy access for earth moving equipment.

A typical debris diverter is a metal rack or frame set into the stream above a stream crossing. It would trap larger debris and prevent it from clogging the culvert or bridge. The amount of maintenance required for this structure and the relatively small amount of debris that would be trapped make installation of this practice impractical for this watershed. Therefore, debris diverters were dropped from further consideration by the Planning Team.

Channel improvements include changing the cross-section, slope, and/or lining material of a stream reach. There are two goals in stream channel improvements: 1) maintain the natural characteristics of the stream and 2) provide the maximum capacity possible. This will be accomplished by a channel-within-a-channel type design. The "natural" stream will be designed using fluvial geomorphology and will accommodate the "bankfull" event (approximately 1-1.8 year return frequency). Typically, the "natural" stream will be bounded on one side by the stream bank and on the other side by an earthen bench set at the bankfull elevation. The width of the bench will determine the additional capacity of the entire channel.

To the extent possible, the work done in the stream will be done during the season in which the channel is dry. The streambanks will be armored where needed to protect against scouring. One of the possible alternatives for the armoring is the use of interlocking concrete grids. Many of these grids have openings that can be filled with soil and vegetated. This will both protect the bank and provide a more attractive appearance.

Channel crossing improvements are made when the size or the configuration of the culvert or bridge causes a constriction in the flow. One option for improvement is to remove the culvert or bridge and close the road. Another option is to replace the crossing with a low-water crossing. Neither of these options is acceptable to the community. The third option is to replace the crossing with a larger structure. An example of this would be a hy-span type bridge that has no piers in the channel. Large parallel box culverts that closely match the channel capacity are another option.

The option of constructing detention facilities upstream of the town to reduce peak discharges and gather sediment was evaluated. With the steep mountains, the volume available for detention was found to be insufficient to reduce peak discharges significantly. These structures would also be classified as "High Hazard", and as such, are unacceptable to the City residents. Therefore, detention structures were dropped from further consideration by the Planning Team.

Floodwalls and berms were considered for the locations where the flow area needed to be constricted for a short reach of the stream. For the purposes of this study, only small structures, less than 4 feet high,

were considered. The floodwalls were modeled as free-standing concrete walls approximately two feet thick. Berms are typically made of earth with 2:1 side slopes. Earth structures have a relatively large "footprint" on the ground and require more land than a concrete floodwall. The aesthetics are another factor in the selection of the structure used.

Relocation and zoning are ways to keep the floodplain free of obstructions and reduce the threat to life and property. The City is pursuing the use of FEMA's Flood Mitigation Program to possibly acquire, relocate or elevate repetitive loss structures. Therefore, NRCS dropped these non-structural alternatives from further consideration for implementation with PL-566 funds.

Floodproofing may be appropriate for buildings that receive relatively small amounts of water during a flood. This practice could include elevation of the building, closing the point of water entry, or relocating appliances from basements to upper levels. This may be appropriate for individual structures, but was not considered on a wholesale basis as a solution to the flooding problem in Buena Vista.

Land Treatment practices are typically used in rural watersheds where changes in the activities in the watershed tend to increase the quantity of water and decrease the quality. For the Buena Vista watershed, the land use will probably experience little change since most of the headwaters area is in the George Washington and Jefferson National Forests.

Stormwater management is a way to control the quantity of water that is contributing to the stormwater discharge. As the amount of impervious surfaces increases through the installation of roads and roofs, the amount of water that runs off the land increases. In many places, the local ordinances require developers to temporarily detain any runoff that is greater in quantity than the predevelopment runoff.

Description of Alternative Plans

After much debate and discussion, along with hydrology and hydraulic modeling, it was decided that the most probable solutions were related to two major categories of structural practices:

1) Stream Channel Capacity Enhancement, and
2) Debris Removal

These two umbrella solutions made the most sense from a technical and practical perspective. The selected measures under the umbrellas were the following:

1) Construct debris basins;
2) Replace/enlarge/remove culverts and/or bridges;
3) Construct flood walls and berms;
4) Improve/realign stream channel;
5) Replace railroad bridges; and
6) Increase channel gradient.

It was decided that these structural measures in combination, strategically placed throughout the four interior streams, would significantly address the flooding problem in Buena Vista. The Planning Team then looked at each stream individually to determine where these structural measures would best be located in order to fit together into an overall flood control plan.

After each stream was evaluated and modeled separately, the Planning Team packaged the various structural measures for each stream into four alternatives. These alternative packages were discussed

with the project sponsors and met the acceptability test. These alternatives are shown below and are evaluated and described in more detail in later sections of the report.

Alternative 1 - Stream Channel Capacity Enhancement and Debris Removal - Level I.
Alternative 2 - Stream Channel Capacity Enhancement and Debris Removal - Level II.
Alternative 3 - Stream Channel Capacity Enhancement and Debris Removal - Level III.
Alternative 4 - No Action

Evaluation of Alternative Plans

Some of the practices proposed did not affect the hydraulic modeling used in the analysis. Those practices were analyzed separately. The following measures were evaluated to control the flooding:

1. Increase flow capacities
   a. Resize culverts and bridges
   b. Enlarge stream channels
2. Restrict flow area
   a. Berms
   b. Small floodwalls

Modeling

There were two computer models used in the analysis of the four Buena Vista watersheds. The first one, HEC-1, is a program written by the U.S. Army Corps of Engineers Hydrologic Engineering Center that is used to calculate the amount of water that would run off from the watershed during a given storm event. This program evaluates the slope of the land, the soils, and the land use in order to compute the discharge for each storm. For this report, the five, twenty-five, and one hundred year storm discharges calculated by Dewberry & Davis from the HEC-1 model were used in the HEC-2 model to determine the water surface elevations throughout each watershed. The HEC-2 model was also written by the Hydrologic Engineering Center. It uses the discharge for the selected storm event and the shape, size, roughness, and slope of the channel to estimate the elevation of the water surface at each cross-section in the channel. It also evaluates each stream crossing to see what effect it has on the flow.

The HEC-2 computer model can be used to simulate two different flow conditions: subcritical flow and supercritical flow. For channels with earth or riprap linings, the flows are typically slower and deeper than for smoother channel linings, and are best described by the subcritical model. The concrete channel from Cedar Avenue to Chestnut Avenue is very smooth, and its fast, shallow flows are best described by the supercritical model. The transition from subcritical to supercritical will occur if there is a change in grade from a flatter grade to a steeper grade. For the faster supercritical velocities, the flow area will be smaller, and the water will stay in the concrete channel, for the most part. The transition from supercritical to subcritical flow will occur if the grade is flattened or if a constriction causes the flow to slow down. In this transition, the flow will abruptly change from fast, shallow flow with a relatively small cross-sectional area to slow, deep flow with a relatively large cross-sectional area. This phenomenon is called a hydraulic jump.

Project Descriptions

The quantities, elevations and sizes listed in the project descriptions are based on preliminary analysis and should be used for planning purposes only. These criteria could change during final design.

The following provides a breakdown of each individual stream and describes the proposed plan including a detailed description of each considered measure.

Chalk Mine Run

Chalk Mine Run and its tributary, Washer Hollow, both experience flooding along the length of the channel. This is due primarily to lack of channel capacity and to stream crossing constrictions. The lower end of Chalk Mine Run also experiences flooding from the Maury River. (The U.S. Army Corps of Engineers floodwall begins downstream of the outlet of Chalk Mine Run.) Most of the road and railroad crossings along this stream are relatively large. The exceptions to this are the culvert at Rockbridge Avenue and the bridge to Fitzgerald's Lumber Plant. Woody and rock debris often contribute to the flooding by blocking the smaller stream crossings.

The water surface elevation in the lower end of Chalk Mine Run will vary with the elevation of the water in the Maury River. To judge the effect of these elevation changes, several different starting elevations were modeled. In each case, the water surface profiles were identical above the Route 60 bridge. This leads to the conclusion that the flood elevations on Chalk Mine Run will not be impacted by the water surface elevation in the Maury River for the size of storm that will produce a 100 year storm event.

Watershed Description of Chalk Mine Run

Drainage Area: 3847.3 acres (6.01 sq. mi.)
- Woods: 3469.2 acres (90%)
- Residential: 221.5 acres (6%)
- Industrial: 116.3 acres (3%)
- Commercial/Business: 40.3 acres (1%)

Channel Length Modeled:
- Main: 7735 linear feet
- Washer Hollow Tributary: 980 linear feet

Discharge at confluence with the Maury River:
- 5 year frequency event: 2165 cfs
- 25 year frequency event: 5670 cfs
- 100 year frequency event: 8480 cfs

Problem Description of Chalk Mine Run

For the purposes of the evaluation, Chalk Mine Run was divided into three reaches based upon the three primary damage areas. Overland flow, ponding, and debris are the primary damage sources.

From the Norfolk Southern Railroad bridge downstream to the confluence with the Maury River (1475 linear feet), there is ponding due to the lack of channel grade and capacity.

- High water surface elevations on the Maury River will increase the ponding.

From the Norfolk Southern Railroad bridge upstream 1220 feet, the channel capacity is inadequate to carry flood flows.

- Excess water from the channel floods Route 60 at the railroad bridge.
- The culvert under Rockbridge Avenue is too small.

From upstream end of the second section to the confluence of Chalk Mine Run (5040 linear feet) and the tributary Washer Hollow (980 linear feet). the channel capacity is inadequate to carry flood flows.

- The bridge to lumber plant is too small.

Potential Solutions for Chalk Mine Run

The possible solutions considered include:

- channel enlargement
- replacement of bridges
- installation of berms
- enhancement of existing berms
- flood retention structures
- stormwater overflow areas
- debris basins

Alternatives Considered for Chalk Mine Run

Alternative 1 for Chalk Mine Run:

- Increase channel capacity for 1190 linear feet immediately above Norfolk Southern bridge (305 linear feet of riprap, 885 linear feet of earth channel)
- Replace Rockbridge Avenue culvert with a bridge
- Increase channel capacity for 350 linear feet going downstream on main channel behind shopping center from the confluence of Washer Hollow and Chalk Mine (earth channel)
- Increase channel capacity on Washer Hollow upstream of confluence with Chalk Mine Run for 315 linear feet (140 linear feet of earth channel, 175 linear feet of riprap)
- Increase storage capacity of channel for larger storm events by excavating material from existing basin area above lumber plant bridge
- Replace lumber plant bridge with a larger structure
- Raise existing berm behind hotel to provide additional protection for shopping center (water will remain in channel area rather than break over into parking lot)
- Construct a debris basin below the Catalpa Street bridge for the purpose of trapping sediment and debris during smaller storm events.

Alternative 2 for Chalk Mine Run:

Same as Alternative 1 with the following addition:

- Increase channel capacity below Norfolk Southern bridge for a distance of 825 linear feet (545 linear feet of riprap channel and 280 linear feet of earth channel)

Indian Gap Run

When this study was initiated, there were two primary damage areas along Indian Gap Run. Below Walnut Avenue, the damage occurred from water that was ponded due to outlet constrictions. In the upper part of the channel, damages were from overland flow that occurred when water left the channel at Hawthorne Avenue and Cedar Avenue, and flowed down Twentieth Street instead of rejoining the channel. Since this study began, the City has received a grant that will enable them to line the stream channel with concrete from Cedar Avenue to Chestnut Avenue and remove most of the channel constrictions within that reach. The channel lining and removal of the stream constrictions will significantly reduce the amount of damages from overland flooding. This concrete channel, as modeled by City consulting engineering company Mattern & Craig, used the supercritical flow regime of the HEC-2 model. However, there will still be some overland flow down Twentieth Street from water which escapes the channel above Cedar Avenue and is unable to rejoin the stream. Some additional overland flow will occur below Walnut Street where the grade change in the concrete channel causes a hydraulic jump. Additional overland flow damages will occur where rocks and woody debris block the stream crossings and the water is forced out of the channel.

There are three main factors that contribute to the ponding in the lower part of Indian Gap Run. The primary problem is that the flow capacity of the Norfolk Southern railroad bridges is too small. The downstream railroad bridge has a span of only 18 feet, and although the total span of the upstream bridge is 77 feet, the effective span is only 44 feet. The water velocity is significantly reduced when these constrictions are reached. A second problem associated with the railroad crossing is that the railroad embankment is about 6 feet higher than the elevation of the commercial area of the City. This further reduces the available flow area and the flow velocity. The third factor is that the grade of the channel and the floodplain is very flat. This causes additional reductions in the flow velocity. With the slower velocities, more cross-sectional area is needed to carry the flow. The proposed practices are designed to increase the flow capacity and velocity, and thereby, reduce the damage area.

The Magnolia Avenue bridge, and the Forest Avenue and Chestnut Avenue culverts will be inundated by ponded water during the 25 and 100-year floods. The Virginia Department of Transportation (VDOT) plans to replace the Magnolia Avenue bridge. Because of the high backwater, increased capacity at the bridge will not improve the flooding conditions for a storm greater than a 25-year event. However, the new crossing should be sized to provide at least as much capacity as the Forest Avenue culvert but be no larger than the five 10'x10' box culverts at the floodwall. At Forest Avenue, Indian Gap Run passes through a triple 9' x 3.5' box culvert and, at Chestnut Avenue, a triple 10' x 3.5' box culvert. During flooding events, a large percentage of the flow passes over the roads. It is impractical to contain this flow within the culverts because of the high tailwater. During the 100-year flood, this tailwater submerges the roadway. Therefore no alterations are proposed to increase the capacity of these culverts.

The solutions to the flooding problem along Indian Gap Run can be divided into three parts: reducing the ponding area, maintaining the flow within the channel above Cedar Avenue, and eliminating blockages from debris.

Watershed Description Of Indian Gap Run

Drainage Area Above Confluence with Noel's Run: 1051.5 acres (1.64 sq. mi.) (Based on 1993 computations)

Woods: 873.3 acres (83%)
Open: 9 acres (1%)
Residential: 169.2 acres (16%)

Indian Gap was modeled as a single channel from the headwaters to the confluence with the Maury River. Noel's Run is modeled as a tributary.

Drainage Area of Watershed to Confluence with Maury River:
2839.9 acres (4.44 sq. Mi.)

Channel Length Modeled: 7700 linear feet

Discharge at confluence with Maury River:

5 year frequency event: 1652 cfs
25 year frequency event: 4019 cfs
100 year frequency event: 5942 cfs

Problem Description Of Indian Gap Run

There are three areas where flooding from Indian Gap Run occurs.

Above Cedar Avenue, water escapes from the channel and causes damages along Twentieth Street.

- The channel capacity is inadequate.
- The water moves directly down the hill and is unable to rejoin the channel.

Flooding also occurs in the lower section of the concrete channel.

- Buena Vista's design for the planned concrete channel from Cedar Street to Chestnut Street was used in the "Future without Project" and the "Future with Treatment" model.
- Flooding along most of the channel will be negligible after the concrete channel is in place.
- The HEC-2 model, in supercritical flow, shows that there will be two hydraulic jumps in the concrete channel below Walnut Avenue.

However, the vast majority of the damages occur from ponded water in the lower part of the watershed.

- There are two railroad bridges just above the floodwall gates. The downstream bridge is less than 18 feet wide and is a significant constriction to the flow.
- The upstream railroad bridge and its embankment also are a constriction.
- The gates through the floodwall are flap gates. As such, they will allow the free outlet of water from Indian Gap Run unless the Maury River is at a flood elevation greater than that of the interior stream. At that point, the water will be diverted into the interior drainage channel.

The culverts and bridges along the channel were modeled as follows for the "Future without Project" condition:

- Norfolk & Western Railroad: unchanged
- Norfolk & Southern Railroad: unchanged
- Route 501 (Magnolia Avenue): unchanged
- Forest Avenue: unchanged
- Chestnut Avenue: unchanged
- Seventeenth Street: unchanged
- Walnut Avenue: culvert removed
- 18th & Maple: replaced with bridge
- Birch Avenue: culvert removed
- 19th & alley: replaced with bridge
- 20th Street: culvert removed
- Cedar Avenue: new precast bridge

Debris blockages were not modeled due to the difficulty of predicting which combination of culverts would clog in a given storm. The channel was assumed to be free of debris.

Potential Solutions for Indian Gap Run

The possible solutions considered include:

- replace one or both Norfolk Southern railroad bridges with another bridge
- replace the Norfolk Southern railroad bridges with 5 10'x10' box culverts
- increase channel capacity below Chestnut Avenue
- replace Magnolia Avenue bridge
- replace Forest Avenue culvert
- construct berms along the channel from Chestnut Avenue to railroad
- realign Indian Gap Run below Magnolia Avenue
- construct floodwall along channel at Hawthorne
- construct debris basins at the ballfield and at 19th Street, 17th Street, Chestnut Avenue, and Forest Avenue
- regrade Cedar Avenue to drain toward channel

Alternatives Considered For Indian Gap Run

Alternative 1 For Indian Gap Run:

- Replace the two railroad bridges with five 10'x10' box culverts, 130 feet long.
- Install a debris basin at the ballfield at the end of 21st Street.
- Install a 3' high floodwall along the channel at Hawthorne Avenue (500 feet).
- When the new bridge is installed at Cedar, grade the road so that flow that escapes the channel will be directed back in before it reaches Twentieth Street (this will be done by the City).

Alternative 2 for Indian Gap Run:

Same as Alternative 1 with the following additions:

- Add approximately 300 feet of channel improvements below Magnolia Avenue and 700 feet of channel improvements above Magnolia Avenue
- Replace the Magnolia Avenue bridge with 4 8'x6' box culverts. Approximately 150 feet of Noel's Run will be improved to match the new grade on Indian Gap Run.
- Although the channel realignment below Magnolia was not modeled, it seems to be feasible. However, the grade of the realigned channel would change only slightly, and therefore, would not significantly improve the velocity of the water. Due to the known industrial contamination of the site, it may not be practical to build a new channel. Certification from the City stating that the site is free from contamination will be required before any NRCS involvement in the realignment of this channel.

Note: After the channel constriction at the outlet is removed by replacing the railroad bridges with box culverts and the channel is enlarged below Chestnut Avenue, there will still be a significant amount of ponding in the lower end of Indian Gap Run. It was determined that it is neither practical nor economically feasible to construct berms to contain the additional water due to the volume of the water involved and the size of the berms that would be required.

Noel's Run

The dominant cause of damages in the Noel's Run watershed is overland flow. Noel's Run has a 400 foot wide 100-year floodplain that inundates numerous residential structures. However, unlike Indian Gap Run where the water is diverted away from the channel, the flow continues along the stream channel. Several projects have already been constructed that increased the stream capacity. Except for a 300 foot segment of stream upstream of 14th Street that has not yet been enlarged, further enlargement of the stream capacity would not impact enough structures to warrant the cost. Rocks and woody debris blockages occur frequently, and further reduce the stream capacity.

Watershed Description of Noel's Run

Drainage Area: 1427.4 acres (2.23 sq.)
Woods: 1369 acres (96%)
Residential: 58.4 (4%)

Channel Length Modeled: 5970 feet

Discharges at the confluence with Indian Gap Run:
5 year frequency event: 616 cfs
25 year frequency event: 1721 cfs
100 year frequency event: 2619 cfs

Problem Description of Noel's Run

For Noel's Run, overland flow occurs along the entire length of the channel. Additional damage is caused by the ponding at the lower end of the stream below Chestnut Avenue.

From Pine Street to Chestnut Avenue, water escapes from the channel and flows overland in a path that is parallel to the channel.

- The capacity of the stream is not adequate to carry the water during storm events.
- Water that escapes from the channel does not tend to return to the channel.
- There is an abundance of debris in the channel that further reduces the channel capacity.

From Chestnut Avenue to the confluence with Indian Gap Run, the flooding is caused by ponded water.

- In the "Future without Project" condition, the ponding at the lower end of the channel is primarily caused by backwater from Indian Gap Run.
- The ponding from Indian Gap Run is masking the actual flooding that is occurring below Chestnut Avenue from Noel's Run. When the ponding from Indian Gap Run is reduced by modeling Alternative 2, then other causes of flooding are revealed. From Chestnut Avenue to Forest Avenue, overland flooding occurs parallel to the channel. However, the extent of the overland flow is greater below Chestnut Avenue than it is above Chestnut Avenue. The flatter grade that begins at Chestnut Avenue causes the water to flow slower and deeper than it does on steeper grades. From Forest Avenue to the confluence with Indian Gap Run, ponding from Indian Gap Run is still dominant.
- There may be a channel constriction at Forest Avenue that will continue to be masked by the ponded water.

Potential Solutions for Noel's Run

The possible solutions considered include:

- debris basins:
    - headwaters - at the end of Pine Street
    - intermediate - at the end of Oak Avenue
    - intermediate - upstream of Maple Avenue
- channel enlargement

Alternatives Considered for Noel's Run

Alternative 1 for Noel's Run:

- Install debris basins.

Note: Although the channel improvements that were modeled were adequate to carry the storm flows, the overland flow from upstream areas did not return to the channel where it could be contained. Therefore, no channel improvements are planned.

Pedlar Gap Run

The flooding in the Pedlar Gap Run watershed is similar to that of the other streams in Buena Vista. There is ponding in the lower end of the channel, overland flow along the length of the channel, and debris blockages throughout. Additional ponding occurs in the upper part of the watershed at some of the culverts. Much of the damage can be attributed to the stream crossings that are too small to pass the increased discharges caused by changes in land use.

Upstream of Woodland Avenue, several projects to increase stream capacity are in place and functioning properly. There were no additional improvements planned for these reaches.

Watershed Description Of Pedlar Gap Run

Drainage Area: 1299 acres (2.03 sq. mi.)
- Woods: 1172 acres (90%)
- Residential: 120 acres (9%)
- Open: 5 acres (0.4%)
- Industrial: 2 acres (0.2%)

Channel Length Modeled: 8395 feet

Discharge at confluence with Maury River:
- 5 year frequency event: 621 cfs
- 25 year frequency event: 1698 cfs
- 100 year frequency event: 2607 cfs

Problem Description Of Pedlar Gap Run

The majority of the damages caused by flooding from Pedlar Gap Run are caused by ponding in the lower end of the channel. However, flooding does occur along the length of the channel due to changes in stream capacity. Debris blockages contribute to the reduction in capacity.

Overland flow occurs from Third Street to just below Ninth Street.
- The channel capacity is not adequate to carry the flows during storm events.
- Most of the stream crossings on this channel do not have adequate capacity to transport flows from storm events.

Upstream of the Third Street crossing, the water is ponded.

The abandoned bridge below Linden Avenue and the Norfolk Southern Railroad crossing both cause the water to be ponded during the larger storms.

Potential Solutions For Pedlar Gap Run

The possible solutions considered include:

- channel enlargement
- replace the railroad culvert with a bigger structure
- remove culverts and close roads
- replace culverts with hy-span type bridges
- install debris basins

Alternatives Considered For Pedlar Gap Run

Alternative 1 for Pedlar Gap Run:

- Replace the railroad culvert with 2 10'x10' box culverts and lower the invert elevation by 5 feet. The new culverts would be installed parallel to the existing culvert. Approximately 120 linear feet of channel would be realigned.
- Remove the Linden Avenue culvert and replace it with a hy-span type bridge deck.
- Remove the abandoned yard bridge.
- Install 733 linear feet of channel improvement. This includes 120 feet of channel realignment.
- Install a drop inlet at the 9th Street culvert.
- Install one debris basin above 2nd Street and another one above 5th Street.

On Pedlar Gap Run, the configuration of the outlet is such that it is possible to lower the outlet by approximately 5 feet without causing a backwater effect within the stream. This will increase the average slope of the channel and increase the velocity. The proposed channel improvements will also increase the cross-sectional area of the channel. These two changes will have the effect of minimizing out-of-bank flow along the improved length of the stream.

Alternative 2 for Pedlar Gap Run:

Same as Alternative 1 with the following additions:

- Remove the inlet constriction on the 9th Street culvert.
- Remove the Woodland Avenue culvert and replace it with a hy-span type bridge.
- Improve the channel from 9th Street to a point approximately 250' above Woodland Avenue (950 linear feet).
- Install a 4' high floodwall above Magnolia Avenue for approximately 250 feet.

Alternative 3 for Pedlar Gap Run:

Same as Alternative 1 with the following additions:

- Replace the Magnolia Avenue bridge with 3 10'x8' box culverts.
- Remove the 9th Street culvert and replace the culvert with a hy-span type bridge. (The outlet structure from Alternative 1 would not be needed.)
- Remove the Woodland Avenue culvert and replace it with a hy-span type bridge.
- Improve the channel from 9th Street to a point approximately 250 feet above Woodland Avenue (1095 linear feet). The grade of this channel will be different from Alternative 2 due to the removal of the outlet structure and the replacement of the Magnolia Avenue culvert.

General Technical Considerations

1. Although a trapezoidal shape was modeled in the channel improvements, it is not the optimum shape for a good channel design. A low flow channel should be provided in each stream to maximize the sediment carrying capacity of base level flows.

2. Storm water management to maintain existing discharge levels is critical.

3. Any debris basins installed should be well maintained to get the maximum benefit.

4. It would be appropriate to restrict additional construction in the 100 year floodplain.

Economic Considerations

The following table displays all cost categories by subwatershed for each of the three evaluated action alternatives.

Table I - Evaluated Action Alternatives and their Associated Costs

Subwatershed	Alternative #1	Alternative #2	Alternative #3
Chalk Mine Run			
Construction Cost:	$1,188,000	$1,343,000	$1,343,000
Property Rights:	$ 157,000	$ 196,000	$ 196,000
Utility Relocations:	$ 10,000	$ 15,000	$ 15,000
Local Administration:	$ 10,000	$ 10,000	$ 10,000
Local Technical Assistance:	$ 15,000	$ 15,000	$ 15,000
NRCS Administration:	$ 25,000	$ 25,000	$ 25,000
NRCS Technical Assistance:	$ 61,000	$ 61,000	$ 61,000
Total Estimated Cost:	$1,466,000	$1,666,000	$1,666,000
Indian Gap Run			
Construction Cost:	$1,758,000	$2,015,000	$2,015,000
Property Rights:	$ 13,000	$ 67,000	$ 67,000
Road Relocations:	$ 7,000	$ 7,000	$ 7,000
Utility Relocations:	$ 0	$ 15,000	$ 15,000
Local Administration:	$ 15,000	$ 15,000	$ 15,000
Local Technical Assistance:	$ 23,000	$ 23,000	$ 23,000
NRCS Administration:	$ 50,000	$ 50,000	$ 50,000
NRCS Technical Assistance:	$ 122,000	$ 122,000	$ 122,000
Total Estimated Cost:	$1,987,000	$2,314,000	$2,314,000
Noel's Run			
Construction Cost:	$ 526,000	$ 526,000	$ 526,000
Property Rights:	$ 52,000	$ 52,000	$ 52,000
Utility Relocations:	$ 10,000	$ 10,000	$ 10,000
Local Administration:	$ 5,000	$ 5,000	$ 5,000
Local Technical Assistance:	$ 8,000	$ 8,000	$ 8,000
NRCS Administration:	$ 20,000	$ 20,000	$ 20,000
NRCS Technical Assistance:	$ 31,000	$ 31,000	$ 31,000
Total Estimated Cost:	$ 651,000	$ 651,000	$ 651,000
Pedlar Gap Run			
Construction Cost:	$ 901,000	$1,484,000	$1,971,000
Property Rights:	$ 69,000	$ 106,000	$ 103,000
Utility Relocations:	$ 20,000	$ 50,000	$ 50,000
Local Administration:	$ 10,000	$ 10,000	$ 10,000
Local Technical Assistance:	$ 15,000	$ 15,000	$ 15,000
NRCS Administration:	$ 50,000	$ 50,000	$ 50,000
NRCS Technical Assistance:	$ 92,000	$ 92,000	$ 92,000
Total Estimated Cost:	$1,156,000	$1,806,000	$2,291,000
Grand Total Project Cost:	$5,260,000	$6,437,000	$6,921,000

The following table provides a summary description of the main alternative components and the associated damages, number of properties impacted, economic costs, benefits, net economic benefits and the estimated benefit/cost ratios.

Table J - Buena Vista Project Analysis Summary

Subwatershed	Future with Project Alternative 1	Future with Project Alternative 2	Future with Project Alternative 3
Subwatershed Specific Project Actions			
Chalk Mine Run	1855 feet channel improvement, replace Rockbridge Ave bridge, replace lumber plant bridge, raise berm, create stormwater basin, 1 debris basin	Same as Alternative 1 plus 825 feet channel improvement	Same as Alt. 2
Indian Gap Run	Replace railroad bridges with culvert, floodwall above Cedar, 1 debris basin	Same as Alternative 1 plus 1150 feet channel improvement, replace Magnolia Ave. culvert	Same as Alt. 2
Noel's Run	3 debris basins	Same as Alt. 1	Same as Alt. 1
Pedlar Gap Run	Replace railroad culvert, remove 1 bridge, 733 feet channel improvement, install 2 debris basins & 1 drop structure, replace 1 culvert with a bridge, realign 120 feet of channel	Same as Alternative 1 plus improve 1 culvert, replace 1 culvert w/ a high span bridge, install a floodwall above Magnolia Ave, install 900 feet of channel improvement	Same as Alt. 1 plus replace 2 culverts w/ high span bridges, replace Magnolia Ave. bridge, install 900 feet of channel improvement
Total Cost	$5,260,000	$6,437,000	$6,921,000
Local Operation and Maintenance	$21,000/Year	$26,000/Year	$28,000/Year
Local Administration & Technical Assistance	$20,000/Yr. for 5 yrs.	$20,000/Yr. for 5 yrs.	$20,000/Yr. for 5 yrs.
Property Rights (based on $27,500/ac)	$292,500 Approx. 10.6 Acres	$422,000 Approx. 15.3 Acres	$419,000 Approx. 15.2 Acres
Utility & Road Relocation	$47,000	$97,000	$97,000
Average Annual Equivalent Benefits	$502,000	$666,000	$684,000
Average Annual Equivalent Costs	$343,000	$419,000	$451,000
Net Benefits (Present Value)	$2,188,000	$3,386,000	$3,199,000

Table J - Buena Vista Project Analysis Summary (cont.)

Subwatershed	Future with Project Alternative 1	Future with Project Alternative 2	Future with Project Alternative 3
No. Properties Damaged FWOP 5YR 39 25YR 277 100YR 341	No. Properties Damaged Alt. 1 5YR 33 25YR 138 100YR 258	No. Properties Damaged Alt. 2 5YR 4 25YR 96 100YR 230	No. Properties Damaged Alt. 3 5YR 4 25YR 90 100YR 210
Expected Damages FWOP 5YR $480K 25YR $7.40M 100YR $11.40M	Expected Damages Alt. 1 5YR $350K 25YR $2.00M 100YR $6.60M	Expected Damages Alt. 2 5YR $60K 25YR $1.40M 100YR $6.60M	Expected Damages Alt. 3 5YR $60K 25YR $1.38M 100YR $6.30M

Comparison of Alternative Plans

The following table summarizes each alternative considered. Major items included in the decision process are included.

Table K - Comparison of Candidate Plans

Project Investment	**Alternative 1**	**Alternative 2 (NED Plan)**	**Alternative 3 (Recommended Plan)**	**Alternative 4 (No Action)**
Channel Improvement	1,855 feet on Chalk Mine Run, 613 feet on Pedlar Gap Run & realignment of 120 feet on Pedlar Gap Run	Same as Alternative 1 plus 825 feet on Chalk Mine Run, 1,000 feet on Indian Gap Run, 150 feet on Noel's Run and 950 feet on Pedlar Gap Run.	Same as Alternative 1 plus 825 feet on Chalk Mine Run, 1,000 feet on Indian Gap Run, 150 feet on Noel's Run and 1095 feet on Pedlar Gap Run.	none
Bridge Replacement and/or Removal	Rockbridge Ave., Fitzgerald's Lumber Plant on Chalk Mine Run, both Norfolk Southern railroad bridges on Indian Gap Run, and lumber yard bridge on Pedlar Gap.	Same as Alt. 1 plus Magnolia Ave. on Indian Gap Run.	Same as Alt. 2 plus Magnolia Ave. at Pedlar Gap Run.	none
Culvert Replacement	Norfolk Southern RR and Linden Ave. at Pedlar Gap Run.	Same as Alt. 1 plus Woodland Ave. at Pedlar Gap Run.	Same as Alt. 2 plus 9th St. at Pedlar Gap Run	none

Table K - Comparison of Candidate Plans (cont.)

Items for Comparison	Alternative 1	Alternative 2 (NED Plan)	Alternative 3 (Recommended Plan)	Alternative 4 (No Action)
Floodwalls/Berms	Raise berm 2 feet on Chalk Mine Run	Same as Alt. 1 plus install a floodwall on Pedlar Gap Run	Same as Alt. 1	none
National Economic Development Account				
Adverse Annualized (AAEs)*	$343,000	$419,000	$451,000	n/a
Beneficial Annualized (AAEs*)	$502,000	$666,000	$684,000	n/a
Net Beneficial	$159,000	$247,000	$233,000	n/a
Benefit/Cost Ratio	1.47	1.59	1.52	n/a
Environmental Quality Account				
Beneficial				
Water Quality	Reduced NPS pollution from sediment, oils, gas and sewage during flood events.	Same as Alt. 1.	Same as Alt. 1.	n/a
Riparian Area	Planted shrubs and trees will provide some limited wildlife habitat.	Same as Alt. 1.	Same as Alt. 1.	Existing scattered trees and shrubs provide limited wildlife habitat.
Adverse				
Water Quality	Temporary water quality impacts during project construction.	Same as Alt. 1.	Same as Alt. 1.	Water quality impacts from oils, sediment, gas and sewage in floods.
Riparian Area	Loss of a few scattered trees.	Same as Alt. 1.	Same as Alt. 1.	n/a
Other Social Effects Account				
No. of Properties Damaged by storm event:	5YR 33 25YR 138 100YR 258	5YR 4 25YR 96 100YR 230	5YR 4 25YR 90 100YR 210	5YR 39 25YR 277 100YR 341

* AAEs - Average Annual Equivalents based on 7.125% discount rate and a 55 year period of analysis.

Table K - Comparison of Candidate Plans (cont.)

Other Social Effects Account (cont.)				
Adverse				
n/a:	Debris basin at the end of 20th St. reduces size of ballfield parking area	Same as Alt. 1	Same as Alt. 1	Long term stagnation in economic activity and local job opportunities
Beneficial				
n/a	Provides flood protection for many low income, elderly and minority residents. Local economic development prospects improved.	Same as Alternative 1.	Same as Alternative 1.	none
Regional Economic Development Account				
Positive Effect				
	Alternative 1	**Alternative 2 (NED Plan)**	**Alternative 3 (Recommended. Plan)**	**Alternative 4 (No Action)**
Annualized Benefits (AAEs*)				
Region:	$502,000	$666,000	$684,000	n/a
Rest of Nation:	--	--	--	n/a
Negative Effect				
Annualized Costs (AAEs*)				
Region:	$28,000	$40,000	$40,000	n/a
Rest of Nation:	$315,000	$379,000	$411,000	n/a

* AAEs - Average Annual Equivalents based on 7.125% discount rate and a 55 year period of analysis.

Risk and Uncertainty

The estimates for flooding, costs and benefits are based upon the best data available at the time of the evaluation and development of the plan. Most of these data sources were derived from computer models related to hydrology, hydraulics and economics. Therefore, there is always a possibility of errors in measuring or estimating actual impacts. Variance between planned and actual costs and benefit estimates may also result.

Rational for Plan Selection

All three project alternatives have favorable benefit/cost (B/C) ratios and positive net economic benefits. The B/C ratios range from a low of 1.47 for Alternative 1, to 1.59 for Alternative 2. Alternative 3 has a B/C ratio of 1.52, which is in between the estimates for the other two alternatives. Each of the three project alternatives improves upon the Future Without Project alternative by both reducing the total number of properties and infrastructure items damaged, and by reducing the value of remaining damages which result because expected water depths will be lower with each one.

Alternative 2 is projected to yield the highest amount of net benefits, estimated at $3,386,000 in present value terms. NRCS policy requires agency professionals to recommend to the project sponsors the alternative with highest net economic benefits. The alternative which maximizes net economic benefits is considered the one which achieves National Economic Development (NED). National policy requires the NRCS to select the NED alternative for implementation unless other considerations are judged sufficient to result in another alternative being preferred by the NRCS and local sponsors.

After consultation with the local sponsors, alternative 3 was selected as the recommended plan. Alternative 3 yields $187,000 less in net benefits than the NED alternative ($3,199,000), but provides a more complete treatment of the flooding problems. An additional 26 properties are protected with alternative 3 as compared to alternative 2. Alternative 3 also best meets the local acceptability criteria, i.e., t is the preferred alternative of the project sponsors and public because it includes specific considerations that better meet their needs and it provides more protection than the other alternatives. The projected average annual damages associated with alternative 3 are lower for any given storm event than for alternatives 1 and 2. However, the added costs associated with alternative 3 increased more relative to the added benefits which indicates that the point of diminishing returns for added investments has been surpassed.

CONSULTATION AND PUBLIC PARTICIPATION

Local, State and Federal support for the proposed Buena Vista Watershed Project has been overwhelming. Input and involvement of the public has been solicited throughout the planning of the project. Through meetings and correspondence with the local sponsors, public, other agencies and organizations, the members of the Natural Resources Planning Team have received input into the planning of this watershed.

In May 1993, following the flood of 1992, the Sponsors submitted an Application For Federal Assistance requesting that NRCS address the interior streams flooding problem.

In June 1994, a public meeting was held at the Buena Vista City Hall. The meeting was attended by approximately 30 people who were landowners and/or government agency representatives. The project was discussed with people voicing their issues and concerns about the watershed. Almost all in attendance were supportive of the project and were in favor of pursuing the development of a flood control plan for the Buena Vista Watershed.

The project was discussed at a scoping meeting held on February 28, 1995. The meeting was attended by NRCS, U.S. Forest Service, Virginia Department of Conservation and Recreation, City of Buena Vista, Army Corps of Engineers, Central Shenandoah Planning District Commission and local landowners. Forty other groups and individuals that were on a U.S. Forest Service scoping list were also contacted by letter.

A public meeting was held on October 24, 1996 at City Hall where the preliminary hydrology and hydraulics model results were presented and accepted by those in attendance.

Information was presented by NRCS at City Council meetings held on November 18, 1997 and December 18, 1997 on the various alternatives. City Council selected Alternative 3 as the recommended alternative at the December 18, 1997 meeting.

A public meeting was held on January 29, 1998, at City Hall to present Alternative 3, the recommended plan, to the public and get their comments before completing the Draft Plan. The meeting was attended by about 25 people. The plan received favorable support from those in attendance.

A Draft Plan and Environmental Assessment was distributed for interagency and public review and comments on April 1, 1998. The notice of the Draft Plan/EA was published in the Federal Register. The comment period ended on May 18, 1998. Due to the final cost estimates exceeding $5 million dollars, and NRCS statute which require plans that exceed $5 million to be evaluated as an EIS and also to go to Congress for approval. Therefore, NRCS determined that an EIS was needed based on these requirements.

A scoping meeting was held on the intent to prepare an EIS in Lexington on September 3, 1998. The meeting notice was published in the Federal Register and local newspapers and a Notice to Prepare an EIS was sent to interested agencies, organizations and individuals. NRCS was the only agency that attended the meeting. No additional comments were received from others.

A Draft Plan-EIS was distributed for interagency and public review on October 13, 1998. The EIS Notice of Availability was published in the Federal Register, Volume 63, Number 210 on October 30, 1998. The official comment period ended on December 14, 1998.

Comments were requested on the Draft Plan and EA from the following agencies and organizations and they have responded as follows:

Federal Agencies	Draft Plan/EA	Draft Plan/EIS
Environmental Protection Agency		
Office of Federal Activities	No Response	No Response
Region III, Philadelphia	No Response	Responded
U.S. Army Corps of Engineers, Norfolk District	Responded	Responded
U.S. Department of Agriculture		
Forest Service	Responded	No Response
Farm Services Agency	No Response	No Response
Rural Development	Responded	No Response
U.S. Department of Commerce	No Response	Responded
U.S. Department of Energy	No Response	No Response
U.S. Department of Housing and Urban Development	No Response	No Response

Federal Agencies	Draft Plan/EA	Draft Plan/EIS
U.S. Department of Transportation	No Response	No Response
U.S. Department of the Interior		
Secretary of the Interior	No Response	Responded
Office of Environmental Policy and Compliance	Responded	No Response
Fish and Wildlife Service		
Annapolis, Maryland Office	No Response	No Response
White Marsh, Virginia Office	No Response	No Response
Office of Advocacy and Enterprise	No Response	No Response
Federal Emergency Management Agency, Philadelphia	No Response	No Response
Virginia State Agencies		
Virginia Department of Environmental Quality Office of Environmental Impact Review (State Clearinghouse)	Responded	Responded
Virginia Soil and Water Conservation Board (Governor's Designated Agency)	No Response	No Response
Virginia Department of Emergency Services	No Response	No Response
Virginia Department of Agriculture and Consumer Services	Responded	Responded
Virginia Department of Conservation and Recreation,	Responded	Responded
Virginia Department of Game and Inland Fisheries	No Response	No Response
Virginia Marine Resources Commission	Responded	Responded
Virginia Department of Historic Resources	Responded	Responded
Virginia Department of Transportation	Responded	No Response
Other		
Virginia Association of Soil and Water Conservation Districts	No Response	No Response
Natural Bridge Soil and Water Conservation District	Responded	Responded
Buena Vista City	Responded	Responded
Rockbridge County Board of Supervisors	No Response	No Response

Other	Draft Plan/EA	Draft Plan/EIS
Central Shenandoah Planning District Commission	Responded	No Response
National Resources Defense Council, Inc.	No Response	No Response
National Wildlife Federation	No Response	No Response
Sierra Club	No Response	No Response
National Audubon Society	No Response	No Response

CIVIL RIGHTS AND ENVIRONMENTAL JUSTICE IMPACT ANALYSIS

The median housing value in Buena Vista is $42,900, while the state average is $90,400. Buena Vista's median housing value represents 47% of the Virginia value. The average home value in Chalk Mine Run is only $31,447, or 35% of the state-wide median value. The average value of homes in Reservoir Hollow is $32,773, or 36% of the VA value. Average values in Pedlar Gap Run and Indian Gap Run are $39,874 (44% of the VA value) and $47,237 (52% of the VA value) respectively.

The Buena Vista Storm Drainage/Flood Control Survey found that 337 persons (178 households), or 66.2% of those interviewed, had incomes below the low-to-moderate income limits as defined by the latest HUD Section 8 income guidelines for the City. Average household income for Buena Vista residents in 1989 was $26,827, while per capita income (PCI) was only $10,241. PCI for the U.S. during the same year was $17,596, making Buena Vista's PCI only 58% of the national per capita income level. Fourteen percent (870) of Buena Vista total population lived below the poverty level in 1989, as compared to 10 percent for all of Virginia. Fifteen percent of the households (371) in Buena Vista have residents who lived below the poverty line in 1989, while 10.5 percent of the state's households were below the poverty level in 1989. Virginia's average household income for 1996 was $41,470, while per capita income was estimated at $15,688 in 1993.

Median property values as noted above are far lower than 75% of state or national property values and median per capita income is lower than 75% of state and national average per capita incomes. Consequently, Buena Vista meets the criteria of a disadvantaged community according to the NRCS National Watershed Manual. The majority of the community's economically disadvantaged residents are white (95% or 6,093 out of a total population of 6,406). However, 4.9% (313 total) of Buena Vista's population are minorities (282 blacks), as compared to the 3.7% which are minorities in Rockbridge County and 23% in Virginia and 20% in the U.S. as a whole. Buena Vista's minority population is not concentrated in any single area of the City.

In addition to the income and property value criteria used for determining community status, the age distribution of Buena Vista's population indicates that 1,367 (21%) are over 60 years old as compared to 15% for the state as a whole. Finally, Buena Vista has had a depressed economy due to flooding which has driven the population down 7.2% over the 1980 to 1990 time frame and has caused over 48% of the workforce to seek employment outside of the City.

All of the evaluated and proposed project actions will have a positive economic and social effect across all race and ethnic groups in Buena Vista. No race or ethnic groups will be disparately treated as a result of proposed project actions. This is being assured because NRCS policy and the sponsors explicitly wanted to avoid disparate treatment. For example, uneconomical treatment increments within subwatersheds which would not pay for themselves if forced to stand alone as separate projects, were included in the overall B/C analysis on a City watershed-wide scale. Such was the case for the Chalk Mine Run subwatershed. As a result of this consideration the poorest sections of the City will not be excluded from project improvements.

RECOMMENDED PLAN

Purpose and Summary

The primary purpose of this watershed plan is flood prevention. The following section of the watershed plan describes the types and quantities of planned structural measures, permits required, landrights, project costs, project installation and financing, responsibilities of NRCS and the Sponsors, risks and uncertainty, conditions for providing assistance, and operation, maintenance, and replacement agreements. The plan will be installed over a 5 year period and have an expected life span of 50 years.

Measures to be Installed by Subwatershed

The specific plan elements are outlined below by subwatershed. Refer to the project map for an overall perspective for the entire watershed.

Chalk Mine Run

- Increase channel capacity for 1190 feet immediately above Norfolk Southern bridge (305 feet of riprap, 885 feet of earth channel).
- Replace Rockbridge Avenue culvert with a bridge.
- Increase channel capacity for 350 linear feet going downstream on main channel behind shopping center from the confluence of Washer Hollow and Chalk Mine (earth channel).
- Increase channel capacity on Washer Hollow upstream of confluence with Chalk Mine Run for 315 feet (140 feet of earth channel, 175 feet of riprap).
- Increase storage capacity of channel for larger storm events by excavating material from existing basin area above lumber plant bridge.
- Replace lumber plant bridge with a larger structure.
- Raise existing berm behind hotel.
- Construct a debris basin below the Catalpa Street bridge.
- Increase channel capacity below Norfolk Southern bridge for a distance of 825 feet (545 feet of riprap channel and 280 feet of earth channel).

Indian Gap Run

- Replace the two railroad bridges with five 10'x10' box culverts, 130 feet long.
- Install a debris basin near the ballfield at the end of 21st Street.
- Install a 3' high concrete floodwall along the channel at Hawthorne Avenue (500 feet).
- When the new bridge is installed at Cedar Avenue, grade the road so that flow that escapes the channel will be directed back in before it reaches Twentieth Street. (To be done by the City).
- Add approximately 300 feet of channel improvements below Magnolia Avenue and 700 feet of channel improvements above Magnolia Avenue. (To be done by VDOT).
- Replace the Magnolia Avenue bridge with 4 8'x6' box culverts. Approximately 150 FEET of Noel's Run will be improved to match the new grade on Indian Gap Run.

Noel's Run

- Install 3 debris basins.

Pedlar Gap Run

- Replace the railroad culvert with two 10'x10' box culverts and lower the invert elevation by 5 feet. Approximately 120 feet of channel would be realigned.
- Remove the Linden Avenue culvert and replace it with a hy-span type bridge deck.
- Remove the abandoned lumber yard bridge.
- Install one debris basin above 2nd Street and another one above 5th Street.
- Replace the Magnolia Avenue bridge with three 10'x 8' box culverts.
- Remove the 9th Street culvert and replace the culvert with a hy-span type bridge.
- Remove the Woodland Avenue culvert and replace it with a hy-span type bridge.
- Improve the channel from the railroad to a point approximately 250 feet above Woodland Avenue (1708 feet, includes 120 feet of channel alignment).

Effects of the Recommended Plan

Economic Effects

The economic evaluation of all damage categories indicates that the recommended alternative will result in a 61 percent reduction in projected average annual damages. The $1,396,000 in average annual damages estimated for the without project alternative represents about 6.9 percent of the total value of buildings and contents receiving damages. Average annual damages would be reduced to $549,000 or less than 2.7 percent of the estimated total value. Storms comparable to the back to back June floods of 1995 account for a large proportion of total projected future damages. The following summary and comparison of the recommended alternative with the future without project alternative shows that a majority of damages and damage reduction benefits occur within the Indian Gap Run subwatershed.

Table L - Buildings Flooded By Storm Event

Storm Event	Without Project	Recommended Plan	Recommended Plan, Indian Gap Run Only
100 Year	341	210	161
25 Year	277	90	56
5 Year	39	4	2

As indicated above, future flood damages and threats to loss of life would be substantially reduced with the recommended alternative. However, they can not be eliminated entirely. Damaged properties remaining from the 100 year storm event as a result of the recommended alternative include 161 within Indian Gap Run, 23 within Chalk Mine Run, 16 within Noel's Run and 10 within Pedlar Gap Run (210 total properties receiving damages). Thus the recommended alternative protects 130 properties from the 100 year storm event. In addition, 185 properties are afforded protection from 25 year storm events and 35 properties are protected from the more frequent 5 year storm events. It is also noteworthy that this

effort, combined with the Army Corps of Engineers Maury River project, will enhance local economic development opportunities.

Social Effects

The proposed alternative will not have any foreseen long-term or significant negative social effects which the community can not accept. The installation of a debris basin in the headwaters of Indian Gap Run near the public ballpark at the end of 20th Street will negatively affect recreation, but is not anticipated to cause a major impact. The installation of this structure will occupy a portion of the existing parking lot which serves the ballpark. In addition, an additional 6 debris basins and numerous other works of improvement (floodwalls, berms, channel work, etc.) will cause changes to the way the intercity streams look. Efforts will be made to minimize any negative views from these structures by including landscape architecture input into the designs and landscaping around these features.

Perhaps the most important negative social effect of the project will be the procurement of an estimated 15.2 acres of landrights needed to install project measures. This cost category ($419,000) is the responsibility of the sponsors and is expected to be the largest cost component that the community has to pay. In addition, there will be temporary disruptions to local transportation and potable water and sewer services during construction of elements of the proposed project. However, the long-term benefits of reduced damages and decreased threats of loss of life will far exceed any expected inconveniences.

Buena Vista meets the criteria of a disadvantaged community according to the NRCS National Watershed Manual. Median property values are lower than 75% of state property values and per capita income for Buena Vista over the last three years is less than 75% of national per capita income, and the benefit/cost ratio of the Recommended Plan is greater than the ration of the per capita income for Buena Vista divided by the national 3-year average per capita income.

Forestry Resources

All proposed project activities are planned for installation outside of the George Washington and Jefferson National Forests. The project area is outside of, and downslope from, heavily forested areas. Thus, there will be no effects on forestry resources.

Water Quality

A reduction in floodwaters will result in decreased sediment loading and less oils, gases and sewage being washed into the streams. Water quality will be improved in the watershed as a result of the implementation of this project.

There will be temporary water quality impacts during the construction phase of the project. Sediment and erosion control regulations will be followed during construction activities.

Flooding

Economic damages from flooding will be reduced 88% for the typical 5 year storm, 81% for the 25 year storm, and 45% for the 100 year storm event. The number of properties affected by flooding will be reduced from 39 to 4 structures (90%) in a typical 5 year storm, from 277 to 90 structures (68%) in a 25 year storm, and from 341 to 210 structures (38%) in a 100 year storm event.

Cultural Resources

The Virginia Department of Historic Resources (DHR) was consulted in accordance with Section 106 of the National Historic Preservation Act (NHPA). Their cultural resources review of this project indicated that there are no archaeological sites within the construction limits of the project. However, DHR has asked for additional information on the four railroad bridges and one small road bridge which will be impacted by the proposed project. The requested information will be provided by NRCS for DHR's review and concurrence prior to construction. Should cultural resources be discovered during construction, NRCS will take necessary actions according to policy and in compliance with the NHPA.

Wetlands

There are no wetlands within the construction limits of this project and this project will not affect wetlands outside the project area. This project will not create or restore wetlands. Therefore, there will be no effects on wetlands when this plan is completed.

Threatened, Endangered and Rare Species

No threatened or endangered species exist in the project area. There will be no effect on threatened and endangered species due to this project.

Aquatic Resources

These warm water intermittent streams are typical of highly modified, unstable, and disturbed urban streams. The planned 5,538 feet of channel improvements, 7 debris basins and the replacement, enlargement or removal of 7 culverts and bridges will result in a stable stream with low flow channels. Sediment delivery will increase during the construction period. However, this can be minimized if the stream channel modifications are performed during low flow or no flow periods. Debris basins will remove bedload and sediment, improving water quality. Bank erosion will be reduced which will allow the individual landowners and/or project sponsors to establish riparian vegetation. This will provide shade and temperature regulation for the stream. Fish movement in the four streams in the project area is generally limited to periods of high flow and storm events. The fish movement is downstream with high flows. There is very little chance of fish movement upstream at any time due to the intermittent stream conditions. Fish species and benthic organisms are not expected to change. This project will improve the stability of the stream, fisheries habitat, benthic organisms and the riparian area of these streams.

Wildlife

Since this is an urban setting, no significant changes are expected regarding wildlife populations or diversity as a result of the proposed project. However, more stable riparian areas which result in permanent vegetation, will improve habitat for small mammals, resident and migratory birds within the City limits.

Table M - Effects of the Recommended Plan on Resources of Principal National Recognition

Types of Resources	Principal Sources of National Recognition	Measurement of Effects
Air Quality	Clean Air Act, as amended (42 U.S.C. 1857h-7 et seq.)	No change.
Areas of particular concern within the coastal zone	Coastal Zone Management Act of 1972, as amended, (16 U.S.C. 1451, et seq.)	The project area is not located in a coastal zone.
Endangered and Threatened Critical Habitat	Endangered Species Act of 1973, as amended (16 U.S.C. 1531 et seq.)	No threatened and endangered species are present in the project area.
Upland and Wildlife Habitat	Fish and Wildlife Coordination Act (16 U.S.C. Sec. 661 et seq.)	More stable riparian areas resulting in permanent vegetation will improve habitat of aquatic resources, small mammals, resident and migratory birds within the City.
Floodplains	Executive Order 11988, Floodplain Management	Reduce bedload deposition.
Historic and Cultural Properties	National Historic Preservation Act of 1966, as amended, (16 U.S.C. Sec. 470, et seq.)	No known historic resources are to be affected.
Prime and Unique Farmland	CEQ Memorandum of August 1, 1980: Analysis of Impacts on Prime or Unique Agricultural Lands in Implementing the National Environmental Policy Act. Farmland Protection Policy Act of 1981, (7 U.S.C. 4201 et seq.)	None present in the project area.
Water Quality	Clean Water Act of 1977 (33 U.S.C. 1251 et seq.)	Reduced overland flow will result in less contaminants to receiving waters. Sediment carried in storm flows will be reduced.

Table M - Effects of the Recommended Plan on Resources of Principal National Recognition (Con't)

Types of Resources	Principal Sources of National Recognition	Measurement of Effects
Wetlands	Executive Order 11990, Protection of Wetlands; Clean Water Act of 1977 (42 U.S.C. 1857H-7, et seq.)	There are no wetlands identified in the project area. No effect.
Wild and Scenic	Wild and Scenic Rivers Act, as amended, (16 U.S.C. 1271 et seq.)	There are no designated Wild and Scenic Rivers in the project area. No effect.
Economic	NA	Reduced flooding and flood related damages are predicted as a result of this project.
Fisheries	Fish and Wildlife Coordination Act (16 U.S.C. Sec. 661 et seq.)	The fisheries may be adversely impacted during construction. However, long term beneficial effects are expected due to more stable streambanks and vegetation.
Forestry	NA	There will be no forest impacts.
Recreation	NA	This project will have no effect on recreation.
Riparian Zone	NA	Riparian vegetation that is destroyed will be replaced where possible.

Conditions for Providing Assistance

Federal assistance for carrying out this plan will be provided under the authority of PL 83-566. However, it should be noted that this is not a fund obligating document. Financial and other assistance to be furnished by the NRCS in carrying out the plan is contingent upon the availability of federal appropriations and the Sponsors obtaining the necessary landrights and permits.

Project Interaction

This watershed plan was developed to address primarily the interior stream flooding problems in Buena Vista. The plan serves to complement the flood wall constructed by the U. S. Army Corps of Engineers. It further complements additional efforts currently underway by the City to install a concrete lined channel on Indian Gap Run, bridge and culvert improvements throughout the four subwatersheds, and the City, FEMA, Virginia Department of Emergency Services and the Central Shenandoah Regional Planning District Commission plans to buyout, relocate and or floodproof selected repetitive loss structures.

The NRCS will assist the project sponsors with both technical and financial assistance in the installation of the planned works of improvement. Coordination will be required between the City, Norfolk Southern Railroad, Virginia Department of Transportation, and others in order to make the project a reality.

It is expected that many agencies and organizations will be complementary participants in this much needed watershed plan as demonstrated by the widespread input and support during the planning process.

Landrights

An area of approximately 15.2 acres will be required for installation of various works of improvement. This area will be acquired by the local Sponsors.

Permits and Compliance

No adverse effects on wetlands or floodplains are anticipated. However, it is the responsibility of the local sponsors to obtain the necessary environmental permits for the installation of the planned works of improvement. A joint permit application will be necessary and can be filed by applying to the Virginia Marine Resources Commission, the Virginia Department of Environmental Quality and the U.S. Army Corps of Engineers. NRCS will assist the sponsors with the permit application process.

The sponsors are responsible for compliance with the permit conditions once the permits have been obtained.

Costs

As indicated in Table 1, the total project installation cost of the recommended plan is $6,921,000. Of this amount, PL-566 funds will bear $6,305,000 and local funds will bear $616,000. Table 2 shows the cost of structural measures, by category. Construction costs are paid by PL-566 funds and total $5,420,000. This includes all costs of material, labor, and equipment. Engineering costs include all costs for designs (including some architectural and engineering consulting services), construction surveys, geologic and soils investigations, and development of contract drawings and specifications. The total engineering costs, estimated at $740,000, will be paid by PL-566 funds, except for any inspection cost incurred by the sponsors.

Project administration costs are estimated to be $185,000 and will be paid by NRCS ($145,000) and the sponsors ($40,000). NRCS will incur project administration costs through the administration of contracts to install the structural measures and providing government representatives and inspection services during construction to insure that the measures are installed according to plans and specifications. The Sponsors' project administration costs will be associated with the administration of contracts, purchase of property rights, and utility and road relocations.

Landrights costs are estimated at $419,000 and will be paid by the City of Buena Vista. Some of the property is already owned by the City. Utility and road relocation costs total $97,000 and will be paid by the City of Buena Vista.

The above planning costs for the structural measures are estimated costs only. The fact that these costs are included in this plan does not infer that they are final costs. Detailed structural designs and construction cost estimates will be prepared by NRCS or Architectural and Engineering firms prior to contracting for the work to be performed. Final construction costs will be those costs actually incurred by the contractor performing the work, including the cost of any necessary contract modifications. Final landrights costs will be those costs actually incurred by Buena Vista in obtaining the necessary landrights for the project.

Table 4 shows the average annual costs of installation and the estimated cost of annual operation, maintenance, and replacement. The 1998 price base cost estimates were brought to present value and amortized at 7.125% interest for the 55-year period (installation 5 years and evaluation 50 years) . The operation, maintenance, and replacement costs are a local cost amounting to $28,000 annually.

Table 5 displays average annual flood damage reduction benefits by flood damage categories, and Table 6 displays a comparison of annual costs and benefits.

Installation and Financing

The NRCS will provide technical assistance to the Sponsors for designing and constructing planned project measures. NRCS will also provide funds for cost sharing and will administer the overall project, except for obtaining any necessary landrights and permits, or for performing certain contract administrative functions which the Sponsors may conduct. The City of Buena Vista and the Natural Bridge Soil and Water Conservation District will provide sponsorship, specify objectives and concerns, provide inputs, help with plan implementation, and inform the public of the watershed plan activities.

Table N - Schedule of Obligations

Year	Item	PL-566	Other	Total
1999	Construction Costs	$1,084,000	$0	$1,084,000
	Property Rights	$0	$84,000	$84,000
	Utility Relocations	$0	$24,000	$24,000
	Technical Assistance	$148,000	$12,000	$160,000
	Project Administration	$29,000	$8,000	$37,000
2000	Construction Costs	$1,084,000	$0	$1,084,000
	Property Rights	$0	$84,000	$84,000
	Utility Relocations	$0	$18,000	$18,000
	Technical Assistance	$148,000	$12,000	$160,000
	Project Administration	$29,000	$8,000	$37,000
2001	Construction Costs	$1,084,000	$0	$1,084,000
	Property Rights	$0	$84,000	$84,000
	Utility Relocations	$0	$18,000	$18,000
	Technical Assistance	$148,000	$12,000	$160,000
	Project Administration	$29,000	$8,000	$37,000
2002	Construction Costs	$1,084,000	$0	$1,084,000
	Property Rights	$0	$84,000	$84,000
	Utility Relocations	$0	$18,000	$18,000
	Technical Assistance	$148,000	$12,000	$160,000
	Project Administration	$29,000	$8,000	$37,000
2003	Construction Costs	$1,084,000	$0	$1,084,000
	Property Rights	$0	$84,000	$84,000
	Utility Relocations	$0	$18,000	$18,000
	Technical Assistance	$148,000	$12,000	$160,000
	Project Administration	$29,000	$8,000	$37,000
Total Project Cost	----	$6,305,000	$616,000	$6,921,000

February 1998 Price Base

Technical assistance includes design and construction supervision. Utility relocations includes relocation of a small section of 20th St. near the ballfield.

Operation, Maintenance, and Replacement

An operation and maintenance agreement and plan will be developed by the sponsors based on the National Operation and Maintenance Manual of the NRCS before signing landrights, relocation or project agreements. To meet Virginia requirements, an Emergency Action Plan will be developed also. Operation, maintenance (O&M) and replacement of structural measures will be the responsibility of the Sponsors, with technical assistance from the NRCS.

Operation, maintenance and replacement costs include all costs for inspections of the measures, periodic maintenance required to ensure that the measures function over the evaluation period (5 years of installation and 50 years estimated useful life for project structures), and replacement costs necessary to replace project features that become worn or broken during the project evaluation period. The estimated

annual O&M cost represents an average value over the 55 year evaluation period. Initially, the annual O&M costs may be lower than the estimate but will gradually increase as project installations become older. Some of the more obvious operation, maintenance and replacement items are:

- Conduct annual inspections of project structures to determine needed maintenance and repair items.
- Conduct inspections of all structures, especially debris basins and channel improvements, after each major storm event to determine if damage occurred and the maintenance and repair requirements.
- Keep a record of all inspections and their findings, maintenance items performed and costs expended.
- Remove debris from the structures and channels on a regular (annual) basis, and after each major storm event.
- Replace any broken features of project improvements, especially fences, grates, access gates, etc.

The City of Buena Vista will be responsible for maintaining all project structures and channel improvements. The estimated annual cost of this work is $28,000. The City expects to perform this work using its own work force, equipment and other resources.

An establishment period will be required for all structural works of improvement which necessitate vegetative cover and/or landscape features. The establishment period applies to both vegetation installed as a structural measure or in association with structural practices. The establishment period terminates when the NRCS notifies the Sponsors that vegetative cover has been successfully established, but not longer than two years following completion of the construction and/or vegetative contracts. Work needed on vegetative measures after termination of the establishment period is considered as maintenance and is the responsibility of the Sponsors.

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LIST OF PREPARERS

The Draft Watershed Plan and Environmental Impact Statement was reviewed and concurred in by state staff specialists having responsibility for engineering, resource conservation, soils, agronomy, biology, economics, and geology. A similar review was also provided by the U.S. Forest Service personnel. This review was followed by an interagency and public review.

Table O - List Of Report Preparers

VIRGINIA NATURAL RESOURCES PLANNING TEAM

Name	Present Title and Years in Current Position	Education	Previous Experience	Other
R. Wade Biddix	Planning Coordinator - 8	B.S. Agriculture	Area Res. Cons. - 2 yr. District Conservationist - 4 yr. Soil Conservationist - 4 yr.	
David L. Faulkner	Resource Economist - 9	M.S. Ag. Economics B.S. Ag. Economics	NRCS Ag Economist - 2.5 yr. Ag Economist (AID) - 4.5 yr.	
Roger F. Flint	Natural Resource Cons. - 17 yr.	B.S. Forest Resource Mgt.	Soil Conservationist - 5 yr.	
Brian W. Ganoe	Geologist - 7 yr.	B.S. Geology	NRCS Geologist - 13 yr. Geologist (Bureau Rec.) - 2 yr.	CPG in VA and IA
Fred M. Garst	GIS Specialist - 6 yr.	B.S. Geology	GIS/Soil Scientist - 7 yr. Soil Cons. Tech. - 7 yr. Geologist (Private) - 4 yr.	
Alica J. Ketchem	Plng./Environmental Engineer - 4	M.S. Ag. Engineering B.S. Civil Engineering	Civil Engineer - 9	PE
Gregory H. Moser	Biologist - 12	M.S. Aquatic Ecology B.S. Wildlife Mgmt.	Water Res. Biologist - 8 yr. District Conservationist - 5 yr. Soil Conservationist - 4 yr.	

Table O - List Of Report Preparers ((cont.)

VIRGINIA NATURAL RESOURCES PLANNING TEAM

Name	Present Title and Years in Current Position	Education	Previous Experience	Other
John D. Myers	Environmental Specialist - 6	B.S. Wildlife Mgmt.	District Cons. - 12 yr. Soil Cons. - 2 yr. U.S. Fish & Wildlife Service - 2 yr.	

USDA, FOREST SERVICE

Dick Patton	Zone Hydrologist - 3	M.S. Forest Resources M.A.T. History B.A. History	Forest Hydrologist - 10 yr. District Hydrologist - 4 yr. Hydrologist Trainee - 1 yr.	

Note: Glenn Sorensen, Hydraulic Engineer with Dewberry and Davis, developed the initial hydrology and hydraulics models used to evaluate the watershed.

Special Acknowledgment goes to the Engineering Survey Crew who spent many hours in Buena Vista during the spring and summer of 1995.

- NRCS Staff: Jerry D. Hughston, Project Engineer; Charles E. (Billy) Bear, Civil Engineering Technician; John M. Cooke, Construction Inspector; Mike Deacon, Natural Resource Technician; Alica J. Ketchem, Planning/Environmental Engineer; David L. Faulkner, Resource Economist; Roger F. Flint, Natural Resource Conservationist; and R. Wade Biddix, Planning Coordinator.
- Natural Bridge Soil and Water Conservation District Staff: Robert Hickman, District Technician
- Earth Team Volunteers: Rachel Kornfeld, Lee Cundiff and Trey Cooke

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Table 1 - Estimated Installation Cost

Buena Vista Watershed, Rockbridge County, Virginia

(Thousands Dollars)

Installation Cost Item	Units	Number			Public Law 83-566 Funds			Other Funds			Grand Total
		Federal Land	Nonfederal Land	Total	Nonfederal Land NRCS	Nonfederal Land FS	Total	Federal Land	Nonfederal Land	Total	
Bridges/ Culverts	Each	n/a	10	10	3,590	0	3,590	0	55	55	3,645
Channel Improve-ments	Miles	n/a	1.03	1.03	1,206	0	1,206	0	361	361	1,567
Debris Basins	No.	n/a	7	7	1,410	0	1,410	0	184	184	1,594
Flood-walls	Ft.	n/a	700	700	106	0	106	0	9	9	115
Total Project:	n/a	n/a	n/a	n/a	6,312	0	6,312	0	609	609	6,921

Price Base: 1998

Table 2 - Estimated Cost Distribution - Structural Measures

Buena Vista Watershed, Rockbridge County, Virginia

(Thousands Dollars)

	PL-566				Others					
Item	Construc-tion	Engineer-ing [1]	Project Admin.	Sub-Total	Property Rights	Project Admin.	Tech. Assist.	Utility Relocation[2]	Sub-Total	Grand Total
Bridges/ Culverts	2,948	567	76	3,590	0	22	33	7	61	3,651
Channel Improve-ments	1,120	59	28	1,207	271	8	12	70	361	1,568
Debris Basins	1,256	108	39	1,403	141	10	14	20	185	1,589
Flood-walls	96	6	3	105	6	1	1	0	8	113
Totals:	5,420	740	145	6,305	419	40	60	97	616	6,921

Price Base: 1998
Note: Some subtotals may not add up due to rounding.

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[1] Includes $80,000 in NRCS technical assistance during design and $225,000 in NRCS technical assistance costs during construction.
[2] Includes $7,000 for road relocation on Indian Gap Run.

Table 3a - Structural Data - Floodwalls and Dikes

Buena Vista Watershed, Rockbridge County, Virginia

Dike	Stationing	Top width (ft.)	Average side slope	Average height of dike (ft.)	25-year frequency channel velocity (ft/s)	Dike protection	Volume of earth fill (yd^3)
Indian Gap	24 + 63 to 29 + 63	2	vertical	3	9.77	concrete	450
Washer Hollow (a tributary of Chalk Mine Run)	6 + 70 to 8 + 90	6	2:1	4 [1]	10.5	vegetation	330

[1] Existing berm will be made 2 feet higher.

Table 3b - Structural Data - Channel Work

Buena Vista Watershed, Rockbridge County, Virginia

Channel name (reach)	Station begin	Station end	Drain area (mi.^{2})	Year freq.	Design discharge (ft^3/s)	Water surface elev. feet (msl)	Hydraulic gradient (ft/ft)	Channel dimensions[1]				n Value (aged)	Velocity (ft/s) (aged)	Excavation volume[4] (yd^3)
								Gradient[2] (ft/ft)	Bottom width (ft)	Elev. (ft/msl)[3]	Side slope			
CMRc4	7+35	9+10	2.69	5	885	928.0	0.0297	0.0257	25	923.5	1.5:1	0.033	9.7	700
CMRc3	9+10	10+50[5]	2.69	5	885	922.8	0.0171	0.0129	25	919.0	2:1	0.05	7.5	610
CMRc2	16+20	20+30	5.39	5	1725	920.4	0.0183	0.0223	30	917.2	2.5:1	0.05	9.9	2830
CMRc1	20+30	23+30	5.85	5	1910	912.9	0.0123	0.0160	30	908.1	2:1	0.05	8.0	1480
CMRb4	50+40	55+50	5.85	25	5455	868.3	0.0190	0.0198	30	860.0	2:1	0.05	12.7	2070
CMRb3	55+50	57+60	5.85	25	5455	858.6	0.0167	0.0210	30	849.9	1.5:1	0.033	12.8	910
CMRb2	57+60	58+65	5.99	25	5562	855.1	0.0133	0.0050	35	845.5	1.5:1	0.033	9.7	660
CMRb1	58+65	62+40	5.99	5	2165	850.8	0.0148	0.0040	30	844.6	2:1	0.05	5.6	1770
CMRa2	62+60	65+40	5.99	5	2165	842.8	0.0125	0.0033	40	836.6	2:1	0.05	9.1	1850
CMRa1	65+40	70+85	5.99	5	2165	839.3	0.0120	0.0117	45	833.7	1.5:1	0.033	10	4380
IGR	55+69	64+11	3.87	5	1211	822.2	0.0024	0.0080	19	819.2	2:1	0.050	5	2650
IGR	65+26	68+26	4.44	5	1652	820.1	0.0023	0.0034	26	812.3	2:1	0.020	5	950
NR	59+70	61+20[6]	2.23	5	616	821.2	0.0011	0.0240	35	818.0	2:1	0.045	5.3	475
PGR 250 feet above Woodland to Magnolia	65+55	73+50	2.03	100	2607	861.1	0.0239	0.0271	10	852.5	2:1	0.033	11.0	2680
PGR 9th to Magnolia	73+50	76+50	2.03	100	2607	842.0	0.0353	0.0260	10	832.6	2:1	0.033	9.1	1030
PGR 9th to the railroad	76+50	83+83	2.03	100	2607	834.4	0.0148	0.0214	15	827.0	2:1	0.033	12.6	5659

[1] On Chalk Mine Run, cross-sections were modeled as trapezoids. For all other streams non-trapezoidal cross-sections with low flow channels were modeled.

[2] Average gradient for reach.

[3] Upstream end of reach. Elevations are referenced to beginning of reach (u/s end).

[4] Approximate quantities.

[5] Washer Hollow station 10+50 is the same as Chalk Mine Run station 16+20.

[6] Noel's Run station 61+20 is the same as Indian Gap Run station 61+29.

Table 3c - Structural Data - Debris Basins

Buena Vista Watershed, Rockbridge County, Virginia

Stream	Location	Approximate Station	Area
Chalk Mine Run	Catalpa Avenue	(CM 37+10)	1.50 acres
Indian Gap Run	end of 20th St. at the ballfield	(IG 15+48)	0.71 acres
Noel's Run	Pine Avenue	(NR 25+28)	0.90 acres
Noel's Run	Oak Avenue	(NR 38+00)	0.80 acres
Noel's Run	Maple Avenue	(NR 45+05)	0.20 acres
Pedlar Gap Run	end of 2nd Street	(PG 44+83)	1.10 acres
Pedlar Gap Run	Hazel Avenue at 5th St.	(PG 62+08)	0.40 acres

Table 3d - Structural Data - Bridges and Culverts

Buena Vista Watershed, Rockbridge County, Virginia

Stream	Crossing Location	Action	Structure
Chalk Mine Run	Rockbridge Avenue	replace culvert	160'x37' bridge with piers
Chalk Mine Run	Fitzgerald's lumber plant	replace bridge	65'x20' bridge with piers
Indian Gap Run	Norfolk Southern Railroad (2)	replace bridges	5 10'x10' box culverts, 130' long
Indian Gap Run	Magnolia Avenue	VDOT will replace bridge	4 8'x 6' box culverts, 67' long
Pedlar Gap Run	Norfolk Southern Railroad	replace culvert	2 10'x10' box culverts, 57' long
Pedlar Gap Run	Below Linden Ave.	remove bridge	none
Pedlar Gap Run	Linden Avenue	replace culvert	hy-span type bridge
Pedlar Gap Run	9th Street	replace culvert	hy-span type bridge
Pedlar Gap Run	Magnolia Ave.	replace bridge	3 10'x8' box culverts, 60' long
Pedlar Gap Run	Woodland Ave.	replace culvert	hy-span type bridge

Table 5 - Estimated Average Annual Flood Damage Reduction Benefits

Buena Vista Watershed, Rockbridge County, Virginia

(Dollars)

Flood Damage Category	Estimated Average Annual Damages		Damage Reduction Benefits	
	Without Project	With Project	Average Annual	Average Annual Equivalents
Structures	$656,000	$236,000	$420,000	$295,000
Contents	$293,000	$100,000	$193,000	$122,000
Private Clean-Up	$39,000	$22,000	$17,000	$28,000
Private Business Losses	$140,000	$93,000	$47,000	$116,000
Public Infrastructure	$223,000	$77,000	$146,000	$96,000
Public Administration	$45,000	$21,000	$24,000	$27,000
Grand Total	$1,396,000	$549,000	$847,000	$684,000

Price base: February 1998

Average Annual Equivalents based on 7.125% discount rate and a 55 year period of analysis.

Table 6 - Comparison of Benefits and Costs

Buena Vista Watershed, Rockbridge County, Virginia

(Dollars)

	Damage Reduction Benefits						
Item	Building Structures and Contents	Private and Public Clean-up and Public Infrastruc-ture Repairs	Private Business Losses	Public Adminis-tration Costs	Total Annual Benefits	Total Annual Costs	Benefit Cost Ratio
All Public Works of Improve-ment	$417,000	$144,000	$96,000	$27,000	$684,000	$451,000	1.52

Price base: February 1998

Average Annual Equivalents based on 7.125% discount rate and a 55 year period of analysis.

APPENDIX A

LETTERS OF COMMENT ON DRAFT PLAN-EIS

VIRGINIA SOIL & WATER
CONSERVATION

NATURAL BRIDGE
SOIL AND WATER CONSERVATION DISTRICT
30 EAST PRESTON STREET
LEXINGTON, VA 24450
(540) 463-7125

November 24, 1998

Ms. Denise Doetzer
State Conservationist
USDA Natural Resources Conservation Service
1606 Santa Rosa Road, Suite 209
Richmond, Virginia 23229-5014

Dear Ms. Doetzer:

The Natural Bridge Soil and Water Conservation District, which serves the city of Buena Vista, Virginia, would like to go on record in support of the efforts of the Natural Resources Conservation Service to reduce interior stream flooding in the city of Buena Vista. The comprehensive plan for the Buena Vista Watershed will help to alleviate a chronic flooding problem in the city. This is a situation that has caused millions of dollars in damage to homes, industry, businesses, and individual lives. Any means of minimizing this type of flooding will be helpful and very much appreciated.

With the "Buena Vista Watershed Plan" and "Environmental Impact Statement", we can prepare for the city's future in an organized and sound manner. This document provides us with a guide of practices and alternatives based on their benefit to cost. Never before has such a comprehensive study been done of the city.

Thank you and your staff for this effort. We look forward to the next phase in search of funding for this project.

Sincerely,

The Natural Bridge Soil and Water Conservation District Board of Directors

(Signature Page Attached)

cc: R. Wade Biddix
Program/Planning Leader

Signature Page to attached letter from the District:

Natural Bridge Soil and Water Conservation District
30 East Preston Street
Lexington, Virginia 24450

Serving the cities of Lexington, Buena Vista and Rockbridge County

James A. Carter, District Chairman

Danny Goodbar, Vice-Chair

Jon Repair, Secretary

Robert L. Simons, Treasurer

Phillip R. Welch

Virginia Stephanie Porras

Jay Gilliam

E. Burwell Wingfield

CITY OF BUENA VISTA

2039 Sycamore Avenue
Buena Vista, Virginia 24416-3112
Telephone (540) 261-8602
Fax (540) 261-2142

November 25, 1998

M. Denise Doetzer
State Conservationist
USDA - Natural Resources Conservation Service
Culpeper Building, Suite 209
1606 Santa Rosa Road
Richmond, Virginia 23229-5014

Dear Ms. Doetzer:

This is a follow-up to my May 12, 1998, letter which was written in support of the Buena Vista Watershed Plan developed by the Natural Resources Conservation Service (NRCS). As you are aware, the City has an extensive history of flooding from the Maury River and interior streams.

The U.S. Army Corps of Engineers has greatly reduced the potential for flood damages from the Maury with the completion of the James R. Olin Flood Protection Project. We have also undertaken various projects to reduce flooding along our interior streams. The cost to the City for these mitigation efforts is in excess of $5,000,000 which is greater than our typical annual budget (general fund).

Having made such a great financial commitment, the City now needs assistance from the NRCS in our effort to further reduce the susceptibility to flooding from out interior streams. As you know, this is precisely the objective of the NRCS's Watershed Plan. The adoption of the Watershed Plan and implementation of the mitigation measures included therein would greatly benefit our citizens, including many low to moderate income households.

We appreciate the efforts of the NRCS and fully support the Plan. Please feel free to contact me if you should have any questions.

Sincerely,

Stephen G. King, P.E.
City Engineer/Assistant City Manager

CITY OF BUENA VISTA

City Hall

2039 Sycamore Avenue

Buena Vista, Virginia 24416

Telephone (540) 261-6121

November 25, 1998

M. Denise Doetzer, State Conservationist
USDA - Natural Resources Conservation Service
Culpeper Building, Suite 209
1606 Santa Rosa Road
Richmond, VA 23229-5014

Dear Ms. Doetzer:

I am writing on behalf of the City of Buena Vista to express full support for the Buena Vista Watershed Plan. This plan was developed by the staff of the Natural Resources Conservation Service (NRCS). Public Hearings were conducted by the City Council for the City of Buena Vista and after review and consideration, the City Council fully endorsed the project.

The adoption of the Water Shed Plan would be very beneficial to the citizens of the City of Buena Vista. The assistance from the Natural Resources Conservation Service is urgently needed to reduce the potential for flooding from our interior streams.

The City appreciates very much the efforts of the NRCS staff and we fully support the Plan. The Plan would help us protect and maintain our natural resources.

If additional information is needed, please do not hesitate to contact me at 540-261-8600.

Sincerely,

Robert R. Collins
City Manager

P:\SZA\WATERSHED

City of Buena Vista

BUENA VISTA, VIRGINIA

OFFICE OF
THE MAYOR

TELEPHONE 261-6121
AREA CODE 703

November 25, 1998

M. Denise Doetzer, State Conservationist
USDA - Natural Resources Conservation Service
Culpeper Building, Suite 209
1606 Santa Rosa Road
Richmond, VA 23229-5014

Dear Ms. Doetzer:

I am writing on behalf of the City Council for the City of Buena Vista to express council's full support for the Buena Vista Watershed Plan. The Public Hearings have been conducted by the City Council and after review and consideration, the City Council fully endorses the project.

We feel the adoption of the Water Shed Plan would be very beneficial to the citizens of the City of Buena Vista. The Watershed Plan was developed by the Natural Resources Conservation Service and we feel is urgently needed to reduce the potential for flooding from our interior streams.

The Council for the City of Buena Vista appreciates the efforts of NRCS staff to develop this Plan. We feel the Plan is urgently needed to help us protect and maintain our natural resources.

If additional information is needed, please do not hesitate to let us know. I can be reached at 540-261-6315.

Sincerely,

Harold F. Kidd

Harold F. Kidd
Mayor

P:\BZA\WATER.S

COMMONWEALTH of VIRGINIA

DEPARTMENT OF ENVIRONMENTAL QUALITY

James S. Gilmore, III
Governor

John Paul Woodley, Jr.
Secretary of Natural Resources

Street address: 629 East Main Street, Richmond, Virginia 23219
Mailing address: P.O. Box 10009, Richmond, Virginia 23240
Fax (804) 698-4500 TDD (804) 698-4021
http://www.deq.state.va.us

Dennis H. Treacy
Director

(804) 698-4000
1-800-592-5482

December 11, 1998

M. Denise Doetzer
State Conservationist
USDA-National Resources Conservation Service
Culpeper Building, Suite 209
1606 Santa Rosa Road
Richmond, Virginia 23229-5014

RE: Draft Plan - Environmental Impact Statement for Buena Vista Watershed in the City of Buena Vista and Rockbridge County

Dear Ms. Doetzer:

The Commonwealth of Virginia Agencies have completed their review of the draft plan - environmental impact statement for the considered action. The Department of Environmental Quality is responsible for coordinating Virginia's review of federal environmental documents and responding to the appropriate officials on behalf of the Commonwealth. The following locality and agencies participated in this review:

Department of Conservation and Recreation;
Department of Environmental Quality;
Department of Historic Resources;
Marine Resources Commission; and
City of Buena Vista.

The Central Shenandoah Planning District Commission was also invited to comment.

The action under consideration is a draft plan to reduce flood damages in the Buena Vista Watershed caused by Chalk Mine Run, Indian Gap Run, Noel's Run and Pedlar Gap Run. This plan was submitted for comment in April 1998 as an EA. Due to statue requirements, the plan has been revised as a draft EIS.

The Commonwealth asks that you continue to consider the comments submitted for the EA on May 18, 1998, on behalf of the

various state agencies, planning district, and locality. In addition, the Commonwealth offers the following comments and recommendations:

1. **Stream Impacts.** DEQ fully supports the replacement and upgrade of undersized culverts within the City to reduce the potential for flood damage. It is suggested that mitigation measures such as vegetative stabilization of eroding stream banks and associated buffer areas through easement, fee simple acquisition, or other means within and upstream of the City be included in the project as a means of managing debris and bedload transport to areas described in the EIS. Also, please verify that the railroad bridge over Chalk Mine Run, downstream of Route 60, has been evaluated for possible upgrade to ensure it has adequate capacity to allow design storms to pass. Please contact Tom Mizell at DEQ's Valley Regional Office at (540) 574-7800

In addition, where feasible the NRCS should implement Rosgen stream methodologies for stream channelization and/or relocation efforts. For further information, contact DEQ's Tracey Harmon at (804) 698-4105.

2. **Permitting.** Construction activities may result in the discharge of dredged or fill material to State waters requiring permitting by the U.S. Corps of Engineers and/or DEQ. For additional information on Virginia Water Protection Permit (VWPP) requirements, please contact DEQ's Valley Regional Office. Information contained in the EIS document is not adequate to allow an evaluation of potential project impacts to State waters at the level of detail required by the VWPP Regulation. Project proponents should be aware that a complete application for a VWPP must be made at least 180 days prior to the date planned for commencement of any permitted activity resulting in a discharge to State waters. A VWPP permit application must contain a discussion of measures taken to avoid impacts, measures proposed to reduce impacts to surface waters, and measures proposed to mitigate impacts to state waters where impacts are unavoidable.

Also, from the information provided in the EIS, it appears that several of the proposed projects will require a permit from Virginia's Marine Resources Commission (MRC). Joint Permit Applications are available through MRC and can be requested by calling (757) 247-2200.

3. **Erosion and Sediment Control.** If the project construction disturbs over 10,000 square feet of land the project is the responsibility of the owner under the jurisdiction of the City of Buena Vista. An erosion and sediment control plan must

be approved prior to any land disturbing activity on site. Plan requirements and approval should be requested through the Natural Bridge Soil and Water Conservation District or the Department of Conservation and Recreation at (804) 786-2556. A separate stormwater management plan may also be required depending on local requirements.

4. **Air Quality.** Project construction will be subject to regulation by the Department of Environmental Quality. The DEQ - State Air Pollution Control Board's Regulations on the Control and Abatement of Air Pollution is applicable to this project. The specific requirements are:

- 9 VAC 5-50-60 through 9 VAC 5-50-120, governing abatement of fugitive dust emissions; and

- 9 VAC 5-40-5600 through 9 VAC 5-40-5640, governing open-burning control.

For further information contact DEQ's Valley Regional Office.

5. **Historic and Archaeological Resources.** The project satisfactorily presents the results of the on-going consultation with the Department of Historic Resources (DHR). No further identification efforts are needed for archaeological properties. DHR looks forward to receiving the results of the architectural survey of the four railroad bridges and one small road bridge proposed for removal or replacement.

When DHR has the additional information, they will be able to advise on the need for any further identification efforts and treatment measures, if appropriate. For further information, contact DHR's Ethel Eaton at (804) 367-2323.

Thank you for the opportunity to comment on the draft recovery plan for the proposed activity. The comments of the reviewing agencies are attached for your review and consideration.

Sincerely,

Michael P. Murphy, Director
Division of Environmental
Enhancement

Attachments

cc: Robert Collins, City of Buena Vista
William H. Strider, Central Shenandoah PDC
John R. Davy, Jr., DCR
Tracie L. West, VMRC
David H. Dutton, DHR
Tom Mizell, DEQ-VRO
Dona Huang, DEQ-Air
Tracey E. Harmon, DEQ-Water
Melissa S. Porterfield, DEQ-Waste

UNITED STATES
DEPARTMENT OF
AGRICULTURE

NATURAL
RESOURCES
CONSERVATION
SERVICE

1606 Santa Rosa Road
Suite 209
Richmond, Virginia 23229-5014
Tel. (804) 287-1690
FAX (804) 287-1736

December 22, 1998

Mr. Michael Murphy, Director
Division of Environmental Enhancement
Virginia Department of Environmental Quality
629 East Main Street
P.O. Box 10009
Richmond, Virginia 23240

RE: Buena Vista Watershed Draft Plan-Environmental Impact Statement, Virginia

Dear Mr. Murphy:

Thank you for your comments on the above referenced project. We are currently responding to the comments received from the interagency and public review and plan to have a final document prepared for signatures in the next few months.

Responses to your comments:

1. Page 1, comments submitted earlier: NRCS will continue to consider the comments submitted for the EA on May 18, 1998. In fact, the Draft Plan-EIS incorporated many of your previous suggestions.
2. Page 2, Stream Impacts: A combination of vegetative cover and hard armor will be used to stabilize the eroding stream banks, as needed, to prevent further debris and bedload to the interior streams within the City of Buena Vista. Since most of the upstream watershed is on U.S. Forest Service land and the interior streams are located immediately adjacent to the residential properties and commercial enterprises within the City of Buena Vista, no flood easements or fee simple acquisition will be part of this project. However, the City of Buena Vista, along with the Shenandoah Valley Planning District Commission and the Virginia Department of Emergency Services, have plans to utilize funding provided by FEMA to acquire, elevate and/or relocate some of the residential properties most affected by flooding. Those nonstructural measures are needed as well as the various structural measures being proposed in this plan.
3. Page 2, railroad bridge at Chalk Mine: The railroad bridge downstream of Route 60 on Chalk Mine Run does not contribute to the flooding at the lower end of this channel. The gradient of Chalk Mine Run decreases significantly when it reaches the floodplain of the Maury River. This reduced gradient causes decreased stream velocity and increased the flow area needed to carry the flood discharge. Under these ponded conditions, the impacts of structures within the channel is very low.

4. Page 2, where feasible implement Rosgen stream methodologies: There are two goals for the proposed channel improvements within Buena Vista: 1) increase the storm flow capacity, and 2) maintain/establish a naturally, functioning channel. It is not possible to achieve both goals with a single design. For this reason, a channel-within-a-channel design has been proposed. The larger channel will be sized to pass the design storm flow without overtopping. This channel will be basically trapezoidal with 2:1 armored side slopes. The armored side slopes are planned for concrete, interlocking blocks that allow for soil placement in the openings and vegetation. Within the bounds of the larger channel, there will be a much smaller stream channel with a dimension and pattern suitable for the planned gradient. Low earthen benches set at the "bankfull" elevation will be used to contain the stream to a size that is capable of bedload transport for events of bankfull proportions or smaller. Design of the interior stream channels will require the use of fluvial geomorphological techniques.
5. Page 2, permitting: NRCS will advise the City of Buena Vista and the Natural Bridge Soil and Water Conservation District, that they will need to coordinate with the Army Corps of Engineers, DEQ and VMRC to determine any appropriate permits that may be required prior to construction of any planned measures.
6. Page 2, erosion and sediment control and/or stormwater management plans: NRCS will coordinate with the City of Buena Vista, the Natural Bridge Soil and Water Conservation District and/or the Virginia Department of Conservation and Recreation in order to comply with local E&S control and stormwater management ordinances.
7. Page 3, air quality: NRCS will include measures in the construction contracts which will ensure compliance with the applicable air quality regulations.
8. Page 3, historic and archaeological resources: NRCS will continue to consult with the Virginia Department of Historic Resources regarding Section 106 of the National Historic Preservation Act of 1966, as amended through 1992. When available, we will provide the results of the architectural survey of the four railroad bridges and one small road bridge proposed for removal and replacement.

I hope this has addressed all of your concerns. Thanks again for your participation in this process. We look forward to working with you further on this worthwhile project.

Sincerely,

M. DENISE DOETZER
State Conservationist

cc: Mr. James A. Carter, Chairman, Natural Bridge SWCD, Lexington
Mr. Robert Collins, Buena Vista City Manager, Buena Vista
Roger Flint, NRC, Lexington
Wade Biddix, Planning Coordinator

COMMONWEALTH of VIRGINIA

Department of Historic Resources

James S. Gilmore, III
Governor

John Paul Woodley, Jr.
Secretary of Natural Resources

2801 Kensington Avenue, Richmond, Virginia 23221

H. Alexander Wise, Jr.
Director

Tel: (804) 367-2323
Fax: (804) 367-2391
TDD: (804) 367-2386

November 5, 1998

M. Denise Doetzer
State Conservationist
USDA Natural Resources Conservation Service
1606 Santa Rosa Road, Suite 209
Richmond, Virginia 23229-5014

RE: Buena Vista Watershed
Watershed Plan - Draft Environmental Impact Statement
City of Buena Vista, Rockbridge County, Virginia
DHR File No. 98-0413-F

Dear Ms. Doetzer:

Thank you for providing us the opportunity to comment on the Watershed Plan and Draft Environmental Impact Statement prepared for the referenced project.

The document satisfactorily presents the results of the on-going consultation with our Department in compliance with Section 106 of the National Historic Preservation Act of 1966, as amended through 1992. No further identification efforts are needed for archeological properties. We look forward to receiving the results of the architectural survey of the four railroad bridges and one small road bridge proposed for removal and replacement.

Once we have the additional information, we will be able to advise you on the need for any further identification efforts and treatment measures, if appropriate. If you have any questions about our comments, please do not hesitate to contact Ethel R. Eaton of our project review staff at (804) 367-2323; fax (804) 367-2924; e-mail eeaton@dhr.state.va.us. We look forward to working with you and the City on this project.

Sincerely,

David H. Dutton, Director
Division of Project Review

c. John Myers, NRCS
Ellie Irons, DEQ

UNITED STATES
DEPARTMENT OF
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NATURAL
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1606 Santa Rosa Road
Suite 209
Richmond, Virginia 23229-5014
Tel. (804) 287-1690
FAX (804) 287-1736

December 22, 1998

Mr. David Dutton, Director
Division of Project Review
Virginia Department of Historic Resources
2801 Kensington Avenue
Richmond, Virginia 23221

RE: Buena Vista Watershed Draft Plan-Environmental Impact Statement, Virginia

Dear Mr. Dutton:

Thank you for your comments on the above referenced project. We are currently responding to the comments received from the interagency and public review and plan to have a final document prepared for signatures in the next few months.

In response to your comments, we will continue the consultation with your Department regarding Section 106 of the National Historic Preservation Act of 1966, as amended through 1992. When available, we will provide the results of the architectural survey of the four railroad bridges and one small road bridge proposed for removal and replacement.

I hope this has addressed all of your concerns. Thanks again for your participation in this process. We look forward to working with you further on this worthwhile project.

Sincerely,

M. DENISE DOETZER
State Conservationist

cc: Mr. James A. Carter, Chairman, Natural Bridge SWCD, Lexington
Mr. Robert Collins, Buena Vista City Manager, Buena Vista
Roger Flint, NRC, Lexington
Wade Biddix, Planning Coordinator

COMMONWEALTH of VIRGINIA

James S. Gilmore, III
Governor

John Paul Woodley, Jr.
Secretary of Natural Resources

Marine Resources Commission
2600 Washington Avenue
P.O. Box 756
Newport News, Virginia 23607-0756

William A. Pruitt
Commissioner

October 23, 1998

Ms. M. Denise Doetzer
USDA - Natural Resources Conservation Service
Culpeper Building, Suite 209
1606 Santa Rosa Road
Richmond, Virginia 23229-5014

Re: Draft Plan - Buena Vista Watershed Plan
Rockbridge County

Dear Ms. Doetzer:

In accordance with your letter dated October 13, 1998, we have reviewed the above-referenced Environmental Impact Statement to reduce flood damage in the Buena Vista Watershed.

The Marine Resources Commission, pursuant to Chapter 12 of Title 28.2 of the Code of Virginia, is responsible for issuing permits for encroachments in, on, or over State-owned submerged lands throughout the Commonwealth. Accordingly, if any portion of the project involves any encroachments channelward of ordinary high water along any natural rivers and streams, a permit may be required from our agency. For your information, we generally only require permits for encroachments on streams with a drainage area greater than 5 square miles or with an average instream flow of 5 cubic feet per second or higher.

From the information provided in the report, it appears that several of the proposed projects outlined in the EIS will require a permit from this agency. Joint Permit Applications are available through this office and can be requested over the telephone.

Thank you for the opportunity to comment on this project. If we may be of further assistance, please do not hesitate to give us a call.

Sincerely,

Traycie L. West
Environmental Engineer

TLW/kr
HM
cc: Ms. Ellie Irons - DEQ Central Office

UNITED STATES
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1606 Santa Rosa Road
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December 22, 1998

Ms. Traycie L. West
Environmental Engineer
Virginia Marine Resources Commission
2600 Washington Avenue
P.O. Box 756
Newport News, Virginia 23607-0756

RE: Buena Vista Watershed Draft Plan-Environmental Impact Statement, Virginia

Dear Ms. West:

Thank you for your comments on the above referenced project. We are currently responding to the comments received from the interagency and public review and plan to have a final document prepared for signatures in the next few months.

In response to your comments, we will advise the City of Buena Vista and the Natural Bridge Soil and Water Conservation District, that they need to coordinate with your office to determine any appropriate permits that may be required prior to construction of any planned measures.

I hope this has addressed all of your concerns. Thanks again for your participation in this process. We look forward to working with you further on this worthwhile project.

Sincerely,

M. DENISE DOETZER
State Conservationist

cc: Mr. James A. Carter, Chairman, Natural Bridge SWCD, Lexington
Mr. Robert Collins, Buena Vista City Manager, Buena Vista
Roger Flint, NRC, Lexington
Wade Biddix, Planning Coordinator

United States Department of the Interior

OFFICE OF THE SECRETARY
Office of Environmental Policy and Compliance
Custom House, Room 244
200 Chestnut Street
Philadelphia, Pennsylvania 19106-2904

IN REPLY REFER TO:

December 9, 1998

ER 98/668

M. Denise Doetzer
State Conservationist
Natural Resources Conservation Service
1606 Santa Rosa Road
Suite 209
Richmond, Virginia 23229-5014

Dear Ms. Doetzer:

Thank you for the opportunity to review and comment on the Draft Watershed Plan - Environmental Impact Statement for the City of Buena Vista, Rockbridge, County, Virginia.

The U.S. Department of the Interior has no comment on the adequacy of the document or the merits of the project proposal.

Thank you again for consulting with us about document preparation.

Sincerely,

Michael T. Chezik
Regional Environmental Officer

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION III
1650 Arch Street
Philadelphia, Pennsylvania 19103-2029

DEC 1 4 1998

M. Denise Doetzer
State Conservationist
USDA- Natural Resource Conservation Service
Culpeper Building, Suite 209
1606 Santa Rosa Rd
Richmond, VA 23229-5014

Dear Mrs. Doetzer:

In accordance with the National Environmental Policy Act (NEPA), Section 309 of the Clean Air Act, and Section 404 of the Clean Water Act (Section 404), the U.S Environmental Protection Agency (EPA) has reviewed the Draft Environmental Impact Statement (DEIS) for the proposed Buena Vista Watershed project located in the City of Buena Vista, Rockingham County, Va. The recommended $6 million dollar plan is to provide flood protection to a portion of the City of Buena Vista through a series of structural measures to the existing stream channels (5,483 linear feet), culverts and bridges (11), and through the construction of eight debris basins.

After reviewing this document, we have chosen to rate the project and its documentation as EC-2 in EPA's classification system (Environmental Concerns - Insufficient Information). We give this rating due to the lack of a specific description of both the project limits and the resources within the project limits. We also find the document to be lacking in detail regarding the stream channelization design, and in its analysis of non-structural alternatives. With those key elements missing from the document, the reader can not fully understand the impacts and trade-offs of the recommended plan. Our comments are provided in greater detail in the following paragraphs.

To begin, the only map that shows the extent of the project is found in Figure B-2. This map provides a good synoptic look at the project, but the document fails to tie in key aquatic resource information. For example, no sampling station locations are indicated on the mapping. In addition, while a reference to trout habitat is given in the text (page 22-23), no indication is given as to whether the trout occur within the project limits, nor is any additional assessment of the trout resource given in the effects section (page 69). Further, it appears that no sampling of the streams was performed to determine their quality through the use of biological indicators.

Second, there is no empirical documentation of current structural stream habitat conditions and no discussion of the structural habitat after the project is completed. There is reference to maintaining the natural characteristics of the stream within the channel (page 32), but no specific design is given, nor is it clear if the Rosgen methodology will be utilized. EPA recommends the use of the Rosgen method to design the natural stable stream channel. Further,

no mention of bottomless arch culverts is given in the list of potential structures on page 33. EPA recommends the use of bottomless arch culverts where feasible. Finally, it is not clear from the document how fish passage will be maintained through the diverter structures associated with the 8 debris basins. This information should be provided in order for the reviewer to assess the impacts of the project.

Finally, non-structural alternatives are discussed (Page 30) and rejected. No cost estimate is given nor are they ranked with the same rigor as are the structural alternatives (pages 44-54 and page 58). Potentially very high costs are suggested for residential relocation, but no data is given. It is indicated in the text (page 15) that this area is suffering from low real estate prices and the decline is expected to continue. Additionally, 89% of the homes were stated to have been built before 1980, and a large percentage of the homes on the flood plain are rented. Further, while the property at risk is evaluated at $8 million dollars (compared to the project cost of $6 million dollars), no data is provided on the value of the property at risk in the 5, 25, and 100 year flood plain areas. Finally, the document indicates that less than $3 million dollars in flood insurance premiums have been paid since 1978. All the above suggest that buy-outs may be economically feasible in some circumstances. This question is not effectively dealt with in the document. It is referenced that the City of Buena Vista along with the Federal Emergency Management Agency (FEMA) is considering some non-structural alternatives on a case by case basis, but no indication of the effect these will have on this projects' scope or need is given.

Given the above, it difficult to make an informed decision regarding the most cost effective and least environmentally damaging flood control alternative for the project area. We recommend that these issues be addressed further as the environmental review process proceeds.

Thank you for this opportunity to comment. If you have any questions please feel free to call Peter Stokely at 703-648-4292. Mr. Stokely is the principle reviewer of this project for EPA.

Sincerely,

William J Hoffman, Program Manager
NEPA/404 Regulatory Program

UNITED STATES
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1606 Santa Rosa Road
Suite 209
Richmond, Virginia 23229-5014
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FAX (804) 287-1736

January 7, 1999

Mr. William J. Hoffman, Program Manager
NEPA/404 Regulatory Program
Environmental Protection Agency, Region III
1650 Arch Street
Philadelphia, PA 19103-2029

RE: Buena Vista Watershed Draft Plan-Environmental Impact Statement, Virginia

Dear Mr. Hoffman:

Thank you for your comments on the above referenced project. We are currently responding to the comments received from the interagency and public review and plan to have a Final Plan-EIS in the next few weeks.

Responses to your comments:

1. Project impacts regarding the extent of the project and the impact on trout resources will be clarified in the Final Plan-EIS. The only know trout waters are in the headwaters of the watershed on U.S. Forest Service land. There are no planned measures, and thus no project impacts, on Forest Service land upstream of the Buena Vista City limits. All of the interior City streams have intermittent flow and oftentimes have dry stream channels. The Virginia Department of Game and Inland Fisheries verifies that the lack of shading and other urban impacts limits habitat for fish and other aquatic species in the downstream sections of the watershed within the proposed project area. They agreed that no stream sampling was needed within the City of Buena Vista.
2. Stream channel design concerns: A combination of vegetative cover and hard armor will be used to stabilize the eroding stream banks, as needed, to prevent further debris and bedload to the interior streams within the City of Buena Vista. There are two goals for the proposed channel improvements within Buena Vista: 1) increase the storm flow capacity, and 2) maintain/establish a naturally, functioning channel. It is not possible to achieve both goals with a single design. For this reason, a channel-within-a-channel design has been proposed. The larger channel will be sized to pass the design storm flow without overtopping. This channel will be basically trapezoidal with 2:1 armored side slopes. The armored side slopes are planned for concrete, interlocking blocks that allow for soil placement in the openings and vegetation.

Within the bounds of the larger channel, there will be a much smaller stream channel with a dimension and pattern suitable for the planned gradient. Low earthen benches set at the "bankfull" elevation will be used to contain the stream to a size that is capable of bedload transport for events of bankfull proportions or smaller. Design of the interior stream channels will require the use of fluvial geomorphological techniques.

3. Bottomless culverts are an option and will be used where deemed feasible.
4. Fish passage: After further consultation with the Virginia Department of Game and Inland Fisheries (VDGIF), they conclude that due to the fish species involved, their location within the watershed, stream characteristics, and intermittent flow conditions, fish passage throughout the project area is not a concern. See attached letter from the VDGIF.
5. The non-structural alternatives will be clarified in the Final Plan-EIS. The City of Buena Vista, along with the Shenandoah Valley Planning District Commission and the Virginia Department of Emergency Services, have plans to utilize funding provided by FEMA to acquire, elevate and/or relocate some of the residential properties most affected by flooding. Non-structural alternatives were considered and were rejected as viable alternatives from a large scale (floodplain-wide) perspective due to the following considerations: 1) Early warning systems would not work due to the steep slopes and close proximity between the mountain slopes in the upper-watershed and the City. Floodproofing was also determined to not make much sense as a treatment for most homes given that earthen floodwalls require too much space, masonry floodwalls are too expensive relative to the value of the affected homes, and dry and wet floodproofing would be appropriate for only a small number of properties, but still would only afford protection from minor storm events; 2) Non-structural alternatives require voluntary participation. The most effective non-structural alternatives of a preventive nature, buy-out/demolition, relocation and elevation, were judged to not likely be socially acceptable on a widespread basis. These options are unacceptable because of their disruptive nature to the lives of affected families and individuals and due to the fact that many of those affected worst by flooding in Buena Vista are elderly, limited income people, with few options for relocation. In addition, their homes tend to be older with lower values which makes them less likely to be economically justifiable; and 3) Buy-out/demolition, relocation and elevating were deemed the most effective non-structural alternatives with the ability to prevent and/or diminish flood damages, but assuming a very conservative average cost of $35,000 per home would have resulted in an estimated project cost of over $9,625,000 just to protect the 275 properties affected by the 25 year storm event. This alternative would likely cost much more because the average cost for commercial properties would be more than the $35,000 per structure assumed here. Using the same conservative $35,000 per home cost for non-structural alternatives, 100 year storm event protection would cost over $11,900,000. Buena Vista is a relatively small city both in terms of it's physical area occupied and with respect to it's population. Thus, finding sufficient sites for new residences and relocations would also be completely impractical. The Draft Plan-EIS mentioned that non-structural options would be pursued through a hazard mitigation grant proposal sponsored by

the Virginia Department of Emergency Services and FEMA and coordinated with the NRCS project. By using our analysis and data, we assisted them to identify potential properties appropriate for evaluation and inclusion in the project. A total of 39 properties were identified as good candidates to meet the economic defensibility criteria. This effort is intended to complement the broader watershed-wide project proposal from a smaller scale strategic properties focus whereby the properties at greatest risk from recurrent flooding are targeted for buy-out/demolition, relocation and/or elevation. This approach was judged by our Planning Team, the local sponsors and the Virginia Department of Emergency Services, to make the most sense to utilize non-structural alternatives to the maximum extent practical. This effort continues to proceed with 28 homes deemed economically feasible that also have signed voluntary participation forms for the 13 owned and 15 rental properties included. The project proposes to acquire 11 houses and elevate 17 homes which have the potential to receive 2 feet or more of water in the first floor from the 100 year storm event. The total estimated project cost is $1,160,176 or $41,435 per home. These investments are considered non-project actions from the PL-566 perspective and thus the associated benefits and costs have been excluded from the Buena Vista Watershed Plan-EIS. However, as already noted, the non-structural hazard mitigation project was an outgrowth of the coordinated whole-watershed planning process which the NRCS led. In conclusion, the nonstructural measures are needed as well as the various structural measures being proposed in this Plan-EIS.

I hope this has addressed all of your concerns. The Final Plan-EIS will be revised to reflect your suggestions as deemed appropriate. Thanks again for your participation in this process. We look forward to working with you further on this worthwhile project.

Sincerely,

J. W. Miller, Jr.

M. DENISE DOETZER
Acting State Conservationist

Attachment

cc: Mr. James A. Carter, Chairman, Natural Bridge SWCD, Lexington
Mr. Robert Collins, Buena Vista City Manager, Buena Vista
Roger Flint, NRC, Lexington
Wade Biddix, Planning Coordinator, Richmond

COMMONWEALTH of VIRGINIA

Department of Game and Inland Fisheries
4725 LEE HIGHWAY
P.O. BOX 996
VERONA, VA 24482-0996
(703) 248-9360 FAX (703) 248-9399

M E M O R A N D U M

TO: John Meyers

FROM: Larry Mohn

DATE: January 6, 1999

SUBJECT: Buena Vista debris dams

This is in reference to your request for information concerning the need for fish passage at the proposed debris dams on four tributaries within the city of Buena Vista. All four of these streams are intermittent within the city limits and generally only flow during wet periods. Reservoir Hollow and Pedlar Gap Run both have relatively good populations of native brook trout at higher elevations. Associated species include blacknose dace, torrent suckers, bluehead chub and mottled sculpin. The only likely fish movement under current conditions is downstream during high flow periods. Stream conditions further downstream are generally not suitable for survival of trout so few fish would be available to migrate back if conditions were suitable. The other species could survive at lower elevations but movement back upstream does not currently appear likely. I see no need to include fish passage in these structures based on the data we have available.

DEPARTMENT OF THE ARMY
NORFOLK DISTRICT, CORPS OF ENGINEERS
FORT NORFOLK, 803 FRONT STREET
NORFOLK, VIRGINIA 23510-1096

REPLY TO
ATTENTION OF:

December 21, 1998

Western Virginia Regulatory Section
98-H0201-75 (Chalk Mine Run, etc.)

Ms. M. Denise Doetzer, State Conservationist
Natural Resources Conservation Service
USDA
1606 Santa Rosa Road
Suite 209
Richmond, Virginia 23229-5014

Dear Ms. Doetzer:

This is in response to your letter and Watershed Plan-Environmental Impact Statement entitled "Buena Vista Watershed", in which you requested comments from various agencies. After review of the proposed watershed protection and flood prevention project we have determined that your project may impact the channels of Chalk Mine Run, Indian Gap Run, Noel's Run, and Pedlar Gap Run.

This is formal notice that any discharge of dredged or fill material below the ordinary high water mark of "waters of the U. S." and into any adjacent wetlands will require prior coordination with this office to determine any appropriate Department of the Army permit(s) that may be required. In addition there may be permits required from the Virginia Department of Environmental Quality and the Virginia Marine Resources Commission.

We would recommend a preapplication meeting and/or site meeting prior to applying for a DOD permit. If you have any further questions you may contact Mr. Brogdon of in Staunton at (540) 886-4221.

Sincerely,

for J. Robert Hume III, Chief
Western Virginia Regulatory Section

Copies furnished:

Virginia Department of Environmental Quality, Harrisonburg
Virginia Marine Resources Commission, Newport News

UNITED STATES
DEPARTMENT OF
AGRICULTURE

NATURAL
RESOURCES
CONSERVATION
SERVICE

1606 Santa Rosa Road
Suite 209
Richmond, Virginia 23229-5014
Tel. (804) 287-1690
FAX (804) 287-1736

December 22, 1998

Mr. J. Robert Hume, III, Chief
Western Virginia Regulatory Section
Department of the Army
Norfolk District, Corps of Engineers
Fort Norfolk, 803 Front Street
Norfolk, Virginia 23510-1096

RE: Buena Vista Watershed Draft Plan-Environmental Impact Statement, Virginia

Dear Mr. Hume:

Thank you for your comments on the above referenced project. We are currently responding to the comments received from the interagency and public review and plan to have a final document prepared for signatures in the next few months.

In response to your comments, we will advise the City of Buena Vista and the Natural Bridge Soil and Water Conservation District, that they need to coordinate with your office to determine any appropriate permits that may be required prior to construction of any planned measures. We would welcome a preapplication meeting and/or site meeting prior to applying for a permit.

I hope this has addressed all of your concerns. Thanks again for your participation in this process. We look forward to working with you further on this worthwhile project.

Sincerely,

M. DENISE DOETZER
State Conservationist

cc: Mr. James A. Carter, Chairman, Natural Bridge SWCD, Lexington
Mr. Robert Collins, Buena Vista City Manager, Buena Vista
Roger Flint, NRC, Lexington
Wade Biddix, Planning Coordinator

UNITED STATES DEPARTMENT OF COMMERCE
Office of the Under Secretary for
Oceans and Atmosphere
Washington, D.C. 20230

October 30, 1998

Ms. Denise Doetzer
State Conservationist
1606 Santa Rosa Road
Suite 209
Richmond, Virginia 23229-5014

Dear Ms. Doetzer:

Enclosed are comments on the Draft Environmental Impact Statement for Buena Vista Watershed Plan City of Buena Vista Rockridge County, Virginia. We hope our comments will assist you. Thank you for giving us an opportunity to review this document.

Sincerely,

Susan B. Fruchter

Susan B. Fruchter
Acting NEPA Coordinator

Enclosure

MEMORANDUM FOR: Susan B. Fruchter
Acting NEPA Coordinator

FROM: Charles W. Challstrom
Acting Director, National Geodetic Survey

SUBJECT: DEIS-9810-07-Buena Vista Watershed Plan City of Buena Vista
Rockridge County, Virginia

The subject statement has been reviewed within the areas of the National Geodetic Survey's (NGS) responsibility and expertise and in terms of the impact of the proposed actions on NGS activities and projects.

All available geodetic control information about horizontal and vertical geodetic control monuments in the subject area is contained on the NGS home page at the following Internet World Wide Web address: http://www.ngs.noaa.gov. After entering the NGS home page, please access the topic "Products and Services" and then access the menu item "Data Sheet." This menu item will allow you to directly access geodetic control monument information from the NGS data base for the subject area project. This information should be reviewed for identifying the location and designation of any geodetic control monuments that may be affected by the proposed project.

If there are any planned activities which will disturb or destroy these monuments, NGS requires not less than 90 days' notification in advance of such activities in order to plan for their relocation. NGS recommends that funding for this project includes the cost of any relocation(s) required.

For further information about these monuments, please contact Rick Yorczyk; SSMC3, NOAA, N/NGS; 1315 East West Highway; Silver Spring, Maryland 20910; telephone: 301-713-3230 x142; fax: 301-713-4175.

UNITED STATES
DEPARTMENT OF
AGRICULTURE

NATURAL
RESOURCES
CONSERVATION
SERVICE

1606 Santa Rosa Road
Suite 209
Richmond, Virginia 23229-5014
Tel. (804) 287-1690
FAX (804) 287-1736

December 22, 1998

Ms. Susan B. Fruchter
Acting NEPA Coordinator
U.S. Department of Commerce
Office of the Under Secretary for Oceans and Atmosphere
Washington, D.C. 20230

RE: Buena Vista Watershed Draft Plan-Environmental Impact Statement, Virginia

Dear Ms. Fruchter:

Thank you for your comments on the above referenced project. We are currently responding to the comments received from the interagency and public review and plan to have a final document prepared for signatures in the next few months.

In response to your comments, we will identify the locations and designations of any geodetic control monuments that may be affected by the proposed project. We will notify the National Geodetic Survey in advance if any planned activities will potentially disturb or destroy these monuments.

I hope this has addressed all of your concerns. Thanks again for your participation in this process.

Sincerely,

M. DENISE DOETZER
State Conservationist

cc: Mr. James A. Carter, Chairman, Natural Bridge SWCD, Lexington
Mr. Robert Collins, Buena Vista City Manager, Buena Vista
Roger Flint, NRC, Lexington
Wade Biddix, Planning Coordinator

APPENDIX B

FLOODPLAIN MAPS

U.S. DEPARTMENT OF AGRICULTURE

SOIL CONSERVATION SERVICE

79°19'
37°46'

LOCATION MAP

631
733
60
ROCKBRIDGE CO
Mine
Run
JORDAN
STREET
PARKWAY
631
LONG
Chalk
Chimney Rock Mountain
GEORGE
60
79TH STREET
Buena Vista
Washer
Hollow
WASHINGTON
501
South
Fork
RIDGE
ROCKBRIDGE CO
River
CSXT
SOUTHERN AVENUE
Indian
Gap
NATIONAL
745
National Forest Boundary Follows City Limits
Elephant Mountain
Maury
CSXT
NORFOLK
MAGNOLIA STREET
COUNTY
BLUE
COUNTY
N
607
Reservoir
Hollow
FOREST
Watershed Boundary Follows County Line
BLUE
RIDGE
PARKWAY
Lowry
Run
ROCKBRIDGE CO
Pedlor
Gap
Run
607
ROCKBRIDGE
AMHERST
Wilmoth
Hollow
Poplar
Cove
Run
RIDGE
Roundtop Mountain
Moore Mountain
BLUE
79°22'
37°41'

LEGEND

- WATERSHED BOUNDARY
- NATIONAL FOREST BOUNDARY
- COUNTY LINE
- CITY LIMITS
- TOWN
- 60 FEDERAL HIGHWAY
- 631 COUNTY HIGHWAY
- PRIMARY ROAD
- SECONDARY ROAD
- UNIMPROVED ROAD
- RAILROAD
- DRAINAGE
- LAKE
- MOUNTAIN

BUENA VISTA WATERSHED

ROCKBRIDGE COUNTY, VIRGINIA

MILES

0 0.2 0.4 0.6 0.8 1

SOURCE:
BUREAU OF THE CENSUS 1990 TIGER LINE DATA
AND 1:24,000 U.S.G.S. QUADRANGLES.
LATITUDE AND LONGTITUDE GEOGRAPHIC COORDINATE SYSTEM
NATIONAL CARTOGRAPHY AND GEOGRAPHIC INFORMATION
SYSTEMS CENTER, FORT WORTH, TEXAS, 1994.

Sheet
No 1
of 10

FEBRUARY 1994 1004033

USDA, SCS, NATIONAL CARTOGRAPHY & GIS CENTER, FORT WORTH, TX, 1994

B-1

FLOOD CONTROL STUDY
For
BUENA VISTA, VIRGINIA
Rockbridge County, Virginia

Date December, 1997

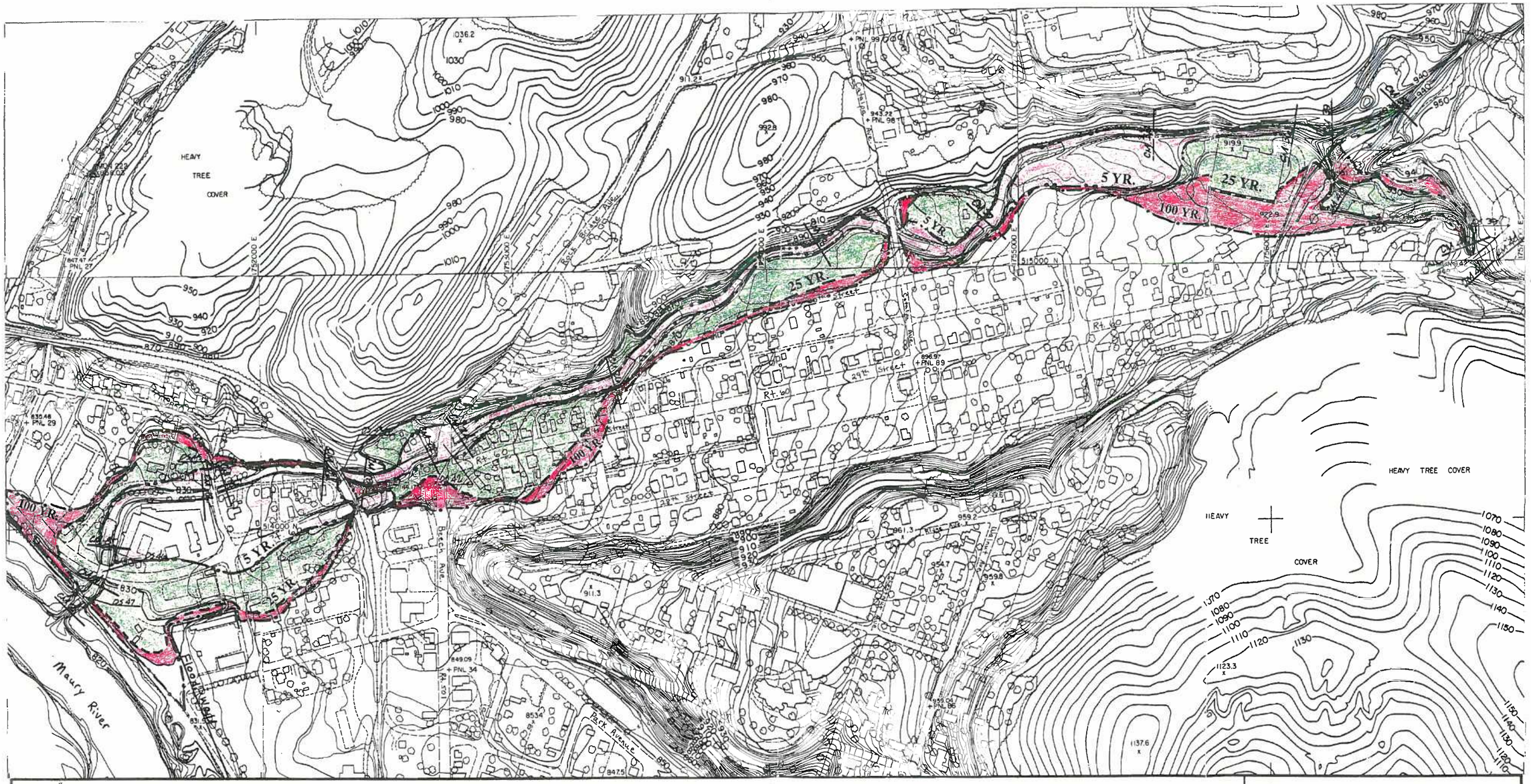
SHEET INDEX

USDA- NATURAL RESOURCES CONSERVATION SERVICE
1606 Santa Rosa Road, Suite 209
Richmond, Virginia 23229-5014
Phone: (804) 287-1691

Sheet No 2 of 10

THE ORIGINAL HYDROLOGY & HYDRAULIC MODELS WERE DONE BY DEWBERRY & DAVIS OCTOBER 1996 WITH PORTIONS REVISED BY USDA - NATURAL RESOURCES CONSERVATION SERVICE SEPTEMBER 1997. PHOTOGRAPHIC MAPPING AND FIELD SURVEYS PREPARED BY NILES & ASSOCIATES WITH A CONTOUR INTERVAL OF 2 FEET.

NILES & ASSOCIATES
435 APPERSON DRIVE SALEM, VIRGINIA 24153
170 E. REYNOLDS RD. LEXINGTON, KENTUCKY 40503



CHALK MINE RUN

5, 25 And 100 Year Floodplain

Future Without Project Conditions

0 200 400 800 1200 1600 2000 FEET

FLOOD-CONTROL STUDY

For

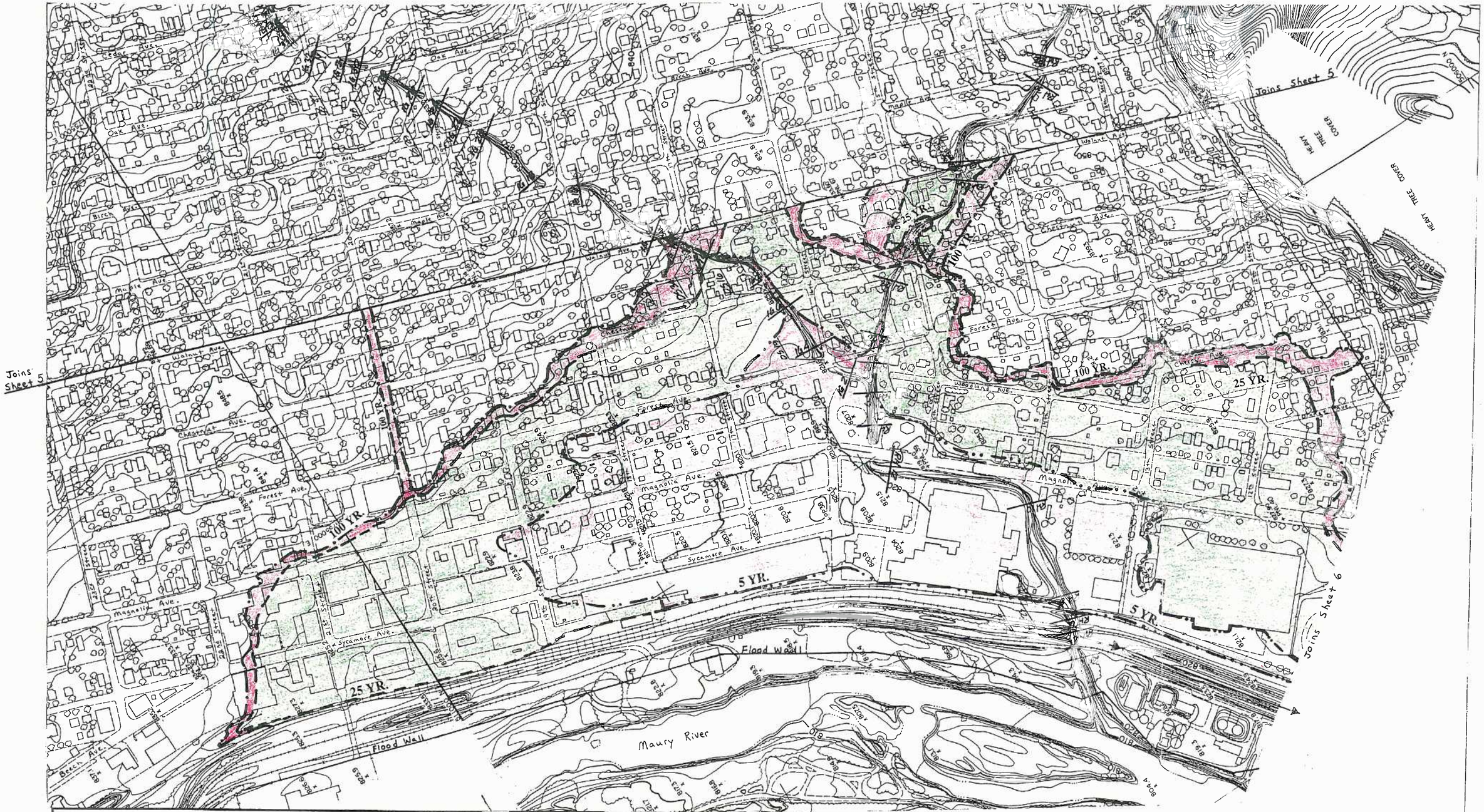
BUENA VISTA, VIRGINIA

Rockbridge County, Virginia

5 YEAR 25 YEAR 100 YEAR

U.S. DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE
1606 Santa Rosa Road, Suite 209
Richmond, Virginia 23229-5014
Phone: (804) 287-1691

	Date	
Designed A. KETCHEM	12/97	Approved by
Drawn A. KETCHEM	12/97	Title
Traced W. BRADIX	12/97	Sheet No. 3 of 10
Checked J. TOENNIESSEN	12/97	Drawing No.



INDIAN GAP RUN AND NOEL'S RUN
5, 25 And 100 Year Floodplain
Future Without Project Conditions

0 200 400 800 1200 1600 2000 FEET

5 YEAR 25 YEAR 100 YEAR

FLOOD CONTROL STUDY
For
BUENA VISTA, VIRGINIA
Rockbridge County, Virginia

U.S. DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE
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	Date		
Designed A. KEICHEN	12/92	Approved by	
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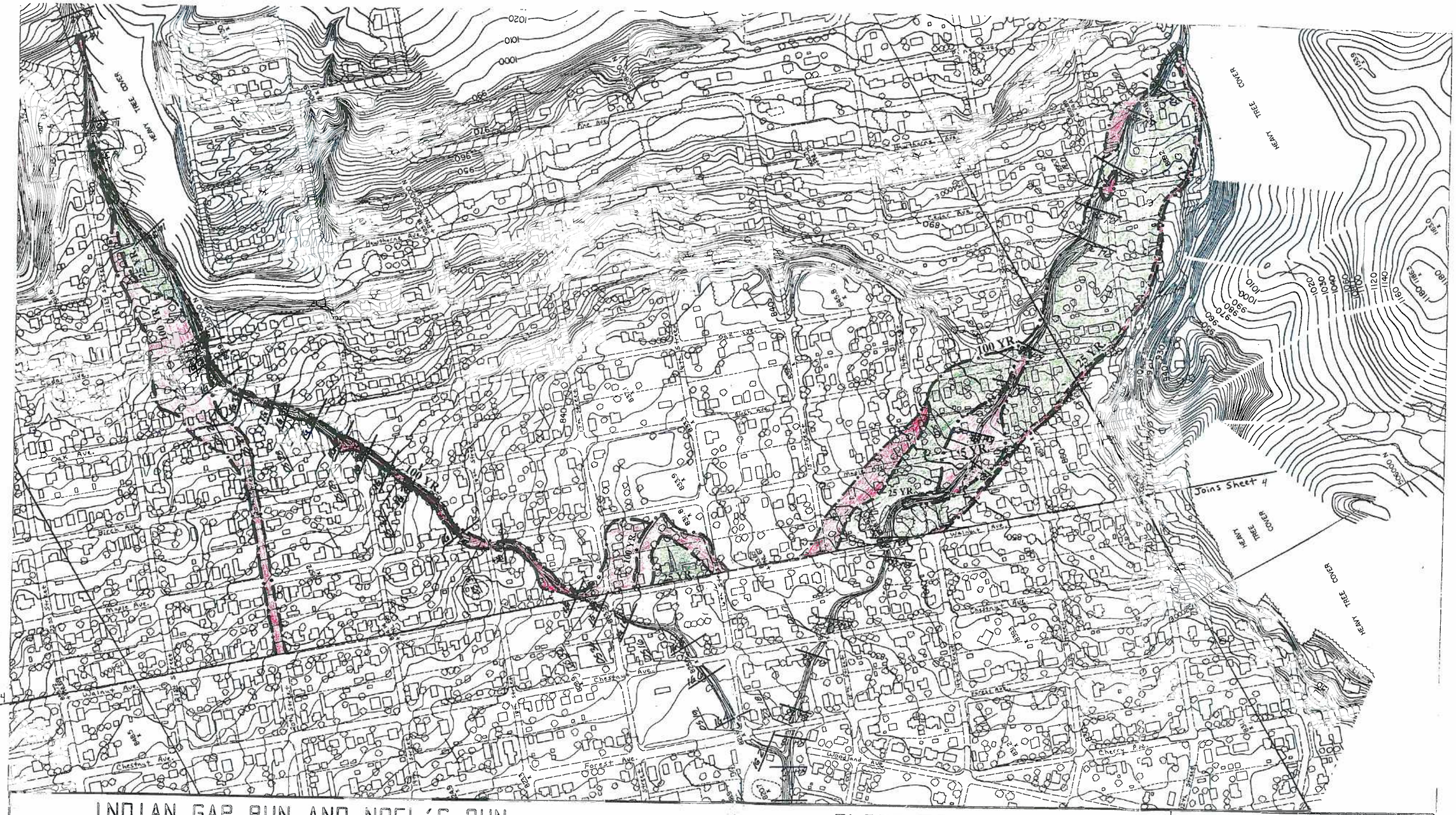

INDIAN GAP RUN AND NOEL'S RUN
5, 25 And 100 Year Floodplain
Future Without Project Conditions

0 200 400 800 1200 1600 2000 FEET

5 YEAR | 25 YEAR | 100 YEAR

FLOOD CONTROL STUDY
For
BUENA VISTA, VIRGINIA
Rockbridge County, Virginia

U.S. DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE
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	Date		
Designed A. KEICHEL	12/92	Approved by	
Drawn A. KEICHEL	12/92	Title	
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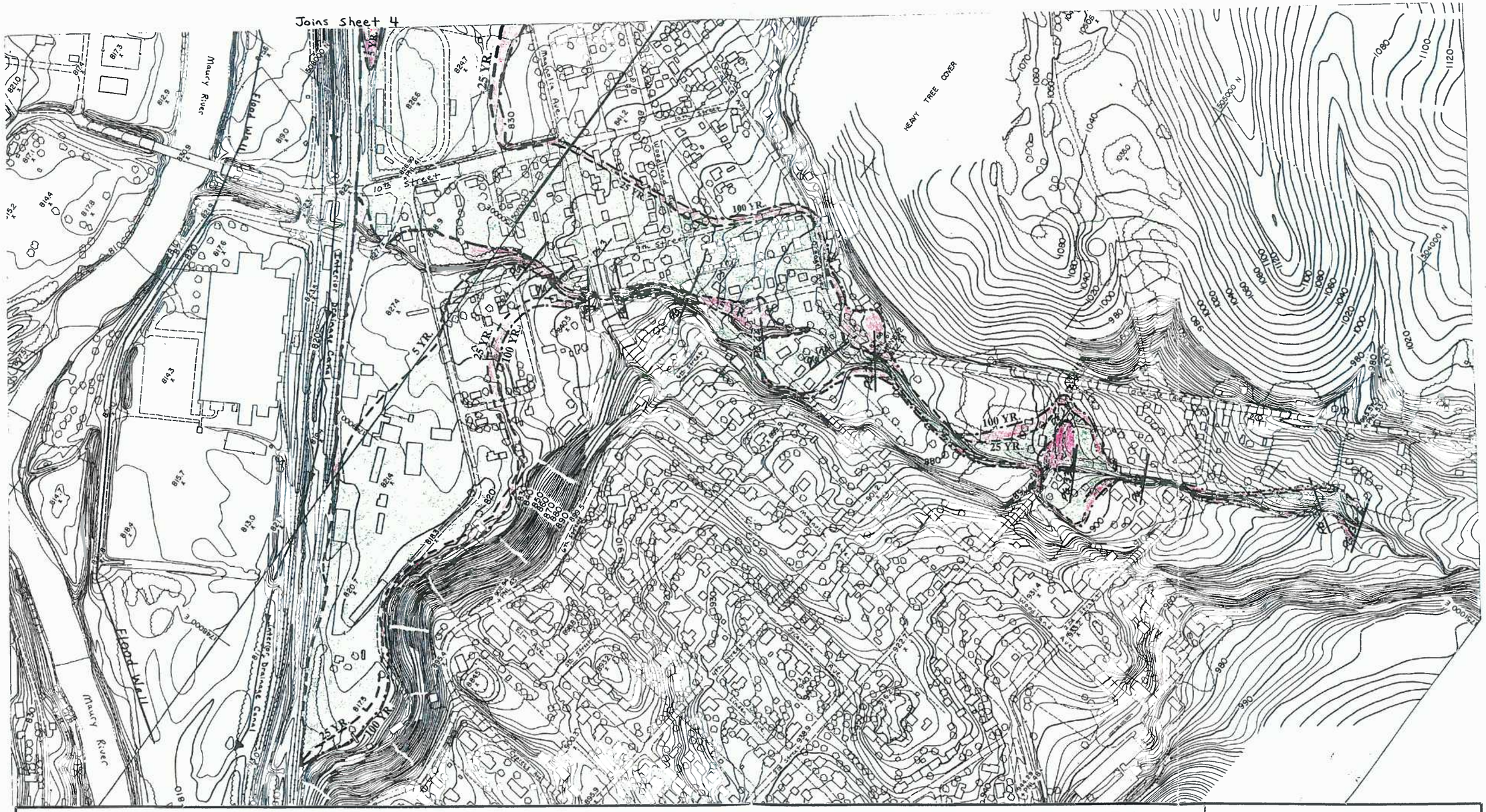

PEDLAR GAP RUN

5, 25 And 100 Year Floodplain

Future Without Project Conditions

0 200 400 800 1200 1600 2000 FEET

5 YEAR 25 YEAR 100 YEAR

FLOOD CONTROL STUDY

For

BUENA VISTA, VIRGINIA

Rockbridge County, Virginia

U.S. DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE
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Richmond, Virginia 23229-5014
Phone: (804) 287-1691

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Designed A. KEICHEM	12/97	Approved by	
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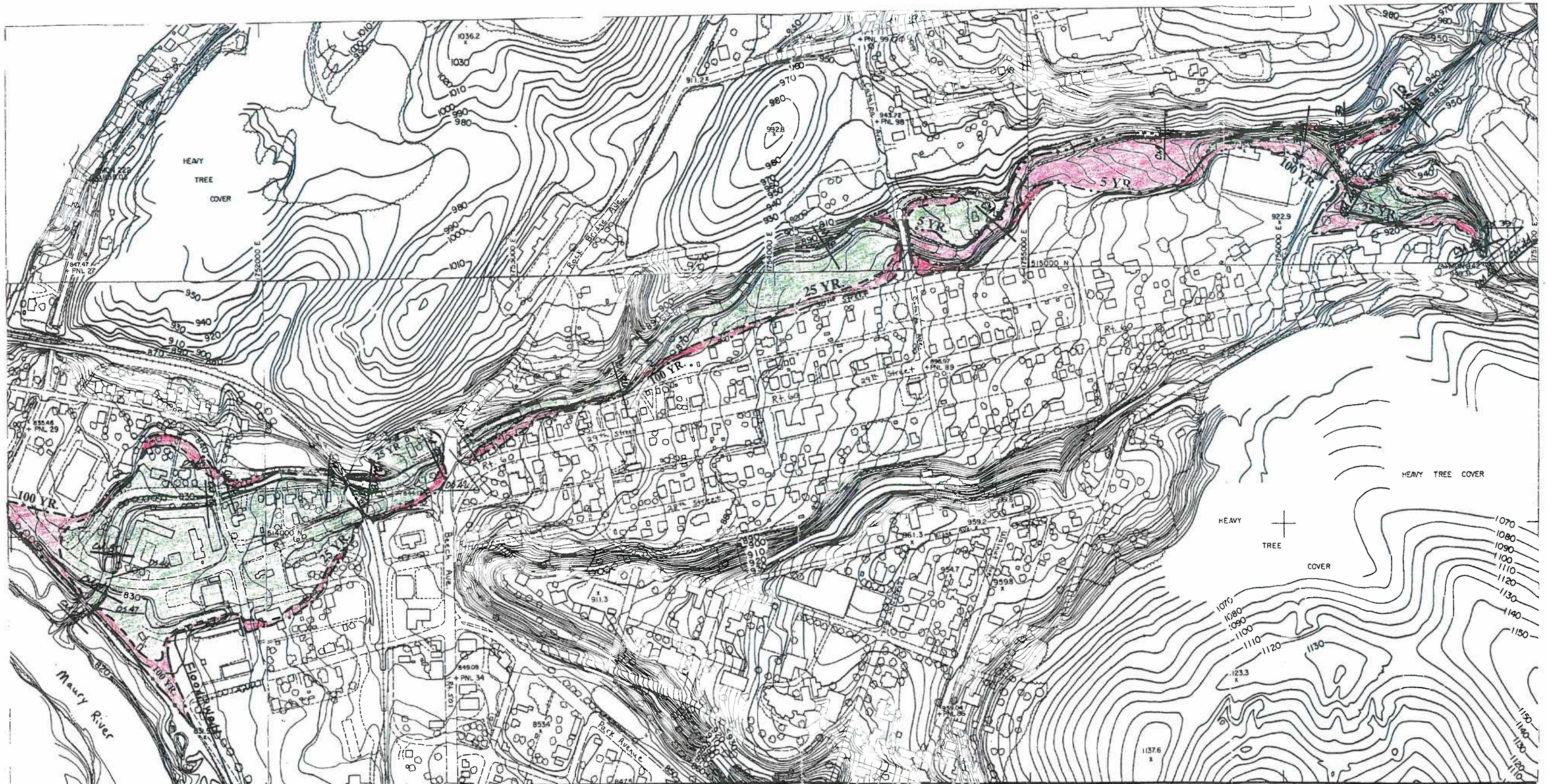

CHALK MINE RUN

5, 25 And 100 Year Floodplain

Future With Project Conditions

0 200 400 800 1200 1600 2000 FEET

FLOOD-CONTROL STUDY

For

BUENA VISTA, VIRGINIA

Rockbridge County, Virginia

5 YEAR 25 YEAR 100 YEAR

U.S. DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE
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	Date		
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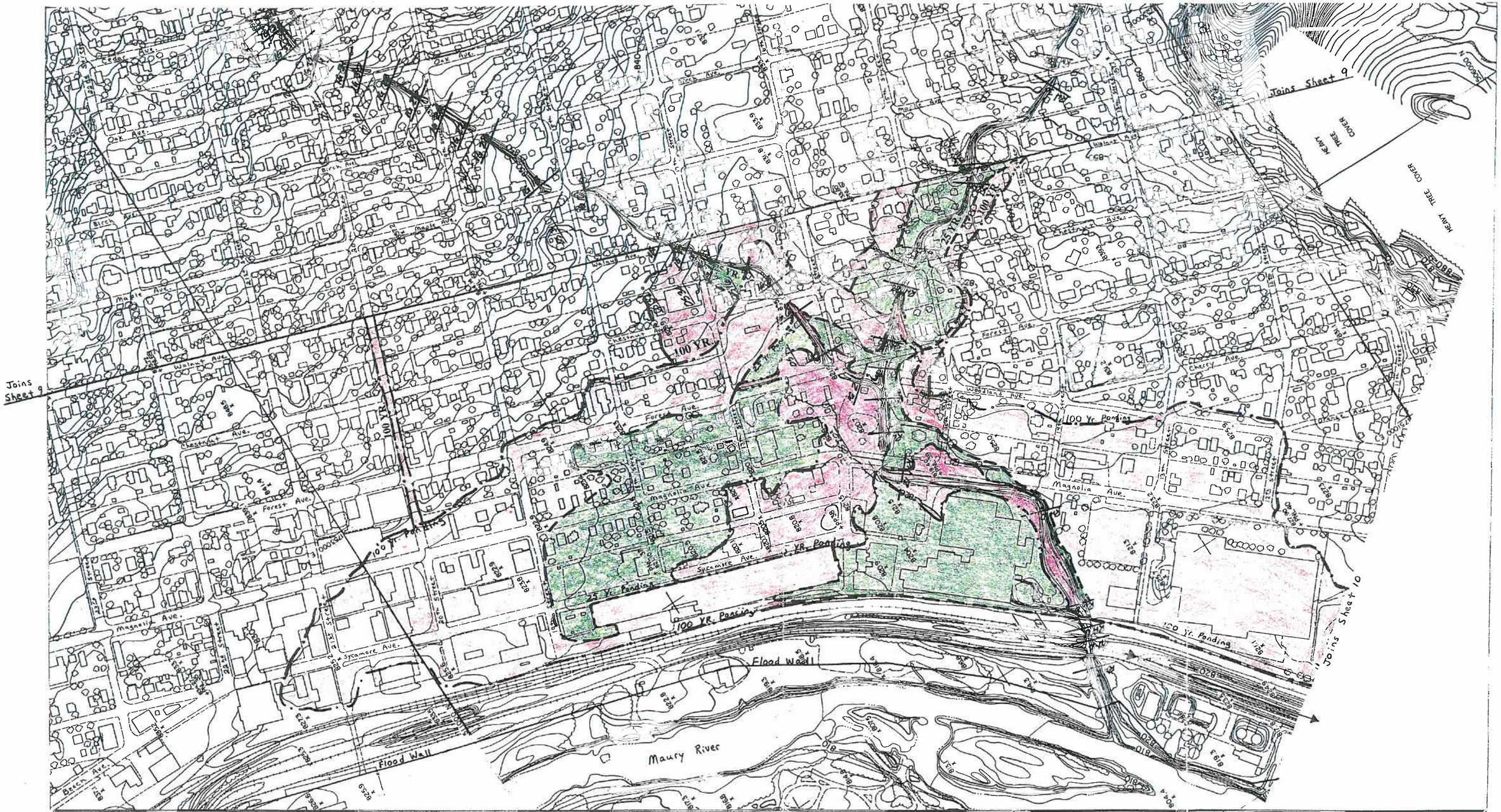

INDIAN GAP RUN AND NOEL'S RUN
5, 25 And 100 Year Floodplain
Future With Project Conditions

0 200 400 800 1200 1600 2000 FEET

5 YEAR 25 YEAR 100 YEAR

FLOOD CONTROL STUDY
For
BUENA VISTA, VIRGINIA
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1606 Santa Rosa Road, Suite 209
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	Date	
Designed A. KETCHEM	12/97	Approved by Title
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Traced K. BIDDIX	12/97	Sheet No. 8 of 10
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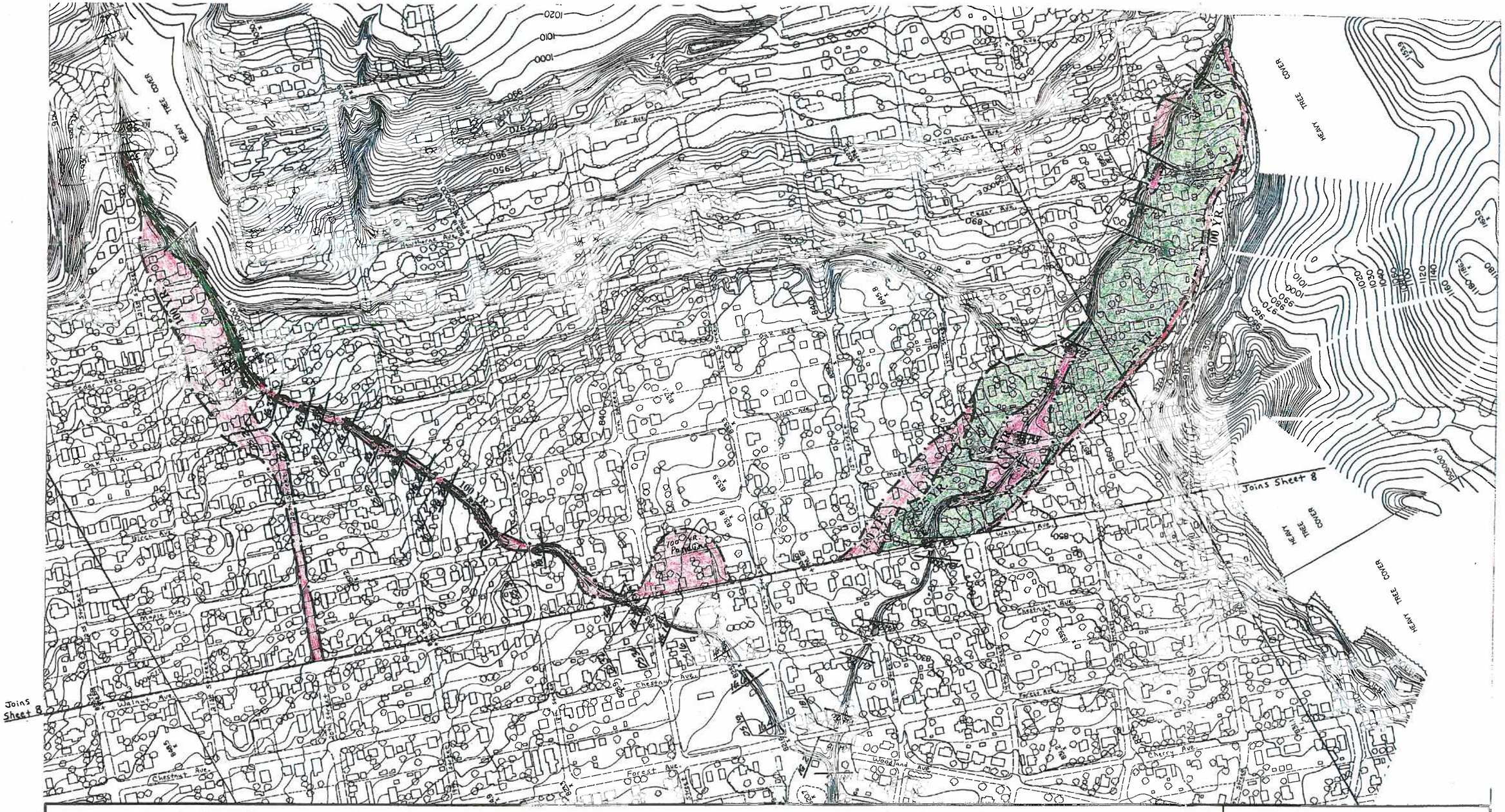

INDIAN GAP RUN AND NOEL'S RUN
5, 25 And 100 Year Floodplain
Future With Project Conditions

0 200 400 800 1200 1600 2000 FEET

5 YEAR | 25 YEAR | 100 YEAR

FLOOD CONTROL STUDY
For
BUENA VISTA, VIRGINIA
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	Date		
Designed A. KETCHEM	12/97	Approved by	
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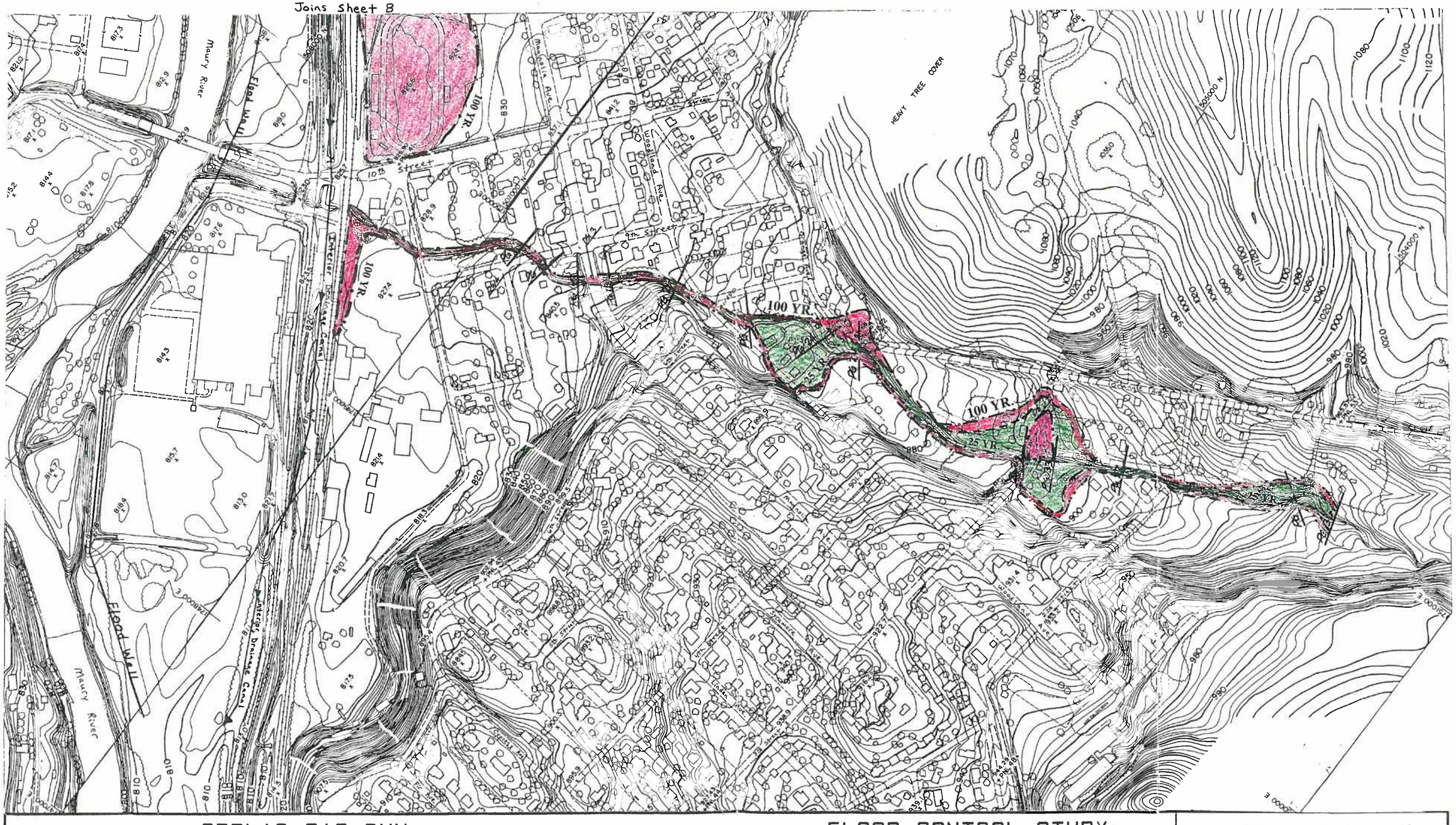

PEDLAR GAP RUN

5, 25 And 100 Year Floodplain

Future With Project Conditions

0 200 400 800 1200 1600 2000 FEET

5 YEAR 25 YEAR 100 YEAR

FLOOD CONTROL STUDY

For

BUENA VISTA, VIRGINIA

Rockbridge County, Virginia

U.S. DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE
1606 Santa Rosa Road, Suite 209
Richmond, Virginia 23229-5014
Phone: (804) 287-1691

	Date	
Designed A. KEICHEM	12/97	Approved by Title
Drawn A. KEICHEM	12/97	Title
Traced W. BIDDIX	12/97	Sheet No. 10 of 13 / Drawing No.
Checked J. TOENNIESSEN	12/97	

APPENDIX C

INVESTIGATION AND ANALYSIS REPORT

Appendix C

Investigation and Analysis Report

Project Formulation

The project was formulated to address the problem of flooding in the City of Buena Vista. The upper watershed is very steep and mountainous and the runoff empties into a floodplain that is all urban. The physically and economically feasible measures which are socially acceptable were limited to structural measures associated with the reduction of intercity stream flooding. These measures included debris basins, berms, floodwalls, channel improvements and bridge upgrades. Large floodwater retarding structures were not considered feasible or acceptable by the local residents. The nonstructural measures are being implemented by the City through some Federal, State and local funding mechanisms, including FEMA, Flood Mitigation Program, and Community Block Grants. Therefore, NRCS only looked at the structural measures. The formulation of the project resolves to finding the combination of measures which will maximize flood damage reduction with the physical, environmental, and economic constraints.

The formulation process consisted of dividing the hydrologic unit into four distinct subwatersheds. These subwatersheds were then subdivided into hydrologic reaches. The hydrologic reaches were then evaluated individually using hydrology and hydraulics models to produce outputs usable in economic models. The type, number, and location of the structural measures were evaluated by multiple computer iterations in order to produce the best combination of measures to maximize the flood damage reduction. Various combinations of these structures were then analyzed to determine the NED Plan and the Recommended Plan.

Physical and Environmental Constraints

The four intercity streams run directly through the City of Buena Vista. Due to the locations of the streams being immediately adjacent to residential and commercial properties, there were some limitations regarding what could reasonably be done to correct the flooding problems. The streams have multiple road crossings using bridges and culverts which tend to clog with debris during storm events. Due to the relatively flat topography in the floodplain and the landscape modifications throughout the City, once the floodwaters got out of the channel, they typically did not get back in right away. This resulted in flooding problems that were hard to predict where they would occur and what was the best way to solve them.

Environmental concerns were identified during the project scoping process. Threatened and endangered species, fish and wildlife habitat, visual resources, wetlands, and cultural resources were identified as concerns. During field visits and preliminary site selections, it was determined that no wetlands would be impacted.

The U.S. Fish and Wildlife Service and the State of Virginia were contacted to provide lists of endangered and candidate species which might be impacted by proposed measures. No species were found and no impacts anticipated.

The Virginia Department of Game and Inland Fisheries were consulted regarding known trout streams in the area. They are all located in the headwaters of the streams and will not be impacted.

The Virginia Department of Historic Resources (DHR) were consulted regarding the archaeological and historical resources within the project area. Several cultural resources were noted in the area. In formal comments from DHR, they stated that no further identification efforts are needed for archaeological properties. However, several bridges will be surveyed and consultation with the State Historic Preservation Officer will be required within the construction limits of the proposed project.

Land Use

Land use data were gathered by the Natural Resource Conservationist and U.S. Forest Service Personnel. These data were confirmed and refined during field inventories and computer modeling.

Forestry

Information on timber types and timber stand conditions was obtained from the Forest Service timber database Continuous Inventory of Stand Condition. Other forest resource information came from compartment prescription folders on file in the Glenwood/Pedlar Ranger District Office. Management area allocations were from the Revised Land and Resource Management Plan for the George Washington National Forest (1993).

Estimates of water yield increases resulting from loss of vegetation in the watersheds were derived from a model in Douglas and Swank (1972). This model was modified to reflect local base water yields and local pine/hardwood mixes.

Hydraulics and Hydrology

Channel and Valley Cross-sections

In 1985, Niles & Associates used aerial photography to produce a topographic map with one foot contours. At that time, cross-sections were taken along each of the stream channels. The bridges and culverts existing at that time were also surveyed. In 1995, 1996, and 1997, additional work was done to survey the bridges and culverts that had changed since 1985. There was also some channel survey work since changes were made in the channel shapes during various flood recovery efforts.

The most important change to Indian Gap Run is that the City plans to install a concrete-lined channel from Cedar Avenue to Chestnut Avenue. This channel was designed by Mattern & Craig. The cross-sections used in the analysis of this reach were taken from the Mattern & Craig design.

Hydraulics

Water surface profiles were developed using the Corps of Engineers program HEC-2. This program computes water surface profiles for one-dimensional steady, gradually varied flow in rivers. Flow may be subcritical or supercritical. For Indian Gap Run, the flow was treated as supercritical along the length of the proposed concrete channel and subcritical along other reaches. The other three channels were modeled as subcritical flow only.

Manning's roughness coefficient, *n*, was determined by field examination and by the tables in *Open Channel Hydraulics* by Chow. Floodplain *n* values were based on the land use in the floodplain.

Hydrology

The hydrologic conditions were determined by using soil maps and soil hydrologic groups. Runoff curve numbers were computed from the soil complex data. There are no anticipated changes in the watershed land usage in the future.

Weather Bureau Technical Paper No. 40 was used to determine the amount and frequency of rainfall for storms of 24-hour duration. These rainfall amounts were for frequencies ranging from 2 years to 100 years.

To determine the discharge for each storm event modeled, the Corps of Engineers HEC-1 computer model was used. This model simulates the surface runoff response of a river basin to precipitation. Output from this model gives the streamflow hydrograph at selected locations in the river basin.

Times of concentration for each watershed were computed using Worksheet 3 from TR-55.

Engineering Design and Cost Estimates

From the water surface profiles, two types of flooding problem were identified: ponded water and out-of-bank flow. Potential causes of each condition were also identified. These causes included 1) lack of capacity in the structure, 2) lack of capacity in the channel, and 3) grade changes in the channel. In some cases, the true problem at a given site was masked by the larger problem nearby. An example of this would be the culvert on Indian Gap Run at Forest Avenue. The culvert is not big enough to carry the storm water flow but since the road is inundated by backwater from the undersized railroad bridges, there is nothing that can be done at Forest Avenue to improve the culvert capacity.

In the case of inadequate structure capacity, the preferred solution is to replace the bridge or culvert with a larger structure. This would allow the traffic pattern for automobiles and trains to continue unchanged. However, in one case on Pedlar Gap Run, an abandoned bridge will be removed altogether.

Where the water is escaping the channel due to inadequate channel capacity, a two-part design was used. Since the overall goal is to keep the water in the channel, large, lined channels were designed. However, since streams with wide, shallow flows cannot carry the bedload, a channel-within-a-channel approach was used. An earthen bench will be formed within each large channel to force the baseflow water to flow in a relatively small area. This will increase the velocities within the stream and maintain the

bedload capacity. The elevation of the bench will be no higher than the "bankfull" elevation, as defined by Rosgen.

On Pedlar Gap Run, there is an opportunity to increase the carrying capacity of the stream by increasing the grade. Significant improvements can be achieved with this work.

For Indian Gap Run, the majority of the damage is caused by ponding in the lower part of the drainage. Again, this is a two part problem. There are two railroad bridges at the lower end of the channel that have very limited capacity. The embankments of these bridges are high and the water has nowhere to go. In addition, the grade of the ponded channel is very flat. This flatter area is the floodplain of the Maury River. The proposed improvements include replacement of the two railroad bridges with culverts and some channel improvement and grade changes. The actual design of the railroad improvements will be done by an A&E firm with oversight from Norfolk Southern Railroad.

For the purposes of this report, it was necessary to make some assumptions about the characteristics of each channel alteration. The final design may be considerably different. Both vehicular bridges and railroad bridges will be designed by an appropriate A&E firm. Channel improvements will be designed by NRCS.

Installation Costs

Installation costs were estimated from recent contracting experience and from estimates provided by the Virginia Department of Transportation and Norfolk Southern Railroad.

Water Quality

There will be very little project impact on the water quality in Buena Vista during low flow periods. During flood events, there will still be a significant debris loading.

Social Resources

Sources for the social resources assessment include the Buena Vista Storm Drainage/Flood Control Survey conducted by the Natural Bridge Soil and Water Conservation District in October, 1992, the Buena Vista Land Book (1994), the U.S. Census Bureau, Department of Commerce, 1992 Census, the Central Shenandoah Planning District Commission (Economic Overview, 1995 of Rockbridge County and the Cities of Buena Vista and Lexington, December, 1995), U.S. Department of Labor Statistics, National Flood Insurance policy data from the Federal Emergency Management Agency (FEMA), the 1992 Donnelly Report, and the Virginia Department of Game and Inland Fisheries (recreation information).

Economics

Two economic analysis methodology guidance documents were used to evaluate damages, project benefits and costs: "Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies", U.S. Water Resources Council, March, 1983, and the "Economics Handbook, Part II for Water Resources", USDA/Soil Conservation Service, March, 1987. The first of these documents was developed to provide consistent project formulation and evaluation guidance for all federal agencies that carryout water and related land resource implementation studies. The basic requirement of the "Principles and Guidelines", or P&G as the document is commonly referred to, is that benefits from project actions must exceed project costs. P&G also requires that the "National Economic Development" or NED alternative, which maximizes net benefits, be selected for implementation unless there is an overriding reason for selecting another alternative based on federal, state, local or international concerns. NRCS policy specifies the criteria for selecting a plan other than the NED plan.

Methods used in making the economic investigations and analyses followed those approved by the Natural Resources Conservation Service for the benefit/cost evaluation of land and water resources. Basic data were obtained from field surveys, interviews with residents, businesses and local government officials within the watershed, and from the secondary data sources listed above. Detailed data on the homes and other structures within the floodplain of Buena Vista were obtained from the office of the Commissioner of the Revenue for the City. Detailed data on infrastructure damages and clean-up costs were obtained from damage survey reports from the 1995 and 1992 floods and directly from landowners and private business interviews. Flood damages were based on the results of the hydraulics and hydrology simulation modeling using HEC-2. The HEC-2 data routed the water for the storm events modeled (5,25 and 100 year storm events) establishing both floodplain perimeters as well as flood depths. This data was then used with water depth to damages functions provided by FEMA to estimate damages by storm event for both the future without project (FWOP) and future with project (FWP) alternatives scenarios.

These estimated damages formed the basis needed to construct damage frequency curves relating percent chance of storm occurrence with specific event damage estimates. The resulting functional relationships permits the prediction of damages for lessor and greater events than the storms of record and the simulated 5, 25 and 100 year storm events. An annualized estimate of storm damages from all storm events is the end result of this analysis. An additional estimate for annual flood damage avoidance expenditures made by private businesses in Buena Vista was added to the predicted annual damages to establish total average annual damages for both the FWOP and FWP alternatives.

All costs of installation, operation and maintenance were based on 1998 prices. The costs of all structural measures were assumed to be implemented over a five-year installation period and to have a 50-year useful life. Thus a 55 year period of analysis was used along with the mandated 7.125% discount rate for all federal water resource projects for FY98 to discount and amortize future costs and benefits.

Damage reduction benefits were determined by computing the difference in damages for the FWOP condition and the damages expected with each alternative in place. The basis for the assumptions concerning FWOP and FWP conditions are covered in the plan under "Effects of Alternative Plans".

APPENDIX D

PROJECT MAP

MAP LEGEND

- Bridge or Culvert Replaced
- Sediment Basin
- Channel Improvement
- Floodwall/Berm
- Concrete Channel (Planned by City)
- Bridge Replaced (Planned by VDOT)
- Benefitted Area

BUENA VISTA PROJECT MAP

0 600 1200 1800 2400 3000 FEET

APPROXIMATE SCALE

CITY OF
BUENA VISTA, VIRGINIA
(INDEPENDENT CITY)

U.S. DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

	Date	
Designed A.KETCHEM	1/98	Approved by
Drawn KETCHEM/V. BIDDIX	1/98	Title
Traced D.WILLIAMS	12/97	Title
Checked		Sheet No. 2 of 12 Drawing No.

Sec. 612.00. - Flood Hazard District FH-1.

612.01 *Purpose of Flood Hazard District [FH-1].* The purpose of these provisions is to prevent the loss of life and property, the creation of health and safety hazards, the disruption of commerce and governmental services, the extraordinary and unnecessary expenditure of public funds for flood protection and relief, and the impairment of the tax base by:

(a) Regulating uses, activities, and development which, acting alone or in combination with other existing or future uses, activities, and development, will cause unacceptable increases in flood heights, velocities and frequencies;

(b) Restricting or prohibiting certain uses, activities, and development from locating within areas subject to flooding;

(c) Requiring all those uses, activities, and developments that do occur in floodprone areas to be protected and/or flood-proofed against flooding and flood damage; and

(d) Protecting individuals from buying lands and structures which are unsuited for intended purposes because of flood hazards.

612.02 *Applicability.* These provisions shall apply to all lands within the jurisdiction of the City of Buena Vista and identified as being floodprone as stipulated in this ordinance.

612.03 *Compliance.* No land shall hereafter be developed and no structure shall be located, relocated, constructed, reconstructed, enlarged, or structurally altered except in full compliance with the terms and provision of this ordinance and any other applicable ordinances and regulations which apply to uses within the jurisdiction of this ordinance.

612.04 *Abrogation and greater restrictions.* This ordinance supersedes any ordinance currently in effect in flood prone areas. However, any underlying ordinance shall remain in full force and effect to the extent that those provisions are more restrictive.

612.05 *Description of districts.*

612.05-1 *Basis of districts.* The various floodplain districts shall include areas subject to inundation by waters of the 100-year flood. The basis for the delineation of these districts shall be the food insurance study (FIS) for Rockbridge County and Incorporated Areas, including the City of Buena Vista, prepared by the Federal Emergency Management Agency, Federal Insurance Administration, dated April 6, 2000, as amended.

A. The floodway district is delineated for purposes of this ordinance, using the criteria that a certain area within the floodplain must be capable of carrying the waters of the 100-year flood without increasing the water surface elevation of that flood more than one foot at any point. These areas included in this district are specifically defined in table 3 of the above referenced flood insurance study and shown on the accompanying flood insurance rate maps;

B. The flood-fringe district shall be that area of the 100-year floodplain not included in the floodway district. The basis for the outermost boundary of this district shall. be the 100-year flood elevations contained in the flood profiles of the above referenced flood insurance study, and as shown on the accompanying flood insurance rate maps;

C. The approximated floodplain district shall be that floodplain area for which no detailed flood profiles of elevations are provided, but where a 100-year floodplain boundary has been approximated. Such areas are shown as zone A on the flood insurance rate maps accompanying the flood insurance study. In determining the necessary elevations for the purpose of this ordinance, other sources of data may be used such as:

(a) Corps of Engineers, floodplain information reports;

(b) U.S. Geological Survey, floodprone quadrangles;

(c) USDA, Soil Conservation Service, flood hazard analyses;

(d) Known high-water marks from past floods;

(e) Tennessee Valley Authority Flood Reports; and

(f) Other sources. Where the specific 100-year flood elevations cannot be determined for this area using other sources of data, then the applicant for the proposed use, development, and/or activity shall determine this elevation in accordance with hydrologic and hydraulic engineering techniques. Hydrologic and hydraulic analyses shall be undertaken only by professional engineers or others of demonstrated qualifications, who shall certify that the technical methods used correctly reflect currently-accepted technical concepts. Studies, analyses, computations, etc., shall be submitted in sufficient detail to allow a thorough review by the City of Buena Vista.

612.05-2 *Overlay concept.*

(a) The floodplain districts described above shall be overlays to the existing underlying districts as shown on the official zoning ordinance map, and as such, the provisions for the floodplain districts shall serve as a supplement to the underlying district provisions;

(b) Where there happens to be any conflict between the provisions or requirements of any of the floodplain districts, and those of any underlying districts, the more restrictive provisions and/or those pertaining to the floodplain districts shall apply;

(c) In the event any provision concerning a floodplain district is declared inapplicable as a result of any legislative or administrative actions or judicial discretion, the basic underlying district provisions shall remain applicable.

612.06 *Official zoning map.* The boundaries of the floodplain districts are established as shown on the flood boundary and floodway map which is declared to be a part of this ordinance and which shall be kept on file at the city manager's office.

612.07 *District boundary changes.* The delineation of any of the floodplain districts may be revised by the council where natural or man-made changes have occurred, and/or more detailed studies conducted or undertaken by the U.S. Army Corps of Engineers of other qualified agency or individual documents the need or possibility for such change. However, prior to any such change, approval must be obtained from the Federal Insurance Administration.

612.08 *Interpretation of district boundaries.* Initial interpretations of the boundaries of the floodplain districts shall be made by the zoning administrator. Should a dispute arise concerning the boundaries of any of the districts, the board of zoning appeals shall make the necessary determination. The person questioning or contesting the location of the district boundary shall be given a reasonable opportunity to present his case to the board and to submit his own technical evidence if he so desires.

612.09 *District provisions.* All uses, activities, and development occurring within any floodplain district shall be undertaken only upon the issuance of a zoning permit. Such development shall be undertaken only in strict compliance with the provisions of this ordinance and with all other applicable codes and ordinances such as the Virginia Uniform Statewide Code and the Buena Vista Subdivision Regulations. Prior to the issuance of any such permit, the zoning administrator shall require all applications to include compliance with all applicable state and federal laws. Under no circumstances shall any use, activity, and/or development adversely affect the capacity of the channels or floodways of any watercourse, drainage ditch, or any other drainage facility of system. Prior to any proposed alteration or relocation of any channels or floodways of any watercourse, stream, etc., within a municipality, approval shall be obtained from the U.S. Army Corps of Engineers, the Virginia Department of Environmental Quality, and the Virginia Marine Resources Commission (a joint permit application is available from any of these organizations). Further, notification of the proposal shall be given to all affected adjacent municipalities. Copies of such notifications shall be forwarded to both the Virginia Department of Conservation and Recreation (Division of Soil and Water Conservation), and the Federal Insurance Administration.

612.10 *Floodway district.* In the floodway district, no encroachments, including fill, new construction, substantial improvements, or other development shall be permitted unless it has been demonstrated through hydrologic and hydraulic analyses performed in accordance with standard engineering practice that the proposed encroachment would not result in any increase in the 100-year flood elevation.

612.10-1 *Permitted uses.* In the floodway district the following uses and activities are permitted provided that they are in compliance with the provisions of the underlying district and are not prohibited by any other ordinance, and provided that they do not require structures, fill, or storage of materials and equipment:

(a) Agricultural uses such as general farming, pasture, grazing, outdoor plant nurseries, horticulture, truck farming, forestry, sod farming, and wild crop harvesting;

(b) Public and private recreational uses and activities such as parks, day camps, picnic grounds, golf courses, boat launching and swimming areas, hiking, and horseback riding trails, wildlife and nature preserves, game farms, fish hatcheries, trap and skeet game ranges, and hunting and fishing areas;

(c) Accessory residential uses such as yard areas, gardens, play areas, and pervious loading areas;

(d) Accessory industrial and commercial uses such as yard areas, previous parking and loading areas, airport land strips, etc.

612.10-2 *Uses permitted by special exception.* The following uses and activities may be permitted by special exception provided that they are in compliance with the provisions of the underlying district and are not prohibited by this or any other ordinance:

(a) Structures except for mobile homes accessory to the use and activities in [sub]section [612.10-1](a) above;

(b) Utilities and public facilities and improvements such as railroads, streets, bridges, transmission lines, pipelines, water and sewage treatment planes, and other similar or related uses;

(c) Water-related uses and activities such as marinas, docks, wharfs, piers, etc.;

(d) Extraction of sand, gravel, and other materials (where no increase in level of flooding or velocity is caused thereby);

(e) Temporary uses such as circuses, carnivals, and similar activities;

(f) Storage of materials and equipment provided that they are not buoyant, flammable or explosive, and are not subject to major damage by flooding, or provided that such material and equipment is firmly anchored to prevent flotation or movement, and/or, can be readily removed from the area within the time available after flood warning;

(g) Other similar uses and activities provided they cause no increase, in flood heights and/or velocities. All uses, activities, and structural development shall be undertaken in strict compliance with the flood-proofing provisions contained in all other applicable codes and ordinances.

612.11 *Flood-fringe and approximated floodplain districts.* In the flood-fringe and approximated floodplain districts, the development, and/or uses of land shall be permitted in accordance with the regulations of the underlying district provided that all such uses, activities, and/or development shall be undertaken in strict compliance with the floodproofing and related provisions contained in the Virginia Uniform Statewide Building Code and all other applicable codes and ordinances. Within the Approximated floodplain district, all new subdivision proposals and other proposed developments (including proposals for manufactured home parks and subdivisions) greater the 50 lots or five acres, whichever is the lesser; include within such

proposals base flood elevation data. The applicant shall also delineate a floodway area based on the requirement that all existing and future development not increase the 100-year flood elevation more than one foot at any point. The engineering principal, equal reduction of conveyance, shale be used to make the determination of increased flood heights. Within the floodway area delineated by the applicant, the provision of section 612.10 shall apply.

612.12 *Special exceptions and variances additional factors to be satisfied.* In passing upon applications for special exceptions and variances, the board of zoning appeals shall satisfy all relevant factors and procedures specified in other sections of the zoning ordinance and the following factors:

612.12-1 The danger to life and property due to increased flood heights or velocities caused by encroachments. No special exception or variance shall be granted for any proposed use, development, or activity within the floodway district that will cause any increase in flood levels during the 100-year flood;

612.12-2 The danger that materials may be swept on to other lands or downstream to the injury of others;

612.12-3 The proposed water supply and sanitation system and the ability of these systems to prevent disease, contamination, and unsanitary conditions;

612.12-4 The susceptibility of the proposed facility and its contents to flood damage and the effect of such damage on the individual owners;

612.12-5 The importance of the services provided by the proposed facility to the community;

612.12-6 The requirements of the facility for a water front location;

612.12-7 The availability of alternative locations not subject to flooding for the proposed use;

612.12-8 The compatibility of the, proposed use with existing development and development anticipated in the foreseeable future;

612.12-9 The relationship of the proposed use to the comprehensive plan and floodplain management program for the area;

612.12-10 The safety of access to the property in time of flood of ordinary and emergency vehicles;

612.12-11 The expected heights, velocity, duration, rate of rise, and sediment transport of the flood waters expected at the site;

612.12-12 Such other factors which are relevant to the purposes of this ordinance: the board of zoning appeals may refer any application and accompanying documentation pertaining to any request for a special exception or variance, to any engineer or other qualified person or agency for technical assistance in evaluating the proposed project in relation to flood heights and velocities, and the adequacy of the plans for protection and other related matters. Special exceptions and/or variances shall only be issued after the board of zoning appeals has determined that the granting of such will not result in:

(a) Unacceptable or prohibited increases in flood heights;

(b) Additional threats to public safety;

(c) Extraordinary public expense;

(d) Create nuisances;

(e) Cause fraud or victimization of the public; or

(f) Conflict with local laws or ordinances.

Special exceptions and/or variances shall only be issued after the board of zoning appeals has determined that the special exception and/or variance will be the minimum relief to any hardship. The board of zoning appeals shall notify the applicant for a special exception and/or variance, in writing, that the issuance of a special exception and/or variance to construct a structure below the 100-year flood elevation:

(a) Increases the risks to life and property; and

(b) Will result in increased premium rates for flood insurance.

A record of the above notification, as well as all variance actions, including justification for their issuance, shall be maintained and any variances which are issued shall be noted in the annual report submitted to the Federal Insurance Administrator.

612.13 Existing structures in floodplain districts. A structure, or use of a structure or premises which lawfully existed before the enactment of these provisions, but which is not in conformity with these provisions, may be continued subject to the following conditions:

612.13-1 Existing structures and/or uses located in the floodway district, shall not be expanded or enlarged (unless the effect of the proposed expansion or enlargement on flood heights is fully offset by accompanying improvements);

612.13-2 Any modification, alteration, repair, reconstruction, or improvement of any kind to a structure and/or use, located in any floodplain district to an extent or amount of less than 50 percent of its market value, shall be elevated and/or flood-proofed to the greatest extent possible, and/or reasonable;

612.13-3 The modification, alteration, repair, reconstruction, or improvement of any kind to a structure and/or use, regardless of its location in a floodplain district to an extent or amount of 50 percent of more of its market value, shall be undertaken only in full compliance with the provisions of the Virginia Uniform Statewide Building Code;

612.13-4 Uses of adjuncts thereof which are, or become, nuisances shall not be permitted to continue.

612.14 *Flood hazard mitigation.* Within the floodplain district as delineated, the following additional provisions shall be met:

612.14-1

All electric water heaters, electric furnaces, and other critical electrical installations shall be permitted only at elevations at or above the level of the 100-year flood;

612.14-2 Water supply systems, sanitary sewage systems, and gas and oil supply systems shall be designed to preclude infiltration of floodwaters;

612.14-3 Adequate drainage shall be provided to minimize exposure to flood heights;

612.14-4 The preliminary plat requirements shall include a map showing the location of the proposed subdivision and/or land development with respect to any designated floodplain district, including information, but not limited to, the 100-year flood elevations, boundaries of the floodplain districts, proposed lots and sites, fills flood or erosion protective facilities, and areas subject to special deed restrictions.

612.15 *Severability.* In any section, subsection, paragraph, sentence, clause, or phrase of this ordinance shall be declared invalid for any reason whatever, such decision shall not affect the remaining portions of this ordinance which shall remain in full force and effect, and for this purpose the provisions of this ordinance are hereby declared to be severable.

612.16 *Municipal liability.* The degree of flood protection, sought by the provisions of this ordinance, is considered reasonable for regulatory purposes and is based on acceptable engineering methods of study. Larger floods may occur on rare occasions. Flood heights may be increased by man-made or natural causes, such as ice jams and bridge openings restricted by debris. This ordinance does not imply that areas outside the floodplain districts, or that land uses permitted within such districts, will be free from flooding or flood damages. This ordinance shall not create liability on the part of the City of Buena Vista, or any officer or employee thereof for any flood damages that result from reliance on this ordinance or any administrative decision lawfully made thereunder.

612.16-1 The repair or rehabilitation of historic structures upon a determination that the proposed repair or rehabilitation will not preclude the structure's continued designation as a historic structure and the special exception is the minimum necessary to preserve the historic character and design of the structure.

Central Shenandoah Hazard Mitigation Plan 2020 Update

"Reducing the impact of disasters on citizens of the Central Shenandoah Region through planning, preparedness, mitigation, and education."

Prepared by the:
Central Shenandoah
Planning District Commission

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CSHMP Executive Summary

- The Central Shenandoah Hazard Mitigation Plan (CSHMP) identifies natural and other hazards that impact the five counties, five cities, and eleven towns within the Central Shenandoah Region.
- The identified hazards were analyzed to determine risk and vulnerabilities in the Region. The highest ranked hazards include Flooding/Dam Failure, Drought, Hurricanes, and Severe Winter Weather.
- This Plan also includes four categories of mitigation goals and strategies:

    1. Local Plans and Regulations
    2. Structure and Infrastructure Projects
    3. Natural Systems Protection
    4. Education and Awareness Programs

- The twenty-one jurisdictions of the Central Shenandoah Region were actively engaged in the planning process. The local jurisdictions shared their past mitigation projects and created strategies for future mitigation activities.
- The public's input was gathered during numerous presentations and a region-wide survey. The results of the survey are included in this Plan.
- Included in the Appendices of the CSHMP is a chapter on Climate Adaptation and the new Central Shenandoah Regional Wildfire Protection Plan.

The purpose of this plan is to increase the resilience of all the communities in the Central Shenandoah Region.

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APPENDICES

I. INTRODUCTION

1. Purpose

The Disaster Mitigation Act of 2000 (DMA2K) was enacted October 10, 2000.

The Central Shenandoah Hazard Mitigation Plan (CSHMP) was developed in accordance with the Disaster Mitigation Act of 2000 (DMA2K), requirements of the Federal Emergency Management Agency (FEMA) Section 322 local hazard mitigation planning regulations, and Title 44 Code of Federal Regulations (CFR) §201.6. DMA2K was enacted on October 10, 2000, when President Clinton signed the Act (Public Law 106-390). The legislation reinforces the importance of mitigation planning and emphasizes planning for disasters before they occur. This Act is also the basis for FEMA mitigation planning requirements for state, local, and tribal governments as a condition of mitigation grant assistance. DMA2K amended the Robert T. Stafford Disaster Relief and Emergency Assistance Act (Public Law 100-707) which was signed into law on November 23, 1988. In turn, the Stafford Act amended the Disaster Relief Act of 1974. The purpose of Title 44 CFR §201.6 is to provide information on the policies and procedures for local mitigation planning under the Stafford Act. It is also FEMA's official source for defining the requirements of original and updated mitigation plans.

The CSHMP is a regional plan covering 21 localities, including 5 counties, 5 cities and 11 towns.

The purpose of the Plan is to identify natural hazards that impact the Region and to offer mitigation strategies that will lessen the effects that these hazards have on the citizens, property, and businesses in the Region. The Plan was developed on a multi-regional basis which included the five counties of Augusta, Bath, Highland, Rockbridge, and Rockingham, the five cities of Buena Vista, Harrisonburg, Lexington, Staunton, and Waynesboro, and eleven incorporated towns Glasgow, Goshen, Craigsville, Grottoes, Bridgewater, Broadway, Dayton, Elkton, Mt. Crawford, Timberville, and Monterey.

The CSHMP was initially adopted in 2005.

The Central Shenandoah Hazard Mitigation Plan was initially adopted in 2005. The planning process was led by the Mitigation and Planning Work Group of the Shenandoah Valley Project Impact and supported by staff of the Central Shenandoah Planning District Commission (CSPDC). The Hazard Identification Risk Assessment (HIRA) was prepared by Virginia Tech's Center for Geospatial Information Technology. Funding for the development of the Plan was provided in large part through a grant from the Virginia Department of Emergency Management (VDEM) with matching funds provided by the Central Shenandoah Planning District Commission.

Updates to the Plan took place from 2010 through 2013, and most recently from 2019 to 2020.

An update of the Plan took place from 2010 through 2013. The update process was led by a Steering Committee made up of local government staff, regional representatives of State agencies, interested citizens, and other organizations. The update was supported by CSPDC staff, who also updated the 2013 HIRA. Funding for the update of the Plan was provided in large part through a Pre-disaster Mitigation Grant from the Federal Emergency Management Agency (FEMA) with matching funds provided by the Virginia Department of Emergency Management and local jurisdictions within the Central Shenandoah Planning District.

The most recent version of the Plan was updated from 2019 to 2020. The update was led by a Steering Committee composed of appointees and alternates from all twenty-one localities, as well as appointees and alternates from twenty-five other organizations including federal agencies, state agencies, other local government agencies, educational institutions, healthcare institutions, business and industry interests, and citizens groups. The update was supported by CSPDC staff. The HIRA was updated by staff of the CSPDC, with assistance from staff at the Northern Shenandoah Valley Regional Commission. Funding for the update of the Plan was provided by Pre-disaster Mitigation Grant from FEMA with matching funds provided by VDEM and the CSPDC.

II. PLANNING PROCESS

1. Planning Process

The planning process began in 1995 after devastating floods in the Region.

The planning process actually began in 1995 when local government officials recognized a void in flood planning and prevention after the devastating floods in 1995 and 1996. They called on the Central Shenandoah Planning District Commission (CSPDC) to develop a local mitigation strategy and offer planning and technical assistance to abate future damages.

Since 1995, CSPDC has helped secure nearly $10 million in funding for these projects.

Over the next several years and flood events, the CSPDC assisted many of the localities in identifying at-risk properties, applying for state and federal funds, and administering flood mitigation projects. Since 1995, the CSPDC has secured nearly $10,000,000 in federal, state and local funds to elevate, move, acquire or floodproof nearly 200 structures and provide a disaster preparedness and mitigation education program in the Region. In 1999, the Region began looking at ways to prevent floods from becoming disasters through a viable planning process with effective public input. A committee comprised of elected officials, local government staff, and private citizens as well as technical experts from various natural resource agencies was created to assess the problem, review possible solutions, and recommend actions for the Region to take.

Photo II-1: Flooding in Rockingham County, Hurricane Fran, 1996

Photo II-2: Town of Glasgow, Flood Mitigation Project, 1997-2002

The Central Shenandoah Valley Regional Flood Mitigation Plan was completed in 1999.

Led by the Central Shenandoah Planning District Commission, the Committee met over the course of a year and half to produce the Central Shenandoah Valley Regional Flood Mitigation Plan. The Plan addressed the flood hazards that put each of our 21 communities at risk. The Plan identified and illustrated flood risks and recorded the history of flooding. It described the projects and efforts that localities have implemented to reduce flood damage and more importantly it explains what still needs to done. The Plan offered sound and effective mitigation options and guidance with options for dealing with floods, setting priorities, and effectively planning to minimize future damage and protect floodplain resources.

The Region became a Project Impact Community, with the formation of Shenandoah Valley Project Impact.

From there, the Region was directed by the Federal Emergency Management Agency and the Virginia Department of Emergency Management to look at other natural hazards that impact the Central Shenandoah Valley. The Flood Mitigation Committee that was created in 1999 to oversee the Central Shenandoah Regional Flood Mitigation Plan was called back into action to address the requirements of the Disaster Mitigation Act of 2000. In the meantime, the Central Shenandoah Region became a Project Impact Community, and named this new program, Shenandoah Valley Project Impact. The purpose of Project Impact was to develop a sustainable long-term program of disaster-resistance education in the Shenandoah Valley. The Central Shenandoah Project Impact structure was made up of a Steering Committee and 4 work groups: 1) Mitigation and Planning; 2) Business Continuity, 3) Public Awareness and 4) Special Populations. Under this structure the former Flood Mitigation Committee was reinstated and reorganized and became Project Impact's Mitigation and Planning Workgroup. The purpose of this committee was to promote mitigation methods that protect homes, public buildings, critical facilities, and natural spaces in the Shenandoah Valley.

The main task of the Mitigation and Planning Workgroup was to develop the Hazard Mitigation Plan. The Mitigation and Planning Workgroup was comprised of elected officials, city, county, and town staff, business persons, and interested citizens. All local jurisdictions were involved in the planning process either through direct representation on the committee or through involvement with Shenandoah Valley Project Impact.

Others involved throughout the planning process included representatives of local government, nonprofit organizations, human service agencies, the business community, universities and colleges, local libraries, the Red Cross, and other organizations interested in disaster mitigation. These persons served on the Project Impact/Citizen Corps Council and met on a regular basis throughout the development of the plan.

The 2020 Steering Committee involved representatives from 21 localities and 25 other organizations.

From 2010 to 2013, a new Steering Committee was formed consisting of former members of the Mitigation and Planning Committee as well as others to help with the task of reviewing the data and information in the original Plan and making revisions and adding additional information where needed.

From 2019 to 2020, an update to the Plan was led by a Steering Committee composed of appointees and alternates from all twenty-one local jurisdictions, as well as appointees and alternates from twenty-five other organizations including federal agencies, state agencies, other local government agencies, educational institutions, healthcare institutions, business and industry interests, and citizens groups. The appointees and alternates are listed in Table II-1 and Table II-2.

91 individuals were nominated as appointees or alternates to serve on the Steering Committee.

Photo II-3: June 2019 Steering Committee Meeting, CSPDC Staff

Photo II-4: June 2019 Steering Committee Meeting

Table II-1: 2020 Steering Committee, Local Government Members

Local Government	Name / Title	Role
City of Buena Vista	Thomas Roberts, Director of Planning & Community Development	Appointee
City of Buena Vista	Lt. Waylon Miller, Emergency Management Coordinator	Alternate
City of Buena Vista	Chief Keith Hartman, Police Chief	Alternate
City of Harrisonburg	Paul Helmuth, Administrative Officer	Appointee
City of Harrisonburg	Ian Bennett, Fire Chief	Alternate
City of Lexington	Trent Roberts, Emergency Management Coordinator	Appointee
City of Lexington	Arne Glaeser, Director of Planning & Development/Floodplain Administrator	Alternate
City of Staunton*	Colten Lotts, Deputy Emergency Management Coordinator	Appointee
City of Staunton*	Scott Garber, Fire Chief/ Emergency Management Coordinator	Appointee
City of Staunton*	Perry Weller, Deputy Fire Chief/ Deputy Emergency Management Coordinator	Alternate
City of Waynesboro	Gary Critzer, Director, Emergency Management	Appointee
County of Augusta	Donna Good, EOC Director & Emergency Management Coordinator	Appointee
County of Augusta	Anthony Ramsey, Assistant Emergency Management Coordinator	Alternate
County of Augusta	Doug Wolfe, County Engineer/Floodplain Administrator	Alternate
County of Bath	Andy Seabolt, Emergency Manager	Appointee
County of Bath	Sherry Ryder, Planning and Zoning Administrator	Alternate
County of Highland	Harley Gardner, Emergency Services Coordinator	Appointee
County of Highland	Carl Williams, Deputy Chief of EMS	Alternate
County of Rockbridge	Captain Kevin Moore, Fire/Rescue	Appointee
County of Rockbridge	Chief Nathan Ramsey, Fire/Rescue	Alternate
County of Rockingham	Jeremy Holloway, Fire/Rescue Chief	Appointee
County of Rockingham	Jeff Michael, Deputy Chief	Alternate

Table II-1: 2020 Steering Committee, Local Government Members , continued

Local Government	Name / Title	Role
Town of Bridgewater*	Patrick Wilcox, Town Planner	Appointee
Town of Bridgewater*	Betsy Putney, Public Works Coordinator	Appointee
Town of Bridgewater*	John Ware, Environmental Agent	Alternate
Town of Broadway	Ross Clem, Project Manager	Appointee
Town of Broadway	Kyle O'Brien, Town Manager	Alternate
Town of Craigsville	Mayor Richard Fox	Appointee
Town of Craigsville	John Temple, Public Works Superintendent	Appointee
Town of Craigsville	Sgt. Corey Wood, Police Department	Appointee
Town of Dayton	Chief Daniel Hanlon, Police Dept	Appointee
Town of Dayton	Lt. Justin Trout, Police Dept	Alternate
Town of Dayton	Joe Paxton, Interim Town Manager	Alternate
Town of Elkton	Joshua Gooden, Mayor	Appointee
Town of Glasgow	Jon Ellestad, Interim Town Manager/ Floodplain Administrator	Appointee
Town of Glasgow	Eric Pollitt, Town Manager/ Floodplain Administrator	Appointee
Town of Glasgow	Chief Nathan Ramsey, Fire/Rescue	Alternate
Town of Glasgow	Captain Kevin Moore, Fire/Rescue	Alternate
Town of Goshen	Megan Deel, Clerk/Treasurer	Appointee
Town of Goshen	Lisa Landrum, Council Member	Alternate
Town of Grottoes	Nathan Garrison, Town Manager	Appointee
Town of Grottoes	AJ Hummel, Public Works Director	Alternate
Town of Monterey	Richard Robinson, Council Member	Appointee
Town of Monterey	Denise Simmons, Council Member	Alternate
Town of Mount Crawford	Eric Ensley, Council Member	Appointee
Town of Mount Crawford	Neal Dillard, Council Member	Alternate
Town of Mount Crawford	Dennis Driver, Council Member	Alternate
Town of Timberville	Austin Garber, Town Manager	Appointee

* CRS Community

Table II-2: 2020 Steering Committee, Non-Local Government Members

Organization	Name / Title	Role
Augusta County Service Authority	Brett Sinclair, Safety Manager	Appointee
Augusta County Service Authority	Tina Solak, Director of Human Resources	Alternate
Augusta Health	Francis Caruccio	Appointee
Augusta Health	Karen Clark	Alternate
Blue Ridge Community College	William Wilkerson, Chief of Police	Appointee
Blue Ridge Community College	Laura Dwyer, Administrative Assistant, Buildings and Grounds	Alternate
Bridgewater College	Milton Franklin, Chief of Police	Appointee
Central Shenandoah Health District, VDH	Hilary Cronin, District Emergency Planner	Appointee
Central Shenandoah Health District, VDH	Dr. Laura Kornegay, District Health Director	Alternate
Central Shenandoah Health District, VDH	Michael Keatts, Northwest Emergency Coordinator	Alternate
Cherry Orchard Homeowners Association	Deane Dozier, Director	Appointee
Dixie Gas and Oil Corporation	Steven Craig, Safety and Regulatory Compliance Manager	Appointee
Greater Augusta Regional Chamber of Commerce	Annette Medlin, President/CEO	Appointee
Greater Augusta Regional Chamber of Commerce	Kim Wilbur, Communications Director	Alternate
Harrisonburg-Rockingham Chamber of Commerce	Chris Ellis, BB&T, Chamber Public Policy Committee	Appointee
Harrisonburg-Rockingham Community Services Board	Dan Jenkins, Risk Management Specialist	Appointee
Harrisonburg-Rockingham Community Services Board	Holly Albrite	Alternate
Harrisonburg-Rockingham Regional Sewer Authority	Sharon Foley, Executive Director	Appointee
Harrisonburg-Rockingham Regional Sewer Authority	Anita Riggleman, Environmental & Safety Manager	Alternate
Holtzman Oil Corp.	Keith Taylor, Safety Director	Appointee
Holtzman Oil Corp.	Calvin R. Lokey	Alternate
James Madison University	Robbie Symons, Emergency Management Coordinator	Appointee
James Madison University	Dale Chestnut, Stormwater Coordinator	Alternate
Lexington-Rockbridge Chamber of Commerce	Tracy Lyons, Executive Director	Appointee
Sentara Rockingham Memorial Hospital	Scott Masincup	Alternate
Shenandoah National Park, NPS	David Robinson	Appointee

Table II-2: 2020 Steering Committee, Non-Local Government Members, continued

Organization	Name / Title	Role
Shenandoah Valley Project Impact	Nancy Sorrells	Appointee
Shenandoah Valley Project Impact	Sharon Angle	Appointee
Shenandoah Valley Project Impact	Steve Strawderman	Appointee
Shenandoah Valley Regional Airport	Gary Craun, Director of Operations/Chief	Appointee
Shenandoah Valley Regional Airport	Chris Cary, Captain	Alternate
USDA-NRCS	Kathy Holm, Assistant State Conservationist (Field Operations)	Appointee
USDA-NRCS	Philip Davis, Soil Conservationist	Alternate
Valley Community Services Board	Roger Ramsey, Facility Manager	Appointee
Virginia Department of Environmental Quality	Jennifer Welcher, Pollution Response Coordinator	Appointee
Virginia Department of Forestry	Patti Nylander, Senior Area Forester- Mountain Valley Area	Appointee
Virginia Department of Forestry	Clint Folks, Area Forester	Alternate
Virginia Military Institute	Jay Williams, Post Engineer	Appointee
Virginia Military Institute	David Williams, Director, Auxiliary Services	Alternate
Washington and Lee University	Paul Burns, Director of Environmental Health & Safety	Appointee
Washington and Lee University	Brendan Perry, Director of MEP Services	Alternate
Western State Hospital	Patrick Robertson, Risk Manager	Appointee
Western State Hospital	David Mawyer	Alternate

The 2020 Steering Committee held three meetings.

Information was gathered from the localities and stakeholders in the Region as a group through Steering Committee meetings and in one-on-one input sessions. The Steering Committee met three times during 2019 to develop the Plan. Below in Table II-3 is a list of the meeting dates, agenda topics, and the number of attendees. A list of attendees and meeting agenda packets can be viewed in Appendix A – Planning Process and Public Engagement. Surveys of individual Steering Committee members and in-depth group discussions were conducted in order to prioritize the hazards in the Region and revise the mitigation strategies from the previous HMP. CSPDC staff also consulted with individual local jurisdictions and stakeholder organizations representatives individually either in person or by phone to discuss their community's unique vulnerabilities and mitigation goals. CSPDC staff also consulted with individual members of the Steering Committee to gather information regarding critical facilities, damage assessments, capabilities, and mitigation strategies. Following this process, CSPDC staff incorporated the newly updated information and Steering Committee recommendations into the 2013 Plan to create the 2020 edition of the Central Shenandoah Hazard Mitigation Plan.

61 people attended the kick-off meeting.

Table II-3: Steering Committee Meetings

Meeting Date	Agenda Topics	Number of Attendees
04/03/2019	Regional Hazard Identification Regional/Local Mitigation Goals and Strategies Public Outreach	61
06/05/2019	Regional Hazard Identification 2019 Ranking Results - Ranking of Prior Hazards - Consideration of Other Hazards Regional/Local Mitigation Goals and Strategies Public Input and Outreach	37
10/07/2019	Project Status Update and Timeline Update on HIRA and Critical Facilities Maps Damage Assessments Regional Strategies Local Strategies VDEM and FEMA Review Process Locality Adoption Process	45

2. Staff Training

Throughout the course of the planning process, CSPDC staff participated in training related to the development of the Plan as well as sponsored a number of training workshops for the public.

Table II-4: Training Attended by Staff / Committee

Date	Topic
02/19/2019	Virginia Department of Conservation and Recreation Dam Safety/Floodplain Program Grant Training
03/06/2019	Virginia Department of Emergency Management Hazard Mitigation Grant Program Briefing
03/14/2019	Environmental Protection Agency Webinar: Integrating Water Quality/Nature-based Approaches into Hazard Mitigation Plans
03/28/2019	Webinar: Plain Language Communication for Results
05/15/2019	Federal Emergency Management Agency Region III Webinar: Floodplain Management and Hazard Mitigation Planning
06/12/2019	United States Forest Service Webinar: Planning in the Wildland Urban Interface
07/10/2019	Federal Emergency Agency Region III Webinar: Engaging the Arts in Mitigation Planning
08/13/2019	Natural Hazards Center Webinar: Aligning Mitigation Investment for the Whole Community
08/15/2019	Planning Information Exchange Webinar: Planning for Drought and Cascading Hazards
09/10/2019	Making Mitigation Work Series Webinar: Ethical/Efficient Infrastructure Resilience - The Battle For Better Building Codes
09/19/2019	Webinar: The Art of the Narrative: Creating CEDS and Other Plans that People Want To Read
10/08/2019	Making Mitigation Work Series Webinar: Moving Mitigation Forward - the Past, Present, and Future of Hazard Mitigation Assistance
10/30/2019	Environmental Protection Agency Webinar: Integrating the EPA and Hazard Mitigation Planning

3. Partnering/Mentoring Opportunities

Throughout the planning process, CSPDC staff partnered with staff from other Planning District Commissions, and students at James Madison University:

- CSPDC staff consulted with staff from the Northern Shenandoah Valley Regional Commission (NSVRC) in analyzing data with HAZUS software. This partnership and the assistance received is discussed in more detail in the HIRA section of the Plan.
- CSPDC staff shared ideas and strategies with staff from the Central Virginia Planning District Commission (CVPDC). CSPDC staff attended a Steering Committee meeting for the CVPDC's Hazard Mitigation Plan on July 11, 2019 in Lynchburg. During the meeting, the CVPDC Steering Committee discussed their Hazard Identification and Risk Assessment (HIRA). Staff from the CSPDC and the CVPDC also met to share information during the Resilient Virginia Conference held at the Darden School of Business at the University of Virginia in Charlottesville on July 18 - 19, 2019.
- Students from the School of Integrated Sciences at James Madison University spent Spring Semester 2019 assisting in the update of the Hazard Mitigation Plan. The students researched issues related to climate adaptation in the Region, sharing information about population, land use, changes to climate and weather patterns, hazard profiles and recommendations, and social impacts. The information was compiled into a chapter on Climate Adaptation that can be viewed in Appendix B.

Photo II-5: James Madison University Students.

III. PUBLIC PARTICIPATION

1. Public Participation

In 2000, the Central Shenandoah Region was designated a Project Impact Community by FEMA. Through Shenandoah Valley Project Impact (SVPI), thousands of citizens, businesses, and community organizations have been educated regarding disaster preparedness and mitigation. Through SVPI, many opportunities have been made available to gather public input into the planning process for the original Plan, the 2013 update, and this current update. Numerous presentations were made to civic groups, human service organizations, and other groups working with citizens (young and old) in the Valley. Educational materials have been distributed to thousands of citizens at community events. In January 2003, the Central Shenandoah Region also became a Citizen Corps Council enabling the Region to continue the work and programs initiated by Project Impact. In 2020, Shenandoah Valley Project Impact will turn twenty years old. Included in Table III-1 are events where the general public was given the opportunity to learn more about disaster preparedness, mitigation, and most importantly, the current update of the Plan.

The Region was designated as a Project Impact Community in 2000.

Shenandoah Valley Project Impact (SVPI) has provided disaster preparedness and mitigation education in the region.

Figure III-1: Project Impact Logo

Figure III-2: Citizens Corps Council Logo

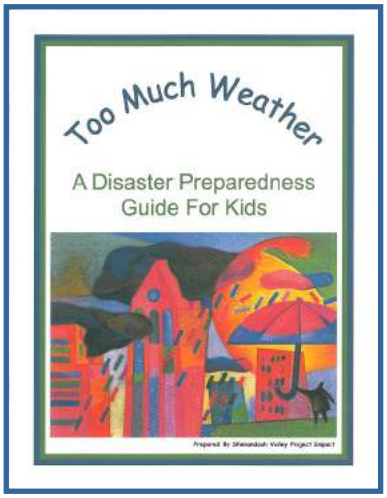


Figure III-3: Shenandoah Valley Project Impact, Disaster Preparedness Guide

The CERT Basic Course Has Been Offered 38 times and over 603 people have been trained.

Another avenue used to reach the public and gain their input into the planning process was through the Community Emergency Response Team (CERT) program. CERT is a national program offered through FEMA. The goal of CERT is for emergency personnel to train members of neighborhoods, community organizations or workplaces in basic response skills like disaster preparedness, fire safety, emergency first aid, search and rescue, and terrorism awareness. The Central Shenandoah Planning District began offering CERT classes in September 2003. Since then, 38 courses have been held resulting in a total of 603 volunteers trained in CERT. For this update of the Plan, CERT members provided input by filling out the public survey, participating in planning meetings, and assisting in public outreach activities.

Photo III-1 : Staunton-Augusta-Waynesboro CERT Volunteers

Photo III-2: CERT Volunteers participating in 2018 Shenandoah Valley Regional Airport Disaster Drill

Public participation again played a key role in the revision process for this update of the Plan. Public input was received by creating a new survey. The survey was widely distributed through an email blast, and a press release to a variety of media outlets in the Region, including local newspapers, radio and television stations. The survey and discussion of the Plan was also incorporated into many public education and awareness events (listed in Table III-1). The survey could be completed online, through a paper copy, or by a phone call with CSPDC staff. 557 surveys were completed and tabulated. A report of the survey results can be found in Appendix A - Planning Process and Public Engagement. Information from the public survey was used to guide the Steering Committee and CSPDC staff as they updated the Hazard Mitigation Plan. Public input from the survey included confirmation that the disasters respondents are most concerned about are the ones that occur the most frequently in the Region, are the ones ranked highest by steering committee and stakeholders, and are the ones that have the most emphasis in the Plan. Another valuable insight that was gained through the public survey is that the mitigation and preparedness education efforts in the Region are having a positive effect. Public education is one of the mitigation strategies included in the HMP. Also, during the update process, a copy of the original Plan was kept on the CSPDC website to allow for comment from the public as well.

During the adoption process of the update of the Plan by the 21 jurisdictions in the Region, the public will have another opportunity to provide input during the public comment period held at each Board of Supervisors, City Council, or Town Council meeting where adoption of the Plan will be on the agenda. The CSPDC will also have the Plan on their website for public comment as well. The CSPDC will issue a press release regarding the adoption process and the opportunity for additional public comment to the media throughout the Region. Any public comments received during the adoption process will be recorded and included in the Plan.

After the Plan has been approved by the Federal Emergency Management Agency and been adopted by the local jurisdictions, the Hazard Mitigation Plan will be kept on the CSPDC website for public comment throughout the five year plan update cycle. Over the five years between revisions of the Plan, public comment will be allowed and any comments received will be recorded.

Table III-1: Public Involvement Activities, 2019

Date	Event
03/05/2019	Valley Community Service Board Day Program Presentation - Staunton/Augusta County/Waynesboro
03/11/2019	Pleasant View/Spring Hill Ruritan Club - Augusta County
04/11/2019 - 05/23/2019	SAW Basic Training Course - Staunton/Augusta County/Waynesboro
04/24/2019	Harrisonburg Health and Safety Fair - Harrisonburg
04/27/2019	Dooms Fire Department Kids Fun Day - Augusta County/Waynesboro
05/14/2019	Gypsy Hill House Senior Apartments Presentation - Staunton
05/18/2019	Green Valley Book Fair Kids Safety Day - Rockingham County
05/28/2019	Plaza Apartments for Seniors/Persons with Disabilities - Staunton and Augusta County
06/14/2019	Historic Staunton Foundation Brown Bag Talk - Flooding Presentation - Staunton
07/16-2019 and 09/12/2019	Grace Lutheran Church Presentations - Waynesboro
09/17/2019	Bath County Local Emergency Planning Committee Meeting - Bath County
09/20/2019	Virginia Department of Health Staff Retreat Presentation - Regionwide
09/25/2019	Bath County Housing Study Community Meeting - Bath County
09/26/2019 11/14/2019	SAW Basic Training Course - Staunton/Augusta County/Waynesboro
09/28/2019	Girl Scout Preparedness Fair - Rockbridge County
10/06/2019	Touch-A-Fire Truck Event - Staunton/Augusta County/Waynesboro

IV. HAZARD IDENTIFICATION RISK ASSESSMENT (HIRA)

1. Purpose

In accordance with the requirements of **Title 44 Code of Federal Regulations (CFR) § 201.6** for local jurisdictions to have a Hazard Mitigation Plan (HMP), communities must conduct a hazard identification risk assessment (HIRA) to be included in the Plan. Having the HIRA in place allows local jurisdictions in the Region to better understand local hazards and the risks posed by them, begin to develop mitigation activities to lessen the impacts, and to acquire disaster-related grants in the aftermath of a disaster. The HIRA was developed to serve as a guide to all communities in the Region for assessing potential vulnerabilities to natural and other hazards. When developing this section, every effort was made to use the best data available to assure that the results of this analysis were as accurate as possible.

The planning area for this assessment includes the 21 jurisdictions of the Central Shenandoah Planning District Commission (CSPDC). All jurisdictions located in the CSPDC Region have been included in this portion of the study, as this analysis has been completed on a regional basis. It should be noted that the local jurisdictions included in the Plan were engaged participants in providing input throughout the entire planning process.

The purpose of the HIRA is to:

1. Identify hazards that that have impacted and/or could affect the Central Shenandoah Planning District Commission Region.
2. Profile hazard events and determine what areas and community assets are the most vulnerable to damage from these hazards.
3. Estimate losses and prioritize the potential risks to the community.

Methodology for Identifying and Prioritizing Hazards

One of the first steps in the planning process and the hazards identification risk assessment phase was to identify each of the hazards that can occur and impact the Region. CSPDC staff reviewed hazards that were included in the 2005 Plan and the 2013 update of the Plan. These hazards were previously identified based upon extensive research and review of historical data provided through studies, reports and existing plans. During those planning processes, hazards were prioritized by members of the Steering Committee and survey results collected from the general public.

At the April 2019 Steering Committee Meeting, CSPDC staff presented information on the previously identified hazards to members of the committee. The members were asked to rank the hazards based upon the impact that the hazard has on their community. Categories were provided for significant, high, medium, low or none. Members were also asked to identify and rank any hazards that had not been previously included.

The results of the rankings were shared at the June 2019 Steering Committee Meeting. CSPDC staff presented information on the other hazards that had been newly identified by the members of the committee. A second ranking occurred for the newly identified hazards with categories provided for significant, high, medium, low or none. Members that could not attend the meeting were also contacted and requested to submit their rankings.

CSPDC staff reviewed the results of the rankings and the comments submitted by the Steering Committee to identify and prioritize the hazards in our region. These hazards are the focus of the 2020 Plan and the mitigation strategies developed. The following hazards were identified and are described in detail below:

- Flooding or Dam Failure
- Drought
- Hurricane

- Severe Winter Weather
- Land Subsidence/Karst
- Wind (Tornado, Derecho, Straight-Line Winds)
- Wildfire
- Landslide
- Earthquake
- Hazardous Materials (Transportation and Industrial)
- Terrorism
- Power Outages

The CSPDC is the largest geographic planning district region in Virginia.

Project Study Area and Planning District Description

The Region is comprised of five Counties, five Cities and eleven incorporated Towns.

The Project Study Area is located in the historic Shenandoah Valley in western Virginia and includes the 21 jurisdictions of the Central Shenandoah Planning District Commission (CSPDC). Interstate 81 and Interstate 64 run through the Region, which is approximately 45 miles north of Roanoke, 68 miles south of the Virginia Inland Port, 100 miles west of Richmond, 125 miles southwest of Washington, D.C., and 200 miles northwest of the Port of Hampton Roads. With a land area of 3,439 square miles, the CSPDC is the largest geographic planning district in the Commonwealth. As shown in Figure IV-1, the Region is comprised of Augusta, Bath, Highland, Rockbridge and Rockingham counties, and the independent cities of Buena Vista, Harrisonburg, Lexington, Staunton and Waynesboro. The Region also has 11 incorporated towns including Bridgewater, Broadway, Craigsville, Dayton, Elkton, Goshen, Glasgow, Grottoes, Monterey, Mount Crawford, and Timberville.

Table IV-1 provides an overview of land area and demographic information for each of the communities in the Region, and Figure IV-2 illustrates population density by Census Block Group. The Region is home to an estimated population of 294,719 individuals (Weldon Cooper Center, 2017 Population Estimates). According to the American Community Survey 5-Year Estimates (2013-2017), there are 128,853 housing units in the Region and 58.3% are owner-occupied.

Figure IV-1: Central Shenandoah Planning District Boundaries

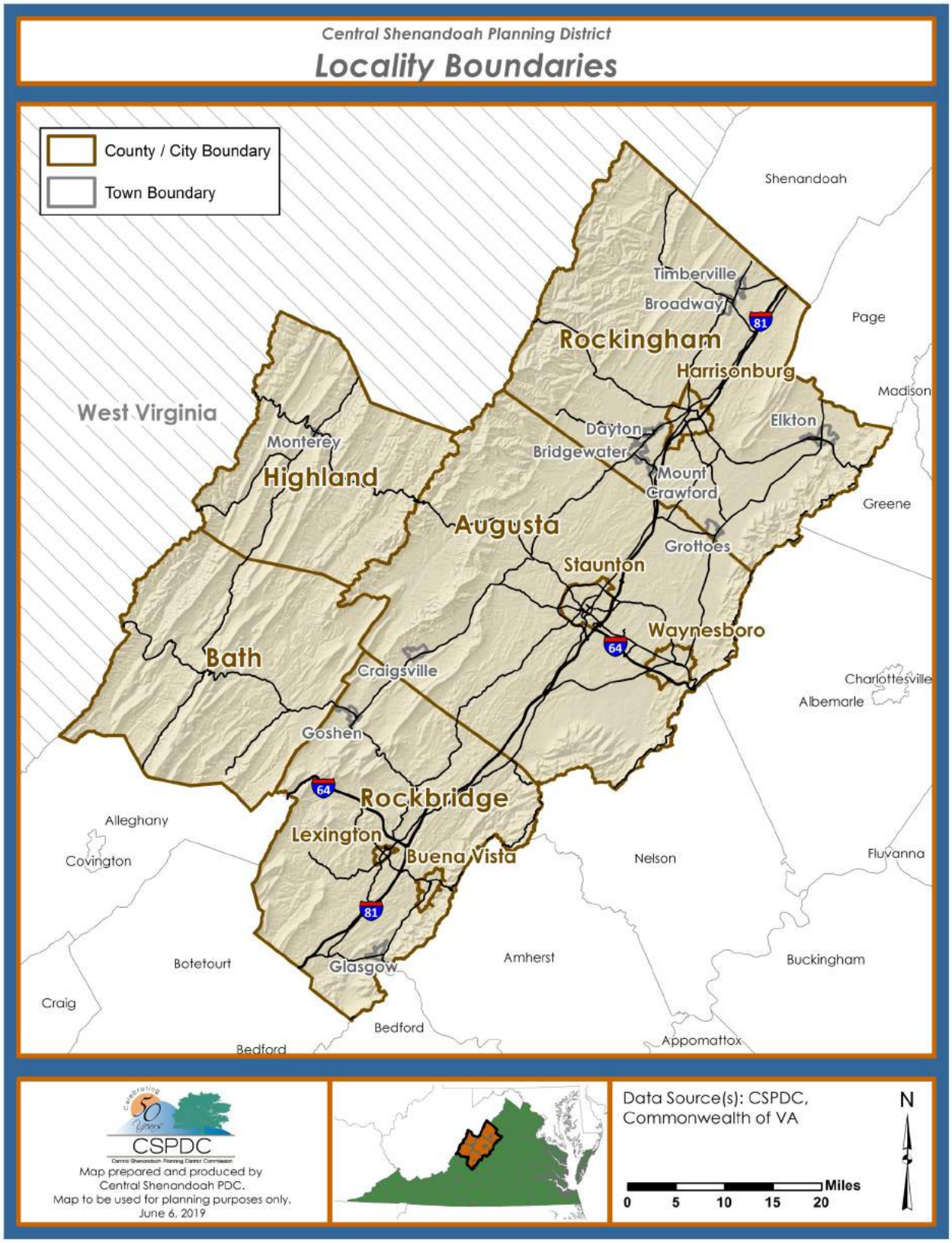


Table IV-1: Central Shenandoah Planning District Commission Demographics

Locality	Area (Square Miles)	2017 Population	2017 Population Per Square Mile	Median Home Value	Total Housing Units
Augusta County	971	74,390	76.61	$206,300	32,153
Craigsville, Town of	2.07	956	461.84	$118,400	475
Bath County	535	4,458	8.33	$151,100	3,353
Buena Vista City	7	6,495	927.86	$111,700	2,895
Harrisonburg City	17	53,064	3,121.41	$196,200	18,154
Highland County	416	2,213	5.32	$184,000	2,069
Monterey, Town of	0.3	156	520.00	$152,900	146
Lexington City	3	7,113	2,371.00	$252,500	2,248
Rockbridge County	600	22,440	37.40	$197,200	11,352
Glasgow, Town of	1.53	1,298	848.37	$98,600	549
Goshen, Town of	1.75	317	181.14	$96,300	205
Rockingham County	854	78,653	92.10	$206,700	34,891
Bridgewater, Town of	2.52	5,930	2,353.17	$220,000	2,170
Broadway, Town of	2.4	3,793	1,580.42	$197,200	1,644
Dayton, Town of	1.03	1,622	1,574.76	$214,200	659
Elkton, Town of	3.21	2,795	870.72	$180,600	1,395
Grottoes, Town of	2.07	2,734	1,320.77	$165,000	1,198
Mt. Crawford, Town of	0.49	403	822.45	$235,700	205
Timberville, Town of	1.29	2,592	2,009.30	$154,900	1,132
Staunton City	20	24,273	1,213.65	$162,500	11,782
Waynesboro City	15	21,620	1,441.33	$161,600	9,956

Source: U.S. Census, American Community Survey 5-Year Estimates, 2013-2017

Note: Town totals are included in County totals.

The top three industries by employment include Government, Manufacturing and Health Care and Social Assistance, with an average earnings of $45,859 across all industries and an estimated 144,466 people in the civilian labor force (Central Shenandoah Valley Regional Data Center, 2019).

The Region is part of the Valley and Ridge, and the Blue Ridge Physiographic Provinces.

The Region is bounded on the east by the crest of the Blue Ridge Mountains and on the west by the Allegheny Mountains and West Virginia Border. The Region is part of the Valley and Ridge Physiographic Province, which is characterized by gently rolling and hilly valleys, as well as gradual mountain slopes. The extreme eastern edge of the Region is within the Blue Ridge Physiographic Province which is distinguished by mountain peaks. The western edge of the Region is characterized by high, narrow, mountain ridges that run northeast to southwest forming relatively narrow river valleys. Elevations range from a high of 4,546 feet above sea level in Highland County, to a low of 720 feet above sea level near Glasgow in Rockbridge County.

Soils in the valley range from carbonate soils to alluvial soils along rivers and streams. Colluvial soils resulting from the weathering of the sandstone and shale mountains are found in the foothills paralleling the valley. The mountain areas are covered with shallow, rocky, excessively drained soils that derive from the weathering of acidic sandstone, shale, quartz, and granite parent material. The predominant geological structure underlying the Region is a complex formation of limestone, calcareous shale, and dolomite, with smaller amounts of sandstone, conglomerate, and chert.

Of the Region's 2.2 million acres of land, over 1 million acres of land are publicly held and protected.

Of the Region's 2.2 million acres of land, over 1 million acres are publicly held and protected. The Region contains a high quality and quantity of natural resources, made evident by large areas held in national forest and park land.

The region's land use is extremely diversified containing rural, agricultural areas to cities with the characteristics of small urban centers including universities, industries, and public transportation. Local jurisdictions deal with anticipated future land use issues through the mandated creation and updating of local Comprehensive Plans. Hazards and vulnerabilities are examined through the planning process.

The region's land use is mostly dominated by forest and agriculture. Much of the forested area in the Region is within either Shenandoah National Park or the George Washington and Jefferson National Forests. Forest resources are important in maintaining the local forestry industry, watersheds, wildlife habitats, and outdoor recreation. The dominant forest type in the Region is mixed hardwoods, specifically oaks, hickories, and maples.

The Region drains into the Potomac River basin and the James River basin.

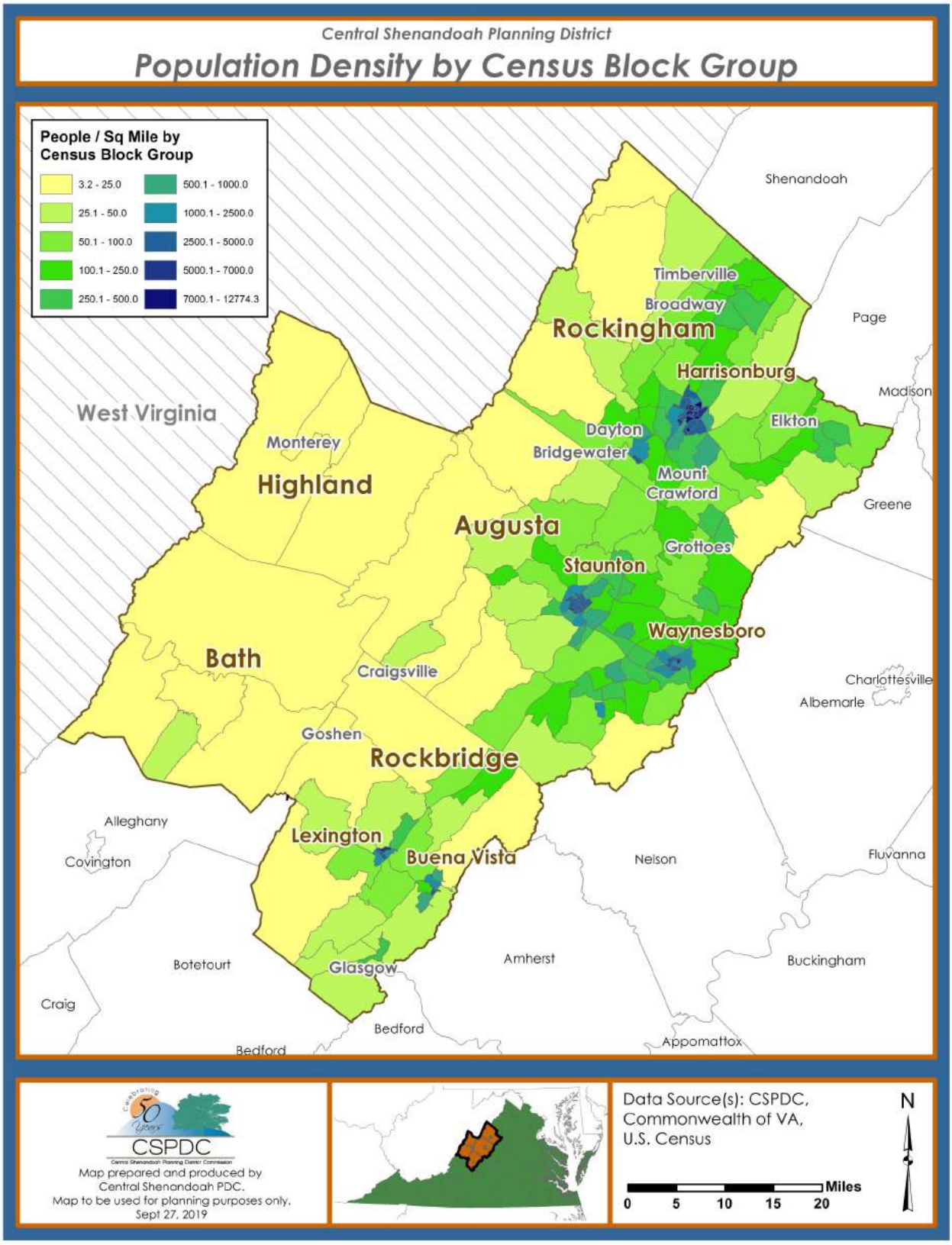
Figure IV-3 illustrates the location of the hydrologic basins and hydrography for the Region. Surface water in the Region drains into the Potomac River basin and the James River basin. The major tributaries to the Potomac River basin and the James River basin in the Region include the Bullpasture River, Calfpasture River, Cowpasture River, Little Calfpasture River, Jackson River, Middle River, the North Fork of the Shenandoah River, North River, South Fork South Branch Potomac River, the South Fork of the Shenandoah River, South River (Maury River tributary) and South River (South Fork Shenandoah River tributary).

Lake Moomaw is the second largest multi-purpose reservoir in western Virginia.

Many of these major waterways are used as public water supply sources. The Region is also home to several reservoir impoundments that have uses such as public water supply, flood control measures, or outdoor recreation opportunities. Lake Moomaw in Bath County, with a surface area of 2,530 acres, is the second largest multi-purpose reservoir in western Virginia and was completed in the 1980s with the construction of the Gathright Dam on the Jackson River by the U.S. Army Corps of Engineers.

This information about the Region will prove to be a key component in determining the risk to communities from natural hazards.

Figure IV-2: Central Shenandoah Planning District Population Density



Critical Facilities

According to the FEMA State and Local Plan Interim Criteria, a critical facility is defined as a facility in either the public or private sector that provides essential products and services to the general public, is otherwise necessary to preserve the welfare and quality of life in the local jurisdiction, or fulfills important public safety, emergency response, and/or disaster recovery functions.

Each of the 21 jurisdictions were requested to review the critical facility list for their community.

In the past, critical facilities were identified based upon data provided by the CSPDC, ESRI and the Virginia Tech Center for Geospatial Information Technology (CGIT). During this update of the Plan, each of the 21 jurisdictions was requested to review the local critical facility list for their community. Feedback was provided on revisions including additions or deletions of critical facilities from the list. For the CSPDC region, 1,153 critical facilities were identified. The coordinate locations for the critical facilities were intersected with floodplain data and other hazard data for the region. Figure IV-4 shows the location of critical facilities in the region in comparison to one percent annual chance of flood hazards in the FEMA floodplains.

In the CSPDC region, 1,153 critical facilities were identified.

Data Limitations

Inadequate information posed a problem for developing loss estimates for most of the identified hazards. The limiting factor for the data was the hazard mapping precision at only the jurisdiction level. Many of the hazards do not have defined damage estimate criteria. Available data for this Plan was very limited. The FEMA guidelines emphasize using "best available" data for this Plan. The impact of these data limitations will be shown through the different vulnerability assessment and loss estimation methods used for hazards.

Emergency Managers in the Region were contacted and information was requested on damage assessments for past events that have occurred in the Region since 2000. Information was requested on weather, rainfall/ precipitation totals, wind speeds, and financial damages for damages to structures, infrastructure or agricultural losses. Unit Coordinators with Virginia Cooperative Extension for each of the five counties within the Region were contacted and information on agricultural losses was requested. The responses that were received were incorporated into the Plan, but information received was limited. At the October 2019 Steering Committee Meeting, a

recommendation was made to the members of the Steering Committee to start tracking this information within their localities to assist with future Plan updates.

Critical facilities were determined based on best available data which were reviewed and updated by the 21 localities. Critical facilities, residential and industrial buildings within the 100 year floodplain were identified for flood analysis (CSPD Flood Mitigation Plan).

The HAZUS-MH model was used to estimate damage from flooding, hurricanes, and earthquakes in the Central Shenandoah region. The CSPDC had several issues with the HAZUS software and after attempting to contact the HAZUS help team, the CSPDC decided to partner with the Northern Shenandoah Regional Commission to run HAZUS reports for the CSPDC region. One of the main issues is that the current HAZUS software provided by FEMA is not compatible with the most recent version of ESRI's ArcMap software. The ESRI software must be uninstalled to install the HAZUS software, which makes the process very difficult. We recommend that FEMA improve HAZUS to be more compatible with current ESRI software.

The CSPDC also had difficulty accessing the FEMA's Repetitive Loss Property information for the Region. Some of this data is restricted or is unable to be shared publicly due to privacy concerns.

Future Conditions of Hazard Activity

Climate change is expected to have a major impact on hazard activity around the world, and in the Central Shenandoah region. Our region will experience more frequent, severe storms and natural disasters, resulting in disruptions in the economy and overall safety concerns for residents in our area. All hazards listed in this plan could be potentially affected by climate change and to address these growing issues, there is a separate chapter on Climate Adaptation. This chapter shares information about the region's population, land use, changes to climate and weather patterns, hazard profiles and recommendations, and social impacts. The Climate Adaptation chapter can be viewed in Appendix B.

Figure IV-3: Central Shenandoah Planning District Hydrologic Basins and Hydrography

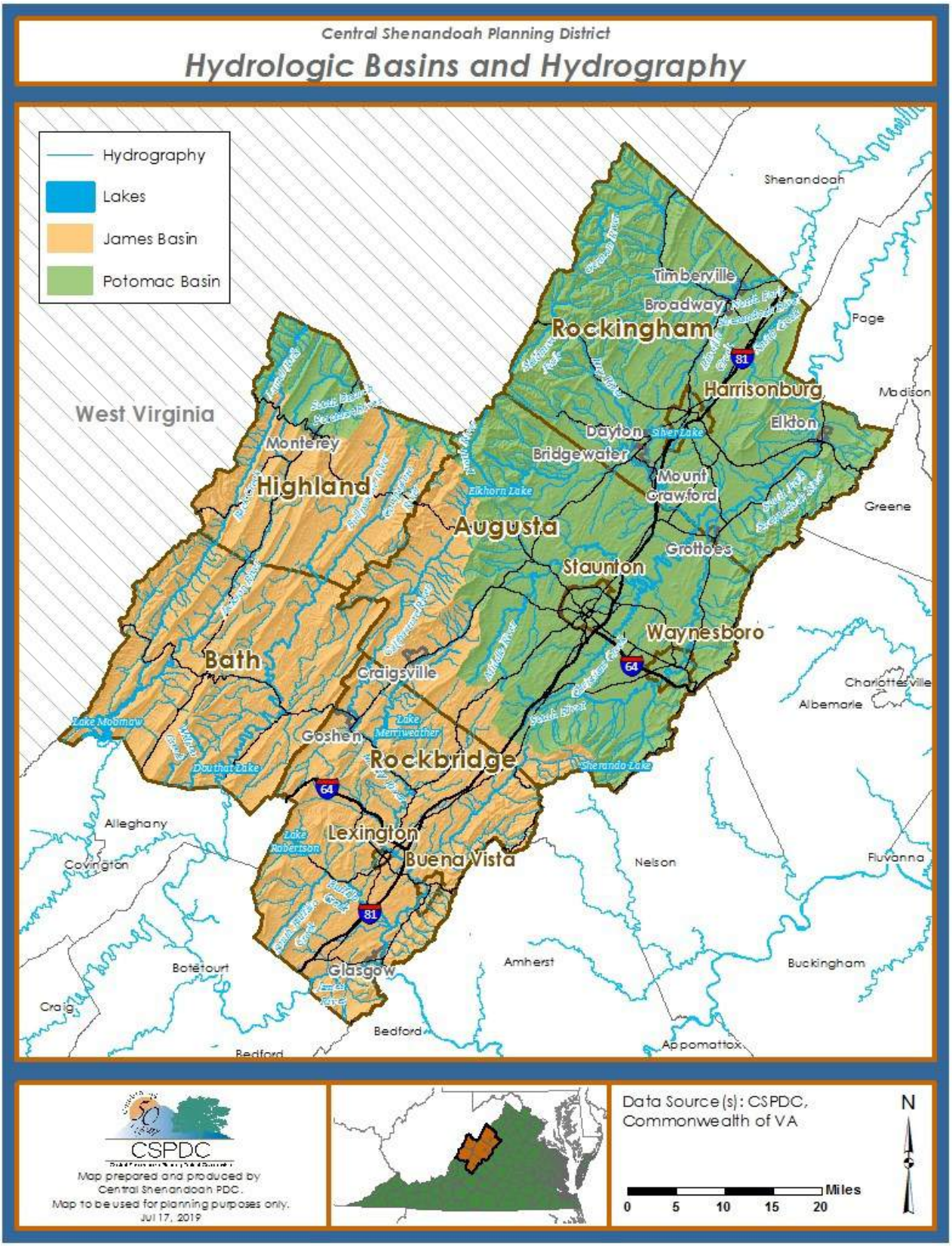
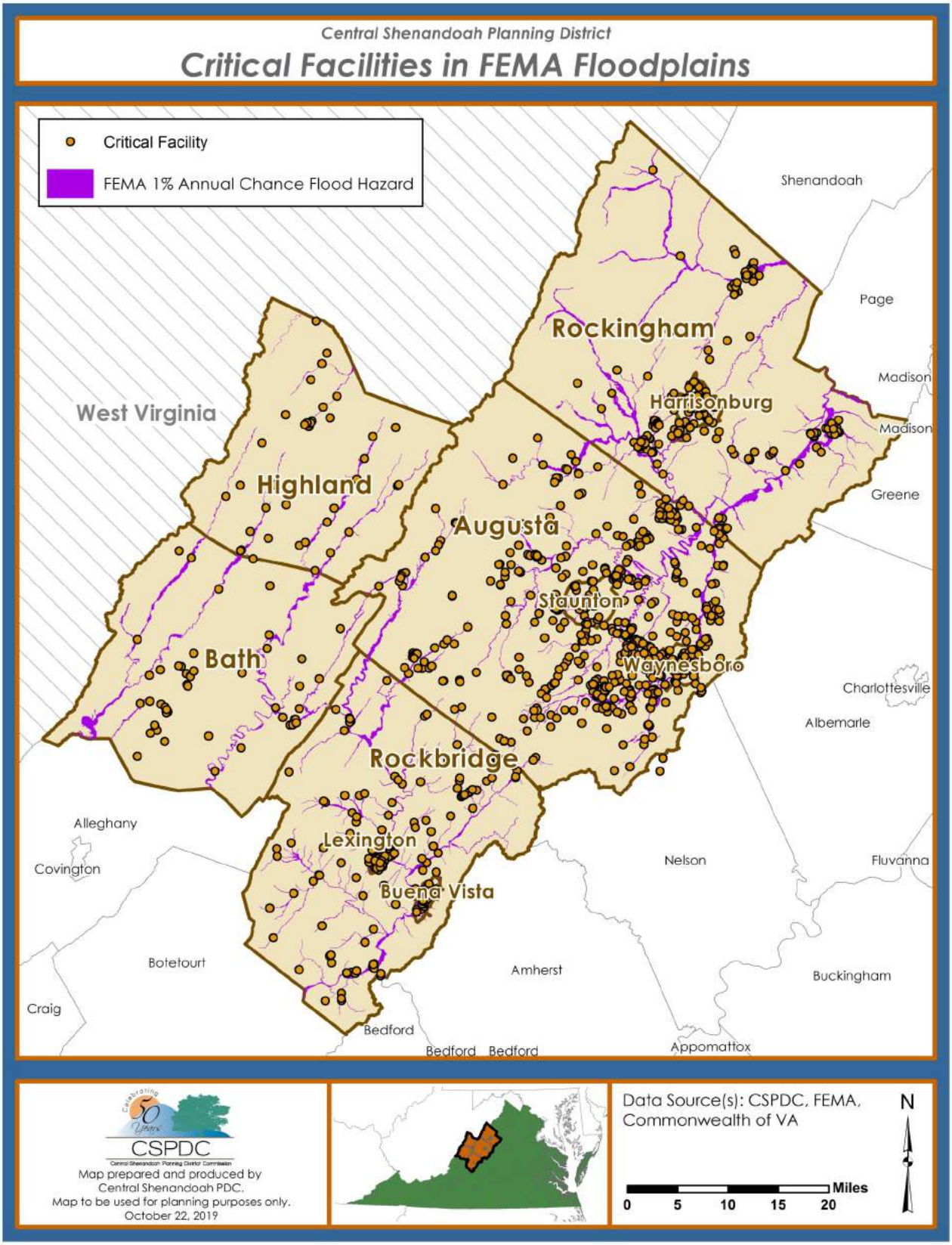


Figure IV-4: Critical Facilities in FEMA Floodplains



Glossary

A-Zone – An area that would be flooded by the Base Flood, and is the same as a Special Flood Hazard Area (SFHA) or a 100-year floodplain. A-Zones are found on all Flood Hazard Boundary Maps and Flood Insurance Rate Maps (FIRMS).

Acquisition – Removal of structures from the floodplain through purchase and demolition with the property to be forever maintained as open space.

Aftershock – An earthquake of similar or lesser intensity that follows the main earthquake.

Alluvium – Sand, mud and other material deposited by a flowing current.

Annual Flood – The flood that is considered the most significant flood event in a one-year cycle of a floodplain.

Backwater – Rise in water caused by downstream obstruction or restriction or by high stage on an intersecting stream. Also referred to as "heading up."

Base Flood – Sometimes referred to as a 100-year flood, it is a flood of the magnitude that has a one percent chance of occurring in any given year.

Base Flood Elevation (BFE) – Elevation of the 100-year flood. This elevation is the basis of the insurance and floodplain management requirements of the National Flood Insurance Program.

Basin – The largest watershed management unit. A basin drains to a major receiving water such as a large river, estuary or lake.

Benefits – Future losses and damages prevented by a project.

Benefit Cost Analysis (BCA) – An assessment of project data to determine whether or not the cost of the project is justified by its benefits.

Berm – Small levees, usually built from fill dirt.

Blizzard Warning – Winds or frequent gusts to 35 miles per hour or greater and considerable falling or blowing snow expected to prevail for a period of three hours or longer.

Buffer – Vegetated strips of land surrounding ecosystems.

Buyout – Commonly used term for property acquisition.

Catchment – The smallest watershed management unit. The area that drains an individual development site to its first intersection with a stream.

Channel – A natural or artificial watercourse with definite bed and banks to confine and conduct flowing water.

Check Dam - A small, low dam constructed in a gully or other watercourse to decrease the velocity of stream flow, for minimizing channel scour.

Community Rating System (CRS) – A system, administered by the Federal Emergency Management Agency (FEMA), where communities are recognized for their mitigation efforts that exceed the National Flood Insurance Program (NFIP)'s minimum standards for floodplain regulation. NFIP policyholders in the community are rewarded with reduced annual flood insurance premiums as part of this program.

Confluence – The section where one stream joins another stream.

Crest – The maximum stage or elevation reached or expected to be reached by the water of a specific flood at a given location.

Critical Facility – Facilities that are critical to the health and welfare of the population and are especially important following hazard events. Critical facilities include, but are not limited to, shelters, police and fire stations, and hospitals.

Debris/Debris Flow – Materials (broken bits and pieces of wood, stone, glass, etc.) carried by wind or floodwaters, including objects of various sizes.

Declaration – Presidential finding that a jurisdiction of the United States may receive Federal aid as a result of damages from a major disaster or emergency.

Design Wind Speed Map – A map of the United States development by the American Civil Engineers that depicts wind zones based on frequency and strength of past tornadoes and hurricanes.

Development – Any man-made change to improved or unimproved real estate, including, but not limited to, buildings or other structures, mining, grading, paving, excavation or drilling or storage of equipment or materials.

Digitize – To convert points, lines and area boundaries shown on maps electronically into coordinates for use in computer applications.

Disaster Resistant Communities – A community based initiative that seeks to reduce vulnerability to natural hazards for the entire designated area through mitigation actions. This approach requires cooperation between individuals and the business sectors of a community to implement effective mitigation strategies.

Drought - a period of abnormally dry weather that persists long enough to produce serious effects like crop damage, water supply shortages, etc.

Dry Floodproofing – Protecting a building by sealing its exterior walls to prevent the entry of flood waters.

Earthquake – A sudden slipping or movement of a portion of the earth's crust accompanied and followed by a series of vibrations.

Elevation – The process of raising a house or other building so that it is above the height of a given flood to minimize or prevent flood damage.

Emergency – Any hurricane, tornado, storm, flood, high water, wind-driven water, tidal wave, tsunami, earthquake, volcanic eruption, landslide, mudslide, snowstorm, drought, fire, explosion, or other catastrophe in any part of the United States which requires Federal emergency assistance to supplement State and local efforts to save lives and protect property, public health and safety, or to avert or lessen the threat of a disaster.

Emergency Operations Plan (EOP) – Sets forth actions to be taken by the State or local governments in response to emergencies or major disasters.

Encroachment – Any physical object placed in a floodplain that hinders the passage of water or otherwise affects flood flow, such as landfills or buildings.

Enhanced Fujita Scale – Rates tornadoes with number value from EF0 to EF5 based on damage indicators and variables to assign wind speed rating.

Epicenter – The area of the earth's surface directly above the origin of an earthquake.

Erosion – The process of the gradual wearing away of land masses during a flood or storm or over a period of years through the action of wind, water, or other geologic processes.

Fault – An area of weakness where two sections of the earth's crust have separated.

Federal Emergency Management Agency (FEMA) – began as an independent agency of the Federal government established in 1979, reporting to the President. In 2003, FEMA became part of the U.S. Department of Homeland Security. FEMA's mission is to help people before, during, and after disasters. It reduces loss of life and property damage and protects critical infrastructure from all types of hazards through a comprehensive, risk-based emergency management program of mitigation, preparedness, response, and recovery.

First Floor Elevation – The elevation of the lowest finished floor of a structure.

Flash Flood – A sudden, violent flood that rises quickly and usually is characterized by high flow velocities. Flash floods often result from intense rainfall over a small area, usually in areas of steep terrain with little or no warning where water levels rise at an extremely fast rate.

Flood – A partial or complete inundation of normally dry land areas from 1) the overland flow of a lake, river, stream, ditch, etc.; 2) the unusual and rapid accumulation or runoff of surface waters; or 3) mudflows or the sudden collapse of shoreline land.

Flood Control – Measures taken to keep the flood waters away from specific developments or populated areas by the construction of flood storage reservoirs, channel alterations, dikes and levees, bypass channels, or other engineering works.

Flood Depth – Height of the floodwater surface above the ground surface.

Flood Duration – The length of time a stream is above flood stage or overflowing its banks.

Flood Frequency – A statistical expression referring to how often a flood of a given magnitude can be expected. (Note: the word "frequency" often is omitted to avoid repetition).

Examples:
10-year flood – the flood which can be expected to be equaled or exceeded on average once in 10 years; and which would have a 10 percent chance of being equaled or exceeded in any given year.
50-year flood - …. two percent chance…in any given year.
100-year flood - …. one percent chance…in any given year.
500-year flood - ….two-tenths percent chance…in any given year.

Flood Fringe – The portion of the floodplain that lies beyond the floodway and serves as a temporary storage area for floodwaters during a flood.

Flood Insurance Rate Map (FIRM) – An official map of a community prepared by FEMA on which areas that may or may not require flood insurance are delineated. These maps also provide flood elevations and velocity zones.

Flood Insurance Study (FIS) – A study prepared by FEMA that provides an examination, evaluation, and determination of flood hazards and, if appropriate, corresponding water surface elevations in a community or communities.

Flood Mitigation Assistance Program (FMA) - Provides pre-disaster grants to State and local governments for both planning and implementation of mitigation strategies. Each State is awarded a minimum level of funding which may be increased depending upon the number of NFIP policies in force and repetitive claims paid.

Floodplain – Land adjoining a stream (or other body of water) which has been or may be covered with water.

Floodplain Management – The operation of an overall program of corrective and preventive measure for reducing flood damage, including but not limited to emergency preparedness plans, flood control work and floodplain management regulations such as zoning ordinances, subdivision regulations, building codes and floodplain ordinances.

Floodproofing – Any combination of structural and nonstructural additions, changes or adjustments to properties and structures which reduce or eliminate flood damage to lands, water, and sanitary facilities, structures, and contents of buildings. May include structural elevation, relocation, acquisition, or other measures.

Floodwall – Flood barrier constructed of manmade materials, such as concrete or masonry designed to keep water away from a structure.

Flood Warning – A warning term that means flooding is already occurring or will occur soon in your area.

Flood Watch – A warning term that means that a flood is possible in your area.

Floodway – The channel of a river or other watercourse and the adjacent land areas required to carry and discharge the base flood without cumulatively increasing the water-surface elevation more than one foot at any point.

Floodway Fringe – The area between the floodway and the 100-year floodplain boundaries.

Freeboard – An additional amount of height usually expressed in feet above the Base Flood Elevation used as a factor of safety in determining the level at which a structure's lowest floor must be elevated or floodproofed to be in accordance with State or community floodplain management regulations.

Freezing Rain – Rain that freezes when it hits the ground, creating a coating of ice on roads, walkways, trees, and power lines.

Frost/Freeze Warning – Below freezing temperatures are expected.

Geographic Information System (GIS) - A computerized mapping and analysis tool. GIS can be a useful tool in mapping at-risk structures and infrastructure in the floodplain.

Greenways – Greenways are linear parks or corridors of open space that may extend across many communities. They can provide walking and biking links between parks, businesses, and culturally important sites. They embody a strategy for keeping riverside areas largely undeveloped, which provide recreational, cultural and aesthetic resources. Greenways can help to protect stretches of floodplain ecosystems.

Hail – Hail or hailstones are irregular pellets or balls of ice falling from a cumulonimbus clouds.

Hazard – A source of potential danger or adverse condition. Hazards include naturally occurring events such as floods, earthquakes, tornadoes, tsunami, coastal storms, landslides, and wildfires that strike populated areas. A natural event is a hazard when it has the potential to harm people or property.

Hazard Mitigation – A plan to alleviate or make less severe the effects of a major disaster. Hazard mitigation can reduce the severity of the effects of a flood on people and property by reducing the cause or occurrence of the hazard and reducing exposure to the hazard.

Hazard Mitigation Grant Program (HMGP) – Authorized under Section 404 of the Stafford Act; provides funding for cost-effective hazard mitigation projects in conformance with the post-disaster mitigation plan.

Hazard Mitigation Plan – A plan resulting from a systematic evaluation of the nature and extent of vulnerability to the effects of natural hazards present in a community that includes the actions needed to minimize future vulnerability to hazards.

HAZUS – A GIS-based nationally standardized loss estimation tool developed by FEMA.

Headwater – Highest reaches of a stream in a drainage basin.

Hurricane – A severe tropical disturbance in the North Atlantic Ocean, Caribbean Sea, or Gulf of Mexico that achieves a sustained wind force of at least 74 miles per hour.

Hydrology – The science of the behavior of water in the atmosphere, on the earth's surface, and underground.

Hydrostatic Pressure – Forces imposed on an object, such as a structure, by standing water.

Increased Cost of Compliance (ICC) – Coverage under a standard NFIP flood insurance policy. ICC helps pay for the cost of mitigation, including demolition and relocation for a flood-insured structure that sustains a flood loss and is declared to be substantially or repetitively damaged.

Infrastructure – Public services that have a direct impact on the quality of life such public water supplies and sewer treatment facilities, and transportation networks such as airports, roads and railways.

Integrated Flood Observing and Warning System (IFLOWS) - A flood warning system developed by the National Weather Service that combines sensors, communication, and computer technology with advanced forecasting to provide timely guidance and advice to local emergency services staff.

Karst – A land area with topographic depressions such as sinkholes, springs, sinking streams, and caves caused by underground solution of limestone bedrock.

Landslide - Downward movement of a slope and materials under the force of gravity.

Levee – A man-made flood barrier constructed of compacted soil designed to contain, control, or divert the flow of water.

Lightning – Lightning is an electrical circuit that is generated in cumulonimbus clouds (thunderheads) which have a negative electrical charge at the base and a positive charge at the top.

Lowest Floor – Under the NFIP program, the lowest floor of the lowest enclosed area, including a basement. An unfinished or flood-resistant enclosure such as a garage or storage area is not considered a building's lowest floor.

Magnitude – Measurement of the relative size of the earthquake compared to other standard earthquakes based on a logarithmic scale.

Mitigation – Sustained action that reduces or eliminates long term risk to people and property from natural hazards and their effects.

Mitigation Reconstruction – The construction of an improved, elevated building on the same site where an existing building and/or foundation had been partially or completely demolished or destroyed. Mitigation reconstruction is only permitted outside of the regulatory floodway or Coastal High Hazard Area (Zone V) as identified by the existing best available flood hazard data.

Mudflows – Sometimes called debris flows; mudflows are rivers of rock, earth, and debris saturated with water. They develop when water accumulates rapidly in the ground, so that earth becomes a flowing river of mud (called a slurry).

National Flood Insurance Program (NFIP) – Provides the availability of flood insurance in exchange for the adoption and enforcement of a minimum local floodplain management ordinance. The ordinance regulates new and substantially damaged or improved development in identified flood hazard areas. The Federal Emergency Management Agency administers this program.

Open Space – An area of land that is free of development, i.e. houses and other buildings that alter the area's natural appearance and impede the area's ability to covey flood flows. Open space can be used for parks, ball fields, hiking trails, garden spaces and other compatible open space uses.

Palmer Drought Severity Index (PDSI) – A measurement index which tracks moisture conditions and severity of drought conditions ranging from –10 (dry) to +10 (wet). Values below –3 represent severe to exceptional drought.

Pre-FIRM/Post-FIRM – Pre-FIRM means that a building was constructed before the date of the initial Flood Insurance Rate Map (FIRM) issued to the community or before December 31, 1974, whichever is later. Post-FIRM means the building was constructed on or after the date of community initial FIRM, or after December 31, 1974, whichever is later.

Preparedness – Activities to ensure that people are ready for a disaster and respond to it effectively. Preparedness requires figuring out what will be done if essential services break down, developing a plan for contingencies, and practicing the plan.

Project Impact – A project introduced by FEMA to reduce the damage of disasters. It helped communities protect themselves by taking actions to reduce disruption and loss.

Rain Gardens – A water quality practice in which plants and soils are used to remove pollutants from stormwater. Also known as bio-retention.

Recovery – Activities necessary to rebuild after a disaster. Recovery activities include rebuilding homes, businesses, and public facilities; clearing debris; repairing roads and bridges; and restoring water, sewer and other essential services.

Recurrence Interval – The time between hazard events of similar size in a given location. It is based on the probability that the given event will be equaled or exceeded in any give year.

Relocation – The process of moving a house or other building to a new location outside the flood hazard area.

Repetitive Loss Property – 1. The National Flood Insurance Program defines Repetitive Loss as 2 or more claims of at least $1000 over a 10 year rolling period. This is the data that appears in this plan. 2. The Hazard Mitigation Assistance program defines Repetitive Loss as having incurred flood-related damage on 2 occasions, in which the cost of the repair, on the average, equaled or exceeded 25 percent of the market value of the structure at the time of each such flood event; and, at the time of the second incidence of flood-related damage, the contract for flood insurance contains increased cost of compliance coverage.

Response – Activities to address the immediate and short-term effects of an emergency or disaster. Response activities include immediate actions to save lives, protect property, and meet basic human needs.

Retrofitting – Making changes to an existing house or other building to protect it from flooding or other hazards.

Richter Scale – A numerical scale of earthquake magnitude devised by seismologist C. F. Richter in 1935.

Riparian System – Ecosystem occurring in the interface between aquatic and terrestrial systems, in floodplains and adjacent to rivers and streams. Riparian systems are subject to direct influences of ground and or surface waters, and occasional flooding.

Riprap – Broken stone, cut stone blocks, or rubble that is placed on slopes to protect them from erosion or scouring caused by floodwaters.

Riverine – Relating to, formed by, or resembling a river, including tributaries, streams, brooks, etc. Riverine flooding occurs when a river or stream overflows its banks and causes considerable inundation of nearby land and roads.

Seismic – Describes activity related to earthquakes.

Seismic Waves – Vibrations that travel outward for the center of the earthquake at speeds of several miles per second.

Severe Thunderstorm Watch – A severe thunderstorm is expected in the next six hours within an area approximately 120 to 150 miles wide and 300 to 400 miles wide.

Severe Thunderstorm Warning – Indicates a severe thunderstorm is occurring or is imminent in about 30 minutes to 1 hour.

Sinkholes – Natural depressions in the landscape caused by solution and subsidence of earth materials.

Sleet – Rain that turns to ice pellets before reaching the ground. Sleet also causes roads to freeze and become slippery.

Special Flood Hazard Area (SFHA) - The shaded area on a FIRM map that identifies an area that has 1% chance of being flooding in any given year (100-year floodplain).

Stafford Act – Robert T. Stafford Disaster Relief and Emergency Assistance Act, PL 100-707, signed into law November 23, 1988; amended the Disaster Relief Act of 1974, PL 93-288. The statutory authority for most Federal disaster response activities especially as they pertain to FEMA and FEMA programs.

Stormwater – Water from precipitation that flows across the ground and pavement when it rains, floods, or when snow and ice melt. The water seeps into the ground or drains into what we call storm sewers.

Substantial Damage – Damage of any origin sustained by a structure whereby the cost of restoring the structure to its pre-damaged condition would equal or exceed 50 percent of the market value of the structure before the damage occurred.

Topography – The elevations of the land surface.

Tornado – A violently rotating column of air extend from thunderstorm to the ground.

Tornado Warning – A tornado has been sighted or indicated by weather radar. Take shelter immediately.

Tornado Watch – Tornadoes are possible.

Tropical Storm – A tropical cyclone with maximum sustained winds greater than 39 mph and less than 74 mph.

Urban-Wildland Interface Zone – The developed area that occupies the boundary between an urban or settled area and the undeveloped natural forest environment.

Vulnerability – A term used to describe how exposed or susceptible to damage an asset is. Vulnerability depends on an asset's construction, contents and the economic value of its function.

Watershed – The area of land that is drained by a river and its tributaries. Ridges or divides separate watersheds from each other.

Waterspout – A tornado that forms over water.

Wet Floodproofing – Protecting a building by allowing flood waters to enter so that internal and external hydrostatic pressure is equalized. Usually enclosed areas used for parking, storage, or building access are wet floodproofed.

Wetlands – Those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs and similar areas.

Wildfire - An uncontrollable fire spreading through vegetative fuels, exposing and possibly consuming structures.

Wildland Fire – A fire in which development is essentially nonexistent, except for roads, railroads, power lines and similar facilities.

Winter Storm Watch – A winter storm is possible in your area.

Winter Storm Warning – A winter storm is occurring, or will soon occur in your area.

2. Hazard Identification

Types of Hazards

While nearly all disasters are possible for any given area in the United States, the most likely hazards that could potentially affect the communities in the Central Shenandoah Planning District generally include:

- Flooding or Dam Failure
- Drought
- Hurricane
- Severe Winter Weather
- Land Subsidence/Karst
- Wind (Tornado, Derecho or Straight-line Winds)
- Wildfire
- Landslide
- Earthquake
- Hazardous Materials (Transportation and Industrial)
- Terrorism
- Power Outages

Probability of Hazards

Hazards were ranked by the Steering Committee to determine what hazards have the largest impact on their communities. The results are summarized in Table IV-2. Analysis level was determined by the type of data available and the scale of data available for the analysis.

Table IV-2: Central Shenandoah PDC Planning Consideration Levels

Hazard Identification Results	
Hazard Type	**Ranking**
Flooding or Dam Failure	Significant
Drought	High
Hurricane	High
Severe Winter Weather	High
Land Subsidence/Karst	Medium
Wind (Tornado, Derecho or Straight-Line Winds)	Medium
Wildfire	Medium
Landslide	Low
Earthquake	Low
Hazardous Materials (Transportation and Industrial)	Medium
Terrorism	Low
Power Outages	Medium

2020 Plan Update Steering Committee Comments

At meetings in April and June 2019, the Steering Committee charged with updating the Plan discussed the Hazard Identification and Rankings for the Region. Based upon review of the ranking results, it was determined the rankings would remain the same, especially since we have not had any large scale disasters since the previous Plan update. In addition to examining the rankings, the Steering Committee discussed other hazards where they felt the Region faces vulnerability including derechos, hazardous materials, livestock and poultry disease, opioid/drug abuse, infectious disease/pandemic, criminal behavior, power outages, environmental/water quality issues, dam failure, and civil unrest. As a result of this discussion and additional rankings, it was determined to include hazardous materials (transportation and industrial), dam failure (in the flood section), derechos and straight line winds (in the tornado section), and power outages. While some of these hazards may be limited in mitigation options it was important to include these topics because they are seen as vulnerabilities by the Region's communities.

Major Disasters

Since 1969, there have been 22 Major Disaster Declarations in the Region. As of July 23, 2019, individual communities in the Region have been included within the Major Disaster Declarations a combined total of 108 times. Table IV-3 includes information on the number of Major Disaster Declarations in the Region by individual community. Data for Towns is not separated from the County totals. Table IV-4 shows the types of hazards, the date of the declaration and disaster declaration number, and descriptions of the events for the 22 Major Disaster Declarations in the Region. For more detailed historical information on the individual events, refer to the hazard history sections found under each hazard type.

Since 1969, there have been 22 Major Disaster Declarations in the Region.

Table IV-3: Central Shenandoah PDC - Number of Major Disaster Declarations by Community (last updated 7/23/2019)

Communities	Number of Major Disaster
Augusta County	14
Bath County	14
Buena Vista City	12
Harrisonburg City	7
Highland County	14
Lexington City	7
Rockbridge County	15
Rockingham County	10
Staunton City	7
Waynesboro City	8
Total	108

Rockbridge County has had the highest number of Major Disaster Declarations in the Region, with 15.

Table IV-4: Central Shenandoah PDC - Major Disaster Declarations

Community	Date Of Declaration	Disaster Declaration Number	Description
Augusta, Bath, Rockbridge	8/23/1969	DR - 274	Hurricane Camille was a major storm that made landfall out of the Gulf as a category 5 and weakened to a tropical depression before reaching the state. Flooding and landslides, triggered by saturated soils, resulted in catastrophic damage.
Bath, Buena Vista, Harrisonburg, Lexington, Rockbridge, Rockingham, Staunton, Waynesboro	6/23/1972	DR - 339	Hurricane Agnes produced devastating flooding throughout the Mid-Atlantic States.
Buena Vista	10/7/1972	DR – 358	Severe Storms and Flooding
Augusta, Buena Vista, Rockbridge, Rockingham	10/10/1972	DR – 359	Severe Storms and Flooding

Table IV-4: Central Shenandoah PDC - Major Disaster Declarations—continued

Community	Date Of Declaration	Disaster Declaration Number	Description
Augusta, Bath, Buena Vista, Harrisonburg, Highland, Lexington, Rockbridge, Rockingham, Waynesboro	11/9/1985	DR-755	Hurricane Juan brought heavy rain, causing record-breaking floods.
Augusta, Bath, Buena Vista, Lexington, Rockbridge, Rockingham	5/19/1992	DR - 944	Severe Storms and Flooding
Bath, Buena Vista, Rockbridge	3/10/1994	DR - 1014	Severe Ice Storms, Flooding
Augusta, Highland	4/11/1994	DR-1021	Winter Storm brought ice, freezing rain and sleet.
Augusta, Bath, Buena Vista, Lexington, Rockbridge, Staunton	7/1/1995	DR-1059	A week-long period of ground saturating rains fell, resulting in flash flooding.

Table IV-4: Central Shenandoah PDC - Major Disaster Declarations—continued

Community	Date Of Declaration	Disaster Declaration Number	Description
Augusta, Bath, Buena Vista, Harrisonburg, Highland, Lexington, Rockbridge, Rockingham, Staunton, Waynesboro	1/13/1996	DR - 1086	Severe winter weather resulted in a blizzard, followed by two additional snowstorms bringing over a foot of snow. Snowpack was on the ground for an extended period of time. It was thawed by higher temperatures and heavy rain, resulting in severe flooding.
Augusta, Bath, Buena Vista, Harrisonburg, Highland, Rockbridge, Rockingham, Waynesboro	1/27/1996	DR - 1098	Flooding was caused by melting snow.
Augusta, Bath, Buena Vista, Harrisonburg, Highland, Lexington, Rockbridge, Rockingham, Staunton, Waynesboro	9/6/1996	DR – 1135	Hurricane Fran brought record-level flooding to many locations in the region.
Augusta, Bath, Highland, Rockbridge, Rockingham	2/28/2000	DR-1318	Winter Storms brought a blizzard to the East Coast that impacted the region from January 25 through January 30, 2000.

Table IV-4: Central Shenandoah PDC - Major Disaster Declarations—continued

Community	Date Of Declaration	Disaster Declaration Number	Description
Bath	7/12/2001	DR - 1386	Severe Storms and Flooding from July 8, 2001 through August 27, 2001.
Highland	3/27/2003	DR - 1458	Severe Winter Storm, Snowfall, Heavy Rain, Flooding and Mudslides from February 15, 2003 through February 28, 2003.
Augusta, Buena Vista, Harrisonburg, Highland, Rockbridge, Rockingham, Staunton, Waynesboro	9/18/2003	DR – 1491	Hurricane Isabel brought significant rainfall to the region, resulting in major flooding.
Bath, Highland, Rockbridge	7/13/2006	DR -1655	Severe storms, tornadoes, and flooding occurred from June 23 – July 6, 2006.
Augusta, Bath, Highland, Rockbridge, Staunton, Waynesboro	2/16/2010	DR – 1874	Severe winter storm and snowstorm occurred from December 18, 2009.
Augusta, Highland, Waynesboro	4/27/2010	DR – 1905	Severe winter storm and snowstorms occurred from February 5-11, 2010.

Table IV-4: Central Shenandoah PDC - Major Disaster Declarations—continued

Community	Date Of Declaration	Disaster Declaration Number	Description
Augusta, Bath, Buena Vista, Harrisonburg, Highland, Lexington, Rockbridge, Rockingham, Staunton	7/27/2012	DR-4072	Severe Storms and straight-line winds from derecho during the period from June 29-July 1, 2012.
Highland	11/26/2012	DR-4092	Impacts from Hurricane Sandy caused damage to utility infrastructure.
Highland	3/7/2016	DR-4262	Severe winterstorm and snowstorm.

Agricultural Disasters

The Region has a strong agricultural heritage and is home to some of Virginia's top agricultural producing counties. The total market value of products sold in the Region is over $1.1 billion. Rockingham County produces 20 percent of agriculture sales in Virginia. It is ranked number one in total market value of products sold; number one in livestock, poultry, and products; and number four in crops in Virginia. Augusta County produces 7 percent of agricultural sales in Virginia. It is ranked number two in total market value of products sold; number two in livestock, poultry, and products, and number ten in crops in Virginia. Table IV-5 provides an overview of 2017 Agricultural Census Data by County for the Region.

The total market value for agricultural products sold in the region is over $1.1 billion

Table IV-5: Central Shenandoah PDC - Agricultural Census Data

County	Number of Farms	Land in Farms (Acres)	Total Producers	Total Market Value of Products Sold
Augusta	1,665	290,911	2,841	$292,547,000
Bath	110	47,854	193	$6,747,000
Highland	275	92,950	419	$26,120,000
Rockbridge	752	134,789	1,241	$30,983,000
Rockingham	2,026	228,542	3,491	$795,919,000
Regional Total	4,828	795,046	8,185	$1,152,316,000

Rockingham County ranks #1 in total market value or products sold, and in livestock, poultry and products.

Source Data: National Agricultural Statistics Service (NASS), U.S. Department of Agriculture, 2017 Census of Agriculture, State and County Profiles.

The Farm Service Agency administers four types of disaster designations.

As a top agricultural producing region in Virginia, the Region is susceptible to impacts from natural disasters on the agricultural industry. The Farm Service Agency administers four types of disaster designations that provide for the ability of low-interest emergency loans to eligible producers. The four disaster designations include:

- U.S. Department of Agriculture Secretarial Disaster Designation;
- Presidential Major Disaster and Presidential Emergency Declaration;
- Farm Service Agency Administrator's Physical Loss Notification; and
- Quarantine designations by the Secretary under the Plant Protection Act or animal quarantine laws.

Eligible producers can receive low-interest emergency loans.

A locality may be considered for disaster designation if it has experienced an eligible disaster that has impacted farmers and caused production losses. For a Secretarial Disaster Designation for droughts, the locality may be eligible if any portion experiences the D2 Severe Drought intensity value for eight consecutive weeks, or if the locality experiences a higher drought intensity value for any period of time. For other natural disasters, the locality may be eligible if it experiences a 30 percent production loss of at least one crop, or if after surveying producers it is determined that emergency financing may not be available from other sources.

Table IV-6 provides information on U.S. Department of Agriculture Secretarial Disaster Declarations in the Region since 2012. Table IV-7 provides information on Presidential Major Disaster and Presidential Emergency Declarations in the Region since 2017.

Table IV-6: U.S. Secretary of Agriculture Disaster Designations, 2012-2019

Designation Number	Locality	Primary or Contiguous	Approval Date	Begin Date	End Date	Description of Disaster	Crop Disaster Year
S3418	Augusta Rockbridge Rockingham	Contiguous	10/10/2012	6/28/2012	7/3/2012	Excessive rain, hail, high winds and lightning associated with a Derecho Windstorm	2012
S3422	Rockbridge Rockingham	Contiguous	10/17/2012	1/1/2012	Continuing	Drought and related disasters, including excessive heat and high winds	2012
S3443	Rockingham	Contiguous	11/26/2012	6/29/2012	Continuing	Drought, excessive heat	2012
S3782	Augusta Bath Highland Rockbridge	Primary (Bath); Contiguous (Other Localities)	1/28/2015	8/22/2014	10/15/2014	Drought	2014
S3793	Augusta Bath Highland	Primary (Highland); Contiguous (Other Localities)	2/11/2015	6/1/2014	10/31/2014	Drought	2014
S4297	Rockingham	Contiguous	3/29/2018	6/30/2017	Continuing	Drought and Excessive Heat	2017
S4493	Augusta Harrisonburg Rockingham	Primary (Rockingham); Contiguous (Other Localities)	7/9/2019	4/15/2018	Continuing	Excessive rain, flash flooding, flooding and hail	2018

Source Data: Farm Service Agency, U.S. Department of Agriculture, Disaster Designation Information, U.S. Secretary of Agriculture Disaster Designation, 2012-2019

Table IV-7: Presidential Major Disaster and Presidential Emergency Declarations, 2017-2019

Designation Number	Locality	Primary or Contiguous Designation	Approval Date	Begin Date	End Date	Description of Disaster	Crop Disaster Year
4378	Augusta Highland	Contiguous	7/12/2018	5/28/2018	6/3/2018	Severe Storms, Flooding, Landslides, and Mudslides	2018
4401	Rockbridge	Contiguous	10/15/2018	9/8/2018	9/21/2018	Hurricane Florence	2018
4455	Augusta Highland Rockingham Harrisonburg Staunton Waynesboro	Contiguous	8/2/2019	6/29/2019	6/30/2019	Severe Storms, Flooding, Landslides and Mudslides	2019

Source Data: Farm Service Agency, U.S. Department of Agriculture, Disaster Designation Information, Presidential Major Disaster and Presidential Emergency Declarations, 2017-2019

Level of Hazard

Table IV-8 provides a breakdown of the natural hazards addressed in the Plan. The level of planning consideration given to each hazard was determined by the committee members. Based on the input of committee members, the hazards were broken into four distinct categories which represent the level of consideration they will receive throughout the planning process.

In order to focus on the most critical hazards that may affect the communities of the Region, the hazards assigned a level of *Significant*, *High* and *Medium* will receive the most extensive attention in the remainder of the planning analysis.

Table IV-8: Central Shenandoah PDC Natural Hazards HIRA Overview

Hazard	Type	Ranking	Data Reference
Flooding or Dam Failure	Riverine	Significant	FEMA, DCR, FEMA HAZUS-MH, NID, NHD
Drought	Including excessive heat	High	Drought Monitor Task Force, Water Systems, US Census, Commonwealth of Virginia, NCEI/NCDC
Hurricane	Wind	High	FEMA HAZUS-MH, NOAA
Severe Winter Weather	Including winter storms, ice storms, and excessive cold	High	NOAA National Weather Service Records, VirginiaView PRISM, Climate Source, Commonwealth of Virginia, NCEI/NCDC
Karst/Land Subsidence	Karst/Land Subsidence	Medium	USGS, VT Mines & Minerals
Wind	Tornado, Derecho or Straight-line Winds	Medium	NOAA, Commonwealth of Virginia, NCEI, NCEI/NCDC
Wildfire	Wildfire	Medium	Virginia Department of Forestry, USGS, DCR
Landslide	Landslide	Low	USGS
Terrorism	Terrorism	Low	Addressed in depth in community Emergency Operation Plans (EOP)
Earthquake	Earthquake	Low	FEMA, VDEM, FEMA HAZUS-MH
Hazardous Materials	Transportation and Industrial	Low	Addressed in depth in community Hazardous Materials Plan (HMP)
Power Outages	Power Outages	Low	No maps included.

3. Flooding or Dam Failure (Significant Ranking)

Flooding Hazard History

Listed below are flooding events that have occurred in the Region. In Appendix C - Flood History and Dam Risk Assessment and Inventory, flooding events have been broken down by the date of occurrence and when available, by individual community descriptions. When no community specific description is available, the general description should be used as representing the entire planning area.

- July 13, 1842
- 1846
- January 1854
- August 4, 1860
- September 28 - 30, 1870
- August 28, 1893
- September 29, 1896
- August 15, 1906
- November - December 1934
- March 16 - 17, 1936
- April 1937
- October 1942
- June 18, 1949
- September 10, 1950
- Hurricane Hazel - October 15, 1954
- Hurricanes Connie and Diane - August 1955
- Hurricane Gracie - September 29, 1959
- Hurricane Camille - August 19, 1969
- Hurricane Agnes - June 19, 1972
- October 7, 1972
- October 10, 1972
- Hurricane Juan - November 4 - 7, 1985
- May 19, 1992
- April 1993

- March 10, 1994
- June 22 - 28, 1995
- January 13, 1996
- January 27, 1995
- Hurricane Fran - September 6, 1996
- July 8– August 21, 2001
- February 15-February 28, 2003
- August 8, 2003
- Hurricane Isabel – September 18, 2003
- Hurricane Charley—August 2004
- Hurricane Frances—August 2004
- Hurricane Ivan– September 2004
- Hurricane Jeanne– September 2004
- Hurricane Cindy– July 2005
- November 29, 2005
- June 23 - July 6, 2006 "Mid-Atlantic United States Flood"
- Hurricane Hanna- August and September 2008
- January 25, 2010
- April 11-12, 2011
- April 16, 2011
- April 27-28, 2011
- Hurricane Sandy– October 2012
- May 9, 2013
- June 17, 2013
- April 15-16, 2018
- May 14, 2018
- May 21, 2018
- May 28-June 3, 2018
- June 21-June 22, 2018
- June 27-30, 2018
- August 30, 2018
- Hurricane Florence- September 2018
- June 29-June 30, 2019

Flooding Hazard Profile

A flood is a natural event for rivers and streams. Excess water from snowmelt, rainfall, or storm surge accumulates and overflows onto the banks and adjacent floodplains. Floodplains are lowlands, adjacent to rivers, lakes, and oceans that are subject to recurring floods. Under natural conditions, a flood causes little or no damage. Flood problems only exist when the built environment is damaged by nature's water or when property and lives are jeopardized. Floods in the Region are almost always associated with hurricanes, tropical storms, and tropical depressions. However, some of the Region's flooding is caused by sustained heavy rains, severe thunderstorms, and even rapid snowmelts.

The Region has received 15 Major Disaster Declarations due to flooding.

The Central Shenandoah Region experiences both riverine flooding and urban flooding. Most riverine flooding occurs from either the Shenandoah River or James River or their tributaries that are found throughout the Central Shenandoah Region. The Region's cities and towns experience flash flooding from stormwater runoff but a majority of their flooding is riverine due to the tributary creeks and small streams of the major river systems that run through them. Some of these streams are actually underground, buried as communities developed, especially during a "boom" in the late 1800s. Because of the historic nature of the Shenandoah Valley, most communities were developed long before floodplains were mapped.

Individual localities have been included in the Major Disaster Declarations a combined total of 81 times.

While the Region experiences nearly all types of natural disasters, including snow storms, ice storms, wildfires, and tornadoes, flooding is perhaps the most common and devastating type of disaster. It is also the most common hazard in the United States with hundreds of floods occurring every year causing an average of 150 deaths annually.

Since 1969, the Central Shenandoah Valley Region has received fifteen Major Disaster Declarations due to flooding. Individual localities in the Region have been included in the Major Disaster Declarations a combined total of 81 times. Floods in 1969, 1972, 1985, 1992, 1994, 1995, 1996, 2001, 2003, and 2006 have had severe and long-term effects on property owners, local businesses,

industry, and our economy. Flooding has also impacted agriculture in the region, with one Secretarial Disaster Declaration since 2012 and three Presidential Major Disaster and Presidential Emergency Declarations since 2017. The Secretarial Disaster Declaration included three localities, and the Presidential Major Disaster and Presidential Emergency Declarations included 10 localities.

Flooding can jeopardize lives and cause damage to buildings, infrastructure and the environment.

Floods typically are characterized by frequency. For example, the "1%-annual chance flood" is commonly referred to as a "100-year" flood. While more frequent floods do occur, as well as larger events that have lower probabilities of occurrence, for most regulatory and hazard identification purposes, the 1%-percent annual chance flood is used.

A 1% Annual Chance Flood is commonly referred to as a 100-Year Flood

Homes and businesses may suffer damage and be susceptible to collapse. Floods pick up chemicals, sewage, and toxins from roads, factories, and farms. Any property affected by the flood may be contaminated with hazardous materials. Debris from vegetation and man-made structures may also be hazardous following the occurrence of a flood. In addition, floods may threaten water supplies and water quality, as well as initiate power outages.

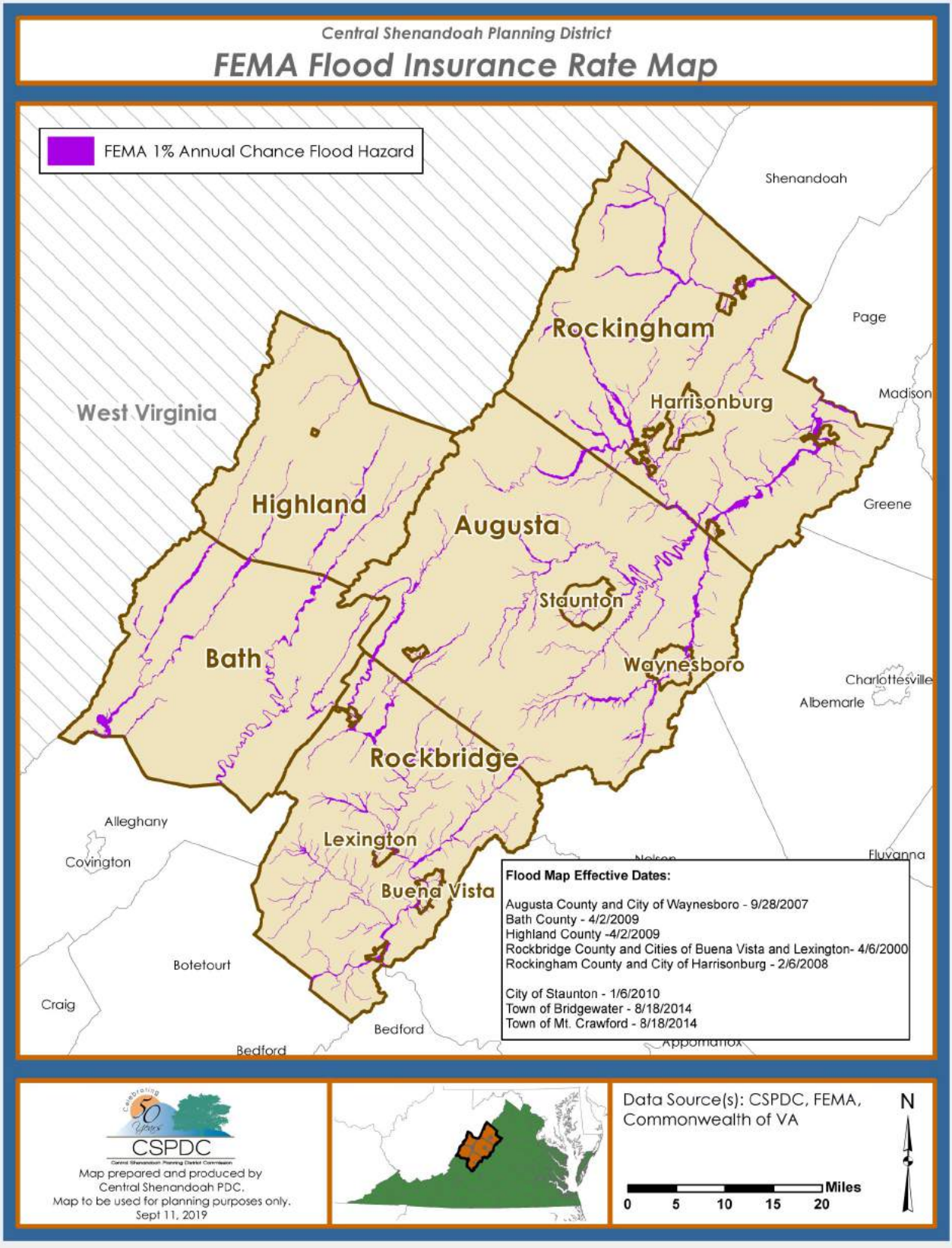
Secondary Effects

Flooding can pose some significant secondary impacts to the area where the event has taken place. Some of the impacts to consider include infrastructure and utility failure and impacts to roadways, water service, and wastewater treatment. These impacts can affect the entire Region, making the area vulnerable to limited emergency services.

Flood Maps

FEMA's National Flood Hazard Layer (NFHL) was used for all locality flood mapping and analysis. This layer is a geospatial database that contains current flood hazard data and supports the National Flood Insurance Program. This GIS data was used to better understand the region's level of flood risk.

Figure IV-5: Central Shenandoah PDC - FEMA Floodplains - 1% Annual Chance Flood



Vulnerability Analysis

There are 175 repetitive loss properties in the CSPDC region.

Many factors contribute to the relative vulnerabilities of areas within the floodplain. Some of these factors include development which increases the presence of people and property in the floodplain, flood depth, velocity, elevation, construction type, and flood duration. Specific areas that are susceptible to flooding were determined by the CSPDC when developing the Central Shenandoah Valley Regional Flood Mitigation Plan.

Approximately 6.61% of the CSPDC total structures are vulnerable to flooding.

FEMA's HAZUS software was used to complete a 100-year flood scenario for the CSPDC localities. Figure IV-5 shows the 1% Annual Chance Flood Hazard for the Region. For more detailed flood maps and critical facilities by locality, see Appendix D. These maps provide detailed information on areas susceptible to flooding. These areas were taken into account when completing the hazard identification and risk assessment.

FEMA-Designated Repetitive Loss Properties

FEMA provides a Repetitive Loss List of the properties in a community. A Repetitive Loss Property is a structure covered by a contract for flood insurance made available under the National Flood Insurance Program (NFIP). The NFIP defines Repetitive Loss as 2 or more claims of at least $1000 over a 10 year rolling period. This is the data that appears in the Plan. Please see Appendix E to view tables for the number of repetitive losses and severe repetitive losses for each locality or contact your local NFIP coordinator for specific information. There are 175 repetitive loss properties and 6 severe repetitive loss properties in the Region (Appendix E). Note that FEMA designates counties, cities and towns separately in the table.

Table IV-9: Structures at Risk Due to Flooding from the CSPDC Flood Mitigation Plan

Community	Structures at Risk	Total Structures	% of Structures at Risk	% of Structures not at Risk
Augusta County	2,851	69,338	4.11%	95.89%
Bath County	238	3,628	6.56%	93.44%
Highland County	85	2,106	4.04%	95.96%
Rockbridge County	1,183	12,195	9.70%	90.30%
Rockingham County	6,383	88,855	7.18%	92.82%
City of Buena Vista	815	2920	27.91%	72.09%
City of Harrisonburg	1,034	20,494	5.05%	94.95%
City of Lexington	36	2,298	1.57%	98.43%
City of Staunton	668	14,698	4.54%	95.46%
City of Waynesboro	1,048	13,512	7.76%	92.24%
Town of Bridgewater	206	3,223	6.39%	93.61%
Town of Broadway	114	2,625	4.34%	95.66%
Town of Craigsville	240	890	26.97%	73.03%
Town of Dayton	114	1,347	8.46%	91.54%
Town of Elkton	283	2,510	11.27%	88.73%
Town of Glasgow	197	553	35.62%	64.38%
Town of Goshen	61	228	26.75%	73.25%
Town of Grottoes	620	2,325	26.67%	73.33%
Town of Monterey	19	180	10.56%	89.44%
Town of Mt. Crawford	29	453	6.40%	93.60%
Town of Timberville	63	1,891	3.33%	96.67%
Total	**16,288**	**246,267**	**6.61%**	**93.39%**

Structures at Risk-Vulnerability

To determine an estimated number of structures vulnerable to flooding in the CSPDC region, a GIS analysis was performed. Using the Virginia Geographic Information Network (VGIN) structure layer, structures were overlaid with FEMA's flood zones with 1% and 0.2% annual chances. These structures that intersected with these zones were extracted and then calculated for each locality. Table IV-9 is a summary of these at risk structures.

The Town of Glasgow has the highest percentage of at risk structures at 35.62% . The City of Buena Vista is estimated to have 815 structures at risk to flooding, which is 27.91% of the City's total structures. Approximately 6.61% of the CSPDC total structures are vulnerable to flooding.

Estimating Losses

FEMA's HAZUS-MH software was used to generate 100 year flood scenarios for all of the 21 jurisdictions of the CSPDC Region to better understand the estimated damage and losses associated with flooding. On the county level, drainage areas of 10 miles were identified to develop a stream network. On the City and Town level, the drainage areas were delineated at 2 miles. It is noted that this version of HAZUS utilizes 2010 Census Data and totals produced by HAZUS only reflect data for those census tracts/blocks included in the study region.

HAZUS-MH software produces Quick Assessment (QA) reports providing locality statistics, including building exposure estimated in dollar amounts. The QA report also list the results of the 100 year flood scenario. A summary of the results from the HAZUS-MH Quick Assessment reports for each jurisdiction are shown in Table IV-10. See Appendix G to view flooding HAZUS reports.

Table IV-10: CSPDC HAZUS-MH 100 Year Flood Scenario Quick Analysis

HAZUS-MH 100 Year Flood Scenario Quick Analysis							
Locality	**Residential Building Exposure ($ Millions)**	**Total Building Exposure ($ Millions)**	**Displaced Households**	**People Seeking Shelter**	**Residential Property (Capital Stock) Losses ($ Millions)**	**Total Property (Capital Stock) Losses ($ Millions)**	**Business Income Interruption Losses ($ Millions)**
Augusta County	6,296	7,634	702	35	68	108	56
Craigsville	64	70	34	0	3	3	1
Bath County	739	818	91	0	30	52	23
Highland County	320	367	51	1	12	13	2
Monterey	25	37	0	0	0	0	0
Rockbridge County	2,182	2,612	300	6	44	105	57
Glasgow	81	116	8	0	1	9	2
Goshen	28	29	14	0	2	2	1
Rockingham County	6,609	7,870	809	25	75	117	63
Bridgewater	473	586	19	0	2	2	1
Broadway	311	379	23	0	2	6	7
Dayton	118	151	20	1	1	5	2
Elkton	241	295	5	0	0	0	0
Grottoes	186	228	35	2	1	1	1
Mt. Crawford	261	306	24	0	2	3	1
Timberville	219	238	14	0	2	2	1
City of Buena Vista	510	725	269	13	23	46	44
City of Harrisonburg	3,460	5,091	476	110	31	68	121
City of Lexington	715	958	25	1	2	3	2
City of Staunton	2,264	3,047	98	3	10	75	147
City of Waynesboro	1,831	2,667	567	65	63	280	182
CSPDC Total	**26,933**	**34,224**	**3,584**	**262**	**374**	**900**	**714**

Table IV-11: CSPDC Critical Facilities within FEMA Designated Floodplain

Type	Number of Facilities
CELL TOWER	3
CHILD DAY CARE	3
CHURCH	29
EMERGENCY GENERATOR	4
EMERGENCY RESPONSE	9
GOVERNMENT	15
IFLOWS GAUGE	8
INDUSTRY	13
JAIL	1
POWER UTILITY	2
PUBLIC WORKS	1
SCHOOL	2
SENIOR LIVING	1
TOWN HALL	1
WASTEWATER PUMP STATION	2
WASTEWATER TREATMENT	10
WATER TREATMENT	3
WELL	2
TOTAL	**109**

Critical Facilities

The impacts of flooding on critical facilities can significantly increase the overall effect of a flood event on a community. It should be noted that these facilities have been determined to be in the floodplain using Geographic Information Systems (GIS) and should be used only as a planning tool. In order to accurately determine if a structure is actually in the floodplain, site-specific information must be available. 109 critical facilities were determined to be within the FEMA designated floodplain. Table IV-11 denotes the critical facilities that are located within or in close proximity to the FEMA designated 100 year and 500 year floodplains. Using GIS, the critical facility points were intersected with the FEMA flood zones. A 30-foot buffer on the facilities provided a radial distance from the center of the building that was used to determine the proximity to the floodplain. While Table IV-11 shows 109 critical facilities are located near or in the floodplain, there is great diversity in the type of facility located within or in close proximity to the floodplain. See Appendix D for the maps of the critical facilities within the floodplain for each locality.

109 critical facilities were determined to be within the FEMA designated Floodplain.

Critical Facility Points were intersected with FEMA flood zones.

Dam Failure Hazard Profile*

Description

Flooding due to impoundment failure refers to a collapse, breach, or other failure that causes an uncontrolled release of water or sludge from an impoundment, resulting in downstream flooding. Dam or levee failures can occur with little warning in either wet or dry conditions. Intense storms may produce a flood in a few hours or even minutes from upstream locations. Flash floods can occur within six hours of the beginning of heavy rainfall, and impoundment failure may occur within hours of the first sign of breaching. Other failures and breaches can take much longer to occur, from days to weeks, because of debris jams or the accumulation of melting snow.

Levee/Floodwall Failure

FEMA defines a levee as "a man-made structure, usually a earthen embankment, designed and constructed in accordance with sound engineering practices to contain, control, or divert the flow of water to reduce the risk from temporary flooding. A levee designed to provide flood protection from at least the 1% annual chance flood is eligible for accreditation by FEMA. When accredited, the area protected by the levee will be mapped as a moderate risk zone instead of a high-risk zone on the Flood Insurance Rate Map (FIRM). In the CSPDC region, the Bridgewater Levee System in Rockingham County in Rockingham County had record of levee coordination with FEMA through the Provisionally Accredited Levee (PAL) process. It is important to note that many of the causes and effects of levee failure are similar to dam failure.

* *Information in the Dam Failure Hazard Profile is taken from the Commonwealth of Virginia Hazard Mitigation Plan, Chapter 3 - HIRA, Section 3.11 Flooding Due To Impoundment Failure and is in italics.*

Dams Impoundments in the Commonwealth of Virginia

Dams and associate lakes, ponds, and impoundments are part of the Commonwealth's overall water resource landscape. As such, a dam failure or breach can have an extensive impact on the magnitude of downstream flooding which could result in wide scale damages. The Virginia Department of Conservation and Recreation's Division of Dam Safety and Floodplain Management (Virginia DSFPM) administers the Virginia Dam Safety Program, under the authority of the Virginia Soil and Water Conservation Board (Virginia SWCB). The Virginia DSFPM by authority of the Virginia SWCB is the key regulatory entity for dams in Virginia not otherwise regulated by the Virginia State Corporation Commission, Virginia Department of Mining, Minerals, and Energy (DMME), United States Government, or as defined in Section 4VAC50-20-30 of the Virginia Impounding Structure Regulations. Any references to VA DSFPM shall be made with the understanding that the VA DSFPM administers the Virginia Dam Safety Program under direct authority of the Virginia SWCB.

The Virginia SWCB regulates impounding structures in the Commonwealth to ensure that they are properly and safely constructed, maintained, and operated. Per section 4VAC50-20-50 of the Virginia Impounding Regulations, "an impounding structure shall be regulated if the impounding structure is 25 feet or greater in height and creates a maximum impounding capacity of 15 acre-feet or greater, or the impounding structures is six feet or greater in height and creates a maximum impounding capacity of 50 acre-feet or greater and is not otherwise exempt from regulation by the Code of Virginia." The regulations, known as the Virginia Impounding Structure Regulations are promulgated to achieve these ends and are recorded in the Virginia Administrative Code Ongoing dam inspections and Virginia's participation in the National Dam Safety Program administered by FEMA and the US Army Corps of Engineers serve as a preventative measure against dam failures. Disaster recovery programs include assistance to dam owners and local officials in assessing the condition of dams following a flood disaster and assuring the repairs and reconstruction of damaged structures are in compliance with the National Flood Insurance Program (NFIP) regulations.

Per current Virginia Impounding Structure Regulations, an "impounding structure" or "dam" can be defined as the following: "a man-made structure, whether a dam across a watercourse or structure outside a watercourse, used to be used to retain or store waters or other materials." Dams are classified with a hazard potential depending on the downstream impacts during a dam failure event situation. Hazard potential is not related to the structural integrity of a dam or environmental impacts but strictly to the potential for adverse downstream effects if the dam were to fail. Regulatory requirements, such as the frequency of dam inspection, the standards for spillway design, and actions within established emergency plans, are dependent upon the dam's assigned hazard potential classification.

The Owner(s) of each regulated high, significant, or low hazard potential dam is required to apply to Virginia DSFPM for a Regular Operation and Maintenance Certificate every 6 years. The application must include an assessment of the dam by a licensed Virginia Professional Engineer, an Emergency Plan (EAP – Emergency Action plan or EPP - Emergency Preparedness Plan), the appropriate forms, and the appropriate fee(s), submitted separately. An executed copy of the Emergency Plan

be filed with the appropriate local emergency management official and the Virginia Department of Emergency Management. Please note the Emergency Plan may also be routinely updated by the dam Owner during the term of the six-year certificate if any relevant information has changed.

Virginia DSFPM issues Regular Operation and Maintenance Certificates to the dam Owner for a period of six years. If a dam has a deficiency but does not pose imminent danger, Virginia DSFPM may issue a Conditional Operation and Maintenance Certificate, during which time the dam Owner is to correct the deficiency. After a dam has been granted a Regular Operation and Maintenance Certificate by Virginia DSFPM, annual inspections are required either by a Professional Engineer or the dam Owner, and the Annual Inspection Report is submitted to the appropriate Virginia DSFPM Regional Dam Safety Engineer.

According to the National Inventory of Dams, there are 70 regulated dams in the Region.

Please See Appendix C for Dam Risk Assessment and Inventory of dams in the CSPDC region regulated and not regulated by the Virginia DSFPM.

Dam Failure Vulnerability Analysis

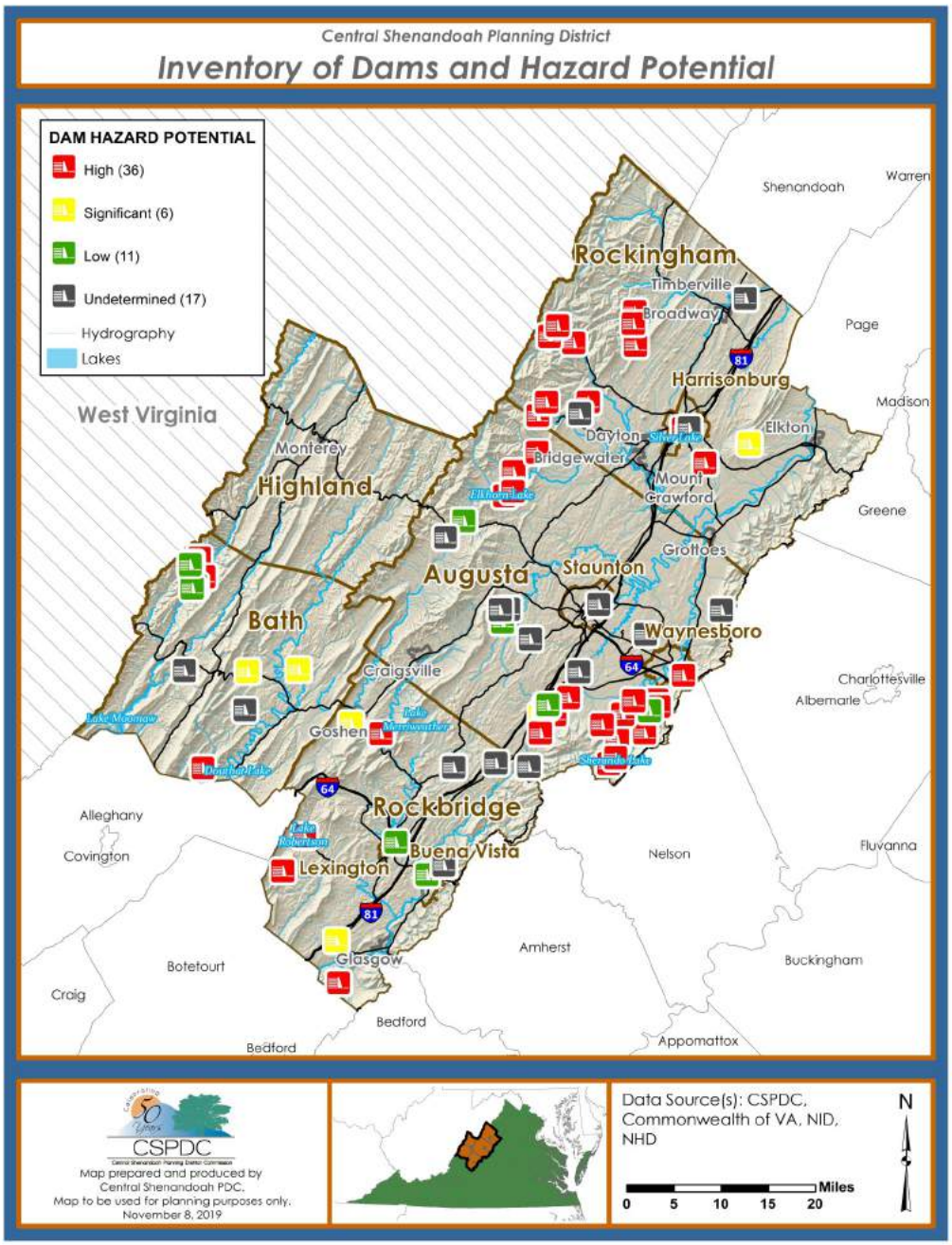
The Dam Safety Impounding Structure Regulations require that dams be classified based upon potential impacts from dam failure. The classifications are not based upon the condition of the dam itself. The classifications consider the potential for impact in the area downstream, known as the inundation zone, by assessing potential impacts on loss of life and property damage. The classification can also change over time if land use downstream changes. The classifications include:

36 dams have a high hazard potential and 6 dams have a significant hazard potential in the Region.

- **High:** Upon failure would cause probable loss of life or serious economic damage. (Annual owner inspection and Professional Engineer inspection every 2 years is required).
- **Significant:** Upon failure might cause loss or life or appreciable economic damage. (Annual owner inspection and Professional Engineer inspection every 3 years is required).
- **Low:** Upon failure would lead to no expected loss of life or significant economic damage. This classification includes dams that upon failure would cause economic damage only to the property of the dam owner. (Annual owner inspection and Professional Engineer inspection every 6 years is required).

Figure IV-6 displays data from the National Inventory of Dams (NID). The map shows regulated dams within the CSPDC region and indicates their hazard potential status. According to NID, there are 70 regulated dams in the CSPDC region and 36 dams have a high hazard potential. 6 dams are in the significant hazard level status. This results in 60% of total regulated dams in the region with a high or significant hazard status. NID also estimates that the average age of a dam in Virginia is 56 years old.

Figure IV-6: Inventory of Dams and Hazard Potential



4. Drought (High Ranking)

Hazard History

Table IV-12 includes descriptions of droughts that have occurred in Virginia and the Region. Events have been broken down by the date of occurrence and when available, by individual community descriptions. When no community specific description is available, the general description should be used as representing the entire planning area. Data compiled from the U.S. Drought Monitor for the time period from 2000 to 2019 showing the history of D1 Moderate Droughts through D4 Exceptional Droughts by locality in the Region can be reviewed in Appendix F. Since 2012, the U.S. Secretary of Agriculture has declared five Agriculture Disaster Designations for localities within the Region impacted by drought.

Table IV-12: CSPDC Drought Hazard History

Date	Damages
1930-1932	Considered the worst drought in Virginia history. Piedmont area recorded only 21 inches of rainfall in 1930. The three largest rivers (Potomac, Rappahannock and Rapidan) were reduced to mere puddles.
1938-1942	Less severe than the previous 1930 drought. Saw below average levels of rainfall and low stream flow levels in local rivers.
1962-1971	Also, less severe than the previous 30'-32' drought, however, the cumulative stream flow deficit was the greatest of all the major droughts because of its lengthy duration.
1976 - 1977	Ten months of below average precipitation. The drought began in November of 1976 when rainfall totaled to only 50% to 75% of normal. During the rest of the winter, the storms tracked across the Gulf. During the spring and summer the storms tracked across the Great Lakes. These weather patterns created significant drought throughout most of Virginia.
5/1980-8/1980	Warm and dry conditions prevailed through the beginning of the summer. June precipitation data show that much of Virginia received record low rainfall. No crop damage reported.

Table IV-12: CSPDC Drought Hazard History - continued

Date	Damages
1985 - 1986	Very little rainfall began in December and the trend continued throughout the summer. Total precipitation for January and February was 2 inches. Palmer Index values dropped below -2 by June. High temperatures along with scarce precipitation created a drought that lasted well into the fall.
6/1988 - 7/1988	A heat wave over the southeast produced warm and dry conditions over much of Virginia. Although the news reported stories of a drought in Virginia, the Drought Monitoring Team never stated in a report that these conditions were indicative of a drought. Palmer Drought Index values were above -2.
5/1993 - 8/1993	Very warm temperatures and little rain were noted beginning June 5, 1993. Precipitation shortages were greater than five inches for southwestern and southeastern Virginia from May through July. Surface soil moisture levels were low enough to result in significant agricultural damage. However groundwater remained at normal levels.
6/1999- 9/1999	Northern Virginia and Shenandoah Valley experienced one of the worst droughts of the 20th Century. Moisture shortages first became apparent in the summer of 1998. Record low stream flows on the Rappahannock. Crops, cattle and fisheries were all suffering. Farm ponds completely dried up and fish died in the tepid backwaters of the Chesapeake Bay. The drought was beginning to move into the Piedmont. The Shenandoah River was drier than it had been since the early 1930s drought. Considered “one of the most profound droughts in Virginia during the 20th century”.
2000-2004	Beginning in late 2000, some areas of the Region began to show moderate drought conditions. From November 2000 to October 2002, the Region experienced moderate, severe and extreme drought conditions. All locations within the Region were impacted at various times throughout this period. The Governor of Virginia banned lawn watering, car washing and the filling of swimming pools. Wells dried up in rural areas as the water table dropped drastically. In November 2002, the U.S. Secretary of Agriculture approved 45 counties for primary disaster designation.
2005	In the Fall of 2005, the counties of Augusta, Rockbridge and Rockingham, and the cities of Waynesboro, Staunton and Harrisonburg experienced moderate drought conditions.
2006	At various times throughout the spring and summer of 2006, the counties of Augusta, Rockbridge and Rockingham, and the cities of Lexington, Buena Vista, Waynesboro, Staunton and Harrisonburg experienced moderate drought conditions.

Table IV-12: CSPDC Drought Hazard History - continued

Date	Damages
2007-2009	From the Summer of 2007 to Spring 2009, moderate drought conditions were experienced by all localities within the Region at various times during that period. Highland County and Rockingham County also experienced moderate drought conditions in the Fall of 2009. The counties of Augusta and Rockingham experienced moderate drought conditions in October 2007.
2010-2011	From Summer 2010 to Spring 2011, all localities within the Region experienced moderate drought conditions at various times during that period. Rockingham County experienced severe drought conditions in August and September 2010. Rockingham County leaders applied for agriculture disaster designation.
2012-2013	Rockingham County experienced moderate drought conditions in July 2012. From November 2012 to January 2013, all localities within the Region experienced moderate drought conditions at various times during that period. Rockbridge County and Rockingham County received agriculture disaster designations as contiguous counties in two designations by the U.S. Secretary of Agriculture (S3422 and S3443).
2014	The U.S. Secretary of Agriculture declared two agriculture disaster designations for the Region (S3782 and S3793). The first included Bath County as a primary county, and the counties of Augusta, Highland and Rockbridge as contiguous counties. The second declared Highland County as a primary county, and the counties of Augusta and Bath as contiguous counties.
2016	In the Spring of 2016, the counties of Augusta, Highland and Rockingham experienced moderate drought conditions.
2017-2018	Moderate drought conditions in the Region began in February 2017 and ended in May 2017. All localities within the Region experienced moderate drought conditions at various times during that period. Moderate drought conditions were experienced in Augusta, Rockbridge, Rockingham, Lexington, Buena Vista, Staunton and Waynesboro from December 2017 to February 2018. Due to the drought, the Augusta County Service Authority provided two locations for people to purchase water. One water source was non-potable for livestock or gardening use. The second water source provided drinking water for purchase. The U.S. Secretary of Agriculture declared an agriculture disaster designation for Rockingham County as a contiguous county (S4297).

Table IV-12: CSPDC Drought Hazard History - continued

Date	Damages
2019	Following a long-term wetness that was experienced in the Spring and Summer of 2019, the region experienced a "flash drought" in the Fall of 2019. The "flash drought" was caused by a significant lack of rain and unusual high temperatures. A statewide drought advisory was issued by the Virginia Department of Environmental Quality. During the "flash drought," the counties of Augusta, Bath, Rockbridge, and Rockingham, and the cities of Lexington, Buena Vista, and Waynesboro experienced moderate drought conditions. Bath, Rockbridge and Buena Vista also experienced severe drought conditions in October 2019. The "flash drought" caused stress on

Droughts are a normal and recurrent feature of climate, and is a period of abnormally dry weather.

Droughts can have serious effects like agricultural losses and water supply shortages

Hazard Profile

Droughts are a normal and recurrent feature of climate that can affect vast regions and large population numbers. A drought is a period of abnormally dry weather that persists long enough to produce serious effects like agricultural losses; water supply shortages; and impacts on public health and energy production. Drought increases the risk of other hazards like fire, flash flood, and possible landslide and debris flow. The severity of the drought depends upon the degree of moisture deficiency, the duration, and the size of the affected area, as well as, the demands of human activity and agriculture on water supplies.

According to the National Weather Service, there are four types of drought:

- Meteorological drought, which "is based on the degree of dryness or rainfall deficit and the length of the dry period.".
- Hydrological drought, which is "based on the impact of rainfall deficits on the water supply such as stream flow, reservoir and lake levels, and ground water table decline."
- Agricultural drought, which "refers to the impacts on agriculture by factors such as rainfall deficits, soil water deficits, reduced ground water, or reservoir levels needed for irrigation."

- Socioeconomic drought, which "considers the impact of drought conditions...on supply and demand of some economic goods…"

A drought is a silent but very damaging phenomenon and unlike other natural disasters can last for years. Drought can have significant impacts on local and regional economies focused on agriculture and tourism. Statistics indicate that roughly every 22 years, a major drought occurs in the United States, most seriously affecting the Prairie and Midwestern states. The disastrous drought of the 1930s during which a large areas of the Great Plains became known as the Dust Bowl is one example.

The U.S. Drought Monitor releases weekly data that reflects drought status.

The U.S. Drought Monitor, managed by the National Drought Mitigation Center (NDMC), the National Oceanic and Atmospheric Administration (NOAA) and the U.S. Department of Agriculture, releases weekly data that reflects the short-term and long-term drought status for the United States. It is utilized by federal, state and local agencies to determine drought status and responses. The data is used by the U.S. Department of Agriculture when determining eligibility for agriculture disaster declarations and low-interest loans.

Drought conditions are reflected in five classifications, from DO to D4.

The U.S. Drought Monitor uses several data sources to classify drought status, including the Palmer Drought Severity Index (PDSI), the Standardized Precipitation Index (SPI), the Keech-Byram Drought Index for fire, and indicators for vegetation health, soil moisture, hydrologic data, and other climatological inputs. The Palmer Drought Severity Index (PDSI) is a standardized index for meteorological drought that estimates dryness using temperature and precipitation data. The range on the PDSI is from –10 (dry) to +10 (wet). Values below –3 represent severe to exceptional drought. The PDSI is useful in determining long-term drought conditions.

Drought conditions are reflected in five classifications in the U.S. Drought Monitor. D0 Abnormally Dry are those areas going into or coming out of drought. D1 Moderate Drought through D4 Exceptional Drought classifies the four levels of drought. Table IV-13 provides an overview of the U.S. Drought Monitor classifications and possible impacts.

Table IV-13 Drought Severity Classification

Category	Description	Possible Impacts
D0	Abnormally Dry	Going into drought: short-term dryness slowing planting, growth of crops or pastures; fire risk above average. Coming out of drought: some lingering water deficits; pastures or crops not fully recovered.
D1	Moderate Drought	Some damage to crops, pastures; fire risk high; streams, reservoirs, or wells low, some water shortages developing or imminent, voluntary water use restrictions requested.
D2	Severe Drought	Crop or pasture losses likely; fire risk very high; water shortages common; water restrictions imposed.
D3	Extreme Drought	Major crop/pasture losses; extreme fire danger; widespread water shortages or restrictions.
D4	Exceptional Drought	Exceptional and widespread crop/pasture losses; exceptional fire risk; water emergencies created by shortages of water in reservoirs, streams and wells.

Source: National Drought Mitigation Center (NDMC), U.S. Department of Agriculture (USDA) and the National Oceanic and Atmospheric Association (NOAA); U.S. Drought Monitor, Drought Classification

Table IV-13: CSPDC Drought Vulnerability (from 1990 Census)

Percent Population with Public/Private Water Systems				
Community	**High (< 25%)**	**Medium (25% - 50%)**	**Low (> 50 %)**	**Total**
Augusta County	18,936	8,105	27,636	54,677
*Craigsville, Town of	0	0	812	812
Bath County	1,333	851	2,615	4,799
Buena Vista City	0	0	6,406	6,406
Harrisonburg City	0	0	30,707	30,707
Highland County	1,722	913	0	2,635
*Monterey, Town of	0	222	0	222
Lexington City	0	0	6,959	6,959
Rockbridge County	9,788	6,409	2,153	18,350
*Glasgow, Town of	0	0	1140	1140
*Goshen, Town of	0	366	0	366
Rockingham County	28,040	11,204	18,238	57,482
*Bridgewater, Town of	0	0	3,918	3918
*Broadway, Town of	0	50	1159	1209
*Dayton, Town of	0	0	921	921
*Elkton, Town of	0	85	1850	1935
*Grottoes, Town of	0	0	1455	1455
*Mt. Crawford, Town of		228	0	228
*Timberville, Town of	0	1596	0	1596
Staunton City	0	0	24,461	24,461
Waynesboro City	0	0	18,549	18,549
Total	**59,819**	**27,482**	**137,724**	**225,025**

*Denotes town values that are also included in totals for the perspective County.

Vulnerability Analysis

The U.S. Drought Monitor is an assessment of prior drought conditions that occurs weekly; it is not a forecast of anticipated drought. Based upon best available data, the 1990 U.S. Census data has been utilized for the vulnerability analysis. It contains detailed information about source of water per Census block group. For purposes of this analysis, it was assumed that areas with populations having less than 25% of public/private water systems had a high vulnerability ranking. When a drought occurs, these areas would likely have a larger impact since most homes receive their water from wells, which may dry up during a drought.

Table IV-14 provides a summary of the 1990 population in three categories of drought vulnerability. Note that the Table contains information specific to the towns; this information has also been included with the county totals. As a result of using 1990 U.S. Census data at the block group level, there are some discrepancies with the town boundaries. Boundary adjustments into "high vulnerability" areas are a result of the older census data, which is a data limitation issue. This water source information is no longer updated by the Census, but it was determined that this drought analysis was the best available data available to the CSPDC at this time. Based on the percentage of the population in the high vulnerability category, Highland County has the highest percentage of people vulnerable to drought (65%) followed by the counties of Rockbridge (53%) and Rockingham (49%). Figure IV-7 shows these categories for each of the communities.

Figure IV-7: CSPDC Drought Vulnerability

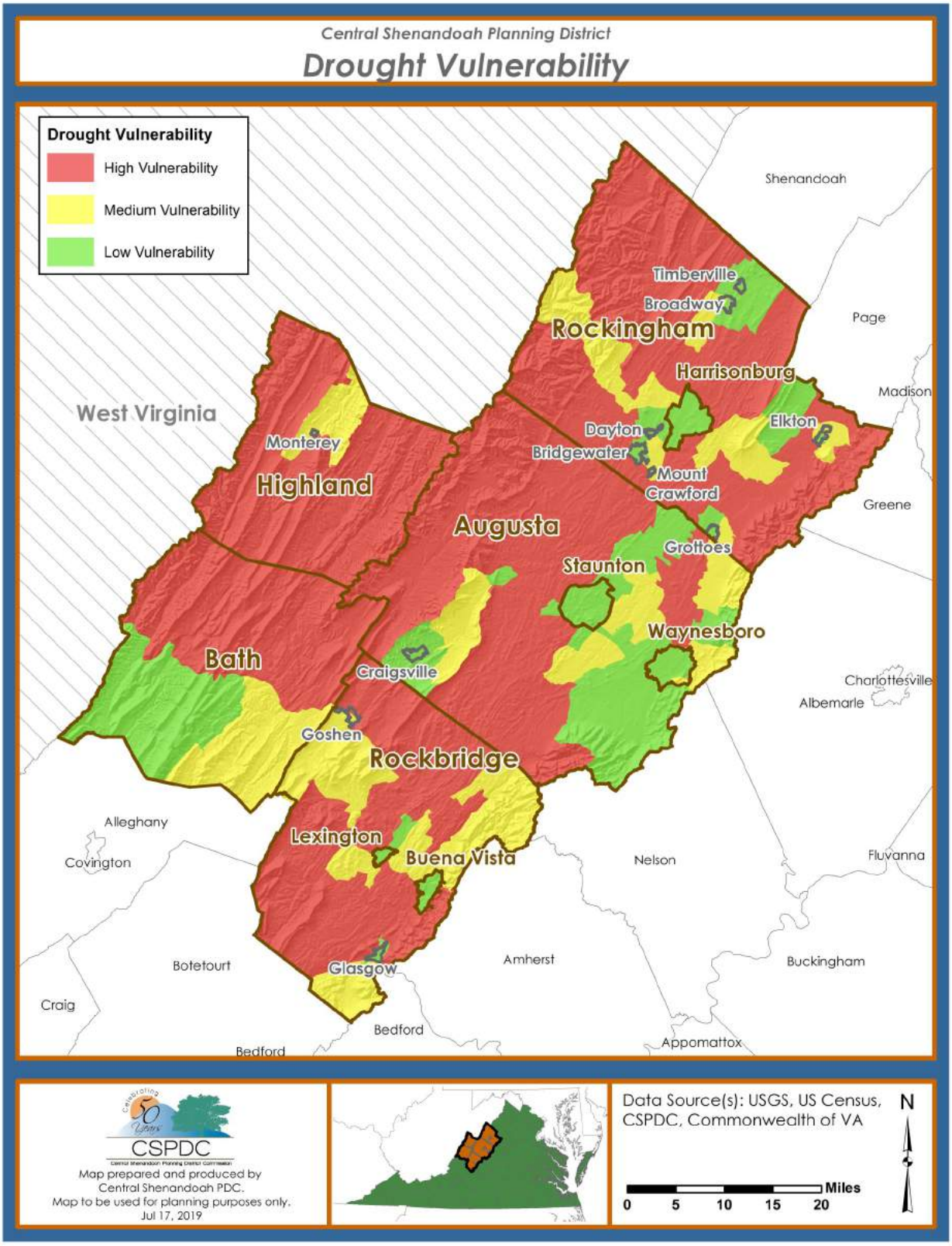
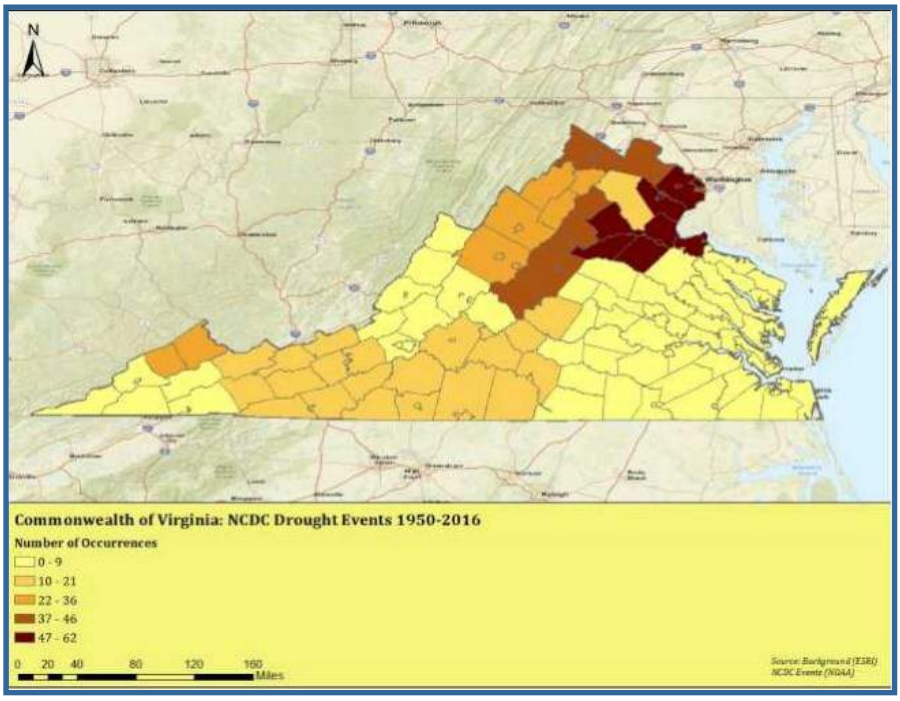


Figure IV-8 is a map included in the Commonwealth of Virginia's Hazard Mitigation Plan and shows National Climatic Data Center data for drought events in Virginia from 1950 –2016. Rockingham and Augusta Counties and the Cities of Staunton, Waynesboro, and Harrisonburg are all shown in the 22 to 26 occurrences range. As an alternative to the 1990 Census data, if the vulnerability analysis were based upon this historical data it would appear that these localities are more susceptible to drought than other localities in the Region.

As discussed in the section on Agricultural Disasters, Rockingham County and Augusta County rank number one and number two in the total market value of products sold in the Commonwealth. They also rank number one and number two in livestock, poultry and products, and are both in the top ten for crops in Virginia. Droughts can cause considerable agricultural damages and financial losses impacting cropland, pastureland and livestock due to soil moisture content; available water supplies for irrigation or livestock watering; and available forage for feeding. Since 2012, the U.S. Secretary of Agriculture has declared five Agriculture Disaster Designations for localities within the Region impacted by drought.

Figure IV-8: Virginia NCDC Drought Events



Source: Virginia's Hazard Mitigation Plan, 2018

5. Hurricane (High Ranking)

Hazard History

See Appendix C, for detailed information on the flooding impacts of hurricanes in the Region.

This section discusses wind impacts related to Hurricanes. Information regarding impacts from flooding is included in the Flooding section. See Appendix C - Flood History and Dam Risk Assessment and Inventory for detailed information on the flooding impacts of hurricanes in the Region. Listed below are major hurricanes that have resulted in wind damages in the Region:

- Hurricane Camille - August 1969
- Hurricane Agnes - June 1972
- Hurricane Juan - November 1985
- Hurricane Fran - September 1996
- Hurricane Isabel – September 2003
- Hurricane Sandy - November 2012

Hurricanes that do not have a historical storm system track through the Region have still have resulted in catastrophic impacts, such as Hurricane Camille in 1969.

Figure IV-9 depicts the historical storm system track for tropical depressions, tropical storms and hurricanes that have passed through the Region from 1842 to 2017. The category of the hurricane shown on the map does not necessarily mean that the storm was at this intensity level when it traveled through the Region. Additionally, hurricanes that do not have a historical storm system track through the Region have still have resulted in catastrophic impacts, such as Hurricane Camille. Secondary impacts from storms have resulted in loss of life, injury, property damage and widespread infrastructure damage.

Hazard Profile

A tropical cyclone is the generic term for a non-frontal synoptic scale low-pressure system over tropical or sub-tropical waters with organized convection

and definite cyclonic surface wind circulation. Depending on strength, they are classified as tropical depressions, tropical storms or hurricanes. Tropical cyclones involve both atmospheric and hydrologic characteristics, such as severe windstorms, surge flooding, high waves, coastal erosion, extreme rainfall, thunderstorms, lightning, and, in some cases, tornadoes. Storm surge flooding can push inland, and riverine flooding associated with heavy inland rains can be extensive. High winds are associated with hurricanes, with two significant effects: widespread debris and power outages. Widespread debris is due to damaged and downed trees and damaged buildings.

Secondary Hazards

Secondary hazards from a hurricane event could include high winds, flooding, heavy waves, and tornadoes. Once inland, the hurricane's band of thunderstorms produces torrential rains and, sometimes, tornadoes. A foot or more of rain may fall in less than a day causing flash floods and mudslides. The rain eventually drains into the large rivers, which may still be flooding for days after the storm has passed. The storm's driving winds can topple trees, utility poles, and damage buildings. Communication and electricity may be lost for days. Roads may be impassable due to fallen trees and debris.

Hurricane Damage Scale

Hurricanes are categorized by the Saffir-Simpson Hurricane Wind Scale as listed below in Table IV-15. Included in the table are detailed descriptions of each category and the potential damage caused by each. The Saffir-Simpson Hurricane Wind Scale contains a 1 to 5 rating that estimates potential damage based upon sustained wind speeds. Major hurricanes are considered storms to be ranked a Category 3 or higher. Category 1 and Category 2 storms can still cause impacts and damages.

Figure IV-9: Central Shenandoah Planning District Hurricane Tracks

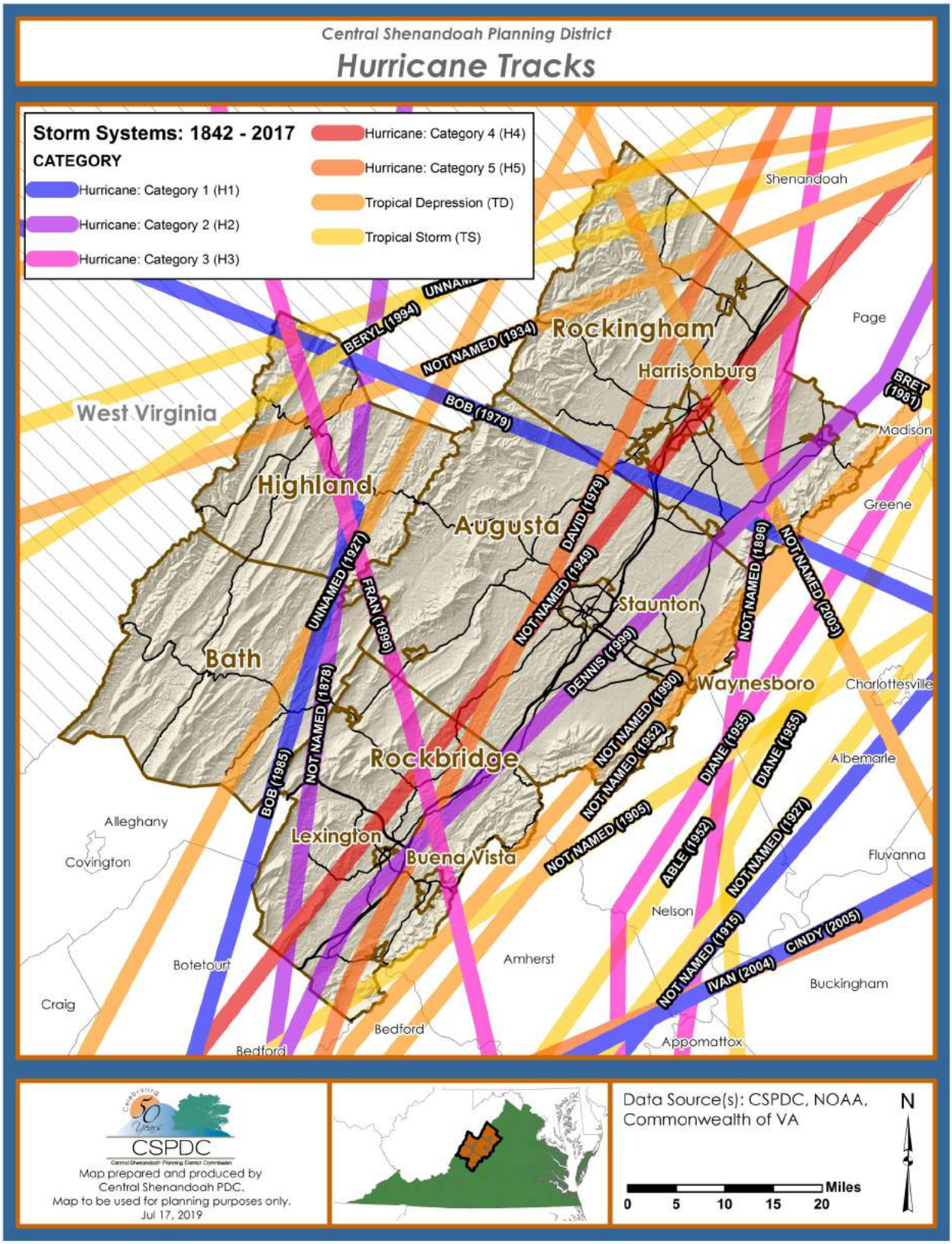


Table IV-15: Saffir - Simpson Hurricane Wind Scale

Hurricane Category	Sustained Winds (mph)	Description
1	74 – 95	**Very dangerous winds will produce some damage:** Well-constructed frame homes could have damage to roof, shingles, vinyl siding and gutters. Large branches of trees will snap and shallowly rooted trees may be toppled. Extensive damage to power lines and poles likely will result in power outages that could last a few to several days.
2	96 – 110	**Extremely dangerous winds will cause extensive damage:** Well-constructed frame homes could sustain major roof and siding damage. Many shallowly rooted trees will be snapped or uprooted and block numerous roads. Near-total power loss is expected with outages that could last from several days to weeks.
3	111 – 129	**Devastating damage will occur:** Well-built framed homes may incur major damage or removal of roof decking and gable ends. Many trees will be snapped or uprooted, blocking numerous roads. Electricity and water will be unavailable for several days to weeks after the storm passes.
4	130 – 156	**Catastrophic damage will occur:** Well-built framed homes can sustain severe damage with loss of most of the roof structure and/or some exterior walls. Most trees will be snapped or uprooted and power poles downed. Fallen trees and power poles will isolate residential areas. Power outages will last weeks to possibly months. Most of the area will be uninhabitable for weeks or months.
5	≥ 157	**Catastrophic damage will occur:** A high percentage of framed homes will be destroyed, with total roof failure and wall collapse. Fallen trees and power poles will isolate residential areas. Power outages will last for weeks to possibly months. Most of the area will be uninhabitable for weeks or months.

Source: Saffir-Simpson Hurricane Wind Scale, National Weather Service

Vulnerability Analysis

HAZUS-MH

FEMA's HAZUS-MH software (4.2) was used to generate hurricane damage and loss estimates for the CSPDC region. Level 1, with default parameters, was used for the hurricane analysis in this Plan. It is noted that this version of HAZUS utilizes 2010 Census Data and totals produced by HAZUS only reflect data for those census tracts/blocks included in the study region. HAZUS-MH uses historical hurricane tracks and computer modeling to identify the probable tracks of a range of hurricane events at the US Census tract level. Results from the model are used to develop the annualized damages. The impacts of various events are then combined to create a total annualized loss or the expected value of loss in any given year. The Hurricane Wind Probabilistic Model with HAZUS-MH predicts hurricane tracks, based on historical hurricane, for different return periods. All hurricane quick assessment and global risk report results can be found in Appendix G.

Building Types

The Global Risk probabilistic 100 year return period scenario report for the CSPDC Region includes estimated information such as building damage, debris generation and possible economic losses. Table IV-16 summarizes the expected damage by general building type. According to HAZUS, Masonry and Wood are the most common building types and expected damage would occur mostly with masonry buildings. The regional report also estimates that a large percentage of this damage would be to residential homes.

Table IV-16: CSPDC Expected Building Damage by Building Type (100 yr Event)

Building Type	None		Minor		Moderate		Severe		Destruction	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Concrete	1,146	99.58	5	0.42	0	0.00	0	0.00	0	0.00
Masonry	27,676	99.82	50	0.18	1	0.00	0	0.00	0	0.00
MH	9,682	100.00	0	0.00	0	0.00	0	0.00	0	0.00
Steel	4,316	99.67	14	0.33	0	0.00	0	0.00	0	0.00
Wood	75,626	99.98	14	0.02	0	0.00	0	0.00	0	0.00

Source: HAZUS-MH 4.2

Loss Estimation

To estimate loss for each County and City in the CSPDC Region, HAZUS was used to generate the following hurricane reports for each locality:

- Quick Assessment
- Global Risk Reports (10, 20 , 50, 100 , 500, and 100 year return periods).

Table IV-17 is from the CSPDC's Quick Assessment report and estimates that the region as a whole would have a combined or annualized total Capital Stock loss of $379,000. Income losses are estimates at $20,000 which results in a total of loss of $399,000 for the region. To see annualized losses broken down by locality, see Table IV-18. The CSPDC also used the Hurricane Quick Assessment reports for each County and City in the Region to summarize building damage and economic losses for a 100-year Event. See Table IV-19 to view this information for each locality for a 100 year return period and see Appendix G to view the HAZUS reports.

Table IV-17: CSPDC Estimated Economic Loss ($)

Economic Loss (x 1000)

	Property Damage (Capital Stock) Losses		*Business Interruption*
ReturnPeriod	*Residential*	*Total*	*(Income) Losses*
10	0	0	0
20	0	0	0
50	214	214	0
100	4,956	5,064	5
200	15,705	16,347	32
500	44,891	46,220	1,022
1000	76,205	78,679	4,886
Annualized	359	379	20

Source: HAZUS-MH 4.2

Table IV-18: CSPDC HAZUS-MH Annualized Expected Losses to Hurricanes by Locality ($)

Annualized Economic Loss (x1000) by Locality			
Locality	**Property Damage (Capital Stock) Residential**	**Property Damage (Capital Stock) Total**	**Business Interruption (Income) Losses**
Augusta County	111	116	6
Bath County	7	7	0
Highland County	3	3	0
Rockbridge County	41	43	2
Rockingham County	104	109	6
City of Buena Vista	9	10	1
City of Harrisonburg	35	39	3
City of Lexington	10	11	1
City of Staunton	31	33	2
City of Waynesboro	30	33	2

Source: HAZUS-MH 4.2

Table IV-19: CSPDC HAZUS-MH Hurricane Probabilistic Scenario Quick Assessment

HAZUS-MH Hurricane Probabilistic Scenario Quick Assessment (100 yr Return Period)							
Locality	**Residential Building Exposure ($ K)**	**Total Building Exposure ($ K)**	**Number of Residential Buildings Damaged**	**Number of Buildings Damaged**	**Residential Property (Capital Stock) Losses (x 1000)**	**Total Property (Capital Stock) Losses (x 1000)**	**Business Income Interruption Losses (x 1000)**
Augusta County	6,296,301	7,633,931	8	13	1,448	1,472	0
Bath County	739,486	817,609	0	1	20	20	0
Highland County	320,363	367,309	0	0	8	8	0
Rockbridge County	2,182,496	2,612,294	2	3	475	795	0
Rockingham County	6,609,137	7,869,924	9	13	1,071	1,105	1
City of Buena Vista	509,866	724,767	1	2	87	87	0
City of Harrisonburg	3,460,375	5,090,915	9	13	314	315	0
City of Lexington	714,506	957,848	2	2	141	141	0
City of Staunton	2,264,098	3,046,627	5	8	403	403	0
City of Waynesboro	1,830,829	2,666,599	4	6	410	410	0
CSPDC Total	**24,927,457**	**31,787,823**	**40**	**61**	**4,377**	**4,756**	**1**

Source: HAZUS-MH 4.2

6. Severe Winter Weather (High Ranking)

Hazard History

Listed below in Table IV-20 are major winter storm events that have occurred in the Region. Major events have been broken down by the date of occurrence and when available, by individual community descriptions. When no community specific description is available, the general description should be used as representing the entire Region.

Virginia has a historic record of significant winter that goes back over two hundred years thanks to George Washington and Thomas Jefferson.

Table IV-20: CSPDC Severe Winter Weather Hazard History

Date	Description and Damages
1/28/1772	A severe snowstorm struck the Mid-Atlantic, dropping anywhere from 30-36 inches across the region. The storm became known as the "Washington and Jefferson" snowstorm because they were mentioned in both their diaries.
1/15/1831	Snows of over 13 inches fell on the Shenandoah Valley.
1/19/1857	Extreme cold hampered cleanup from a 12+ inch snowfall. The storm also brought high winds with the snowfall, and a prolonged period of near-zero temperatures froze all rivers in the state. Snowfall was steady for over 24 hours. Train service in the Valley was suspended for ten days. Two buildings belonging to the Central Virginia Railroad caught fire but it was so could the fire hydrants froze and there was no way to put out the fires.
1/18/1881	Sleet and freezing rain fell all day and everything was coated with ice. Several citizens had injuries from falling. There were several collisions between sleds and horse-drawn coaches. To walk on the icy roads, people wrapped pieces of blanket around their feet.
2/1899	The Great Arctic Outbreak and Great Eastern Blizzard brought the harshest winter conditions ever experienced to the region. Mail service was postponed, countless pipes burst and railroads were shut down, causing fear that coal supplies would run out. **Harrisonburg:** 14" of snow, temperature of -23°F recorded **Highland County:** temperature of -29°F recorded in Monterey **Lexington:** temperature of -9°F recorded, North River froze completely over **Rockingham County:** 30" of snow in parts of the county, temperature of -36°F recorded in Timberville, temperature of -32°F recorded in Edom, temperature of -40°F recorded in Brock's Gap **Staunton:** 18" of snow, temperature of -18°F recorded

Table IV-20: CSPDC Severe Winter Weather Hazard History - continued

Date	Description and Damages
1/14/1912	An Arctic cold wave struck the region with subzero temperatures. Across the area, water pipes froze, kitchen ranges exploded, trains were delayed, and thousands of birds and small animals died. **Harrisonburg:** temperature of -15°F recorded **Rockingham County:** temperature of -18°F recorded at Bridgewater, temperature of -18°F recorded at Dayton, temperature of -20°F recorded at McGaheysville **Staunton:** temperature of -25°F recorded. One man froze to death.
11/25/1938	An average of 6" of snow fell across the Shenandoah Valley. **Rockingham County:** Between 50 and 75 cars were stranded on Rt. 33. Many people were traveling during this Thanksgiving holiday weekend.
3/5/1962-3/9/1962	A severe Nor'easter struck the entire east coast, dumping especially heavy snow on western Virginia. **Harrisonburg:** 20" of snow. **Lexington:** 20" of snow fell. **Rockingham County:** 27" of snow fell, stranding travelers overnight on U.S. Rt. 11 near Lacey Springs. **Staunton:** 26" of snow fell.
3/26/1978	An Easter weekend ice storm brought branches and whole trees crashing down onto power lines, with over 1" of ice accumulating in some places. Over 30,000 in the Shenandoah Valley were without power, and over 2,000 were without telephone service. Radio stations were knocked off the air and many basements were flooded.
2/11/1983	The Blizzard of '83 struck Virginia, dropping heavy snow with drifts up to 6 feet high. **Augusta County:** 18-20" of snow fell. **Harrisonburg:** 20" of snow fell. James Madison University and Eastern Mennonite University were closed, several tractor trailers jack-knifed on I-81. **Lexington:** 18" of snow fell. **Rockbridge County:** 15-24" of snow fell.

Table IV-20: CSPDC Severe Winter Weather Hazard History - continued

Date	Description and Damages
3/13/1993	The Storm of the Century struck the east coast, causing 4 feet of snow in some areas and drifts of up to 15 feet. One hundred and fifty (150) Americans lost their lives to the storm. In the Region, the storm dropped between 12" and 22" of snow, with near hurricane-force winds creating drifts of 8' to 10' deep. Extremely low wind chills caused problems for farmers trying to feed livestock and drifts prevented farmers trying to move the animals to sheltered places. **Harrisonburg:** Roofs of 2 businesses collapsed under the weight of the 10' snow drifts. **Rockbridge County:** 12"-22" of snow fell and 5,000 people lost power. **Rockingham County:** 13"-22" of snow fell; winds of up to 70 m.p.h. caused drifts of 6'-7'. **Staunton:** 18" of snow fell and 200 people were without power. The National Guard was deployed in Staunton.
2/8/1994–2/12/1994	A severe ice storm struck Virginia, bringing 1"-3" of solid ice, causing flooding and $105.8 million (2019 dollars) in damage. In the Region, Bath County Rockbridge County and the City of Buena Vista were included in a federal disaster declaration (DR-1014). Conditions were treacherous across the Central Shenandoah Valley Region, where 24 out of the past 54 days had winter precipitation.
3/1/1994-3/5/1994	A severe winter storm and ice storm hit Virginia. Augusta County and Highland County were included in a federal disaster declaration (DR-1021).

Table IV-20: CSPDC Severe Winter Weather Hazard History - continued

Date	Description and Damages
January 1996	The Blizzard of 1996 struck the east coast, killing 40. The blizzard paralyzed the I-95 corridor and reached westward into the Appalachians where snow depths of over 48 inches were recorded. To compound things, the blizzard was followed the next week by two additional heavy snowstorms bringing over a foot of snow. Snowpack was on the ground for an extended period of time. It was thawed by higher temperatures and heavy rain, resulting in severe flooding. The Governor declared a State of Emergency in Virginia, with the hardest hit area being the Shenandoah Valley, with over 40" of snow reported in areas of Shenandoah National Park. The Region reported an average of 28"-30" of snowfall. Local governments also declared states of emergency and all non-essential travel was banned. Several local governments and schools were closed for more than a week. Dozens of hikers were stranded in the Shenandoah Valley. Eight hundred (800) persons throughout the State required shelter. In Virginia, snow removal costs were estimated at $81.9 million (2019 dollars) and another $11.4 million (2019 dollars) was spent in repairs to damaged infrastructure. VDOT needed crawler tractors to plow the snow in higher elevations because the snow was too deep for regular plows. Two federal major disaster declarations (DR-1086 and DR-1098) were declared. DR-1086 included Augusta County, Bath County, the City of Buena Vista, the City of Harrisonburg, Highland County, the City of Lexington, Rockbridge County, Rockingham County, the City of Staunton and the City of Waynesboro. DR-1098 included all of the same localities, except for Lexington and Waynesboro. **Highland:** 24"-30" of snowfall was reported. **Staunton:** The National Guard's humvees were used by rescue personnel to assist with emergency calls.
1/25/2000-1/30/2000	Winter storms brought a blizzard to the East Coast that impacted the Region. Augusta County, Bath County, Highland County, Rockbridge County and Rockingham County were included in a federal major disaster declaration. (DR-1318)

Table IV-20: CSPDC Severe Winter Weather Hazard History - continued

Date	Description and Damages
2/14/2003– 2/18/2003	A complex storm system known as the "Presidents' Day Storm" dropped snow and sleet across the State of Virginia. In some places, schools were closed for a week. Across the northern Central Shenandoah Valley, 12 to 20 inches of snow and sleet fell. Across the southern Central Shenandoah Valley, 7 to 12 inches of snow and sleet fell. **Augusta County:** $2.1 million (2019 dollars) worth of damages reported. Barns and turkey sheds collapsed killing livestock. A 39 year old man died after sledding into the path of a car in Craigsville. **Bath County:** Received 5 to 8 inches of snow and sleet. **Highland County:** A turkey house collapsed near McDowell and killed 500 turkeys. Highland County was included in a federal major disaster declaration (DR-1458) for the severe winter storm, snowfall, heavy rain, flooding and mudslides that occurred during a period from February 15 through February 28. **Rockingham County:** Twelve (12) chicken/turkey houses collapsed killing 37,000 chickens/turkeys. A dairy barn collapsed in Grottoes, killing one cow and injuring 17.
2/12/2007	Complex storm of snow and sleet. In Northwestern and Central Virginia, snowfall ranged from 1 - 7 inches with sleet between 1/10 and 3/4 of an inch. There were dozens of automobile accidents, including pileups of dozens of cars on Afton Mountain. The storm caused 22 deaths in the U.S. In the Region, as many as 20,000 people lost power at the height of the storm. Ice was followed by gusty winds and bitter cold. Virginia Governor declared a State of Emergency for the State. **Augusta County:** Augusta County was the hardest area hit in the Central Shenandoah Region and the County declared a local state of emergency. **Bath and Highland County:** The storm brought sleet and ice causing downed trees, downed power lines and power outages.
1/17/2008	Severe winter weather resulted in snowfall in the region. Augusta County received between 2.5 inches and 8 inches of snow, as well as ice on trees. Highland County received 4.8 inches of snow. Rockingham County received between 3.5 inches and 6 inches of snow.

Table IV-20: CSPDC Severe Winter Weather Hazard History - continued

Date	Description and Damages
12/18/2009–12/20/2009	A strong area of low pressure tracked up the Mid-Atlantic Coast and tapped into moisture from the Gulf of Mexico and the Atlantic Ocean causing copious amounts of precipitation to develop. The severe winter storm that hit the Shenandoah Valley in December 2009 was one of the biggest snow falls in the past 13 years. Snow fall was recorded ranging from 18 inches to 28 inches of snow during the 2 day storm throughout the Valley. The Virginia State Police estimated the storm caused a 42% increase in calls for service. State Troopers responded to more than 4,000 traffic crashes and disabled vehicles. Officials reported only 2 traffic fatalities. Interstates 81 and 77 were hit the heaviest with traffic accidents. A federal major disaster declaration (DR-1874) included Augusta County, Bath County, Highland County, Rockbridge County, the City of Staunton and the City of Waynesboro. **Harrisonburg**: 13 inches of snow recorded. **Rockingham County**: Received up to 2 feet of snow. **Staunton:** Used 96' storm experience in preparation for 09' storm. They had 20 people in the armory on stand-by to get people out of trouble. Biggest community problem was the amount of disabled vehicles on the road.
2/5/2010 - 2/11/2010	Governor McDonnell declared Virginia in a state of emergency as the second severe storm of the season hit in February, dropping nearly 2 feet of snow throughout the state on February 5 - 6, 2010. This was followed by another system that dropped more snowfall on February 9 - 10, 2010. Gov. McDonnell assisted the state by deploying National Guard soldiers and emergency response teams. VDOT used up all $79 million budgeted for statewide snow removal and nearly exhausted their $25 million reserve. The National Weather Service described the storm as very heavy, wet snow with strong winds. Dominion Virginia power reported half of the 200,000 power outages came from the Charlottesville and Shenandoah Valley region, while Appalachian Power reported an additional 40,000 outages in the Valley. Virginia State Police responded to more than 2,000 traffic crashes and disabled vehicles along with 2 traffic fatalities. A federal disaster declaration (DR-1905) included Augusta County, Highland County and the City of Waynesboro. **Staunton** – accumulated 15 inches of snowfall. **Augusta County** - received 16 inches of snowfall. **Waynesboro** – accumulated 13.5 inches of snowfall. **Rockingham County** - received between 13 and 17 inches of snowfall. During the second snowfall, parts of Rockingham received an additional 6 inches. **Bath County** - totals were between 15 - 18 inches for both storms.

Table IV-20: CSPDC Severe Winter Weather Hazard History - continued

Date	Description and Damages
3/7/2013	Severe winter weather brought wet, heavy snow approaching 20 inches in the Region. The area received some of the highest snowfall levels in the state, including the highest level of 20.3 inches in Fishersville. A state of emergency was declared by Governor Bob McDonnell. Power outages were reported for more than 200,000 customers in the state, and the Town of Craigsville water and sewer plant was left without power. Slick roads resulted in abandoned vehicles, and police responding to hundreds of crashes, including two tractor trailer accidents. In the Highlands, 16 inches of snow was reported in Bath County and 14 inches of snow was reported in Highland County.
2/13/2014	A nor'easter brought more than 24 hours of steady snowfall to the Region closing schools, governments and businesses. Governor McAuliffe declared a state of emergency. More than 1,000 pieces of equipment were deployed in the VDOT Staunton District. No deaths or major injuries were reported in the Shenandoah Valley. The storm cancelled flights. Statewide, the Virginia State Police responded to more than 4,052 calls for service, with 1,095 crashes and 905 disabled vehicles. Bath County received 15 inches of snow.
3/17/2014	Winter weather brought snowfall to the region. 6 inches were reported in Augusta County and up to 13.5 inches were reported in Rockingham County.
3/7/2015	A strong storm steered by upper level winds from the northwest and Ohio Valley, resulted in a winter storm warning for the area. 11.5 inches of snow were reported in Waynesboro, and there were more than 200,000 power outages statewide. One of the heaviest areas for calls to service to the Virginia State Police was in Augusta County.
1/22/2016-1/23/2016	A nor'easter storm known as Winter Storm Jonas brought a blizzard to the Northeast and Mid-Atlantic, affecting nearly one-third of the U.S. population. The storm brought heavy snowfall to our region. Governor McAuliffe declared a state of emergency and deployed the Virginia National Guard. Heavy snowfall caused the roof of a bowling alley in Waynesboro to collapse, leading to its condemnation and later demolition. Areas of Bath and Highland County received 17-20 inches of snow. Highland County was included in a federal disaster declaration (DR-4262). The countywide per capita impact for Highland was $23.69.
12/17/2016	A light coating of ice fell in the region, impacting roadways in Augusta County.

Table IV-20 CSPDC Severe Winter Weather Hazard History - continued

Date	Description and Damages
11/15/2018	A winter ice storm brought widespread power outages to the entire Region. More than 40,000 customers were without power in Rockingham, Augusta, Staunton and Waynesboro. In Rockbridge County, around 1,800 Dominion customers were without power. In the BARC service area in Rockbridge and Bath counties, around 4,758 customers were without power due to downed trees and ice on the power lines. Businesses, including grocery food retailers, were also impacted causing financial losses of perishable food products. A CenturyLink fiber optic line was damaged by heavy ice in Rockbridge County, causing outages for customers. The storm caused road closures and impacted traffic signals in Rockbridge County, and an accident between a semi-tractor trailer and a pickup truck was reported in Buena Vista.

Hazard Profile

Winter storms may include a variety of cold weather conditions such as heavy snowfall, extreme cold temperatures, freezing rain, sleet, ice, and high winds. Blizzards are a type of winter storm with high winds and considerable blowing snow. Winter storms may last from just a few hours to several days and affect the entire Region. The impacts of winter storms include downed power lines and trees, hazardous walking and driving conditions, road closures, and business, government facilities and school closures. Health risks include hypothermia and frostbite if exposed to winter storm conditions and heart attacks due to overexertion. Winter storms are considered deceptive killers because most deaths are not directly related to the actual storm event. The leading cause of death and injury during winter storms is automobile accidents when freezing rain and sleet cause road surfaces to become extremely treacherous and dangerous to motorists. Other dangers related to winter weather and extreme cold include exposure, hypothermia, and asphyxiation due to improper use of heating systems. House fires occur more frequently in the winter months and during winter storms because of the use of alternative heating sources. Frozen water lines and limited access to waterlines poses a significant risk for fighting fires in the winter weather. Injury or death caused by chain-saw accidents and electrocution are also possible in the aftermath of the winter storm as residents try to remove fallen trees and power lines.

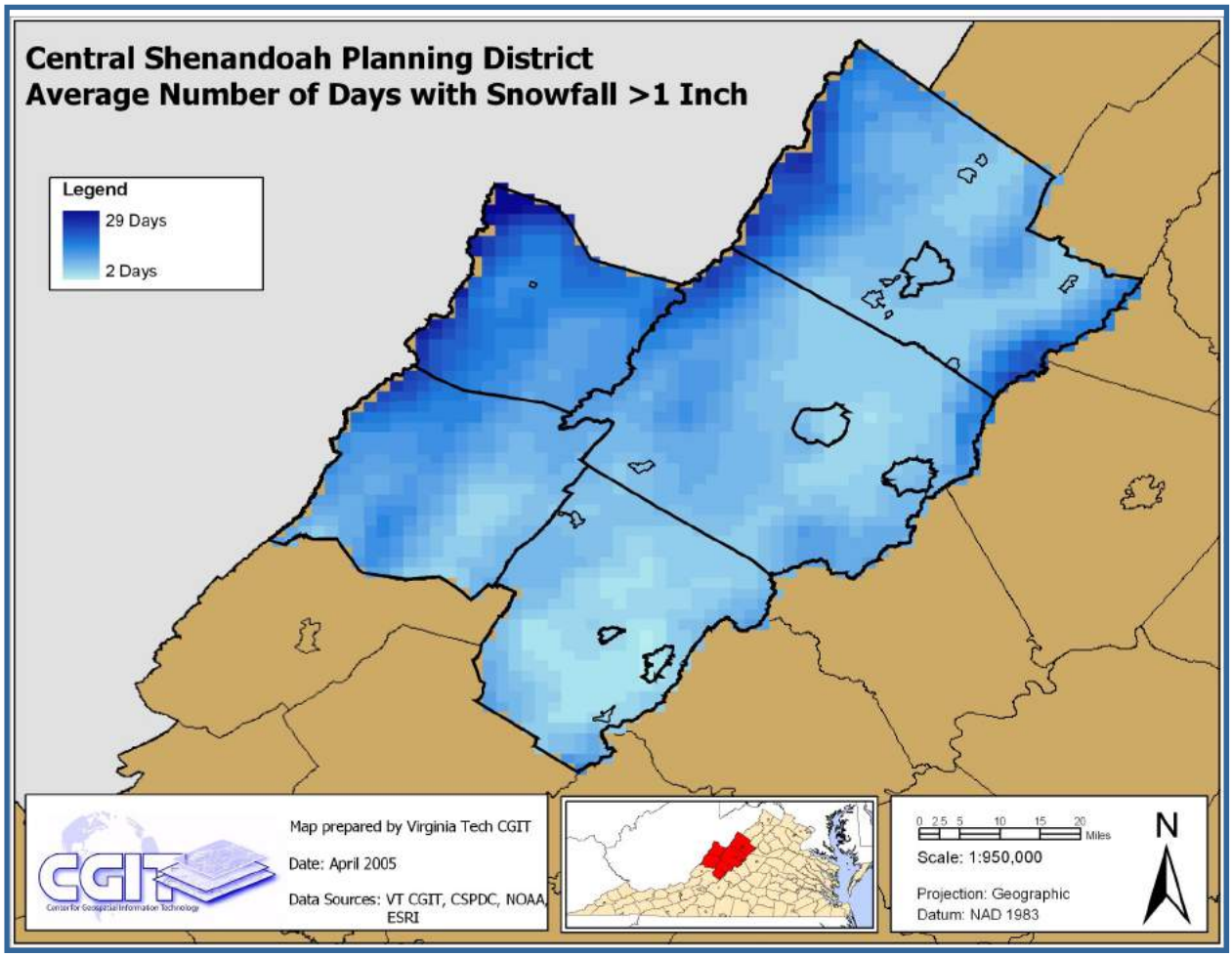
Winter storms also impact our economy. Public funds are generally associated with labor and equipment costs for snow removal, road clean-up and repair and utility restoration. Business losses are attributed to closures and the inability of employees and customers to travel. Electrical, communication and utility disruption also impact the private sector. Buildings may be damaged or destroyed when heavy snow loads collapse roofs. The agricultural economy can also suffer as a result of winter storms especially those that occur later in the season affecting crops and livestock.

Predictability and Frequency

Winter storms can be a combination of heavy snowfall, high winds, ice and extreme cold. These are classified as extra-tropical cyclones that originate as mid-latitude depressions. Winter weather impacts the Region between the months of November and April, with varied intensities from east to west. In the last Plan, winter weather hazard potential maps were created that capture this variability, gridded climate data was obtained from the Climate Source and through the VirginiaView program. This data was developed by the Oregon State University Spatial Climate Analysis Service (SCAS) using **PRISM** (**P**arameter -elevation **R**egressions on **I**ndependent **S**lopes **M**odel). This climate mapping system is an analytical tool that uses point weather station observation data, a digital elevation model, and other spatial data sets to generate gridded estimates of monthly, yearly, and event-based climatic parameters.

The winter storm analysis from the 2013 plan was kept for this Plan update. The CSPDC determined that the analysis and maps were still representative of the CSPDC region's snow and ice risk. In this analysis, a criterion of greater than 1 inch was selected for winter snowfall severity assessment because this depth will result in complete road coverage that can create extremely dangerous driving conditions and will require snow removal by the local community. This amount of snowfall in a 24-hour period can also lead to business closure and school delays or cancellation. Figure IV-10 shows the average number of days with snowfall greater than one inch for the Region.

Figure IV-10: CSPDC Average Number of Days with Snowfall > 1 inch



Ice Potential

Another challenge with winter weather in Virginia and the Region is the amount of ice that often comes as part of winter weather. Snowfall and ice potential are generated based on the percentage difference between the total precipitation from November to April and the corresponding liquid equivalent snowfall depth. Since snowfall is in a frozen state, it does not accumulate on the surface the same way that liquid rainfall would. In order to account for this difference, there are characteristic snow/rain relationships that have been created. For example, a value of 1 would mean that all of the precipitation at the location falls as liquid rainfall, and a value of 0.5 would mean that half of the precipitation falls as liquid rainfall and half falls as frozen precipitation. It is assumed that the lower the percentage, the greater potential that precipitation within these months is falling as snow. The values in the middle of the two extremes would represent regions that favor ice conditions over rain and snow. A five quantile distribution was applied to the output statewide grid to split the percentages into five characteristic climatological winter weather categories (snow, snow/ice, ice, rain/ice, and rain). This ice potential analysis was used in the last Plan to create a relative ice risk map. The CSPDC decided to continue using this map since it is the best known available data for the Region's ice potential. See Figure IV-12 for relative ice risk map.

Vulnerability Analysis

Figures IV-11 and IV-12 show relative risk or vulnerability based on the previous analysis. These were developed by assigning a high risk to those census blocks within the regions with the greatest potential for snowy days (> 1 in of snow) or ice. Division into high, medium and low were based on the levels predicted from potential maps. Future revision of this Plan will need to develop a method to calculate the potential loss from these winter storms.

Relative snowfall risk (Figure IV-11) illustrates Highland County and the Town of Monterey with the highest relative potential for snow, followed by a band of medium snow potential in the counties of Rockingham, Augusta and Bath and in the Town of Craigsville. The southeast portion of the Region has a relatively low potential for snow, with the exception being the eastern portion of Rockingham County and the Town of Grottoes.

Relative ice risk (Figure IV-12) characterizes the Region as low and medium potential for receiving ice as the dominant type of winter weather. Areas with medium potential for ice are clustered around Rockbridge and Augusta Counties, including the cities of Lexington, Waynesboro and Buena Vista and the towns of Goshen and Glasgow.

To view maps of relative ice and snowfall risk overlaid with the region's critical facilities, please see Appendix D.

Figure IV-13 is from the 2018 Commonwealth of Virginia, Hazard Mitigation Plan and is a map of winter weather event occurrences from 1950 to 2016 for the State. Five out of the 11 CSPDC localities are in the highest range of occurrences: Augusta, Rockingham and Highland Counties, and the Cities of Staunton, Waynesboro and Harrisonburg.

Figure IV-14 is from the National Oceanic and Atmospheric Administration (NOAA) and displays data for 3-Day snowfall extremes from 1914 to June 2018 in inches. According to this map, Rockingham County is more vulnerable to heavy 3-day snowfalls compared to the rest of the localities in the CSPDC Region.

Figure IV-11: Central Shenandoah PDC Snowfall Relative Risk

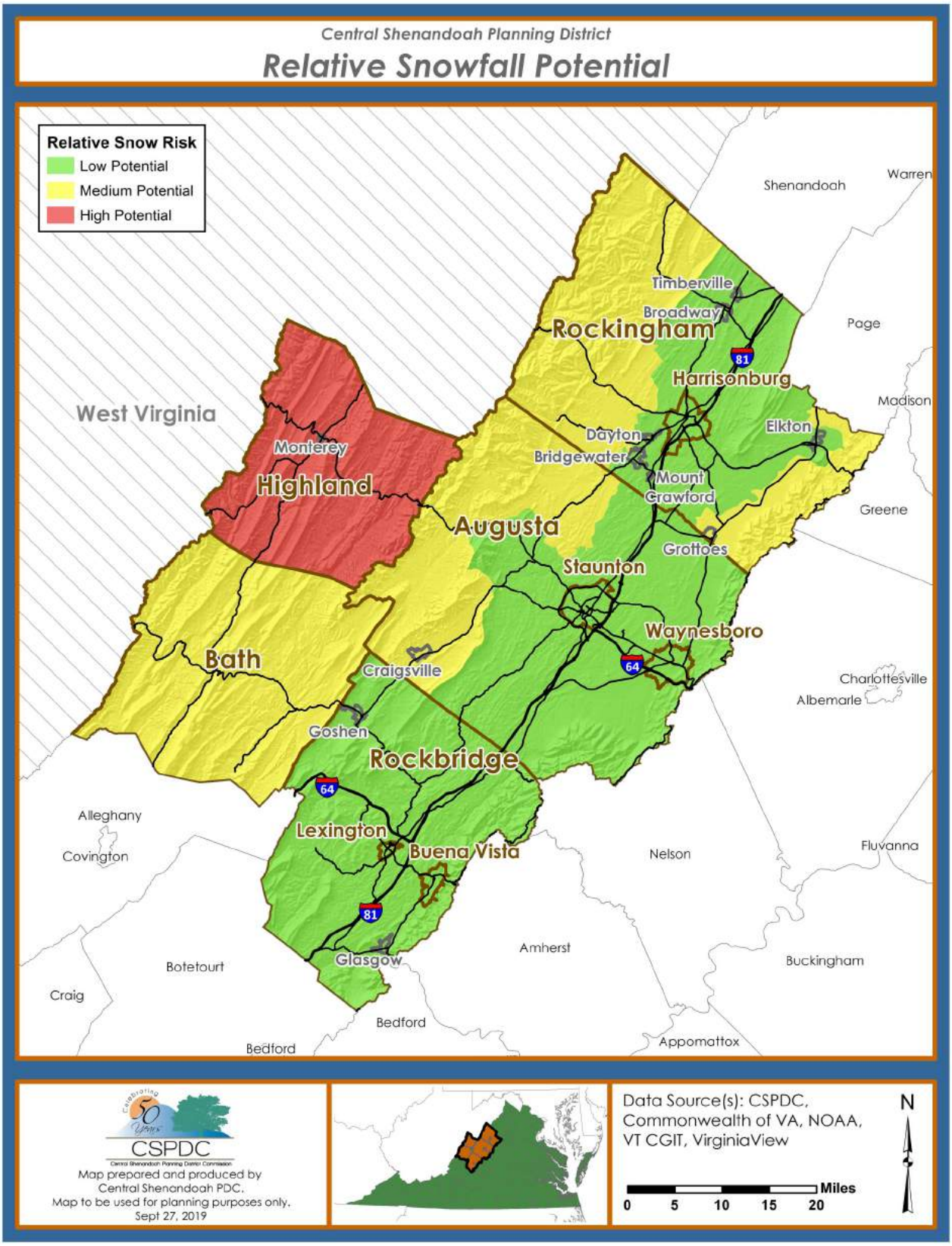


Figure IV-12: Central Shenandoah PDC Relative Ice Risk

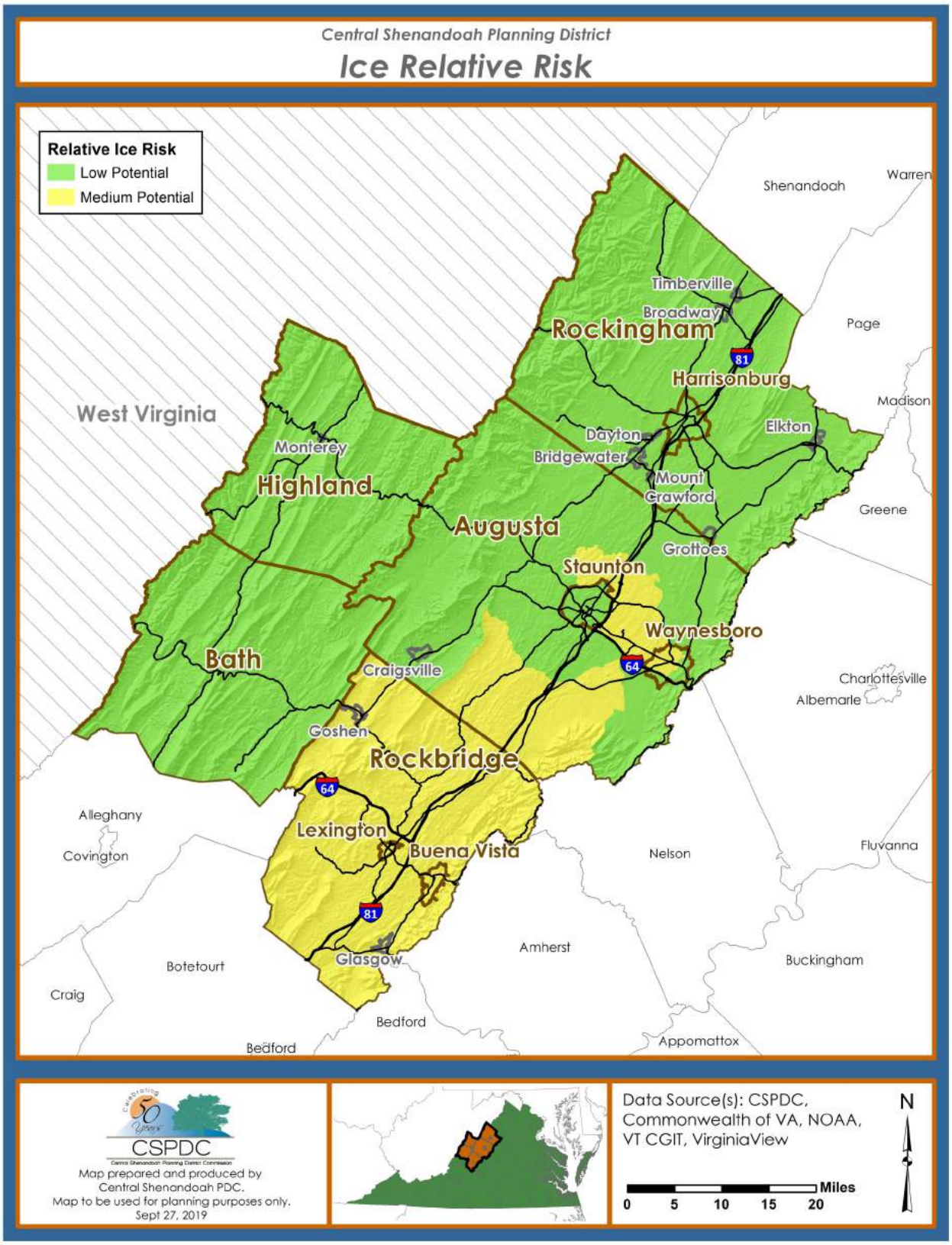
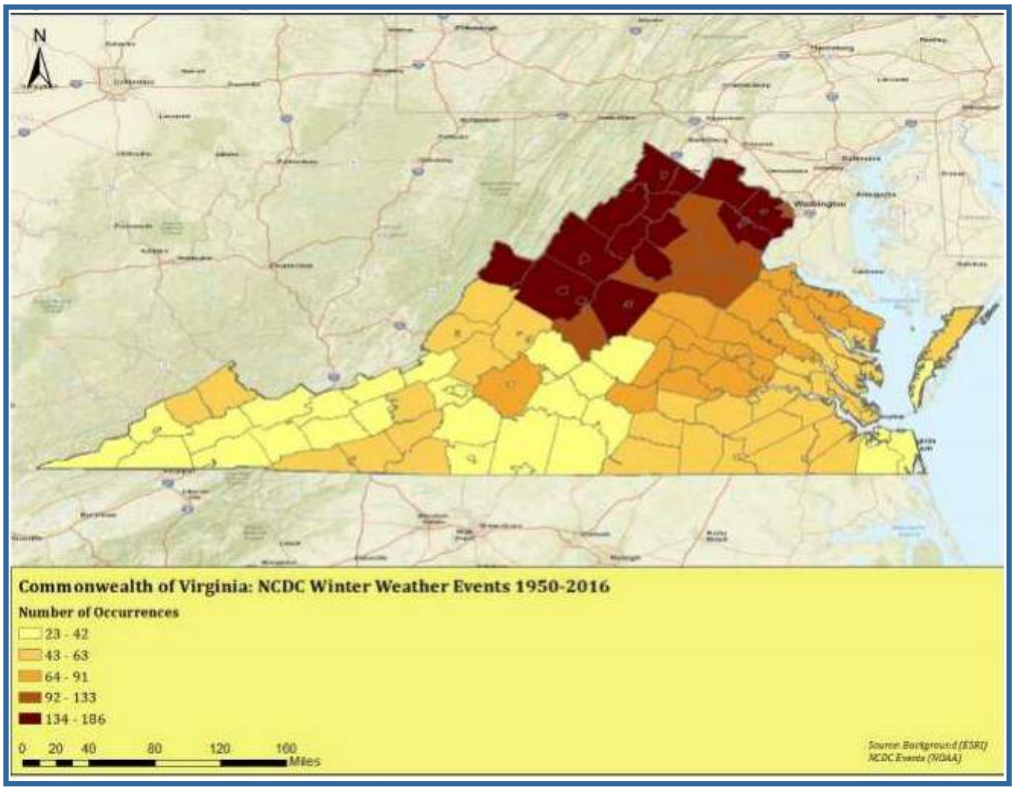
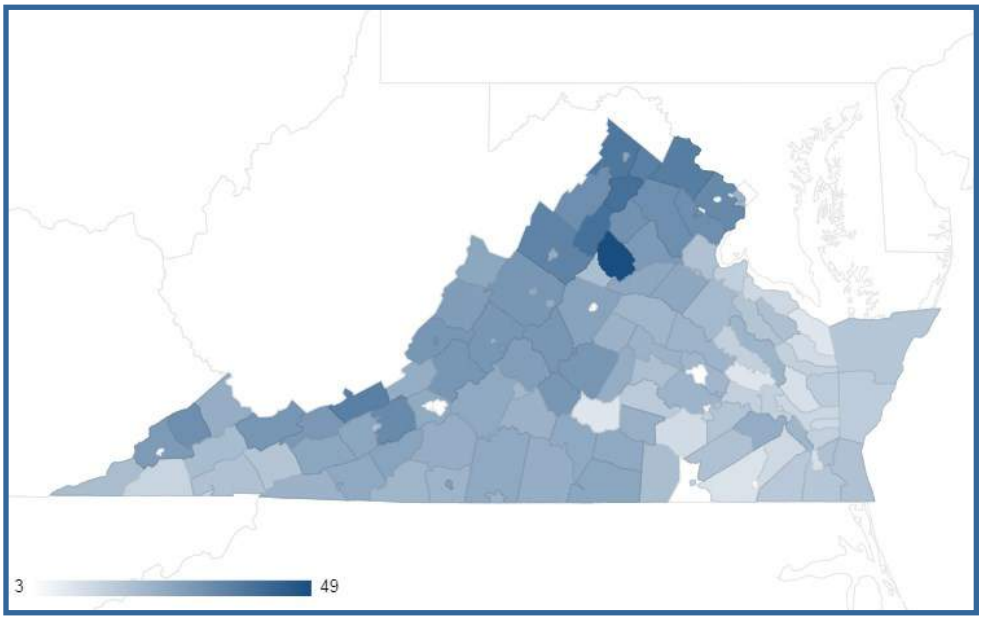


Figure IV-13: NCDC Winter Weather Events 1950-2016



Source: Commonwealth of Virginia, Hazard Mitigation Plan, 2018

Figure IV-14: NDCC and NOAA 3-Day Snowfall Extremes (1914 -June 2018) in Inches



Source: NDCC, NOAA

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7. Land Subsidence/Karst (Medium Ranking)

Hazard History

There is no existing long-term record of sinkholes for our region or for Virginia because sinkholes caused by karst are very site-specific and often occur in undeveloped areas. A number of sinkholes over the years have opened up on Interstate 81 which runs through the Region. Documented occurrences of sinkholes are included in Table IV-21.

Thirty-two sinkholes were reported after 7" of rain fell in April 2000 after a long dry spell.

Table IV-21: Central Shenandoah PDC Karst and Land Subsidence History

Date	Damages
8/11/1910—The Big Cave-In	**Staunton:** Three sinkholes opened up on Lewis and Baldwin Street and Central Avenue that were 60 feet deep. The sinkholes impacted homes, a fire station and a school. One worker was killed when he fell into one of the chasms caused by the sinkhole as it was being repaired.
4/16/1961 - 8/4/1961 2/1962 - 4/1962 3/2/1963 – 3/22/1963 11/21/1972 4/2/1982 4/12/1983	**Timberville:** Incidences of sinkholes opening up in the Town.
April 2000	Thirty-two sinkholes were reported after 7" of rain fell in April after a long dry spell.
3/1/2001	**Augusta County:** Interstate 81 was closed for a nine-mile stretch due to the sudden appearance of three sinkholes. The largest sinkhole measured 20 feet long, 11 feet wide and 22 feet deep, costing over $145,000 (2019 dollars) to repair.
10/28/2001	**Staunton:** A 45-feet deep sinkhole opened up at the corner of Lewis Street and Baldwin Street in Downtown Staunton, damaging three vehicles.
10/7/2005	**Timberville**: A sinkhole opened up in the Town.

In June 2017, A sinkhole opened up on Interstate 81 near Greenville closing the right lane of southbound I-81

Table IV-21: Central Shenandoah PDC Karst and Land Subsidence Hazard Histories—continued

Date	Damages
9/30/2015	**Augusta County**: A sinkhole opened up on a Dominion Virginia Power electric transmission line easement near Breezy Knoll Lane and Warren Oaks Lane. The sinkhole exposed telephone, cable and high voltage electric lines on the underground easement.
1/26/2016	**Staunton:** Following a snowstorm with 18 inches of snow in Staunton, fluctuating temperatures caused 9 water main breaks. Three occurred on Skymont Road, leaving several homes without water. During the same period, a sinkhole opened up on Skymont Road swallowing a car and condemning a house.
6/5/2016	**Augusta County:** A sinkhole opened up on Broad Run Road (Route 774) in Mount Sidney.
6/23/2017	**Augusta County:** A sinkhole opened up on Interstate 81 near Greenville closing the right lane of southbound I-81. The closure caused traffic backups of 10 miles on the interstate, and traffic congestion on Route 11.
9/27/2018	**Augusta County:** A sinkhole opened up on Hundley Mill Road in Staunton measuring about three feet wide, six feet long and fifteen feet deep. A 700-pound cow fell into the sinkhole. After attempts to rescue the cow alive by County authorities, a veterinarian and a backhoe operator were unsuccessful, the animal had to be euthanized.

Photo IV-1 and IV-2: The Big Cave-In Occurred in Staunton in August 1910, when three large sinkholes opened up, along Baldwin Avenue and Central Avenue.

Hazard Profile

Land subsidence is caused by the gradual settling or sudden sinking of the ground due to subsurface movement. It commonly occurs in areas with karst terrain, which is a type of topography formed by dissolution of soluble rock such as limestone and dolomite. The soluble rock dissolves when acidic water percolates through the soil. Karst terrain is characterized by the presence of sinkholes, caves, springs, sinking streams and solution valleys.

Land subsidence is caused by the gradual settling or sudden sinking of the ground.

Sinkholes are natural depressions of the land surface that are bowl-shaped, funnel-shaped or vertical sided. Sinkholes are formed when the land surface sinks or collapses because the soluble rock underneath dissolves. Sinkholes are a natural geological process but can be impacted by human activities that can cause issues with subsidence, flooding and pollution.

Sinkholes are a natural geological process, but can be impacted by human activities.

Human activities that impact the hydrology, such as groundwater pumping, mining, and leaking water from sewer and stormwater pipes, can accelerate the natural processes of land subsidence. Sinkhole flooding can be caused by natural conditions or man-made conditions. Increased surface runoff can result in sedimentation blocking the natural drain, resulting in ponding or flooding.

Groundwater contamination from pollution is a significant concern in areas with karst terrain. As water percolates through the underlying rock, contaminants can be transferred into the groundwater polluting water supplies. Examples of contaminants include chemical based products such as petroleum, herbicides, solvents and fertilizers; sewage from leaking septic systems or utilities; and household garbage. While it is prohibited by the Code of Virginia, the dumping of wastes, such as household garbage, agricultural waste, and dead livestock have occurred.

Land subsidence and sinkholes can result in damages to buildings and personal property, transportation infrastructure and utility infrastructure. Impacts to infrastructure can occur damaging roadways, bridges, railroads, storm drains, sanitary sewer, water lines, gas lines, power lines and telecommunications.

Hazard Areas

In Virginia, the areas mostly impacted by sinkholes are in the Valley and Ridge physiographic province.

In Virginia, the areas that are mostly impacted by sinkholes are in the Valley and Ridge physiographic province. The Valley and Ridge province has long parallel ridges and valleys underlain by limestone and dolomite rock. The vast majority of the localities in the Region are located in the Valley and Ridge province. Very small portions of the Region including the eastern boundaries of Augusta, Rockbridge and Rockingham Counties, and the cities of Buena Vista and Lexington are located in the Blue Ridge province, which runs along the Blue Ridge Mountains.

Transportation infrastructure within the Region has been impacted along the interstate corridors.

Interstate 81 also runs through the Valley and Ridge province, from Washington County in the south to Frederick County in the north. In the region, Interstate 81 runs through Rockbridge County, Augusta County, the City of Staunton, Rockingham County and the City of Harrisonburg. Interstate 64 also runs through Rockbridge County, the City of Lexington, Augusta County, the City of Staunton and the City of Waynesboro. In the area from the City of Lexington to the City of Staunton, Interstate 64 runs concurrently along Interstate 81 in Rockbridge and Augusta Counties.

Due to the karst terrain, transportation infrastructure within the Region has been impacted along the interstate corridors. Past sinkholes have resulted in the closure of Interstate 81/Interstate 64, resulting in significant traffic backups and congestion along alternate routes in the Region along a major trucking corridor. The Virginia Department of Transportation maintains an emergency contract for sinkhole repair, and repair costs can range anywhere from tens of thousands of dollars to hundreds of thousands of dollars per sinkhole. The interstate systems in the Region also increase the vulnerability of groundwater contamination from the transportation of hazardous materials. If an accident occurs that leaks hazardous materials, the chemicals can remain in the groundwater for many years.

In the Region, private and public water supplies can be impacted by groundwater contamination due to the karst terrain. Karst aquifers are vulnerable to contamination, especially in populated areas. Contaminated groundwater can impact local governments, private citizens, businesses, agriculture, and industry. Rockingham County and Augusta County are the top two agricultural producing counties in Virginia. The Region is also home to industries that rely on the water supply to operate.

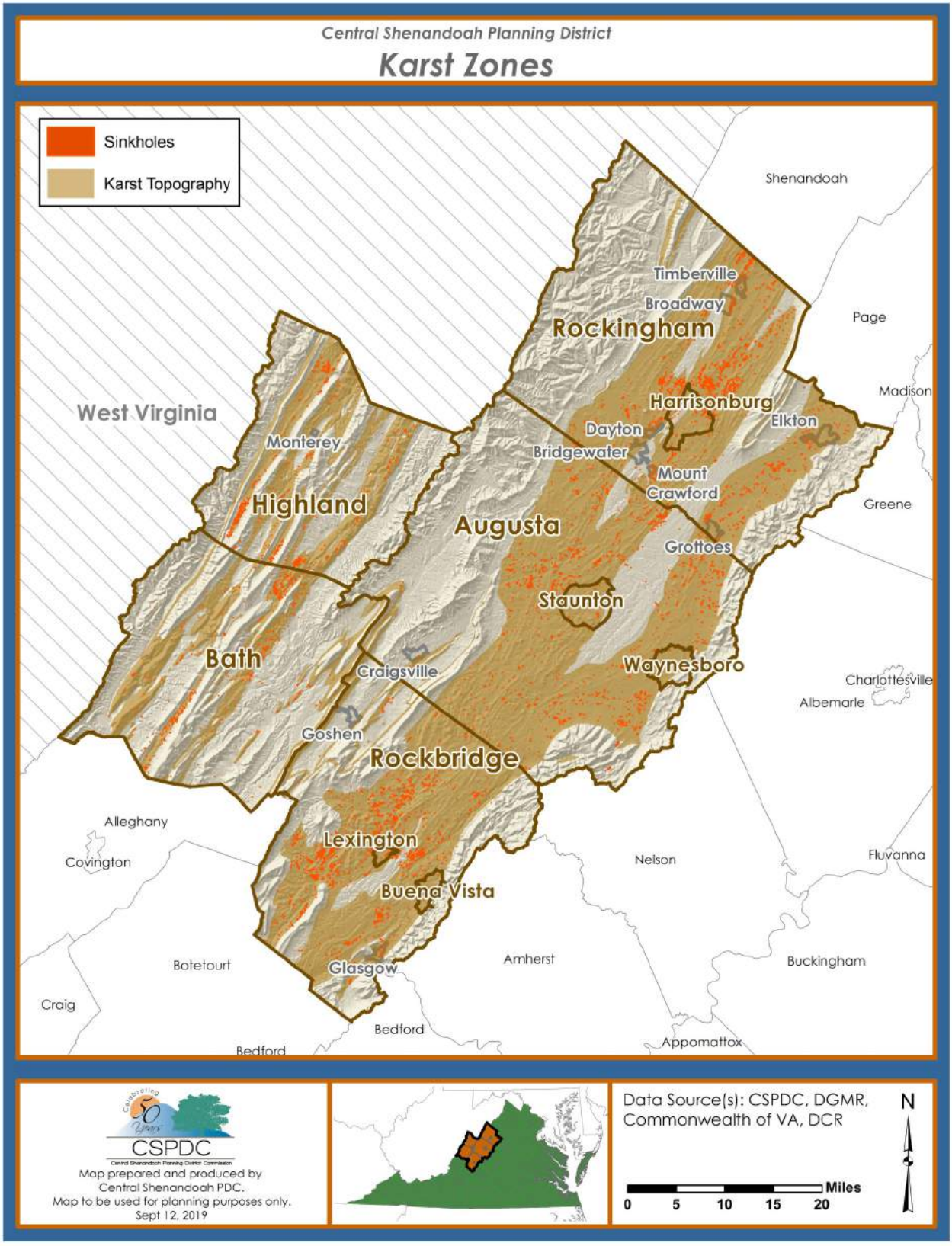
Karst aquifers are vulnerable to groundwater contamination, especially in populated areas.

Figure IV-15 shows the locations in the Region that contain karst topography. Sinkholes identified by the Virginia Division of Geology and Mineral Resources are also shown. The sinkhole data is meant to provide a general guide to the presence of sinkholes in the Region, and does not reflect the presence of all sinkholes. These areas are broadly defined and mapped with a general understanding of karst hazard risks. A more detailed study would be required to determine the actual vulnerable structures at individual sites within these risk areas.

Contaminated groundwater can impact local governments, private citizens, businesses, agriculture and industry.

As seen in Figure IV - 15, karst topography is more prevalent in the lower valley regions and the probability of sinkholes and land subsidence is higher in these areas; however, this map is generally a reference of karst geology and does not portray hazards associated with karst. Karst development is always changing, making it harder to predict the probability of hazardous events. Since karst topography is present throughout the region's urban areas, it can be assumed that risk of karst related events will be increased as there is more development around these urban areas. Many human induced sinkholes can be created by construction or changing the land's natural drainage and hydrology. Climate change is also a concern for increasing karst hazards in our region due to greater rainfalls and longer periods of saturated soil.

Figure IV-15: Central Shenandoah PDC Karst Zones



Vulnerability Analysis

Table IV-22 illustrates the number of critical facilities and structures in the mapped karst zones. The Cities of Lexington and Staunton have the largest amount of structures in the karst zone at around 99% of their total structures. Figure IV-15 also shows, generally, the distribution of karst-related sinkholes in the region. This sinkhole data was mapped by the Virginia Division of Geology and Mineral Resources (DGMR). Rockingham and Rockbridge counties have the highest amount of sinkholes in the CSPDC region according to this DGMR data.

Table IV-22: CSPDC Structures and Critical Facilities Near Mapped Karst Zones

Community	Structures in Karst Zones	Critical Facilities in Karst Zones
Augusta County	53,833	356
Bath County	1,385	22
Buena Vista City	2,540	40
Harrisonburg City	16,558	65
Highland County	979	17
Lexington City	2,302	53
Rockbridge County	10,260	104
Rockingham County	68,035	137
Staunton City	14,497	39
Waynesboro City	11,270	80
Total	**181,659**	**913**

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8. Wind (Tornado, Derecho, or Straight-Line Winds); (Medium Ranking)

Hazard History

Throughout its history, the Region has experienced wind damage from tornadoes, straight-line winds and a derecho. For information on wind damage from hurricanes, refer to Section IV-5 on hurricanes. Wind events have caused fatalities, injuries, and property damage in the Region. Table IV-23 details major wind events in the Region.

Table IV-23: Wind Hazard History

Date	Location	Description and Damages
6/14/1834	Rockbridge County	A tornado had a damage path 18 miles long and 16 miles wide. Trees were flattened and windows broken. Hail was "hen egg" size, measuring 8 - 9 inches in diameter. Wind/hail most destructive to residents within their memory.
6/4/1911	Staunton, Augusta County (Possibly started in Mt. Solon area, blew southeast to Staunton where it zigzagged north and east. It also hit Greenville, Fishersville, and Verona. From Augusta County, it crossed into Nelson and Amherst Counties)	The tornado damage path was 30 miles long and 7 miles wide – shaped like an hour glass. Hail ranged in size from marbles to goose eggs. Damages included broken windows, roofs blown off, barns destroyed, water damage to houses, and impacts on crops and livestock. People were injured but there were no fatalities. Many people were caught outdoors on Sunday afternoon outings. The Staunton property loss was estimated between $600,000 to $1.3 million (2019 dollars). The county crop loss was $27 million (2019 dollars). Turkeys/ chickens killed at farms. Boy Scouts helped clean up damaged houses. Four carloads of glass were sold to replace broken windows in Staunton.
9/22/1921	Augusta County (1 mi. west of Mint Springs - moved to Barterbrook)	An F2 tornado had a damage path 5 miles long and 100 yards wide. The damage amounts are not known. No reports of fatalities. A mother and child were severely injured when their home was destroyed and scattered a ½ mile.

Table IV-23: Wind Hazard History –continued

Date	Location	Description and Damages
5/2/1929 "Virginia's Deadliest Tornado Outbreak"	Bath County	A storm swept across 12 states from Florida to Missouri to Virginia. More than 200 were injured and 40 killed in the United States. There were five tornadoes in Virginia that resulted in 22 people killed and over 150 injured. There were approximately $7.5 million (2019 dollars) in damages. In the state, 4 schools were destroyed including one school at Rye Cove in Scott County where 12 children and 1 teacher were killed and 42 injured. A tornado occurred in the Cowpasture Valley in Bath County at an elevation of 1,500 feet. Ten people were injured but no one was killed. Roofs were blown off, barns destroyed and two schools were damaged. Students had already been released. Several homes and a church at Nimrod Hall were destroyed. Weather turned cold and snow fell after the storm. "In some places, where a house, a barn, a garage or other building stood, there is only a bare spot to indicate where a structure stood, not even a splinter of the building being left." – Lexington News-Gazette 5/7/1929
4/5/1952	Augusta County, Rockingham County	Two tornados occurred in the region. A tornado in Augusta County tracked 1 mile and had a damage path 150 yards wide. No fatalities and 2 people injured. In Rockingham County, a tornado had a damage path 4.9 miles long and 100 yards wide. No damage amounts are known.
4/28/1959	Highland County	An F1 tornado hit Highland County. The path is not known. Damage to property estimated at over $22,000 (2019 dollars)
7/1/1959	Augusta County	An F1 tornado hit Augusta County. It tracked 11.3 miles with a damage path of 100 yards. No fatalities or injuries were reported. Damage to property was over $220,000 (2019 dollars).
8/6/1960	Rockingham County	An F2 tornado occurred in Rockingham County where the damage path is unknown. There were no reported injuries. Damage amounts to property were over $217,000 (2019 dollars)
11/29/1963	Augusta County	An F2 tornado hit Augusta County where the damage path was one mile long. The width is not known. There were no fatalities or injuries. A house under construction was leveled and the roof came off another house. Damage estimated at over $420,000 (2019 dollars).
4/4/1974 "Super Outbreak"	Augusta County, Staunton, Bath County, Highland County	In Augusta County, an F2 tornado struck near Westview, and moved northeast to Weyers Cave. The damage path was 18 miles long and 200 yards wide. The tornado damaged over 90 barns, destroyed 2 homes, and damaged 4 homes, outbuildings and a school. The Verona area was hit hard and Fort Defiance High School lost part of the roof. Damages in Augusta County were $13 million (2019 dollars). There was roof damage to Staunton City Hall. In Bath County, Bacova Junction and Millboro were affected. In Millboro, roofs were blown off, windows broken, and barns damaged. There was a possible touchdown in the Big Valley area of Highland County. These tornadoes were the last of the Super Outbreak which totaled 148 tornadoes over 2 days affecting 13 states. Most of the tornadoes were recorded in a 24 hour period. The average path length of the tornadoes was 18.7 miles. Six of the tornadoes during the Super Outbreak were F5s. 330 people died in the United States with two deaths in Virginia. Nineteen counties in Virginia were hit with thunderstorms or tornadoes.

Table IV-23: Wind Hazard History –continued

Date	Location	Description and Damages
6/5/1975	Augusta County, Rockbridge County	An F0 Tornado struck near Lyndhurst. The weak tornado tracked 0.2 miles with a damage path of 30 yards wide. It destroyed a small building and 25-30 trees. Damage estimated at over $9,000 (2019 dollars). No deaths or injuries were reported. A tornado struck near Collierstown damaging trees and fences. Damage was estimated at over $4,000 (2019 dollars).
8/15/1975	Rockingham County	An F1 tornado struck the Melrose area which is 6 miles northwest of Harrisonburg. The damage path was 1 mile long and 27 yards wide. No injuries were reported. The tornado overturned a trailer, ripped off a roof, and carried away outbuildings. Damages were over $119,000 (2019 dollars)
10/2/1979	Town of Dayton	An F1 tornado had a damage path 1.1 miles long and 37 yards wide. No injuries were reported. It snapped off tree tops and utility poles, and broke windows. The storm flipped an unoccupied trailer. Damages were over $88,000 (2019 dollars).
5/4/1990	Augusta County	An F2 tornado had a damage track 7 miles long and 27 yards wide. It hit Augusta Springs and Swoope. The tornado tracked a mile through the community of Augusta Springs. It lifted 2,500 feet over mountains and set back down again on other side. 2 people were killed in a mobile home in Swoope. Three people were injured in Swoope and 7 were injured in Augusta Springs. Damages were $4.9 million (2019 dollars). The tornado formed in a thunderstorm along a warm front well out ahead of the expected threat area.
6/10/1995	Waynesboro, Augusta County	A strong F2 touched down on the west side of Waynesboro. It tracked 3.5 miles through the County and southwest portion of the City, and had an average damage path of 300 yards wide. No deaths or injuries were reported. It hit an industrial area, peeling off roofs and damaging 15-20 homes. The tornado flipped a 22.5 ton crane and mowed down over 100 pine trees in a park. Quarter sized hail accompanied the storm. Damages were $3.3 million (2019 dollars).
6/24/1996	Town of Broadway	An F1 tornado had a damage path that was 0.5 miles long and 100 yards wide. No injuries. were reported. The tornado tore roofs off 2 homes and 2 poultry houses, and damaged trees. Several chimneys were blown off homes. Damage estimates were over $65,000 (2019 dollars).
7/11/1999	Harrisonburg, Rockingham County	An F0 tornado had a damage path that was 0.1 mile long and 15 yards wide. No injuries were reported. The storm damaged a store's tin roof and singles on a home. Damages were estimated at more than $3,000 (2019 dollars).

Table IV-23: Wind Hazard History –continued

Date	Location	Description and Damages
7/31/1999	Augusta County	An F1 tornado struck 5 miles east of Staunton. The damage path was 0.1 mile long and 100 yards wide. It destroyed a barn, damaged a greenhouse, and took down trees. No injuries were reported. The storm produced 3/4 inch diameter hail. A 100 pound beam from a barn roof was buried in the ground and the roof rolled into a ball by the force of the wind. Damage estimates were over $23,000 (2019 dollars).
5/9/2003	Augusta County	An F0 tornado touched down in Verona, then moved southeast to Hermitage. The tornado downed a 195-foot radio tower. The path of the tornado was 5 miles long and 100 yards wide. The storm also downed trees in New Hope and produced hail near Mt. Solon.
6/23/2006-7/6/2006	Augusta County	Severe storms and tornadoes resulted in flooding in Augusta County.
2/10/2008	Augusta County	High wind resulted in significant damage to trees, utility lines and utility poles in Augusta County.
8/2/2008	Town of Elkton, Rockingham County	An EF0 tornado touched down on the banks of the South Fork of the Shenandoah River along Park Avenue. The tornado's path was 1/4 mile long and 70 yards wide. This series of strong thunderstorms also produced large hail. Witnesses spotted swirling wind and a funnel cloud. Hail and damaging winds also occurred in other parts of Rockingham County downing trees.
4/16/2011	Augusta County, Bath County, Highland County, Lexington, Rockbridge County, Town of Glasgow	An EF1 tornado reached wind speeds in excess of 95 mph traveling 4.1 miles in Augusta County. The tornado damaged 37 structures and downed numerous trees and powerlines. Preliminary damage estimates from Augusta County listed storm damage to 12 residences, 3 businesses, 15 outbuildings, 2 mobile structures and 5 barns. Preliminary damage cost is estimated at over 2.5 million dollars (2019 dollars). An EF0 tornado touched down near Vesuvius in Rockbridge County causing minor damage to a barn and a house, and slightly moving another barn off its foundation. The twister left a path about 100 yards wide and 1.3 miles in length. Wind speeds were estimated at 80 mph. Rockbridge also experienced 3.5 inches of rain and reports of quarter size hail. Numerous trees were reported downed in Lexington and countywide in Rockbridge. In Glasgow, the Maury River reached near flood stage at 18 feet. As many as 33 roads were closed due to high waters and fallen trees, the worst being Rt. 631, Furrs Mill Road. A swift water rescue was required to retrieve two women and two small children stranded in a van. 350 Dominion Power customers lost power. In Bath County, downtown Hot Springs flooded. Flooding, mud and rock slides also occurred in other areas of Bath County damaging roads, driveways, homes and the Warm Springs Pools at the Homestead. Highland County experienced power outages, downed trees and flooded roadways. Highland County Supervisors declared the County a disaster area.

Table IV-23: Wind Hazard History –continued

Date	Location	Description and Damages
4/28/2011	Augusta County, Bath County, Rockbridge County, Rockingham County	Four tornadoes touched down in Augusta County and Rockingham County. The strongest was an EF-2 that started in Fulks Run and traveled 33.2 miles into Shenandoah County, damaging homes and farm buildings; downing trees and causing 2 injuries. An EF-1 tornado occurred in Churchville in Augusta County, and traveled for 4 miles damaging homes, downing trees and destroying outbuildings. Two EF-1 tornados occurred in Rockingham. A tornado in Keezletown was on the ground for 2.7 miles causing tree damage and damage to two homes, farm buildings and an outbuilding. A tornado in Linville traveled for 0.9 miles causing tree damage. Other reported storm damage from the Region included reports of downed trees in Bath County, Rockbridge County, Augusta County and Rockingham County. A tree fell on a trailer in the Colen Hollow area of Rockbridge and damage was reported to houses in Rockingham. The storm brought heavy rains and flooding in Bath County. It caused downed trees and powerlines, washed debris in the road and damaged roads in Burnsville and Williamsville. Rt. 614 Muddy Run Road in front of the Burnsville Volunteer Fire Department and Rescue Squad was washed out. Flooding damaged a home in Williamsville.
6/29/2012	Entire Region	Severe storms and straight-line winds from a derecho impacted the entire Central Shenandoah Region bringing high winds, excessive rain, hail and lightning. In the days afterwards, it was followed by excessive heat. The derecho traveled over 600 miles in about 10 hours. Peak wind gusts were 80-100 mph. In the Valley, a quarter million people lost power. The storm damaged homes, businesses, trees and powerlines. Nine localities were included in a federal major disaster declaration (DR-4072) including Augusta County, Bath County, Buena Vista, Harrisonburg, Highland County, Lexington, Rockbridge County, and Staunton. Three localities- Augusta County, Rockbridge County and Rockingham County- were included in an federal agricultural disaster declaration (S3418).
5/14/2018	Augusta County, Rockbridge County, Rockingham County, Staunton and Waynesboro.	A series of severe thunderstorms with high winds, heavy rain and hail caused flash flooding in the central Shenandoah Valley, resulting in downed trees and power outages. Several homes or businesses in the Region were damaged. In Verona, a family was displaced when flooding caused their basement wall to collapse leading to the condemnation of their home. Homeowners insurance denied the claim since the property was not covered by flood insurance. Strong winds struck a local bank branch during business hours, damaging the building, while employees and customers took shelter in the bank vault. A tree fell damaging a home in Waynesboro. Hail was reported in Verona, and half dollar size hail was reported in Rockbridge County. Trees were reported downed in other areas of Augusta County, Rockingham County and the City of Staunton. 21,000 Dominion Power customers were without power in the region.
10/31/2019	Rockingham County	An EF-0 tornado touched down at 6:04 p.m. on Halloween night in Rockingham County near Timberville. It had a maximum wind speed of 75 mph and a damage path of 0.5 miles long and 25 years wide. There were no injuries and no fatalities. The tornado was produced by a segment of thunderstorms and damaged corn crops and a grove of trees. It destroyed a barn and a small shed. A piece of lumber from the barn impaled the windshield of a nearby vehicle. The path of the tornado ended shortly before it would have crossed several propane tanks at Southern States. Further west on VA-211, straight line winds caused scattered tree limb damage. Prior to the tornado hitting, the entire Region had been placed into a risk level 3 for severe weather with the timeframe of largest concern being during peak trick-or-treating hours. Many festivities in the region were rescheduled as a result.

Hazard Profile

From 1991 to 2010, Virginia averaged 18 tornadoes per year.

In the Region, damaging winds have typically been associated with tornadoes, hurricanes or straight-line winds. In 2012, the Region also experienced a derecho. For information on wind hazards from hurricanes, refer to Section IV-5 on hurricanes.

Tornadoes are classified into six categories using the Enhanced Fujita Scale.

Tornadoes are classified as a violently rotating column of wind that extends between a thunderstorm cloud and the earth's surface. The rotating column of air often resembles a funnel shaped cloud. The widths of tornados are usually several yards across, with infrequent events being over a mile wide. Tornadoes can occur at any time throughout the year, but tornado activity normally spans from March through May with a peak in April. Tornadoes may be produced by thunderstorms, hurricanes or tropical storms. Those tornadoes produced by hurricanes or tropical storms are typically on the eastern half of the outer bands. From 1991 to 2010, Virginia averaged 18 tornadoes each year. The total number may be higher as incidents may occur over areas with sparse populations, or may not cause any property damage.

Tornadoes and their resultant damage can be classified into six categories using the Enhanced Fujita Scale, as shown in Table IV-24. The Enhanced Fujita Scale replaced the original Fujita Scale in 2007. The scale assesses damage in comparison to damage indicators and varying degrees of damage. This assessment is used to estimate wind speeds and assign the rating.

A majority of Virginia's tornadoes are EF-0 and E-F1 on the Fujita Scale/ Enhanced Fujita Scale, as shown in Table IV-24, which result in light or moderate damage. Table IV-23, the Wind Hazard History Chart for the Region has information on twenty-eight tornadoes documented since 1834. In reviewing Table IV-23, the Region has experienced ten F-1 or EF-1 tornadoes, seven F-2 or EF-2 tornadoes, six F-0 or EF-0 tornadoes, and six tornadoes whose rankings are not documented in the table. Figure IV-16 shows the location and intensity of tornado touchdowns in the Region since 1950.

Since tornadoes are less frequent for the Region, the Hurricane Wind analysis covers more probable high wind occurrences. It is also interesting to note that there are no recorded tornadoes in the national forests and parks. This is a result of tornadoes only being recorded when impacts affect people or property. Some areas in the Region appear to be slightly more prone to tornadoes than others. It is thought that this is caused by topographical influences on thunderstorms such as the change in low-level wind flow and humidity caused by the orientation of the mountains. One such area is near the cities of Staunton and Harrisonburg. It should be noted that areas with denser population are more likely to report a tornado than less populated areas.

While the tornadoes that have occurred in the Region do not compare to the numbers or strength of the tornadoes that have touched down in Tornado Alley in the Midwest, the tornadoes that have occurred in the Region have caused property damage, injuries and fatalities. The tornadoes that the Region does experience are most frequently spawned from thunderstorms and have little to no warning time. Tornadoes did affect the Region in three significant events- Virginia's Deadliest Tornado Outbreak in 1929, the Super Outbreak of 1974 and the 2011 Super Outbreak.

Photos IV: 3-5: Structural damages from the April 2011 Tornadoes in Rockbridge County and Augusta County.

Table IV-24: Enhanced Fujita Scale

EF Rating	3 Second Gust (MPH)	Damage Level
EF-0	65 to 85	Light Damage
EF-1	86 to 110	Moderate Damage
EF-2	111 to 135	Considerable Damage
EF-3	136 to 165	Severe Damage
EF-4	166-200	Devastating Damage
EF-5	Over 200	Incredible Damage

Damage Level	Description
Light Damage	Peels surface off some roofs; some damage to gutters or siding; branches broken off trees; shallow-rooted trees pushed over. Confirmed tornadoes with no reported damage (i.e. those that remain in open fields) are supposed to be rated EF0 as a matter of policy; however, some NWS local offices have adopted an "EFU" (for "unknown") rating for such tornadoes.
Moderate Damage	Roofs severely stripped; mobile homes overturned or badly damaged; loss of exterior doors; windows and other glass broken.
Considerable Damage	Roofs torn off from well-constructed houses; foundations of frame homes shifted; mobile homes completely destroyed; large trees snapped or uprooted; light-object missiles generated; cars lifted off ground.
Severe Damage	Entire stories of well-constructed houses destroyed; severe damage to large buildings such as shopping malls; trains overturned; trees debarked; heavy cars lifted off the ground and thrown; structures with weak foundations are badly damaged.
Devastating Damage	Well-constructed and whole frame houses completely leveled; some frame homes may be swept away; cars and other large objects thrown and small missiles generated.
Incredible Damage	Strong-framed, well-built houses leveled off foundations and swept away; steel-reinforced concrete structures are critically damaged; tall buildings collapse or have severe structural deformations; cars, trucks, and trains can be thrown approximately 1 mile.

Source: National Weather Service; The Weather Channel; and Wikipedia.

Figure IV-16: Central Shenandoah PDC Tornado Touchdowns

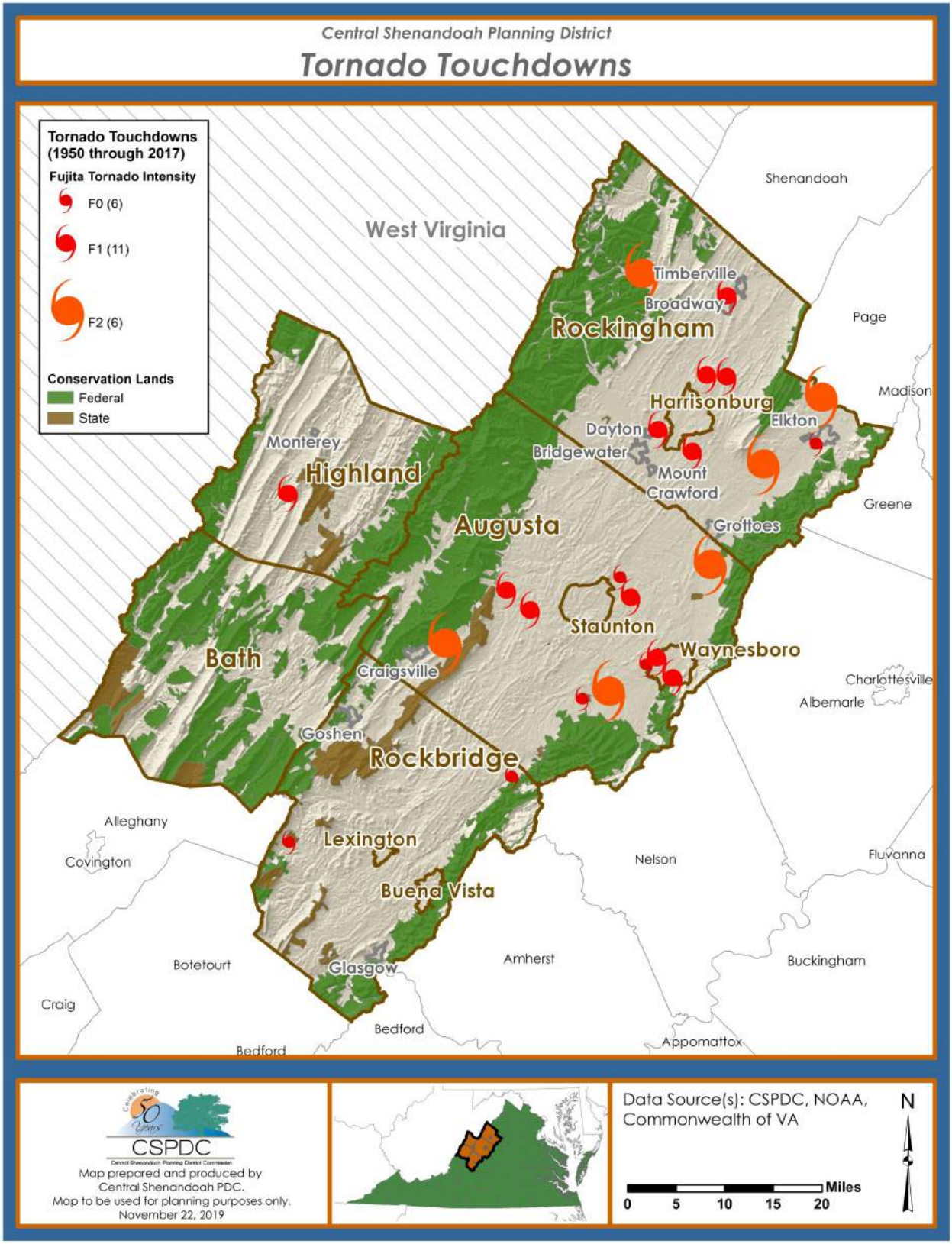
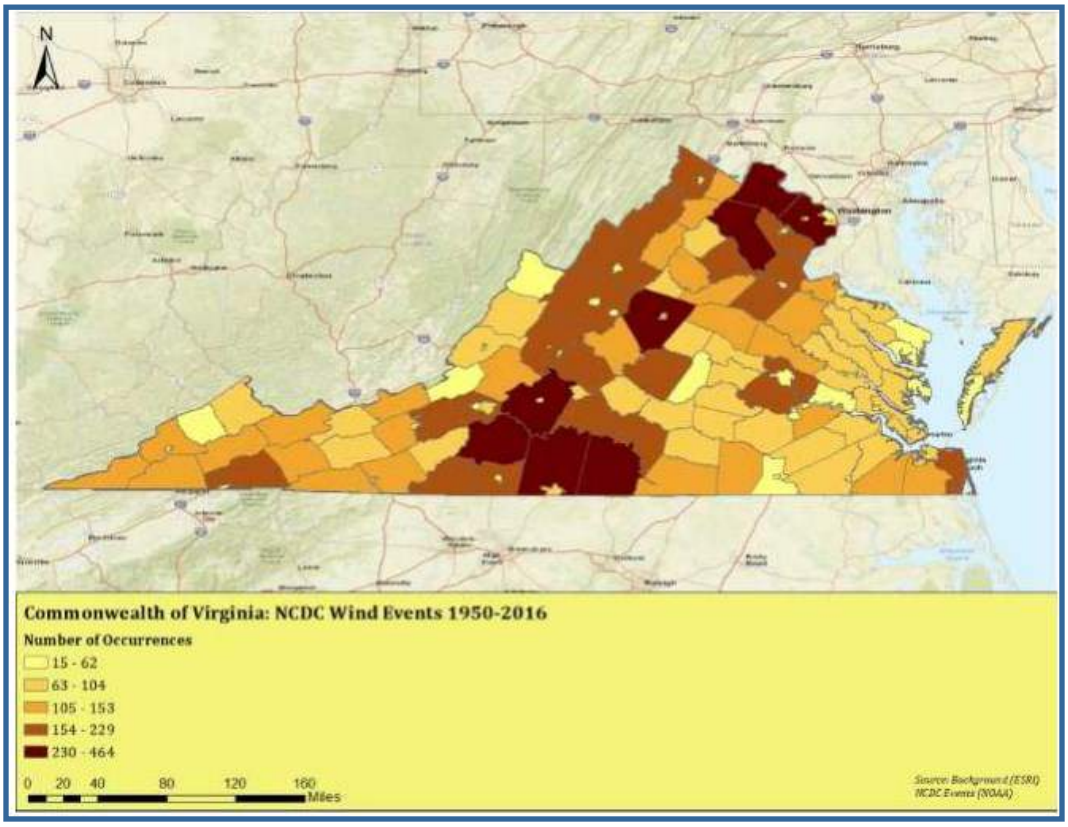


Figure IV-17: NCDC Significant Non-Rotational Wind Events in Virginia (1950 –2016)



Source: Commonwealth of Virginia, 2018 Hazard Mitigation Plan

In addition to tornadoes, the Region has also experienced non-rotational wind events including isolated "downburst" or "straight-line" winds, as well as a derecho.

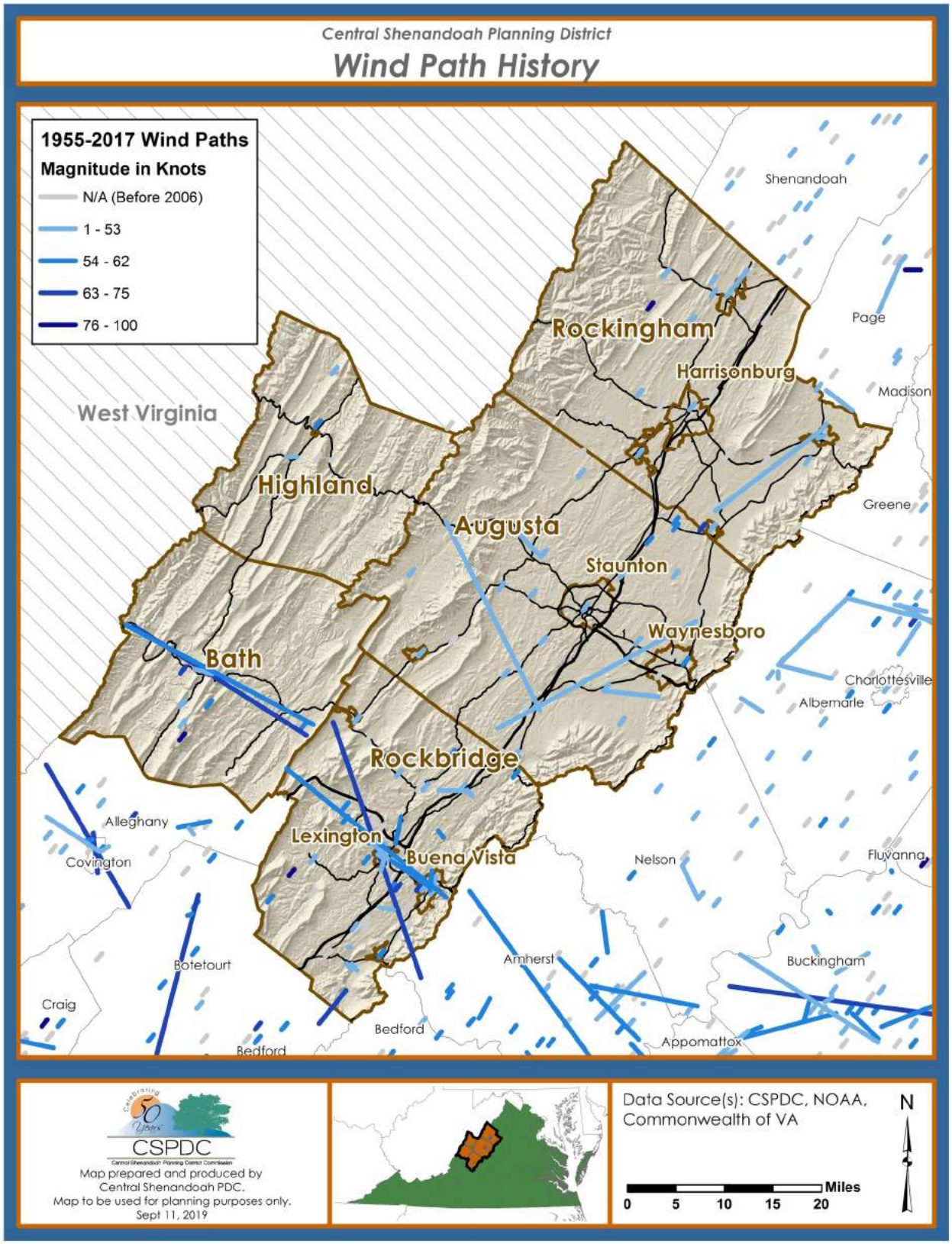
Straight-line winds are associated with thunderstorms and can cause extensive property damage. A more severe type of damage occurs from straight-line winds experienced during a derecho. A derecho is a wind storm that is widespread and long-lived. It is associated with rapidly moving thunderstorms that are in a curved shape, and called bow echoes. Wind speeds during a derecho do vary and are not constant. A storm may be classified as a derecho if the storm includes several wind gusts of 75 mph or greater, wind gusts of at least 58 mph along most of its length, and extends for more than 250 miles. During the storm, straight-line wind damage from downbursts, microbursts and burst swaths occurs, but the damage is similar to that produced by a tornado.

Derechos are more common from May through August during warm weather and intense heat waves. They can be hazardous causing injuries, fatalities and widespread property damage. Due to their rapid movement and short notice, those participating in outdoor activities, as well as those driving vehicles are more vulnerable and at risk. Examples of damages that can occur during a derecho storm include downed trees, utility poles and electrical lines; damaged or overturned vehicles and mobile homes; structural damages to buildings; and injuries or fatalities to people from flying debris. Widespread damage caused to utility poles and electrical lines can cause long-lasting power outages, while the area is also dealing with high temperatures.

While derechos are rare in our region, other occurrences of straight-line wind are more common. Figure IV-17 is from the Commonwealth of Virginia Hazard Mitigation Plan and shows the number of occurrences for wind events in the state using National Climatic Data Center (NCDC) data. According to this map, Rockingham, Augusta, and Rockbridge counties are in the 154 to 229 event range, which are the highest occurrences for the region. The wind events depicted are non-rotational, and do not include weather events such as tornados or hurricanes. Figure IV-18 is a map of wind path history from 1955 to 2017 with magnitudes for the Region using data from the NOAA. Strong wind paths can be seen in Bath and Rockbridge Counties between 76 to 100 knots.

The entire region's population and infrastructure are vulnerable to tornados, derechos and straight-line winds based on the historical occurrences and volatility. Previous tornado events appear to be more common in less mountainous landscapes in the region, especially in Augusta and Rockingham counties, although tornadoes have been known to occur in mountainous areas. However, historical occurrences of derechos and straight-line winds have impacted the entire region. Tornadoes and derechos may occur less frequently in the region but can have a high impact. The severity of damage will depend on the intensity of the wind event and the population density of the storm's path. With the climate changing, this could increase the number of thunderstorms and other wind events in the future.

Figure IV-18: CSPDC Wind Path History



9. Wildfire (Medium Ranking)

Hazard History

From 1995 to 2001, there were 386 wildfires in the Region.

The Virginia Department of Forestry (VDOF) website provided fire incidence data for fire years 1995-2001. The data provided by VDOF was summarized into the following tables.

Table IV-25 provides information on the number of wildfires per county. Table IV-26 is a summary of the number of acres and total damages of wildfires in the Region. Note that the tables do not include data for Towns or Cities; this data was not available through VDOF. Table IV-27 illustrates the cause of fire, broken down by County. The data shows that 27% of fires were caused by debris, followed by 21% caused by incendiary devices and 21% caused under miscellaneous conditions.

The Rocky Mountain Fire in 2016 was the second largest forest fire in the history of Shenandoah National Park.

See Table IV-28 for a list of wildfires that have occurred recently in the Region. This list includes the fires of Rocky Mountain, Goshen Pass and Tye River, which burned thousands of acres.

Table IV-25: Wildfire Statistics by Fire Year 1995-2001

County	1995	1996	1997	1998	1999	2000	2001	Total
Augusta County	17	6	2	20	9	18	24	96
Bath County	5	2		4	6	3	6	26
Highland County	2	1	2	1	4	1	1	12
Rockbridge County	5	3	5	6	5	1	7	32
Rockingham County	36	20	17	18	40	13	76	220
Total	**65**	**32**	**26**	**49**	**64**	**36**	**114**	**386**

Source: Virginia Department of Forestry

Table IV-26: Wildfire Summary 1995 - 2001

Fire Year	1995		1996		1997		1998		1999		2000		2001			
County	Total Acres	Total Damage	Total Acres	Total Damage	Total Acres	Total Damage	Total Acres	Total Damage	Total Acres	Total Damage	Total Acres	Total Damage	Total Acres	Total Damage	Acres Total	Damages Total
Augusta County	61.3	$1,600	6.2	$2,500	2.5	$1,500	482.3	$206,275	113.2	$10,000	214.5	$35,700	355.8	$31,801	1235.8	$289,376
Bath County	17	$4,100	3	$8,500	0	$0	17.3	$2,825	53	$11,200	23	$23,500	93	$58,800	206.3	$108,925
Highland County	29	$1,700	2	$500	2	$500	35	$7,000	35.3	$4,000	0.3	$0	5	$500	108.6	$14,200
Rockbridge County	4.9	$405	0.3	$20	481.1	$6,360	4.6	$170	100.3	$5,150	2	$1,900	31	$112,950	624.2	$126,955
Rockingham County	166.7	$75,560	8.3	$33,725	16.1	$100	24.4	$2,100	151.6	$5,950	10	$0	147	$728,095	524.1	$845,530
Total	**278.9**	**$83,365**	**19.8**	**$45,245**	**501.7**	**$8,460**	**563.6**	**$218,370**	**453.4**	**$36,300**	**249.8**	**$61,100**	**631.8**	**$932,146**	**2699**	**$1,384,986**

Source: Virginia Department of Forestry

Table IV-27: Wildfire Causes 1995-2001

County	Lightning	Camp	Smoking	Debris	Incendiary	Equip. Use	R&R	Child	Misc.	Total
Augusta County	2	3	14	25	17	4	5	3	23	96
Bath County	2	4	1	6	2	5	0	1	5	26
Highland County	5	1	0	2	0	1	0	0	3	12
Rockbridge County	5	0	3	10	1	1	0	2	10	32
Rockingham County	4	4	11	61	61	26	1	12	40	220
Total	**18**	**12**	**29**	**104**	**81**	**37**	**6**	**18**	**81**	**386**

Source: Virginia Department of Forestry

Table IV-28: Recent Wildfires in the Region

Name	Year	Locality	Description
Rocky Mountain Fire (SNP)	2016	Rockingham County	This fire started on 4/16/2016 in Shenandoah National Park and burned 10,326 acres. It was the second largest forest fire in the history of Shenandoah National Park. On April 29 the fire was fully contained.
Goshen Pass Wildfire	2017	Rockbridge County	3,100 Acres were burned from this fire that started on 4/10/2017 in the Goshen area.
Tye River Fire	2018	Rockbridge County Augusta County	This fire was caused by a vehicle fire that quickly spread onto National Forest lands and nearby private lands. The fire was first reported on 5/3/2018 and burned approximately 2,057 acres.

Source: Virginia Department of Forestry

Hazard Profile

A wildfire is an uncontrollable fire spread through vegetative fuels, exposing and possibly consuming structures. They often begin unnoticed and spread quickly and are usually signaled by dense smoke that fills the area for miles around. Naturally occurring and non-native species of grasses, brush, and trees fuel wildfires. Wildfire behavior is based on three primary factors:

1. Fuel - The type, and amount of fuel, as well as its burning qualities and level of moisture affect wildfire potential. The continuity of fuels, expressed in both horizontal and vertical components is also a factor.

2. Topography – The topography is important because it affects the movement of air, fueling the fire over the ground surface. The slope and shape of terrain can change the rate of speed at which the fire travels. In general terms, the steeper the slope of the land, the faster a fire can spread up the slope.

3. Weather – The weather affects the probability of wildfires and has a significant effect on its behavior. Temperature, humidity and wind affect the severity and duration of wildfires. Areas that have experienced prolonged droughts or are excessively dry are also at risk for wildfires.

People start more than four out of every five wildfires, usually due to debris burns, arson, or carelessness. Lightning strikes are the next leading cause of wildfires.

Hazard Areas

Figure IV-19 shows the wildfire vulnerability map with data developed by the Virginia Department of Forestry (VDOF). In 2002 and 2003, VDOF examined which factors influence the occurrence and advancement of wildfires and how

these factors could be represented in a GIS model. VDOF determined that historical fire incidents, land cover (fuels surrogate), topographic characteristics, population density, and distance to roads were critical variables in a wildfire risk analysis. The resulting high, medium, and low risk category reflect the results of this analysis. The large percentage of high risk areas are in national forests and parks. These areas of concern are managed and monitored by the Virginia Department of Forestry.

71% of the woodland homes are considered to have high potential for a wildfire in the Region.

Vulnerability Analysis

Tables IV-29 and IV-30 illustrate the number of homes in woodland homes and communities, as designated by the Virginia Department of Forestry. In the Region, 71% of the woodland homes are considered to have high potential for a wildfire, while 63% of woodland communities in the planning area are considered at high risk for wildfire.

Approximately 14% of the Region's critical facilities are located in a high risk area for wildfires.

The CSPDC also used VDOF data to create the Wildland Fire Incident map seen in Figure IV-21. This data shows a high number of incidents in Augusta and Rockingham counties. There are a total of 522 incidents in the region.

Critical Facilities at Risk

Table IV-31 shows the percentages of critical facilities in fire risk zones. Approximately 14% of the Region's critical facilities are located in a high risk area. Figure IV-20 shows the locations of critical facilities in relation to fire risk zones.

Photos IV: 6-7: Goshen Pass Wildfire, April 2017 (Source: VDOF)

Table IV-29: Woodland Communities Wildfire Risk

County	Low Potential	Medium Potential	High Potential	Total	% High Risk
Augusta	0	21	19	**40**	**48%**
Bath	0	4	4	**8**	**50%**
Highland	N/A	N/A	N/A	**N/A**	**N/A**
Rockbridge	1	6	9	**16**	**56%**
Rockingham		1	25	**26**	**96%**
Total	**1**	**32**	**57**	**90**	**63%**

Table IV-30: Woodland Homes Wildfire Risk

County	Low Potential	Medium Potential	High Potential	Total	% High Risk
Augusta	0	493	580	**1,073**	**54%**
Bath	0	120	65	**185**	**35%**
Highland	0	20	10	**30**	**33%**
Rockbridge	300	82	458	**840**	**55%**
Rockingham	0	25	1,523	**1,548**	**98%**
Total	**300**	**761**	**2,636**	**3,697**	**71%**

Photos IV: 8-9: Tye River Wildfire, May 2018 (Source: Sandra Berry)

Table IV-31: CSPDC Critical Facilities Wildfire Vulnerability

County	Low Potential	Medium Potential	High Potential	Grand Total	% High Risk
Augusta County	72	325	94	**491**	19%
Bath County	5	38	13	**56**	23%
Buena Vista City	35	4	2	**41**	5%
Harrisonburg City	45	19	8	**72**	11%
Highland County	13	22	3	**38**	8%
Lexington City	48	1	3	**52**	6%
Rockbridge County	11	96	14	**121**	12%
Rockingham County	57	78	18	**153**	12%
Staunton City	28	7	3	**38**	8%
Waynesboro City	70	17	4	**91**	4%
Total	**384**	**606**	**159**	**1,153**	14%

Figure IV-19: Wildfire Vulnerability

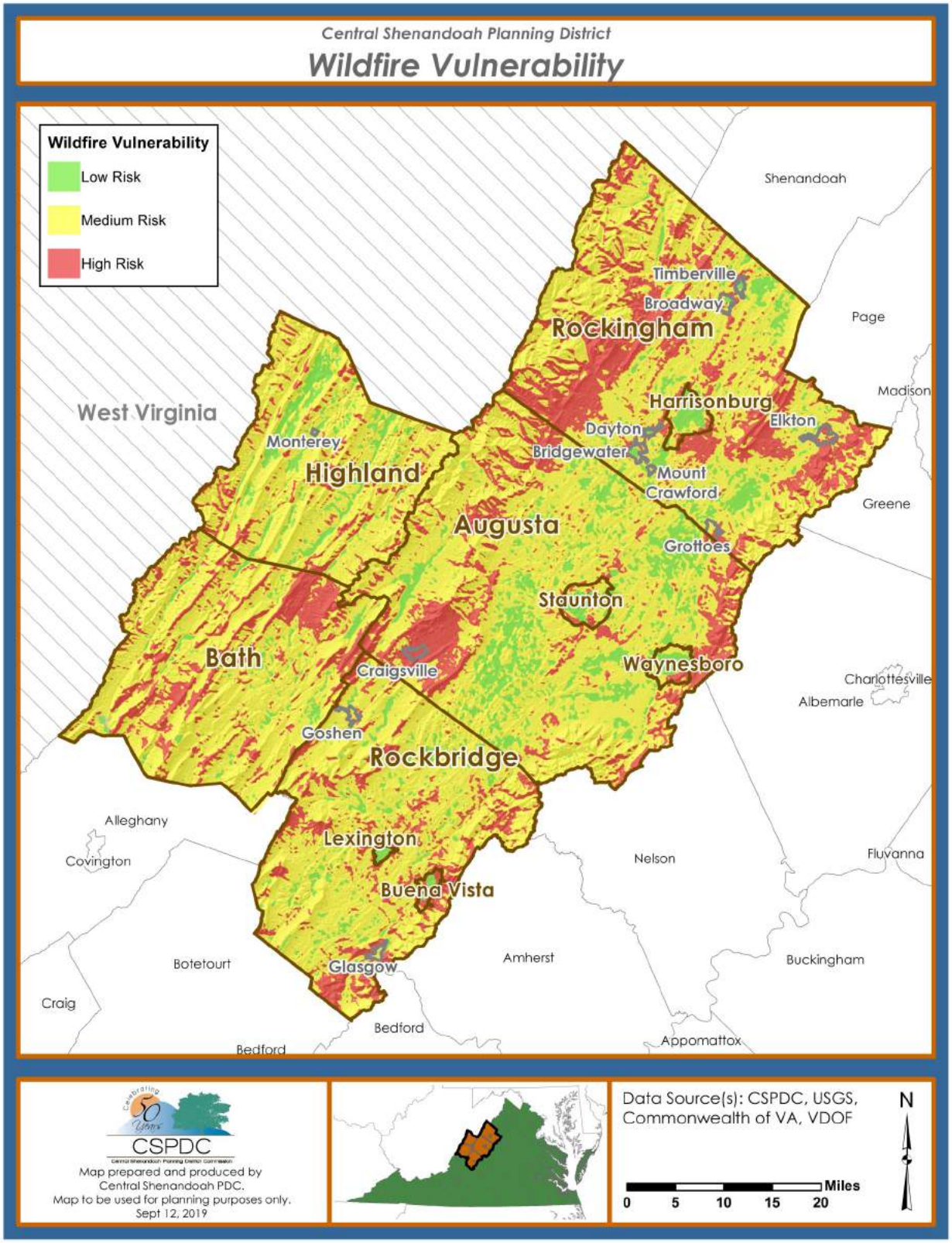


Figure IV-20: Wildfire Vulnerability And Critical Facilities

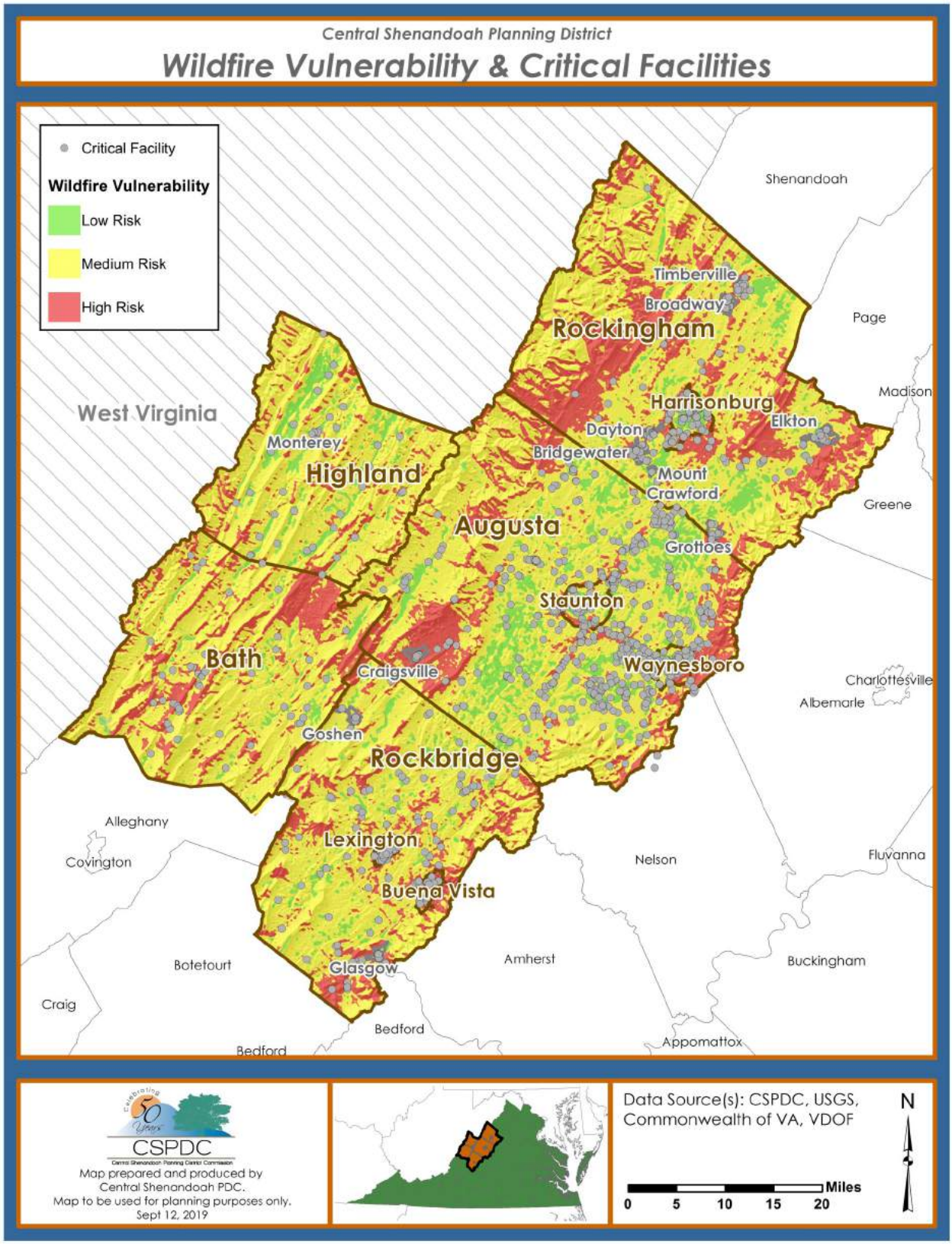
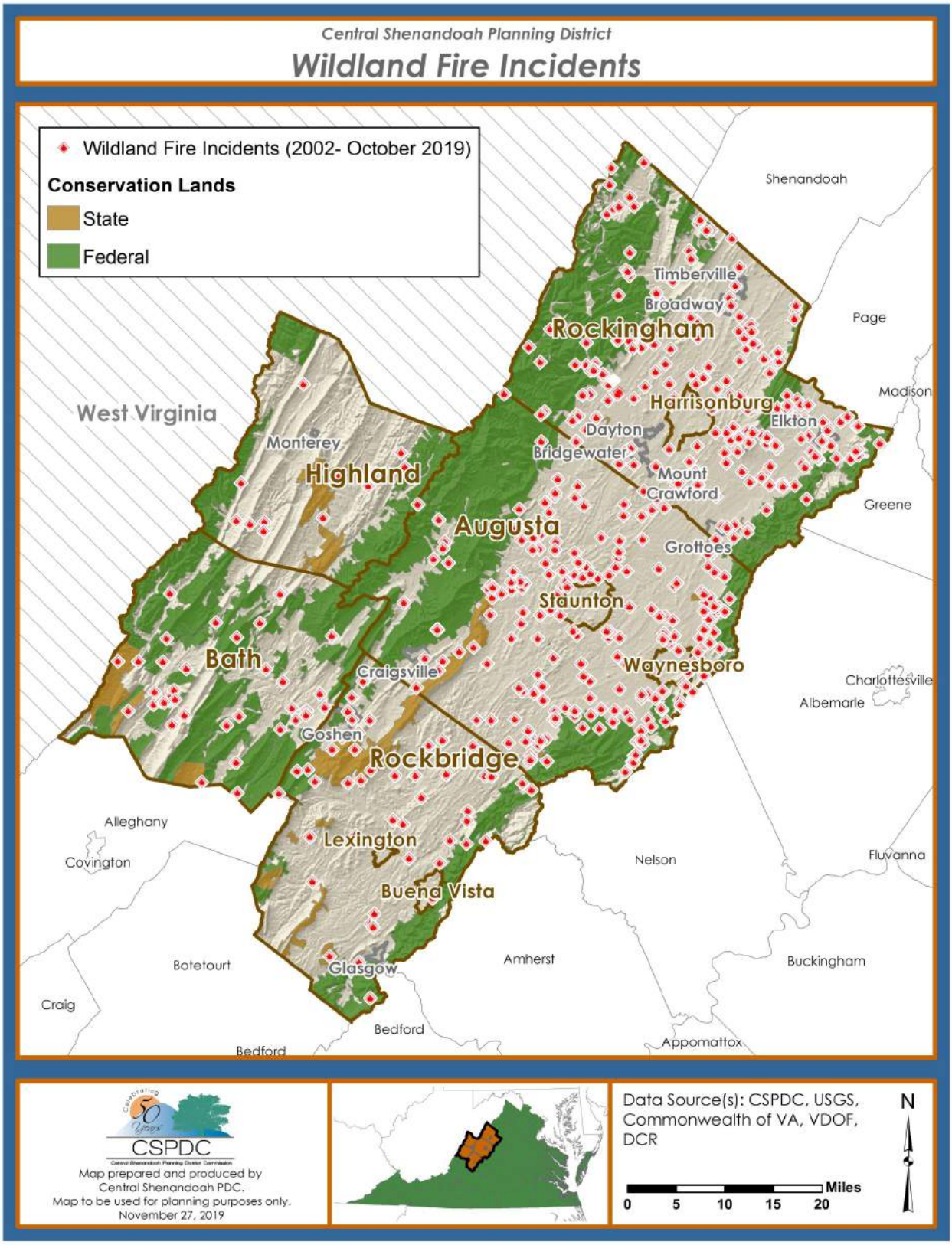


Figure IV-21: Wildland Fire Incidents



Central Shenandoah Valley Community Wildfire Protection Plan

The CSPDC completed the 2020 Central Shenandoah Valley Community Wildfire Protection Plan. This Plan was created to provide a strategy for the community to decrease vulnerability to wildfires that may occur in the Region. The Plan consists of several components including hazardous fuels reduction and fire prevention, vulnerability mitigation, and effective response to incidents that occur. Please see Appendix H to view this Plan.

Photo IV: 10: Rocky Mountain Fire, April 2016 (Source: Bob Adamek)

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10. Landslide (Low Ranking)

Hazard History

The best predictor of future landslides is past landslides in the same place. Figure IV-22 illustrates potential risk areas for the Region. Additionally, areas with steep slopes, poor drainage, and erosion have a greater probability of landslides. Developed hillsides and slopes denuded by wildfires can also lead to landslides. One area in our Region where rock slides are common is Interstate 64 at Afton Mountain, both in Nelson (outside the CSPDC region) and Augusta counties. Many thousands of dollars have been spent removing debris from the highway and installing barriers since the highway was constructed in the late 1960s. The worst landslide in and adjacent to our Region occurred as a result of Hurricane Camille in 1969, where catastrophic debris flows were responsible for the deaths of more than 150 people in the Virginia Blue Ridge. Table IV-32 provides an overview of the history of some of the landslides, mudslides and rockslides in the region. Additional events may have occurred but are not listed.

Table IV-32: History of Landslides

Date	Description and Damages
August 19, 1969	Hurricane Camille was a major storm that made landfall out of the Gulf as a category 5 and weakened to a tropical depression before reaching the state. Flooding and landslides, triggered by saturated soils, resulted in catastrophic damage. Augusta County, Bath County and Rockbridge County were included in a federal major disaster declaration (DR-274).
February 15-February 28, 2003	A severe winter storm brought snowfall, heavy rain, flooding and mudslides. Highland County was included in a federal major disaster declaration (DR-1458).
April 11-April 12, 2011	Heavy rains caused mud and rock slides in Bath County, downing trees and blocking roads. The Cowpasture River crossed Route 42, and flooding, rock slides and mud slides occurred in areas near Burnsville, Williamsville, Bacova, and Bolar. No homes were damaged, but several road washouts occurred. Flooding occurred in northern Augusta County.

Table IV-32: History of Landslides - continued

Date	Description and Damages
April 16, 2011	An EF1 tornado reached wind speeds in excess of 95 mph traveling 4.1 miles in Augusta County. The tornado damaged 37 structures and downed numerous trees and powerlines. Preliminary damage estimates from Augusta County listed storm damage to 12 residences, 3 businesses, 15 outbuildings, 2 mobile structures and 5 barns. Preliminary damage cost is estimated at over 2.5 million dollars (2019 dollars). An EF0 tornado touched down near Vesuvius in Rockbridge County causing minor damage to a barn and a house, and slightly moving another barn off its foundation. The twister left a path about 100 yards wide and 1.3 miles in length. Wind speeds were estimated at 80 mph. Rockbridge also experienced 3.5 inches of rain and reports of quarter size hail. Numerous trees were reported downed in Lexington and countywide in Rockbridge. In Glasgow, the Maury River reached near flood stage at 18 feet. As many as 33 roads were closed due to high waters and fallen trees, the worse being Rt. 631, Furrs Mill Road. A swift water rescue was required to retrieve two women and two small children stranded in a van. 350 Dominion Power customers lost power. In Bath County, downtown Hot Springs flooded. Flooding, mud and rockslides also occurred in other areas of Bath County damaging roads, driveways, homes and the Warm Springs Pools at the Homestead. Highland County experienced power outages, downed trees and flooded roadways. Highland County Supervisors declared the County a disaster area.
July 12, 2018	Augusta County, Highland County, and Rockingham County were included in an agricultural disaster designation (4378) for severe storms, flooding, landslides and mudslides.
June 29-June 30, 2019	Severe storms resulted in flooding, landslides and mudslides. Augusta County, Highland County, Rockingham County, Harrisonburg, Staunton and Waynesboro were included in an agricultural disaster designation (4455).

Hazard Profile

A landslide is a downward movement of a slope and masses of rock, earth or debris materials under the force of gravity. Some move slowly causing gradual damage, while others move rapidly destroying property unexpectedly. They are activated by rainstorms, snowmelts, earthquakes, fires, volcanoes and by human modification to the land such as mining and construction. They are common all over the United States and cause up to 2 billion dollars in damages and from 25 to 50 deaths annually. Common types of landslides include rock slides, slumps, mudslides, debris flows, avalanches, and earth flows. Types of landslides vary depending on the amount of water and type of materials that they carry. Landslides usually affect infrastructure such as roads and bridges,

but they can also affect individual buildings and businesses, especially those located close to dangerous topographic features such as the top or bases of slopes or in valleys.

Landslides occur in every state and U.S. territory and are common throughout the Appalachian Region, particularly where there are steep slopes, clay-rich soils, periodic heavy rains and vegetation loss caused by wildfires. A debris flow event can be expected to occur somewhere in the southern Appalachian Mountains on the order of once every three years.

Several natural and human factors may contribute to or influence landslides. How these factors interrelate is important in understanding the hazard. The three principal natural factors are topography, geology, and precipitation. The principle human activities are cut-and-fill construction for highways, construction of buildings and railroads, and mining operations.

The USGS recognizes four major impacts caused by land subsidence:

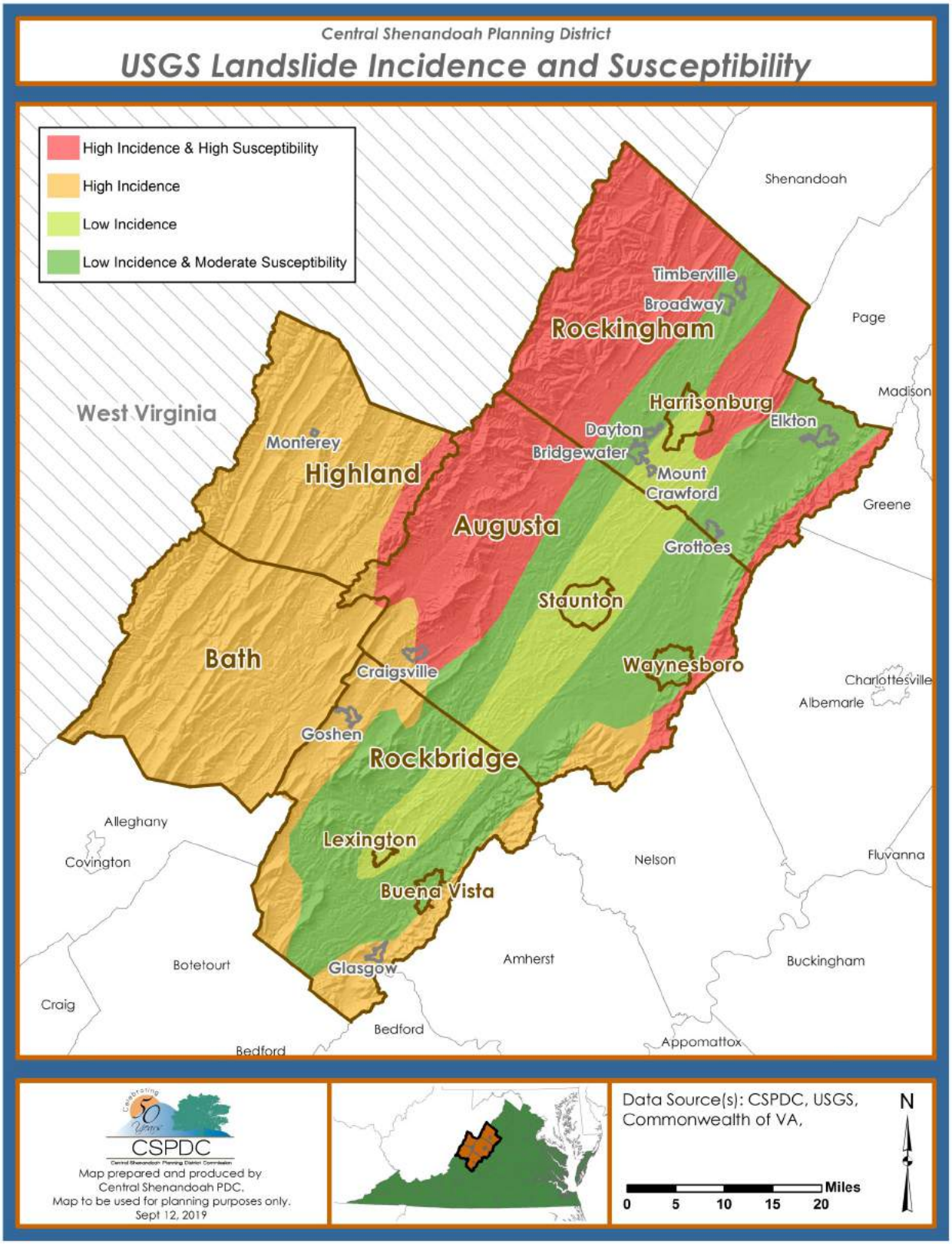
- changes in elevation and slope of streams, canals, and drains;
- damage to bridges, roads, railroads, storm drains, sanitary sewers, canals, and levees;
- damage to private and public buildings;
- and failure of well casings from forces generated by compaction of fine-grained materials in aquifer systems.

Landslides can cause serious damage to highways, buildings, homes, and other structures that support a wide range of economies and activities. Landslides commonly coincide with other natural disasters. Expansion of urban development contributes to greater risk of damage by landslides.

Hazard Areas

According to the landslide susceptibly and incidence map (Figure IV-22) Augusta and Rockingham Counties have the highest susceptibility and incidence risk in the region. The remaining areas are characterized as areas of high incidence. These areas are broadly defined and mapped with a general understanding of landslide hazard risks. A more detailed study would be required to determine the actual vulnerable structures at individual sites within these risk areas.

Figure IV-22: USGS Landslide Susceptibility



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11. Earthquake (Low Ranking)

Hazard History

Since 1853, there have been 9 earthquakes with epicenters within, or within close proximity to the Region.

Since 1853, there have been 9 earthquake epicenters within, or within very close proximity to the Region. Some of these earthquakes were of a low intensity level and may not have been felt by humans or caused property damage. Refer to Table IV-33 and Figure IV-23 for the earthquake description and damages, as well as the epicenter location.

The highest magnitude level with an epicenter in the Region was 4.6 Mb recorded during an 1853 earthquake.

The Region has also been impacted by earthquakes with epicenters in other areas. Table IV-34 and Table IV-35 provide an overview of historic and modern earthquakes felt within the region with epicenters in other locations of Virginia. Historic earthquakes are those that were documented based on observations and historical records. Modern earthquakes are those that have been recorded since a network of seismometers was installed in 1963. Figure IV-24 shows the epicenter locations of all earthquakes in Virginia from 1744 to 2017. Based on review of records, property damage in the region has thus far been minimal.

Table IV-33: Historic and Modern Earthquake Epicenters located within or within close proximity to the Region

Date	Description and Damages
May 2, 1853	A 4.6 magnitude (Mb) earthquake had an epicenter near the Highland County, Virginia/Pendleton County, West Virginia border with a VI intensity. It occurred at 9:20 a.m. and was felt across a multi-state area from Washington D.C., Virginia, West Virginia and Ohio. Reports indicate the earthquake was felt in an area between 61,400 sq. miles and 72,000 sq. miles. No damage was reported.
February 8, 1910	A 3.2 magnitude (MAG) earthquake had an epicenter near New Market, VA, in close proximity to the Rockingham County/Shenandoah County border. It was felt in the Shenandoah Valley over an area of 500 to 1,000 square miles. The main shock was felt at 9:00 a.m., with two aftershocks following at 9:05 a.m. and 9:30 a.m.

Table IV-33: Historic and Modern Earthquake Epicenters located within or within close proximity the Region - continued

Date	Description and Damages
June 10, 1927	A 3.6 magnitude (MAG) earthquake had an epicenter in southeastern Augusta County at 2:16 a.m.. It was felt over a 2,500-2,900 square mile area which included Augusta County, Charlottesville, Richmond, and Campbell County. No damage was reported, but the earthquake did rattle windows and wake people up in Richmond.
November 5, 1980	A 2.8 magnitude (ML) earthquake had an epicenter in Bath County near the Virginia/West Virginia state line at 4:48 p.m. with a depth of 3.8 km.
June 6, 1981	A 0.5 magnitude (Mc) earthquake had an epicenter in southeastern Highland County, near the Augusta County border at 4:06 a.m. with a depth of 14 km.
November 23, 1981	A 2.1 magnitude (MLD) earthquake with a depth of 9.8 km had an epicenter in Augusta County, north of the City of Staunton at 8:15 a.m. Loud noises were reported, with descriptions ranging from a blast or sonic boom to a low rumble or muffled explosion. The earthquake caused houses to shake, with rattling windows and picture frames.
June 16, 1982	A 2.1 magnitude (MLD) earthquake with a depth of 10.9 km had an epicenter in Augusta County, northeast of the City of Waynesboro at 1:41 p.m.
May 29, 1984	A 1.3 magnitude (MLD) earthquake with a depth of 7.4 km had an epicenter in Augusta County, northeast of the City of Waynesboro. It was located near Jarmans Gap and occurred at 6:29 a.m.
December 27, 1997	A 2.2 magnitude (Mc) earthquake had an epicenter in southwestern Bath County, near Healing Springs at 2:45 a.m.

Source: Anne C. Witt, Wendy S. Kelly,, Matthew J. Heller, and David B. Spears, 2017, Virginia Department of Mines, Mineral and Energy, Division of Geology and Mineral Resources, "GIS Fault Mapping of Virginia Seismic Zones"

Table IV-34: Historic Earthquakes Felt Within the Region

Date	Description and Damages
February 21, 1774	An earthquake with an estimated magnitude (Mb) of 4.5 and a probable epicenter southeast of Richmond was felt over an 130,000 sq. km. area of Virginia and North Carolina. Near the epicenter, serious structural damage to homes were reported. The earthquake caused houses to shake across the state, and a loud noise was heard in Richmond. Aftershocks were reported on February 22 and February 23. A portion of the Region is estimated to have been included in the felt area.
March 9, 1828	An earthquake with an estimated magnitude (Mb) of 5.0 and a MMI intensity of V was felt over a 500,000 sq. km. area of Pennsylvania, Maryland, Delaware, Washington, D.C., West Virginia, Ohio, Kentucky, Tennessee and South Carolina. The probable epicenter was southwestern Virginia. A loud rumbling was reported; and dishes, windows and doors shook.
August 27, 1833	An earthquake with an estimated magnitude (Mb) of 5.0 and a maximum intensity of VI had a felt area of 150,000 sq. km. in Virginia, Maryland, and North Carolina. No damage was reported, but a loud rumbling sound was reported, and two coal miners were killed. Documents record that in our region, the earthquake was felt in Lexington.
April 29, 1852	An earthquake with an estimated magnitude (mbLg) of 4.9 and a maximum intensity of VI had a felt area of 490,000 sq. km. in Virginia, Maryland, North Carolina, Ohio, Pennsylvania and Tennessee. The probable epicenter was Wytheville and two separate shocks were reported. In the region, the earthquake caused buildings to violently shake in Staunton.
May 2, 1853	An earthquake with an estimated magnitude (Mb) of 4.6 and a maximum intensity of VI had a felt area of 190,000 sq. km. The probable epicenter was located west of the Central Virginia Seismic Zone, and was felt as far away as Ohio. No damage was reported.
December 22, 1875	An earthquake with an estimated magnitude (MbLG) of 4.5 and a maximum intensity of VII was felt over a 130,000 sq. km area including Virginia, Maryland and North Carolina. The probable epicenter was 50 miles northwest of Richmond. The shock caused property damage in Richmond. Prior to the August 23, 2011 earthquake, this earthquake was the most damaging earthquake to occur with an epicenter in the Central Virginia Seismic Zone. The region was included in the felt area and had estimated intensity levels of III to IV.

Table IV-34: Historic Earthquakes Felt Within the Region—continued

Date	Description and Damages
May 31, 1897	An earthquake with an estimated magnitude (Mw) of 5.5 and a maximum intensity of VII was felt over an 780,000 sq. km. area from Georgia to Pennsylvania, and as far away as Indiana. It is on record as one of Virginia's largest earthquakes. The epicenter was in Giles County, in southwest Virginia. Property damage to homes were reported near the epicenter, and in a wide area around the epicenter in Virginia, West Virginia, Tennessee and North Carolina. The earthquake also disturbed springs and triggered landslides. In addition to the main shock on May 31, 1897, a foreshock and a series of aftershocks were recorded. The foreshock occurred on May 3, 1897 and caused property damage in southwest Virginia and North Carolina with an intensity of VII. The series of aftershocks did not cause any significant damage. They were reported on June 28, September 3 and October 20, 1897. The June 28 aftershock was felt in Lexington.
February 13, 1899	An earthquake with an estimated magnitude (Mb) of 4.7 and a maximum intensity of V was felt over an 80,000 sq. km. area. The epicenter was near Wytheville. As many as four separate shocks were felt, causing buildings to shake, furniture to move and a rumbling noise reported. No property damage was reported. Portions of the region were included in the estimated felt area.
April 9, 1918	An earthquake with an estimated magnitude MI of 4.6 and a maximum intensity of VI was felt over an 180,000 sq. km area including Virginia, West Virginia, Maryland, Pennsylvania, Delaware and New Jersey. As many as three shocks, and several aftershocks were reported. The epicenter was near the Town of Luray and in the Shenandoah Valley, the earthquake resulted in property damage from broken windows and cracked plaster.

Source: Wendy S. Kelly, Anne C. Witt, Matthew J. Heller, and Martin C. Chapman, 2017, Virginia Department of Mines, Mineral and Energy, Division of Geology and Mineral Resources, Publication 185, "Seismic History of Virginia"

Table IV-35: Modern Earthquakes Felt Within the Region

Date	Description and Damages
December 9, 2003	An earthquake with a magnitude (MbLg) of 4.5 and a maximum intensity of VI was felt in Virginia, North Carolina, South Carolina, Tennessee, Kentucky, West Virginia, Ohio, Pennsylvania, New Jersey, Delaware and Maryland. The earthquake had a focal depth of 10 km and the epicenter was 60 km west of Richmond, The earthquake included two 4.5 magnitude shocks that occurred 12 seconds and 300 meters apart. No structural damage was reported. Earlier in the year, the shock had been preceded by a 3.6 magnitude shock with an epicenter a few kilometers away.
August 23, 2011	An earthquake with a magnitude (Mw) of 5.8 and a maximum intensity of VIII was felt over the entire eastern United States and into Canada. The epicenter was located near the Town of Mineral in Louisa County, within the Central Virginia Seismic Zone. It is the most damaging earthquake ever felt in Virginia and had a depth of 8 km. Total damages from the earthquake exceeded $343 million (2019 dollars), and eight counties were declared as a federal disaster area (DR-4042). In Louisa County, over 1,500 damage reports were received. Seven homes were destroyed, and 120 homes received major damage. Louisa County Public Schools experienced more than $68 million (2019 dollars) in damages, with two schools damaged beyond repair and condemned. Students were in school when the earthquake hit. Fortunately, no major injuries or fatalities were reported. The school system had to shut-down for several weeks. An automatic shutdown occurred at North Anna Nuclear Generating Station, located only 11 miles from the epicenter. No critical facilities at the nuclear station were affected, and the station experienced only minor damage. Public infrastructure was damaged, including damage to two small dams, the failure of a water main in the Town of Mineral, and power outages. Disturbance in wells and groundwater levels were reported. Damage was reported as far away as Maryland, and the National Cathedral and the Washington Monument were damaged. In the Central Shenandoah Valley Region, minimal damage occurred which included cracks in the foundations of structures and falling pictures. Following the earthquake, a series of over 500 aftershocks were recorded.

Source: Wendy S. Kelly, Anne C. Witt, Matthew J. Heller, and Martin C. Chapman, 2017, Virginia Department of Mines, Mineral and Energy, Division of Geology and Mineral Resources, Publication 185, "Seismic History of Virginia"

Figure IV-23: Earthquake Epicenters located within, or in close proximity to the Region

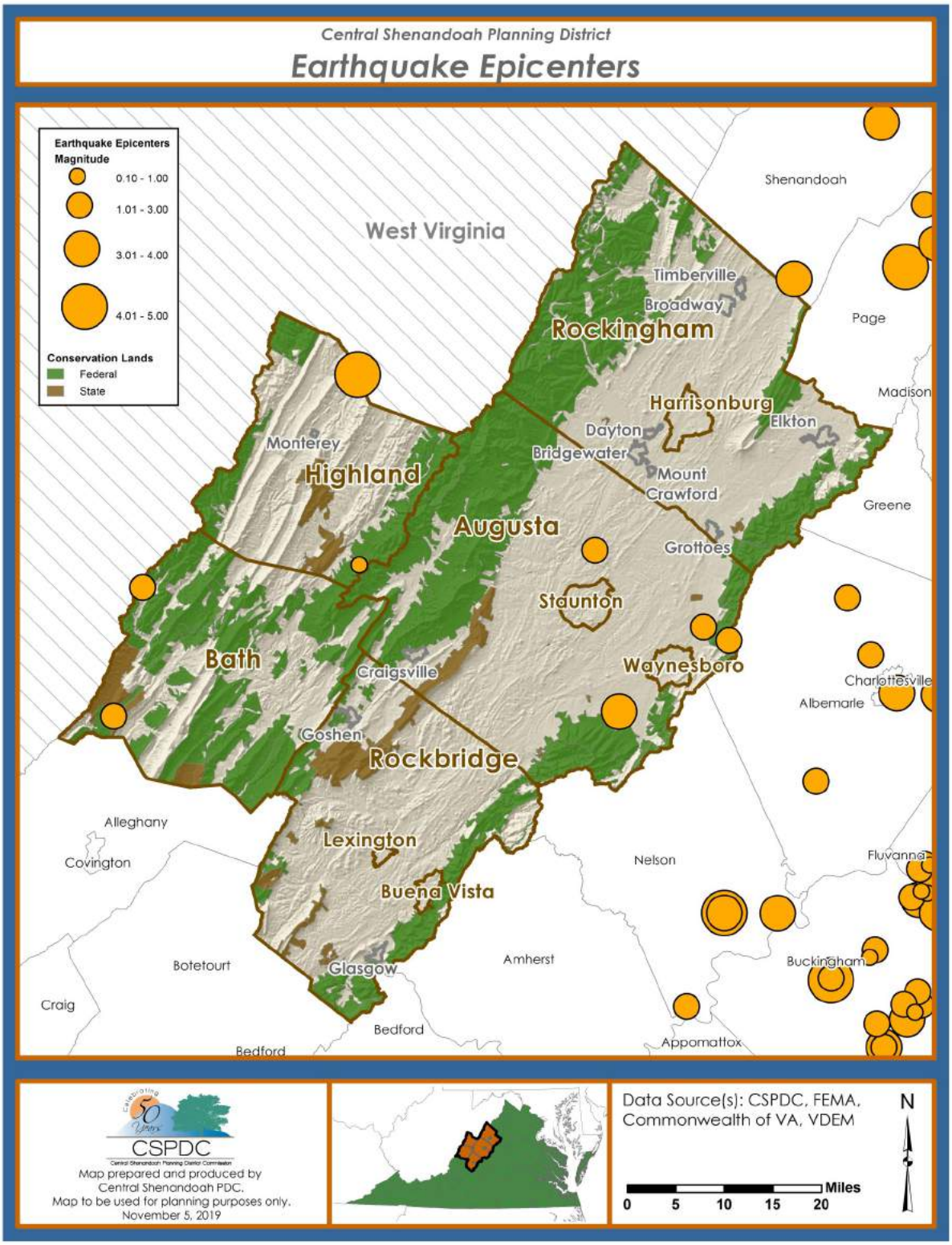
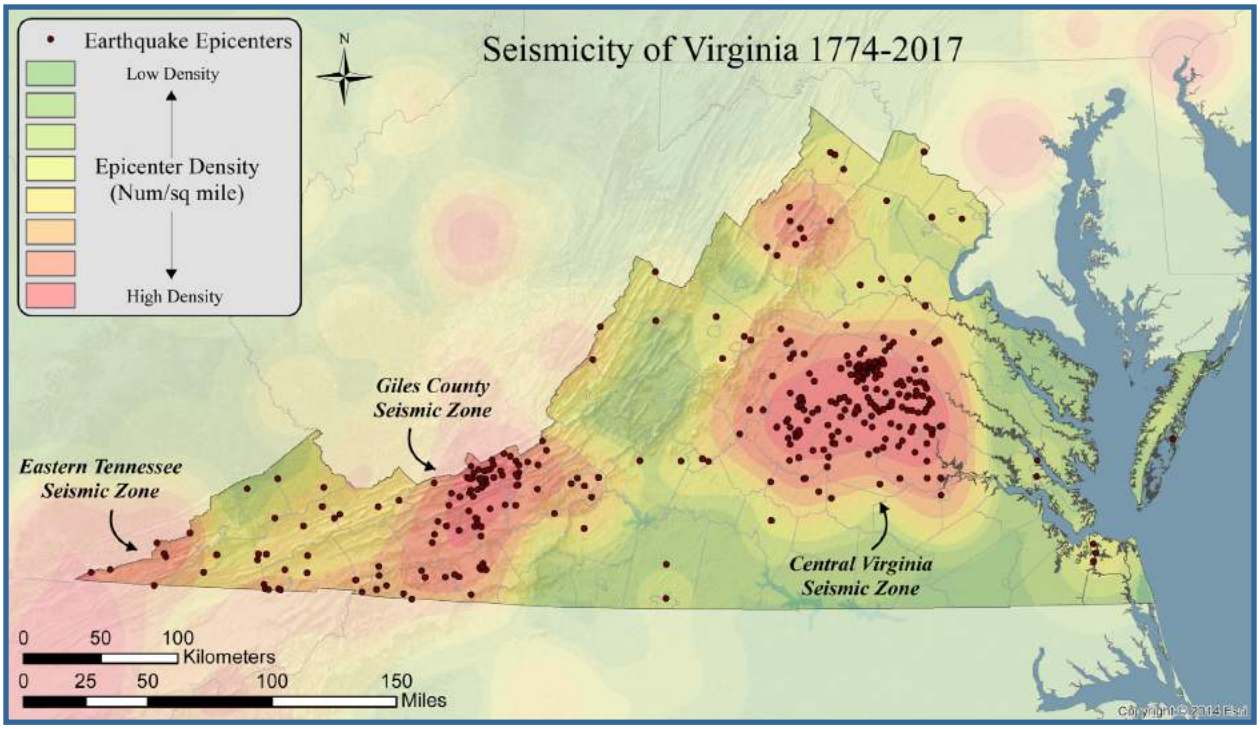


Figure IV-24: Seismicity of Virginia, 1744-2017



Source: Wendy S. Kelly, Anne C. Witt, Matthew J. Heller, and Martin C. Chapman, 2017, Virginia Department of Mines, Mineral and Energy, Division of Geology and Mineral Resources, Publication 185, "Seismic History of Virginia"

Hazard Profile

An earthquake is the result of a sudden release of energy in the Earth's crust.

Earthquakes are caused mostly by rupture of geologic faults, but also by volcanic activity, landslides, mine blasts, changes in groundwater storage, and nuclear tests. An earthquake is the result of a sudden release of energy in the Earth's crust that creates seismic waves. An earthquake's point of initial rupture is called its focus or hypocenter. The point at ground level directly above the hypocenter is the epicenter. The focal depth is the depth from the epicenter to the hypocenter. Once the seismic waves reach the surface, they become surface waves and travel away from the epicenter, causing shaking.

Earthquakes are measured both in magnitude and in intensity level.

Earthquakes are measured both in magnitude and intensity level. Magnitude is a measurement of the relative size of the earthquake compared to other standard earthquakes based on a logarithmic scale. Over time, magnitude has been measured on different scales, with moment magnitude (Mw) being used since 2000. Earthquake intensity is measured based upon the impacts on humans and man-man structures using the Modified Mercalli Intensity (MMI) Scale. It uses a scale of I to XII, with I being rarely felt and XII causing total damage. The intensity of the shaking lessens the further away from the epicenter location. Figure IV-25 depicts earthquake magnitude and the typical correlated intensity.

Earthquake hazards exist in both plate boundaries and intraplate settings. The largest percentage of earthquakes on Earth, 81 percent, occur in the "Ring of Fire" along the Circum-Pacific seismic belt. In this region, earthquakes are caused by the subduction of the ocean crust along the boundaries of the tectonic plats. The other two prominent areas include the Alpide earthquake belt and a belt that follows the Mid-Atlantic Ridge.

Virginia is located in an intraplate setting, within the North American tectonic plate where the tectonic strain is diffused. The state has thousands of geologic faults and three seismic zones– Central Virginia Seismic Zone, the Giles County Seismic Zone and the Eastern Tennessee Seismic Zone. Seismic zones are areas

Figure IV-25: Earthquake magnitude and typical correlated intensity

Magnitude		Intensity (Modified Mercalli)	
1.0 - 3.0		I	Rarely felt by humans
6.0 - 6.9	3.0 - 3.9	II	Felt by only a few people at rest, especially on upper floors of buildings
		III	Felt quite noticeably by persons indoors, especially on upper floors of buildings. Many people do not recognize it as an earthquake. Standing motor vehicles may rock slightly. Vibrations similar to the passing of a truck. Duration estimated.
	4.0 - 4.9	IV	Felt indoors by many, outdoors by few during the day. At night some people are awakened. Dishes, windows, doors disturbed; walls make cracking sound. Sensation like heavy truck striking striking building. Standing motor vehicles rocked noticeably.
		V	Felt by nearly everyone; many awakened. Some dishes, windows broken. Unstable objects overturned. Pendulum clocks may stop.
	5.0 - 5.9	VI	Felt by all, many frightened. Some heavy furniture moved; a few instances of fallen plaster. Damage slight.
		VII	Damage negligible in buildings of good design and construction; slight to moderate in well-built ordinary structures; considerable damage in poorly built or badly designed structures; some chimneys broken.
		VIII	Damage slight in specially designed structures; considerable damage in ordinary substantial buildings with partial collapse. Damage great in poorly built structures. Fall of chimneys, factory stacks, columns, monuments, walls. Heavy furniture overturned.
	7.0 and higher	IX	Damage considerable in specially designed structures; well-designed frame structures thrown out of plumb. Damage great in substantial buildings, with partial collapse. Buildings shifted off foundations.
		X	Some well-built wooden structures destroyed; most masonry and frame structures destroyed with foundations. Rails bent.
		XI	Few, if any (masonry) structures remain standing. Bridges destroyed. Rails bent greatly.
		XII	Damage total. Lines of sight and level are distorted. Objects thrown into the air.

Source: Wendy S. Kelly, Anne C. Witt, Matthew J. Heller, and Martin C. Chapman, 2017, Virginia Department of Mines, Mineral and Energy, Division of Geology and Mineral Resources, Publication 185, "Seismic History of Virginia"

with elevated seismic activity. The nearest seismic zone to the Region is the Central Virginia Seismic Zone, which extends into Albemarle County, adjacent to the Region. The largest earthquake to occur in Virginia's history is the August 23, 2011 earthquake which had an epicenter in Mineral, located within the Central Virginia Seismic Zone.

Although the Region is not located within a seismic zone, based upon historical records, nine earthquakes with epicenters in the Region have occurred since 1853. The majority of the earthquakes have had a magnitude below 3.0, which has a corresponding intensity level rarely felt by humans. The earthquake with the largest magnitude size was a May 2, 1853 earthquake near the Highland County/Pendleton County line. It had a magnitude of 4.6 Mb with an intensity level of VI on the Modified Mercalli Intensity Scale.

Hazard Areas

Following the August 23, 2011 earthquake in Louisa County, the Virginia Department of Mines, Minerals and Energy Division of Geology and Mineral Resources received Hazard Mitigation Grant funding from FEMA and the Virginia Department of Emergency Management (HGMP-4042-000-014). The purpose of the funding was to reduce the impact of future earthquakes in Virginia through:

- Creating a report with a map of prior documented events about past damaging earthquakes in the state.
- Compiling identified faults from existing geologic maps into an ArcGIS geodatabase.
- Conducting geological field studies to verify and classify identified faults.
- Studying the epicentral area of the 2011 earthquake using LiDaR data to identify faults.
- Identifying communities and infrastructure at greatest risk of future damage by conducting GIS analysis.
- Presenting the results in the affected communities to planning and emergency management agencies.

The analysis by the Division of Geology and Mineral Resources resulted in key findings including:

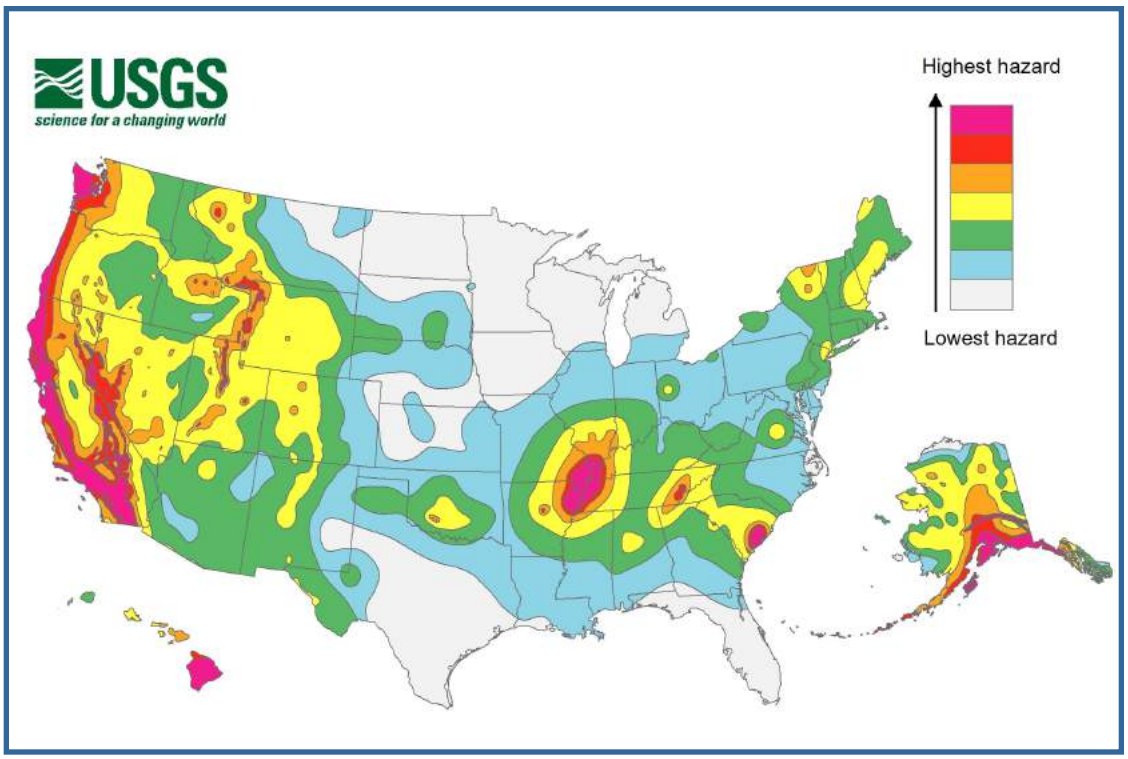
- "Earthquakes are common and widespread in Virginia. Since 1774, 476 earthquakes have been reported. 56 of 95 Virginia counties contain an earthquake epicenter. Earthquakes have occurred in 21 or 27 of Virginia's planning districts."
- "Earthquakes are more common in some parts of Virginia. Since 1774, approximately 90% of seismic events have been spatially associated with the Central Virginia Seismic Zone, the East Tennessee Seismic Zone or the Giles County Seismic Zone…"
- "Damaging earthquakes are rare in Virginia…"

- "Many thousands of faults exist in Virginia…"
- "Most of the faults in Virginia are geologically very old and are not active…"
- "Mapped fault locations at the surface of the Earth do not correlate well with historic epicenter locations in Virginia...in light of this information it is not appropriate to use the locations of mapped faults to assign seismic hazard or risk."

The report discussed that the three seismic zones in the state– the Central Virginia Seismic Zone, the Giles County Seismic Zone and the Eastern Tennessee Seismic Zone– are recognized as having a higher frequency of earthquakes based upon historical records. Over 90% of seismic events have been located in these zones. It was noted though that earthquakes do occur outside of those boundaries, and as a result the zones should not be used to assess seismic hazard. A recommended resource to assess seismic risk and hazard is Figure IV-26, a Seismic Hazard Map produced by the U.S. Geologic Survey. Based on the map, the Region is located in the second lowest hazard ranking.

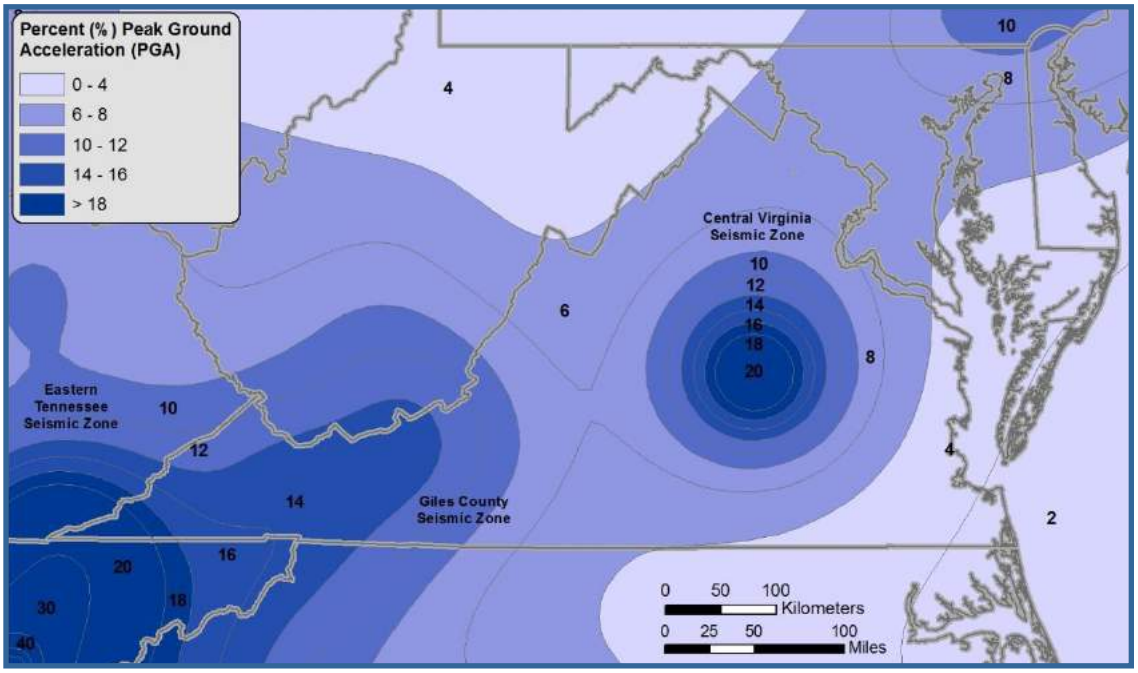
The Division of Geology and Mineral Resources also conducted a GIS analysis to identify those communities and infrastructure that were at greatest risk for future earthquakes based upon the peak ground acceleration for a two percent probability of exceedance in a 50 year period. The results of the analysis are shown in Figure IV-27. Areas of the Region are identified as having a 6% or a 4% probability. Those percentages are designated as being in either the very light damage category (6-8%) or the no damage category (0-4%). The very light damage category generally results in little to no reported damage other than broken dishes, broken windows, stopping of pendulum clocks, or overturning of unstable objects.

Figure IV-26: 2014 USGS National Seismic Hazard Map



Source: U.S. Geological Survey

Figure IV-27: Statewide map showing U.S. Geological Survey Percent Peak Ground Acceleration for a 2% probability of exceedance in a 50 year period.



Source: Anne C. Witt, Wendy S. Kelly,, Matthew J. Heller, and David B. Spears, 2017, Virginia Department of Mines, Mineral and Energy, Division of Geology and Mineral Resources, "GIS Fault Mapping of Virginia Seismic Zones"

In addition to reviewing the findings of the report completed by the Virginia Department of Mines, Mineral and Energy, Division of Geology and Mineral Resources, FEMA's HAZUS-MH software was also utilized to generate a Earthquake Global Assessment Report for the CSPDC region. For this report, the 100 year Probabilistic Earthquake, Magnitude 5 scenario was performed. It is noted in the report that HAZUS utilizes 2010 Census Data and result totals only reflect data for those census tracts/blocks included in the user's study region. The HAZUS report can be viewed in Appendix G and summarizes building inventory, and the estimated damage, social impact and economic losses for the Region as a whole.

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12. Hazardous Materials (Transportation and Industrial) (Medium Ranking)

Hazard History

There have not been any catastrophic Hazardous Materials Incidents in recent history. There have been minor to major incidents at manufacturing/industrial sites or during transportation of hazardous materials. A typical incident would involve an accident on either interstates I-64 or I-81, where a tractor trailer has been damaged causing the release of hazardous materials on the roadway or possibly to nearby soil or a body of water. These incidents while potentially harmful, stressful, and inconvenient are handled in a routine manner by first responders, who are trained and have the proper equipment. The Region has a vulnerability to Hazardous Materials Incidents based on its agriculture, industry and manufacturing, and transportation network. Because of this vulnerability, the Plan's Steering Committee has chosen to include Hazardous Materials in this update of the Hazard Mitigation Plan. The Steering Committee has given this hazard a medium ranking.

Hazard Profile

In 1986, Congress passed the Emergency Planning and Community Right-to-Know Act (EPCRA). As part of the requirements of this Act, local jurisdictions must form Local Emergency Planning Committees (LEPCs) that must meet regularly and maintain a current Emergency Response Plan. EPCRA also requires that facilities that transport hazardous materials or use them at their site, must comply with certain reporting requirements. Through the LEPCs, local Emergency Management, Fire, Medical, and Law Enforcement officials are aware of the hazardous materials in their jurisdiction and plan the response to incidents that potentially could occur. Response is the primary focus in dealing with Hazardous Materials. For local jurisdictions, mitigation for Hazardous Materials Incidents involves planning, training, and ensuring first responders have the proper equipment available prior to an incident. For facilities that use,

store, and/or transport hazardous materials, they can similarly mitigate the occurrence of an incident with the same advance steps of planning, training, and proper equipment to ensure these hazardous materials are handled properly.

Hazard Areas And Vulnerability

Throughout the Region, agricultural communities and manufacturing/industrial centers can be found. A broad transportation network that includes interstate highways, rail and air also covers the Region. Because of these factors, it is possible that a Hazardous Materials Incident could impact any of the 21 localities in the Region.

13. Terrorism (Low Ranking)

Hazard History

To date, there are no recorded terrorism incidents in recent history to include in this Plan. Due to several characteristics of the Region, the Steering Committee for the Hazard Mitigation Plan felt terrorism should be included but with a low ranking.

Hazard Profile

Currently there is no universal definition for terrorism. The Code of Federal Regulations defines terrorism as "the unlawful use of force and violence against persons or property to intimidate or coerce a government, civilian population, or any segment thereof, in furtherance of political or social objectives." (28 C.F.R. Section 0.85) Characteristics that make this Region vulnerable include:

- Proximity to several large urban centers, including Washington, D.C., Richmond, Virginia, and the Hampton-Roads area of Virginia;
- The regional transportation network that includes two major interstates (I-81 and I-64), the Shenandoah Valley Regional Airport and several smaller airports, and rail lines that carry both passenger and freight trainsl
- Manufacturing and industrial facilities that use a variety of hazardous chemicals;
- and several colleges, universities, and other residential institutions that house large numbers of people.

These characteristics possessed by the Region are similar to many communities in Virginia and across the United States. Like others, the communities in this Region have to evaluate the level of "acceptable risk" they have for terrorist events.

Hazard Areas

Unlike other hazards, specific vulnerable areas in the Region are not included in the scope of this Plan because of the security risk of terrorism.

Vulnerability Analysis

A regionwide vulnerability analysis has not been conducted. Due to security concerns, the local jurisdictions in the Region were not asked to share any vulnerability analyses or risk assessments of particular structures or locations within their communities. In terms of hazard mitigation for terrorism, protective measures involving buildings can be successful in reducing vulnerability and decreasing threat.

14. Power Outages (Medium Ranking)

A power outage is an unplanned loss of the electric power network's supply to an end user. Faults at power stations, damage to any part of the electric distribution system, short circuits, cascading failures, or problems with fuses or circuit breaker operations can cause a power outage. These damages to the electric power network may be caused by natural hazards, such as wind, fire, and severe weather; human-causes; the results of mechanical failure; or a variety of other factors.

Hazard History

There have been no catastrophic power outages in recent history. Two events where extended power outages occurred were the derecho in June 2012 and the ice storm in November 2018. Because a power outage can be its own disaster independent of another natural or man-made hazard, the Hazard Mitigation Plan's Steering Committee has chosen to include this hazard and has given it a medium ranking.

Hazard Profile

Power outages can be extremely disruptive and affect the whole community and the economy. Community impacts on communication, water and other utilities, vital services, transportation, and businesses are caused by power outages. Individuals can also be impacted by significant issues such as the inability to use power-dependent medical devices, food spoilage, water contamination, and sanitation issues.

For communities it is important to mitigate the effects of power outages through planning and providing back-up resources that can keep essential personal needs met and community services running. Communities can create Emergency Assurance Plans (EAPs). During the development of an EAP, a community will examine its local and regional energy infrastructure, review supply contracts, establish relationships with energy providers, identify back-up power sources, and ensure adequate emergency fuel supplies. Pre-established plans are not the only mitigation tool for communities. Installing equipment at critical locations to supply back-up power during an outage is a key strategic step in mitigating this hazard. Large-scale generators, generator quick connects, and Uninterruptible Power Supply/Sources (UPS) are valuable for keeping power running and protecting hardware such as computers, telecommunicators, and data centers.

Hazard Areas And Vulnerability

The Region receives its electricity from five service providers: BARC Electric Cooperative, Dominion Energy Virginia, Harrisonburg Electric Commission, Shenandoah Valley Electric Cooperative, and the Town of Elkton which supplies the electricity to its residents. As is common across the United States, the 21 jurisdictions in the Region are dependent on electricity for all manner of services. Each jurisdiction has the possibility of experiencing a power outage.

V. MITIGATION GOALS, STRATEGIES AND PROJECTS

We cannot always prevent the natural or manmade hazards that make us vulnerable, but through proactive planning and mitigation activities we can reduce their impact. The following section describes the four types of mitigation actions (local plans and regulations, structure and infrastructure projects, natural systems protection, and education and awareness programs) that are the focus of the Central Shenandoah Hazard Mitigation Plan's regional mitigation goals. These regional goals are included in this section as well. Following the mitigation goals, the local mitigation strategies are included. Each of the 21 jurisdictions in the Central Shenandoah Planning District has created a set of mitigation strategies for their local community.

1. Mitigation Actions

The four categories of mitigation actions are:

1. **Local Plans and Regulations:** These actions include government authorities, policies, or codes that influence the way land and buildings are developed and built. Examples include: comprehensive plans, land use ordinances, building codes and enforcement, the National Flood Insurance Program's Community Rating System, and stormwater management regulations.

2. **Structure and Infrastructure Projects:** These actions involve modifying existing structures and infrastructure to protect them from a hazard or remove them from a hazard area. This could apply to public or private structures as well as critical facilities and infrastructure. This type of action also involves projects to construct manmade structures to reduce the impact of hazards. Examples include: Acquisitions, elevations, and mitigation reconstructions of structures in flood prone areas, utility undergrounding, structural retrofits, floodwalls and retaining walls, detention and retention structures, culverts, and safe rooms.

3. **Natural Systems Protection:** These are actions that minimize damage and losses and also preserve or restore the functions of natural systems. Examples include: sediment and erosion control, stream corridor restoration, forest management, conservation easements, and wetland restoration and preservation.

4. **Education and Awareness Programs:** These are actions to inform and educate citizens, elected officials, and property owners about hazards and potential ways to mitigate them. These actions may also include participation in national programs, such as StormReady or Firewise Communities. Although this type of mitigation reduces risk less directly than structural projects or regulation, it is an important foundation. Examples include: websites with maps and information, media spots, real estate disclosure, presentations to school groups or neighborhood organizations, mailings to residents in hazard-prone areas.

Prioritization Methodology:

Regional goals and strategies have always been included in the CSHMP. For the 2020 HMP, the goals and strategies from the previous HMP were reviewed and discussed by the Steering Committee and relevant ones were revised to reflect the current situation. Additional goals and strategies were also added to address present gaps and vulnerabilities. While all mitigation actions move a community towards resilience, prioritization of goals and strategies in the Plan are based on those that will create the largest beneficial impacts. Mitigation Education and Awareness Program goals are the first priority because they can be conducted at a regional scale, require minimal resources, can be accomplished through existing partnerships, and encourage people to make safer initial choices that lessen the need for mitigation later. The second priority of goals include mitigation activities that impact a whole community. These goals fall into the Local Plans and Regulations, Natural Systems Protection, and Infrastructure Projects mitigation categories. The goals in the third category of priority are those that make a smaller scale impact at the neighborhood or even individual property level. These goals fall under the mitigation category of Structure and Infrastructure Projects.

2. Regional Mitigation Goals and Strategies

Goal 1: Improve local government operations, planning, zoning, land use regulations, and code enforcement to reduce the impact of natural and man-made hazards and disasters.

Strategies

1.1 For flood hazards, strengthen current floodplain, zoning and site development ordinances by adopting higher standards that provide additional protection and limit or restrict further development in the floodplain, i.e. additional freeboard, flood protection setbacks, limitation on fill, minimization of hydrostatic pressure, protection for mechanical and utility systems, etc. For drought hazards, utilize growth management tools like zoning and land use regulations to encourage low-impact development and forest preservation. For land subsidence hazards, strengthen enforcement of land use, zoning regulations and building ordinances that regulate construction in areas susceptible to landslides and sinkholes i.e. steep slopes, intermittent stream channels, and karst topography.

1.2 Encourage water supply planning and ground water protection projects. Seek and research alternative water supplies for communities. Improve forecasting and monitoring of drought conditions.

1.3 Ensure that floodplain ordinances and building codes are clearly understood by staff, property owners, developers, bankers and insurance companies.

1.4 Implement zoning tools that steer development away from hazardous areas or natural areas deserving preservation. Include Department of Forestry personnel in subdivision review for new development in woodland-urban interface areas.

1.5 Provide for tax incentives, donated easements, and other approaches that can assist in preserving land in the floodplain and other environmentally sensitive areas for agricultural, environmental, recreational or educational uses.

1.6 Rezone to open space or acquire undeveloped portions of floodplain to prohibit future residential building.

1.7 Limit government expenditures for public infrastructure such as roads and water and sewer service in hazard-prone areas.

1.8 Provide necessary staff and staff training to enforce floodplain regulations and building codes.

1.9 Provide training and appropriate equipment/tools for local fire fighters to respond to woodland fires.

1.10 Sponsor workshops for Building Officials that focus on floodplain ordinances and FEMA and NFIP regulations.

1.11 Develop a Continuity of Operations Plan for each locality.

Goal 2: Increase awareness of the National Flood Insurance Program (NFIP) and the Community Rating System (CRS) in local communities in the Region.

Strategies

2.1 Introduce local jurisdictions to the Community Rating System (CRS) and assist them in applying for CRS certification for their communities.

2.2 Encourage communities to remain active and compliant with the NFIP program.

2.3 Encourage citizens to purchase flood insurance. Partner with insurance companies, lenders, and real-estate agents to market the NFIP program.

2.4 Conduct NFIP training workshops for insurance providers.

Goal 3: Continue to improve stormwater management for the infrastructure throughout the Region.

Strategies

3.1 Consider conducting a Regional Storm Water Management Study which would guide the localities in developing the most cost-effective storm water management system, not only within the political boundaries of each locality, but within the locality's watershed.

3.2 Seek funding to prepare site-specific hydrologic and hydraulic studies that look at areas that have chronic and repetitive flooding problems.

3.3 Consider utilizing special utility assessment districts where property owners who directly benefit from a specific public improvement are charged a fee that is proportional to the benefits received.

3.4 Support projects that call for improved ditching, replacement of inadequate and undersized culverts, enlargements of bridge openings, and drainage piping needed to minimize flooding.

3.5 Develop regular maintenance programs and standard operation procedures and budget accordingly.

3.6 Encourage routine maintenance of stormwater management conveyances and culverts to allow more water to be carried with special emphasis placed on culverts where there are repeated problems.

3.7 Notify property owners living along stormwater conveyances to enhance riparian buffers and to be aware of large debris such as deadfall and trees.

Goal 4: Conduct planning and studies for the implementation of stormwater and flood mitigation projects at the watershed level when applicable.

Strategies

4.1 Develop a regional, broad-based watershed plan among localities within a watershed in order to achieve effective and long-term flood protection and a healthy riverine environment.

4.2 Develop a watershed partnership, i.e. watershed roundtable to coordinate planning and program activities among natural resource agencies and stakeholders.

4.3 Conduct a site analysis mapping study to determine and understand the karst topography in our region.

Goal 5: Conduct proactive planning focused on developing mitigation strategies and projects that focus on wildfire mitigation at the landscape scale in wildland areas across communities or at a regional level; to address vulnerabilities of the Wildland Urban Interface in the Region.

Strategies

5.1 Advocate the return of mitigation strategies back in the Wildland Urban Interface (WUI) International Code.

5.2 Encourage Building Codes and Zoning Regulations that support wildfire mitigation in the WUI and other woodland areas.

5.3 Implement public education programs that teach woodland homeowners their responsibilities for choosing to live in areas potentially vulnerable to wildfires.

5.4 Promote inter-agency coordination for wildfire response in the areas of daily communication, training, and especially pre-planning. Include this information in the Central Shenandoah Wildfire Protection Plan as well.

Goal 6: Reduce the impact of natural and man-made hazards and disasters on private residential structures and properties.

Strategies

6.1 Develop a program to elevate, relocate, floodproof, acquire flood-prone houses, or offer substantial reconstruction in order to provide protection to private residential structures and reduce future damages.

6.2 Continue residential buyout and elevation projects of identified structures most at risk of future flooding with priority given to houses that are repetitively flooded.

6.3 For properties where elevation, relocation or acquisition is not feasible, introduce retrofitting measures to protect existing structures from flood damage. Retrofitting is relatively inexpensive and can include dry floodproofing, wet floodproofing, installing sewer backflow valves, berms, and sump pumps.

6.4 Design and landscape structures with wildfire safety in mind by utilizing fire-resistant materials when building especially in the urban-wilderness interface areas. Create safety and defensible space around structures. Provide adequate water resources/dry hydrants nearby woodland communities. Improve access for fire trucks and equipment. Increase knowledge of controlled burns and use of fire-retardant vegetations.

6.5 Offer financial incentives such as tax abatements, conservation easements, and low-interest loans to encourage property owners to elevate, relocate or floodproof buildings.

6.6 Educate and provide guidance and technical assistance to citizens about measures they can take on their own to protect their properties.

6.7 For properties located in known karst and landslide areas, use corrective measures recommended by a professional site analysis (geotechnical or structural engineer) to protect homes.

6.8 Encourage developers to integrate mitigation techniques into new construction and renovation.

Goal 7: Assist with emergency planning, preparedness education, and hazard mitigation to individuals with access and functional needs and service providers. Access and functional needs include but are not limited to physical, sensory, cognitive, or emotional disabilities; medical issues; and communication barriers.

Strategies

7.1 Educate persons with access and functional needs on disaster preparedness and mitigation methods at community events and through public awareness campaigns.

7.2 Provide disaster preparedness and mitigation materials in alternate formats such as large print, digitally, and languages other than English to make materials accessible for a wider audience in the community. Also provide sign language interpreters at community events, workshops, and other educational programs.

7.3 Work with the first responder community to educate them about the access and functional needs that may impact people during a disaster.

7.4 Encourage persons with access and functional needs to contact their local emergency management office so their needs can be noted in the 911 system.

7.5 Offer emergency sheltering for all persons that can provide accommodations that consider access and functional needs including the use of medical equipment requiring electrical power, etc.

7.6 Provide training in emergency operations planning and preparedness to organizations that serve persons with access and functional needs to reduce down-time in service provision, to protect lives of staff and clients, and to reduce damage to facilities.

7.7 Work with emergency managers to make sure that weather alerts and warnings are in accessible formats for all citizens to receive essential information during a disaster.

7.8 Ensure that accessible transport vehicles for evacuations are available for persons with access and functional needs.

7.9 Educate pet owners and farmers so they will include their pets and livestock in their family's preparedness planning.

7.10 Work with local animal welfare organizations to provide emergency sheltering for pets and livestock.

Goal 8: Reduce the impact of natural and man-made hazards and disasters on commercial and industrial structures, properties, and businesses.

Strategies

8.1 Identify and seek funding to provide engineering and design services that would determine the most cost-effective mitigation option for each business.

8.2 Seek funding to floodproof and retrofit commercial buildings where acquisition and elevation are not feasible.

8.3 Sponsor workshops that educate local business and industry about mitigation measures they can install to protect their structures and inventory during a disaster.

8.4 Develop a program to assist local business and industry in developing emergency and business continuity plans.

Goal 9: Improve systems that are used for daily monitoring and that alert local emergency management officials of impending severe weather, emergencies, and disasters.

Strategies

9.1 Identify areas with recurring flood problems and request additional IFLOW stream/rain gauges to ensure that these areas are adequately covered and monitored.

9.2 Seek funding to purchase, install, and maintain public emergency notification systems, Integrated Flood Observing and Warning System (*IFLOWS*) gauges, and other state-of-the-art disaster response and recovery equipment.

Goal 10: Improve community warning systems in the region.

Strategies

10.1 Develop Emergency Action Plans for specific sites such as mobile home parks, apartment complexes, assisted living facilities, industrial facilities, and essential public facilities within disaster-prone areas and develop specific warning or notification plans for each identified site. These plans should include the designation of a point of contact or resident coordinator, with alternates, to receive warnings, the dispatch of police, sheriff, fire rescue units to these sites to issue warnings and pre-designation of routes. These specific warnings will supplement the general television or radio warnings, which most people receive.

10.2 Encourage businesses and public facilities located in high hazard areas to purchase NOAA Weather Radios. By receiving early notification of potential inclement weather, businesses and public facilities can benefit from additional time to prepare for natural disasters. Local governments may be eligible for grants to purchase equipment to be distributed in public facilities, businesses, and industries throughout their jurisdictions.

10.3 Utilize emergency preparedness and evacuation plans for people living in high-hazard areas, especially people with access and functional needs.

10.4 Work with the National Weather Service to expand transmission of Weather Radios or other notification systems.

Goal 11: Reduce the impact of natural and man-made hazards on public utilities, critical infrastructure, and public properties/lands.

Strategies

11.1 Evaluate and provide retrofit measures to prevent disruption of services. Measures can include elevating electrical controls and equipment and installing watertight doors where practicable at water and wastewater treatment plants.

11.2 Bury underground lines deeper and further away from waterways with stronger encasements in floodprone areas with erodible soils.

11.3 Increase the number of wind-secured critical facilities including schools, daycares, hospitals, and shelters.

11.4 Increase number of functional backup generators and generator quick connects at critical facilities.

11.5 Urge local utilities to implement a routine schedule for trimming trees/ limbs around power lines to prevent power outages during wind events and ice storms.

11.6 Limit the construction of new infrastructure in high hazard areas whenever feasible.

11.7 Conduct vulnerability assessments and develop security plans on public utility systems in accordance with the Bioterrorism Act of 2002.

Goal 12: Improve dam safety throughout the Region.

Strategies

12.1 Examine the risks posed by dams in watersheds that drain in the Region and consider adopting ordinances to restrict development around these dams because of the potential flooding danger in areas below and behind the dams.

12.2 Encourage maintenance and improvements to the dams in the Region. Require regular inspection and maintenance schedules.

Goal 13: Implement stream and natural systems protection actions that not only minimize damage and losses but also preserve and restore these systems.

Strategies

13.1 When implementing stream remediation projects consideration should be given when designing these structures and consider stream characteristics that influence the selection of these measures such as channel width, bank height, bend radii, storm event, channel velocities and flood depth, and floodplain configuration.

13.2 Obtain maintenance and access easements from property owners for annual maintenance work.

13.3 Coordinate with and support the U.S. Department of Agriculture's Emergency Watershed Protection Program that is activated during a Presidential Declaration or State Conservation Disaster.

Goal 14: Implement a disaster preparedness and mitigation education program.

Strategies

14.1 Develop comprehensive public information and education programs on disasters, including preparedness, recovery, mitigation and prevention. Other educational topics would also include transportation, the life-safety impact of disasters, and general maintenance of generators. This can be accomplished through presentations, workshops and marketing materials for citizens, business, schools, local staff and elected officials in the Region. Much of this has been and can be accomplished through Shenandoah Valley Project Impact.

14.2 Develop a public education program to educate citizens about water conservation, to use of water-conserving appliances, and irrigation practices in agricultural areas. Written materials could be developed to teach developers and homeowners about native and/or drought-tolerant grasses, shrubs, and trees to be planted around residential structures.

14.3 Increase public education and awareness regarding the dangers of winter storms including driving/traveling during a winter storm event. (Automobile accidents are the leading cause of death during a winter storm event.). Also, increase public awareness to health risks associated with winter storms including exposure, hypothermia, frostbite, overexertion, and accidents from falling/slipping.

14.4 Encourage communities to become involved with the Department of Forestry's Firewise program. Its goal is to encourage and acknowledge action that minimizes home loss to wildfire by preparing for a fire before it occurs.

14.5 Encourage communities to become involved in the National Weather Service program "Storm Ready". This program assists communities with local safety, planning, education, and communication programs needed to save lives and property before and during weather- related disasters.

14.6 Provide Community Emergency Response Team (CERT) training to citizens and maintain a CERT organization. Having an active CERT program will not only educate citizens about preparedness and mitigation measures, it will also provide a pool of trained volunteers that can assist during an emergency or disaster.

14.7 Develop a media campaign to educate the general public throughout the year about disasters when they may be likely to occur. For example a Spring campaign on tornado safety, winter storm preparedness in the Fall, and hurricane safety prior to the start of Hurricane Season. This holistic campaign would be designed to reach a multi-generational audience and would include mitigation and preparedness information.

14.8 Increase the number and use of NOAA weather radios or battery-powered radios or TVs. Improve the effectiveness of NOAA weather radios in the valley.

14.9 Utilize the services of amateur radio operators in the region.

14.10 Sponsor Hazard Mitigation Workshops designed to give information to contractors, property owners, and business owners on mitigation strategies such as acquisition, relocation, elevation, and floodproofing.

14.11 Develop Hazard Awareness programs with the local schools, youth programs, and libraries to disseminate information on natural hazards and mitigation actions. Utilize student environmental clubs to volunteer for projects.

14.12 Notify renters of homes, mobile homes, apartments that they are in an area that is subject to flooding and should consider purchasing flood insurance for their contents. Notification could be done via lease agreements.

14.13 Establish and maintain Hazard Resource Library/ Self Help Programs on natural hazards, mitigation and safety and related topics in a central location and available to or disseminated to property owners and businesses.

14.14 Strategically place flood elevation reference markers throughout the Region to educate and remind people of historical floods. The markers could show the elevation of the high water from previous floods as well as the 100-year flood levels.

14.15 Notify potential homebuyers of flood hazards and requirements for flood insurance. Programs should be developed with the cooperation of banks, real estate agents, and insurance agents as well as community development staff.

14.16 Implement programs to provide property owners with flood elevation certificates in order to alert them to the fact that they their property is in the floodplain.

14.17 Provide appropriate local government staff with technical expertise and training on flood protection measures, retrofitting, flood insurance, flood warning and response, etc. in order to help citizens meet and understand floodplain requirements and flood hazards.

Goal 15: **Improve hazard data collection and GIS for the Region.**

Strategies

15.1 Encourage communities to participate in FEMA's Cooperating Technical Partners (CTP) Program. This FEMA initiative establishes partners with local jurisdictions to develop and maintain up-to-date flood maps and other flood hazards. Mapping activities may include hydrologic and hydraulic analysis, floodplain mapping, preparation of digital FIRMs, and refinement of floodplain boundaries. Also take advantage of any training on FEMA's HAZUS mapping software that is offered in the Region.

15.2 Consider creating a consortium of communities to tackle the problem of outdated FIRM maps and how to update the FIRM maps on a regional basis.

15.3 Ensure that all localities have digitized FIRM maps and that they are current, and correct.

15.4 Acquire technology to assist in managing storm water, floodplain, and other land-based resources.

15.5 Utilize GIS technology to inventory at-risk infrastructure and public and private structures within at-risk areas.

15.6 Determine and map landslide/land subsidence, karst, and sinkhole vulnerable areas in the region. Archive events in a database to monitor trends and recurring sites. Coordinate with VDOT on sites impacting transportation infrastructure.

15.7 Identify and map assisted living centers, nursing homes, and facilities that serve people with special needs that require additional services during disasters.

Goal 16: Implement activities that promote resilience in the Region by enabling communities to better prepare, adapt to changing conditions, and become stronger to withstand and recover rapidly from stresses, shocks, and adverse situations.

Strategies

16.1 Develop local and regional Resilience Plans.

Goal 17: Review Mitigation and Community Improvement Plans in the aftermath of an event in order to encourage the implementation of mitigation projects during the recovery process.

Strategies

17.1 Encourage learning opportunities of best practices and challenges across the Region.

17.2 Conduct After Action Reviews in the aftermath of a disaster.

17.3 Share Community Improvement Plans with other localities in the Region.

3. Local Mitigation Strategies

Each of the 21 jurisdictions in the Central Shenandoah Planning District has created a set of mitigation strategies for their local community. Mitigation strategies were also created by James Madison University, a public university in the City of Harrisonburg. The strategies for each community are listed in the tables that follow in the order below:

- Augusta County
- Bath County
- Highland County
- Rockbridge County
- Rockingham County
- City of Buena Vista
- City of Harrisonburg
- City of Lexington
- City of Staunton
- City of Waynesboro
- Town of Bridgewater
- Town of Broadway
- Town of Craigsville
- Town of Dayton
- Town of Elkton
- Town of Glasgow
- Town of Goshen
- Town of Grottoes
- Town of Monterey
- Town of Mt. Crawford
- Town of Timberville
- James Madison University

Central Shenandoah Hazard Mitigation Plan: Local Mitigation Strategies

Community: **Augusta County**
NFIP Community Number: **510013**

Regional Strategy ID #	Mitigation Strategy	Hazard	Priority High Medium Low	Project Status Delayed On-going Completed	If Not Completed, Why?	Responsible Party	Time Frame
14.1	Continue membership and participation in Shenandoah Valley Project Impact, the regional disaster preparedness and mitigation education program that was started in September 2000. Shenandoah Valley Project Impact educates citizens in the region about disaster preparedness and mitigation through public awareness campaigns, workshops and trainings, and an extensive resource library.	Multi- Hazards	High	On-going	N/A	CSPDC	On-going
14.1	Maintain a relationship with the Southern Shenandoah Chapter of Virginia Voluntary Organizations Active in Disaster (VOAD), to share knowledge and resources throughout the preparation, response, and recovery phases of a disaster.	Multi- Hazards	High	On-going	N/A	County	On-going
6.1 – 6.8 8.1, 8.2 10.1 – 10.4 12.1	Support implementation of structural and non-structural mitigation activities on private or public property to reduce exposure to and provide protection from natural and man-made hazards. Eligible projects include but are not limited to acquisition, elevation, minor structural flood control projects, relocation of structures, retrofitting of existing structures, infrastructure protection measures, stormwater and wastewater management improvements, advanced warning systems, hazard gauging systems, hazard education, and wildfire mitigation projects.	Multi- Hazards	High	On-going	N/A	County	On-going

Regional Strategy ID #	Mitigation Strategy	Hazard	Priority High Medium Low	Project Status Delayed On-going Completed	If Not Completed, Why?	Responsible Party	Time Frame
2.1 – 2.4	Maintain the community's compliance with the National Flood Insurance Program (NFIP) by engaging in various activities included in the three basic components of the NFIP program; 1. floodplain identification and mapping risk, 2. responsible floodplain management, and 3. flood insurance. Sample activities include but are not limited to: maintaining publicly accessible and accurate Flood Insurance Rate Maps (FIRMs), adopting and enforcing a compliant floodplain ordinance, and provide general assistance and education to community members regarding the flood insurance program.	Flood	High	On-going	N/A	County	On-going
5.1 – 5.4	Encourage the lessening of potential wildfires in our community and the region by; 1. Education and outreach to residents, especially those that live in woodland areas and the Wildland Urban Interface (WUI). 2. Reduction of hazardous fuels throughout the community. 3. Reduction of structural ignitability to limit injury, loss of life, and property and structural damage. 4. Having trained first responders with proper tools and equipment that will serve as a frontline defense against a wildfire.	Wildfire	High	On-going	N/A	County	On-going
12.1 – 12.2	Continue study of dam risk assessment. Seek funding to inspect, maintain, and upgrade older dams. * Note: The December 2009 Floodplain Ordinance revision added floodpool areas to the Special Flood Hazard Area. The County continues to work with the HWSWCD, Staunton, and Waynesboro to map inundation zones for all publicly owned, regulated dams in Augusta County.	Flood	Medium	Robinson Hollow Dam 310 – A has been upgraded with reinforced spillways	Completed	County	On-going

Regional Strategy ID #	Mitigation Strategy	Hazard	Priority High Medium Low	Project Status Delayed On-going Completed	If Not Completed, Why?	Responsible Party	Time Frame
				and concrete retaining wall. Inch Branch Dam has been upgraded with increased spillway capacity and a new riser structure.* Currently work is being done on the Hearth Stone dam on Tillman Road.	Completed On-going		
1.3	Floodplain Ordinance – Update and revise ordinance; include floodplain overlay district to zoning ordinance. *Note 2009 revision includes a general prohibition on development on new lots in the floodplain and institutes compensatory storage for any fill in the floodplain.	Flood	Medium	Completed Floodplain Ordinance revised in December 2009*.	N/A	County	N/A

Regional Strategy ID #	Mitigation Strategy	Hazard	Priority High Medium Low	Project Status Delayed On-going Completed	If Not Completed, Why?	Responsible Party	Time Frame
15.3	Update FEMA's flood maps for the following areas in the County that have repetitive flooding problems: North Mountain Estates on East Dry Branch, Deerfield on Hamilton Branch, Crawford Manor at East Dry Branch, Jolliet Springs on South River, near Crimora, Stuarts Draft, and Augusta Springs on Little Calfpasture River.	Flood	Medium	Completed FEMA finished up a Physical Map Revision that has the effective date of **08/3/15.** Other revisions remain on the list for future updates.	N/A	FEMA and County	N/A
14.1	Continue to provide citizens with in-school programs, communication classes, tours, and emergency management seminars.	Multi- Hazards	High	On-going	N/A	County	On-going
10	Increase emergency communications capability including Reverse 9-1-1, Ind. Map, Emergency Action Plans (EAPs), Dam Protocols, Mass E-mails, and "Child Is Missing" Hotline.	Multi- Hazards	High	On-going	N/A	County	On-going
9.1	Maintain IFLOWS Rain-Stream Gauge. Install new gauges in Verona and Swoope.	Flood	High	On-going	N/A	County	On-going
12	Restoration of Dams in Robinson Hollow, Tom Branch, and Mills Creek.	Flood	High	Completed	N/A	County	On-going
13.1 –13.2	County has been an active participant in stream remediation projects through the Emergency Watershed	Flood	High	On-going	N/A	County	On-going

Regional Strategy ID #	Mitigation Strategy	Hazard	Priority High Medium Low	Project Status Delayed On-going Completed	If Not Completed, Why?	Responsible Party	Time Frame
	Protection Program. Maintenance work has been and will continue to be performed when required on a large-scale project on the Saint Mary's River.						
16	Create and keep updated a regional Emergency Operations Plan (EOP) with the cities of Staunton and Waynesboro to more effectively and efficiently utilize the resources of the three localities.	Multi- Hazards	High	Completed On-going	N/A	County and Cities	On-going
5	Complete a wildfire protection plan to assess vulnerable woodland areas and propose mitigation techniques and projects to reduce wildfire risk in the County.	Wildfire	High	Completed	N/A	County	Complete d in 2013
7.9 –7.10	Continue development and implementation of planning, preparedness, and response strategies for pets, livestock, and other animals in the County. Maintain regional animal sheltering trailer to assist with animal needs during a disaster.	Multi- Hazards	High	On-going	N/A	County	On-going
16	Continue to partner with the Shenandoah Valley Regional Airport in training and implementation of their Airport Emergency Response Plan.	Multi- Hazards	High	On-going	N/A	County and Airport	On-going
14.6	Maintain the Staunton-Augusta-Waynesboro Community Emergency Response Team (S-A-W CERT).	Multi- Hazards	High	On-going	N/A	County and Cities	On-going
12	Yearly, participate in a Regional Dam Exercise that also includes private dam owners.	Flooding	Medium	On-going	N/A	County	On-going
11	Work with the Virginia Department of Transportation (VDOT) to keep roadways and stormwater drainage free from debris particularly when severe weather is anticipated.	Multi- Hazards	High	On-going	N/A	County VDOT	On-going
10	Implement a smoke installation program for mobile home and residential structures in the County.	Fire	High	Completed	N/A	County	2018-19

Central Shenandoah Hazard Mitigation Plan: Local Mitigation Strategies

Community: **Bath County**
NFIP Community Number: **51096**

Regional Strategy ID#	Mitigation Strategy	Hazard	Priority High Medium Low	Project Status Delayed On-going Completed	If Not Completed, Why?	Responsible Party	Time Frame
14.1	Continue membership and participation in Shenandoah Valley Project Impact, the regional disaster preparedness and mitigation education program that was started in September 2000. Shenandoah Valley Project Impact educates citizens in the region about disaster preparedness and mitigation through public awareness campaigns, workshops and trainings, and an extensive resource library.	Multi- Hazards	High	On-going	N/A	CSPDC	On-going
14.1	Maintain a relationship with the Southern Shenandoah Chapter of Virginia Voluntary Organizations Active in Disaster (VOAD), to share knowledge and resources throughout the preparation, response, and recovery phases of a disaster.	Multi- Hazards	High	On-going	N/A	County	On-going
6.1 – 6.8 8.1, 8.2 10.1 – 10.4 12.1	Support implementation of structural and non-structural mitigation activities on private or public property to reduce exposure to and provide protection from natural and man-made hazards. Eligible projects include but are not limited to acquisition, elevation, minor structural flood control projects, relocation of structures, retrofitting of existing structures, infrastructure protection measures, stormwater and wastewater management improvements, advanced warning systems, hazard gauging systems, hazard education, and wildfire mitigation projects.	Multi- Hazards	High	On-going	N/A	County	On-going

Regional Strategy ID#	Mitigation Strategy	Hazard	Priority High Medium Low	Project Status Delayed On-going Completed	If Not Completed, Why?	Responsible Party	Time Frame
2.1 – 2.4	Maintain the community's compliance with the National Flood Insurance Program (NFIP) by engaging in various activities included in the three basic components of the NFIP program; 1. floodplain identification and mapping risk, 2. responsible floodplain management, and 3. flood insurance. Sample activities include but are not limited to: maintaining publicly accessible and accurate Flood Insurance Rate Maps (FIRMs), adopting and enforcing a compliant floodplain ordinance, and provide general assistance and education to community members regarding the flood insurance program.	Flood	High	On-going	N/A	County	On-going
5.1 – 5.4	Encourage the lessening of potential wildfires in our community and the region by; 1. Education and outreach to residents, especially those that live in woodland areas and the Wildland Urban Interface (WUI). 2. Reduction of hazardous fuels throughout the community. 3. Reduction of structural ignitability to limit injury, loss of life, and property and structural damage. 4. Having trained first responders with proper tools and equipment that will serve as a frontline defense against a wildfire.	Wildfire	High	On-going	N/A	County	On-going
6.1	Develop a program to elevate, relocate, floodproof or acquire floodprone structures in order to reduce or eliminate future damages with priority given to structures that are repetitively flooded. Areas of concern where flooding is repetitive include Hot Springs, Jackson River, Mill Creek, Millboro, Millboro Springs, Mountain Grove, and Pads Creek.	Flood	High	Pending – County continues to seek NFWF or other funding.	No funding	County State Federal	Unknown

Regional Strategy ID#	Mitigation Strategy	Hazard	Priority High Medium Low	Project Status Delayed On-going Completed	If Not Completed, Why?	Responsible Party	Time Frame
15.3	Explore the possibility of revising the County 's Flood Insurance Rate Maps (FIRMS) through the Physical Map Revision Process to address changes in the current floodplain delineation.	Flood	High	Pending	No funding	County	Unknown
9.1	Maintain current IFLOWS rain/stream gauges and consider installing additional gauges in areas of concern if funding is available.	Flood	High	On-going	N/A	County	On-going
10	Implement the Code Red Emergency Notification system throughout the County. This system allows for telephone notification for the entire County or targeted areas during emergency situations that require immediate action.	Multi- Hazards	High	Completed	N/A	County	On-going
10	Construct new E-911 Center which will contain an enhanced 911 hardware and software program that will allow dispatches to receive telephone calls from land lines as well as cell phones and create location maps.	Multi- Hazards	High			County	
11.4	Continue to implement and expand Emergency Sheltering Program in the County by partnering with the Red Cross and applying for grant funding for emergency generators for shelters.	Multi- Hazards	High	On-going	N/A	County	On-going
16	Continue participation in the Bath County Local Emergency Planning Committee (LEPC).	Multi- Hazards	High	On-going	N/A	County	On-going
13	Consider flood mitigation actions in the County focused on natural systems protection.	Flood	High				On-going

Central Shenandoah Hazard Mitigation Plan: Local Mitigation Strategies

Community: **Highland County**
NFIP Community Number: **510311**

Regional Strategy ID #	Mitigation Strategy	Hazard	Priority High Medium Low	Project Status Delayed On-going Completed	If Not Completed, Why?	Responsible Party	Time Frame
14.1	Continue membership and participation in Shenandoah Valley Project Impact, the regional disaster preparedness and mitigation education program that was started in September 2000. Shenandoah Valley Project Impact educates citizens in the region about disaster preparedness and mitigation through public awareness campaigns, workshops and trainings, and an extensive resource library.	Multi- Hazards	High	On-going	N/A	CSPDC	On-going
14.1	Maintain a relationship with the Southern Shenandoah Chapter of Virginia Voluntary Organizations Active in Disaster (VOAD), to share knowledge and resources throughout the preparation, response, and recovery phases of a disaster.	Multi- Hazards	High	On-going	N/A	County	On-going
6.1 – 6.8 8.1, 8.2 10.1 – 10.4 12.1	Support implementation of structural and non-structural mitigation activities on private or public property to reduce exposure to and provide protection from natural and man-made hazards. Eligible projects include but are not limited to acquisition, elevation, minor structural flood control projects, relocation of structures, retrofitting of existing structures, infrastructure protection measures, stormwater and wastewater management improvements, advanced warning systems, hazard gauging systems, hazard education, and wildfire mitigation projects.	Multi- Hazards	High	On-going	N/A	County	On-going

Regional Strategy ID #	Mitigation Strategy	Hazard	Priority High Medium Low	Project Status Delayed On-going Completed	If Not Completed, Why?	Responsible Party	Time Frame
2.1 – 2.4	Maintain the community's compliance with the National Flood Insurance Program (NFIP) by engaging in various activities included in the three basic components of the NFIP program; 1. floodplain identification and mapping risk, 2. responsible floodplain management, and 3. flood insurance. Sample activities include but are not limited to: maintaining publicly accessible and accurate Flood Insurance Rate Maps (FIRMs), adopting and enforcing a compliant floodplain ordinance, and provide general assistance and education to community members regarding the flood insurance program.	Flood	High	On-going	N/A	County	On-going
5.1 – 5.4	Encourage the lessening of potential wildfires in our community and the region by; 1. Education and outreach to residents, especially those that live in woodland areas and the Wildland Urban Interface (WUI). 2. Reduction of hazardous fuels throughout the community. 3. Reduction of structural ignitability to limit injury, loss of life, and property and structural damage. 4. Having trained first responders with proper tools and equipment that will serve as a frontline defense against a wildfire.	Wildfire	High	On-going	N/A	County	On-going
13	Consider mitigation actions in the County that are focused on natural systems protection.	Flood	High				On-going

Central Shenandoah Hazard Mitigation Plan: Local Mitigation Strategies

Community: **Rockbridge County**
NFIP Community Number: **510205**

Regional Strategy ID#	Mitigation Strategy	Hazard	Priority High Medium Low	Project Status Delayed On-going Completed	If Not Completed, Why?	Responsible Party	Time Frame
14.1	Continue membership and participation in Shenandoah Valley Project Impact, the regional disaster preparedness and mitigation education program that was started in September 2000. Shenandoah Valley Project Impact educates citizens in the region about disaster preparedness and mitigation through public awareness campaigns, workshops and trainings, and an extensive resource library.	Multi- Hazards	High	On-going	N/A	CSPDC	On-going
14.1	Maintain a relationship with the Southern Shenandoah Chapter of Virginia Voluntary Organizations Active in Disaster (VOAD), to share knowledge and resources throughout the preparation, response, and recovery phases of a disaster.	Multi- Hazards	High	On-going	N/A	County	On-going
6.1 – 6.8 8.1, 8.2 10.1 – 10.4 12.1	Support implementation of structural and non-structural mitigation activities on private or public property to reduce exposure to and provide protection from natural and man-made hazards. Eligible projects include but are not limited to acquisition, elevation, minor structural flood control projects, relocation of structures, retrofitting of existing structures, infrastructure protection measures, stormwater and wastewater management improvements, advanced warning systems, hazard gauging systems, hazard education, and wildfire mitigation projects.	Multi- Hazards	High	On-going	N/A	County	On-going

Regional Strategy ID#	Mitigation Strategy	Hazard	Priority High Medium Low	Project Status Delayed On-going Completed	If Not Completed, Why?	Responsible Party	Time Frame
2.1 – 2.4	Maintain the community's compliance with the National Flood Insurance Program (NFIP) by engaging in various activities included in the three basic components of the NFIP program; 1. floodplain identification and mapping risk, 2. responsible floodplain management, and 3. flood insurance. Sample activities include but are not limited to: maintaining publicly accessible and accurate Flood Insurance Rate Maps (FIRMs), adopting and enforcing a compliant floodplain ordinance, and provide general assistance and education to community members regarding the flood insurance program.	Flood	High	On-going	N/A	County	On-going
5.1 – 5.4	Encourage the lessening of potential wildfires in our community and the region by; 1. Education and outreach to residents, especially those that live in woodland areas and the Wildland Urban Interface (WUI). 2. Reduction of hazardous fuels throughout the community. 3. Reduction of structural ignitability to limit injury, loss of life, and property and structural damage. 4. Having trained first responders with proper tools and equipment that will serve as a frontline defense against a wildfire.	Wildfire	High	On-going	N/A	County	On-going
6.1	Complete the South River Flood Mitigation Project which calls for the acquisition of up to 35 properties that were destroyed or damaged in Hurricane Isabel.	Flood	High	Completed	N/A	County State Federal	N/A
3.2	Develop a St. Mary's/South River Watershed feasibility study – a joint project with Augusta County and the Army Corps of Engineers to study the flooding along the St. Mary's and South River watersheds.	Flood	Medium	On-hold	N/A	County Federal	N/A

Regional Strategy ID#	Mitigation Strategy	Hazard	Priority High Medium Low	Project Status Delayed On-going Completed	If Not Completed, Why?	Responsible Party	Time Frame
13.1	Continue the stream remediation and bank stabilization work by NRCS on the South River that was affected by Hurricane Isabel and prior flooding events.	Flood	Medium	Complete	N/A	County Federal	N/A

Central Shenandoah Hazard Mitigation Plan: Local Mitigation Strategies

Community: **Rockingham County**
NFIP Community Number: **510133**

Regional Strategy ID#	Mitigation Strategy	Hazard	Priority High Medium Low	Project Status Delayed On-going Completed	If Not Completed, Why?	Responsible Party	Time Frame
14.1	Continue membership and participation in Shenandoah Valley Project Impact, the regional disaster preparedness and mitigation education program that was started in September 2000. Shenandoah Valley Project Impact educates citizens in the region about disaster preparedness and mitigation through public awareness campaigns, workshops and trainings, and an extensive resource library.	Multi- Hazards	High	On-going	N/A	CSPDC	On-going
14.1	Maintain a relationship with the Southern Shenandoah Chapter of Virginia Voluntary Organizations Active in Disaster (VOAD), to share knowledge and resources throughout the preparation, response, and recovery phases of a disaster.	Multi- Hazards	High	On-going	N/A	County	On-going
6.1 – 6.8 8.1, 8.2 10.1 – 10.4 12.1	Support implementation of structural and non-structural mitigation activities on private or public property to reduce exposure to and provide protection from natural and man-made hazards. Eligible projects include but are not limited to acquisition, elevation, minor structural flood control projects, relocation of structures, retrofitting of existing structures, infrastructure protection measures, stormwater and wastewater management improvements, advanced warning systems, hazard gauging systems, hazard education, and wildfire	Multi- Hazards	High	On-going	N/A	County	On-going

Regional Strategy ID#	Mitigation Strategy	Hazard	Priority High Medium Low	Project Status Delayed On-going Completed	If Not Completed, Why?	Responsible Party	Time Frame
	mitigation projects.						
2.1 – 2.4	Maintain the community's compliance with the National Flood Insurance Program (NFIP) by engaging in various activities included in the three basic components of the NFIP program; 1. floodplain identification and mapping risk, 2. responsible floodplain management, and 3. flood insurance. Sample activities include but are not limited to: maintaining publicly accessible and accurate Flood Insurance Rate Maps (FIRMs), adopting and enforcing a compliant floodplain ordinance, and provide general assistance and education to community members regarding the flood insurance program.	Flood	High	On-going	N/A	County	On-going
5.1 – 5.4	Encourage the lessening of potential wildfires in our community and the region by; 1. Education and outreach to residents, especially those that live in woodland areas and the Wildland Urban Interface (WUI). 2. Reduction of hazardous fuels throughout the community. 3. Reduction of structural ignitability to limit injury, loss of life, and property and structural damage. 4. Having trained first responders with proper tools and equipment that will serve as a frontline defense against a wildfire.	Wildfire	High	On-going	N/A	County	On-going
13.1	Begin the stream remediation projects sponsored by NRCS on Germany River, Naked Creek, and Dry Run River that call for streambank restoration, removal of watershed impairments and installation of debris basins to repair damage caused by Hurricane Isabel.	Flood	High	Complete	N/A	Federal County	NA

Regional Strategy ID#	Mitigation Strategy	Hazard	Priority High Medium Low	Project Status Delayed On-going Completed	If Not Completed, Why?	Responsible Party	Time Frame
14.4	Continue participation in Department of Forestry's Firewise Program, a community awareness and education program that encourages and acknowledges woodland communities to take action that minimizes home loss to wildfires by preparing for a fire before it occurs	Wildfire	High	On-going	N/A	State County	N/A
6.1	Seek funding to continue county-wide residential flood mitigation project that calls for acquisition, elevation, floodproofing of properties identified as at-risk of future flooding. Most of these houses are located in the Naked Creek, Rawley Springs, and Bergton/Criders area of the County.	Flood	High	Delayed	These properties are now mitigated as a result of the Germany River Project.	N/A	N/a
9.1	Rockingham and Page Counties to install an I-Flow gauge on Naked Creek as well as complete stream remediation.	Flood	N/A	Completed	N.A	County	N/A
16	Continue support of the Harrisonburg-Rockingham Disaster Recovery Committee, a volunteer group made up of representatives of local churches, the Red Cross, Salvation Army, United Way, VOAD, Social Services, Rockingham County and others that work with residents affected by disasters in providing assistance not covered by federal and state recovery programs.	Multi-Hazards	High	On-going	N/A	County	N/A
7.10	Continue support of the Harrisonburg and Rockingham SPCA emergency shelter for pets and livestock during a disaster. Volunteers trained to work with animals during disaster situations staff the shelter. Fire Chief also serves on the State Animal Response Committee as well. Completed a grant-funded project that provided a pet emergency supply trailer including supplies and training.	Multi-Hazards	Medium	On-going	N/A	County	On-going

Regional Strategy ID#	Mitigation Strategy	Hazard	Priority High Medium Low	Project Status Delayed On-going Completed	If Not Completed, Why?	Responsible Party	Time Frame
6.1	Acquire houses located in the floodplain along Naked Creek and have land deeded in Open Space.	Flood	High	Delayed	Property owners not willing to sell.	Federal State County	N/A
9.1	Install and maintain I-FLOW gauges in two dams: Dry River and Hone Quarry in the middle of each dam.	Flood	High	Completed	N/A	County and Shenandoah	N/A
3.4 – 3.6	Implement mitigation strategies within the Lake Shenandoah watershed to address recurrent urban flooding. Continue work to select suitable mitigation strategies, including increased detention capacity and increased conveyance capacity. Once suitable options are determined, move forward with implementation when resources are available.	Flood	High	On-going	N/A	Lake Shenandoah Stormwater Control Authority and County	N/A

Central Shenandoah Hazard Mitigation Plan: Local Mitigation Strategies

Community: **City of Buena Vista**
NFIP Community Number: **510027**

Regional Strategy ID #	Mitigation Strategy	Hazard	Priority High Medium Low	Project Status Delayed On-going Completed	If Not Completed, Why?	Responsible Party	Time Frame
14.1	Continue membership and participation in Shenandoah Valley Project Impact, the regional disaster preparedness and mitigation education program that was started in September 2000. Shenandoah Valley Project Impact educates citizens in the region about disaster preparedness and mitigation through public awareness campaigns, workshops and trainings, and an extensive resource library.	Multi- Hazards	High	On-going	N/A	CSPDC	On-going
14.1	Maintain a relationship with the Southern Shenandoah Chapter of Virginia Voluntary Organizations Active in Disaster (VOAD), to share knowledge and resources throughout the preparation, response, and recovery phases of a disaster.	Multi- Hazards	High	On-going	N/A	City	On-going
6.1 – 6.8 8.1, 8.2 10.1 – 10.4 12.1	Support implementation of structural and non-structural mitigation activities on private or public property to reduce exposure to and provide protection from natural and man-made hazards. Eligible projects include but are not limited to acquisition, elevation, minor structural flood control projects, relocation of structures, retrofitting of existing structures, infrastructure protection measures, stormwater and wastewater management improvements, advanced warning systems, hazard gauging systems, hazard education, and wildfire mitigation projects.	Multi- Hazards	High	On-going	N/A	City	On-going

Regional Strategy ID #	Mitigation Strategy	Hazard	Priority High Medium Low	Project Status Delayed On-going Completed	If Not Completed, Why?	Responsible Party	Time Frame
2.1 – 2.4	Maintain the community's compliance with the National Flood Insurance Program (NFIP) by engaging in various activities included in the three basic components of the NFIP program; 1. floodplain identification and mapping risk, 2. responsible floodplain management, and 3. flood insurance. Sample activities include but are not limited to: maintaining publicly accessible and accurate Flood Insurance Rate Maps (FIRMs), adopting and enforcing a compliant floodplain ordinance, and provide general assistance and education to community members regarding the flood insurance program.	Flood	High	On-going	N/A	City	On-going
5.1 – 5.4	Encourage the lessening of potential wildfires in our community and the region by; 1. Education and outreach to residents, especially those that live in woodland areas and the Wildland Urban Interface (WUI). 2. Reduction of hazardous fuels throughout the community. 3. Reduction of structural ignitability to limit injury, loss of life, and property and structural damage. 4. Having trained first responders with proper tools and equipment that will serve as a frontline defense against a wildfire.	Wildfire	Medium	On-going	N/A	City	On-going
8	Continue study of acquiring and demolishing the Reeves Brothers plant, a major industrial site that was closed in 1985 after Hurricane Juan severely damaged the plant.	Flood	Low	Cancelled, Reeves Brothers Plan has been sold.	N/A	N/A	N/A
3.4	Continue the Buena Vista Watershed Project to prevent flooding from four of the interior streams that flow through Buena Vista. The project funded by the USDA	Flood	High	On-going	Funding has been cut.	Federal City	N/A

Regional Strategy ID #	Mitigation Strategy	Hazard	Priority High Medium Low	Project Status Delayed On-going Completed	If Not Completed, Why?	Responsible Party	Time Frame
	would protect 240 residences, 70 commercial structures, and utilities by constructing debris basins, replacing culverts and bridges, and improving stream channels.						
6.1	Seek funding to continue city-wide residential flood mitigation project that calls for the acquisition, elevation, floodproofing of properties identified as at-risk of future flooding.	Flood	High	On-going	Lack of funding.	N/A	N/A

Central Shenandoah Hazard Mitigation Plan: Local Mitigation Strategies

Community: **City of Harrisonburg**
NFIP Community Number: **510076**

Regional Strategy ID #	Mitigation Strategy	Hazard	Priority High Medium Low	Project Status Delayed On-going Completed	If Not Completed, Why?	Responsible Party	Time Frame
14.1	Continue membership and participation in Shenandoah Valley Project Impact, the regional disaster preparedness and mitigation education program that was started in September 2000. Shenandoah Valley Project Impact educates citizens in the region about disaster preparedness and mitigation through public awareness campaigns, workshops and trainings, and an extensive resource library.	Multi- Hazards	High	On-going	N/A	CSPDC	On-going
14.1	Maintain a relationship with the Southern Shenandoah Chapter of Virginia Voluntary Organizations Active in Disaster (VOAD), to share knowledge and resources throughout the preparation, response, and recovery phases of a disaster.	Multi- Hazards	High	On-going	N/A	City	On-going
6.1 – 6.8 8.1, 8.2 10.1 – 10.4 12.1	Support implementation of structural and non-structural mitigation activities on private or public property to reduce exposure to and provide protection from natural and man-made hazards. Eligible projects include but are not limited to acquisition, elevation, minor structural flood control projects, relocation of structures, retrofitting of existing structures, infrastructure protection measures, stormwater and wastewater management improvements, advanced warning systems, hazard gauging systems, hazard education, and wildfire mitigation projects.	Multi- Hazards	High	On-going	N/A	City	On-going

Regional Strategy ID #	Mitigation Strategy	Hazard	Priority High Medium Low	Project Status Delayed On-going Completed	If Not Completed, Why?	Responsible Party	Time Frame
2.1 – 2.4	Maintain the community's compliance with the National Flood Insurance Program (NFIP) by engaging in various activities included in the three basic components of the NFIP program; 1. floodplain identification and mapping risk, 2. responsible floodplain management, and 3. flood insurance. Sample activities include but are not limited to: maintaining publicly accessible and accurate Flood Insurance Rate Maps (FIRMs), adopting and enforcing a compliant floodplain ordinance, and provide general assistance and education to community members regarding the flood insurance program.	Flood	High	On-going	N/A	City	On-going
5.1 – 5.4	Encourage the lessening of potential wildfires in our community and the region by; 1. Education and outreach to residents, especially those that live in woodland areas and the Wildland Urban Interface (WUI). 2. Reduction of hazardous fuels throughout the community. 3. Reduction of structural ignitability to limit injury, loss of life, and property and structural damage. 4. Having trained first responders with proper tools and equipment that will serve as a frontline defense against a wildfire.	Wildfire	Medium	On-going	N/A	City	On-going
15.1	Continue participation in FEMA's Cooperating Technical Program (CTP), a technical assistance program sponsored by FEMA that will assist the City in re-mapping the entire floodplain boundary in the City.	Flood	Medium	Complete	N/A	Federal City	N/A
16	Continue support of the Harrisonburg-Rockingham Disaster Recovery Committee, a volunteer group made up of representatives of local churches, the Red Cross, Salvation Army, United Way, VOAD, Social Services,	Multi- Hazards	High	On-going	N/A	City	On-going

Regional Strategy ID #	Mitigation Strategy	Hazard	Priority High Medium Low	Project Status Delayed On-going Completed	If Not Completed, Why?	Responsible Party	Time Frame
	Rockingham County and others that work with residents affected by disasters in providing assistance not covered by federal and state recovery programs.						
12.2	Decommission the dam at James Madison University* ** Note: Over-topping protection was constructed in 2014-15 to protect impoundment failure.*	Flood	High	Alternate construction completed.	N/A	JMU	N/A
3.4	Replace a deteriorating culvert bridge on Madison Street with upsized culverts which will trap less debris during storm events.	Flood	High	Completed	N/A	City	N/A
3.2, 3.4	Identify and implement drainage improvement projects to mitigate flooding throughout the City. Projects may be identified through the Drainage Improvement Program, the Stormwater Improvement Plan, or other methods.	Flood	High	On-going	N/A	City	On-going
13	Consider mitigation actions in the City that are focused on natural systems protection.	Flood	High				On-going

Central Shenandoah Hazard Mitigation Plan: Local Mitigation Strategies

Community: **City of Lexington**
NFIP Community Number: **510089**

Regional Strategy ID #	Mitigation Strategy	Hazard	Priority High Medium Low	Project Status Delayed On-going Completed	If Not Completed, Why?	Responsible Party	Time Frame
14.1	Continue membership and participation in Shenandoah Valley Project Impact, the regional disaster preparedness and mitigation education program that was started in September 2000. Shenandoah Valley Project Impact educates citizens in the region about disaster preparedness and mitigation through public awareness campaigns, workshops and trainings, and an extensive resource library.	Multi- Hazards	High	On-going	N/A	CSPDC	On-going
14.1	Maintain a relationship with the Southern Shenandoah Chapter of Virginia Voluntary Organizations Active in Disaster (VOAD), to share knowledge and resources throughout the preparation, response, and recovery phases of a disaster.	Multi- Hazards	High	On-going	N/A	City	On-going
6.1 – 6.8 8.1, 8.2 10.1 – 10.4 12.1	Support implementation of structural and non-structural mitigation activities on private or public property to reduce exposure to and provide protection from natural and man-made hazards. Eligible projects include but are not limited to acquisition, elevation, minor structural flood control projects, relocation of structures, retrofitting of existing structures, infrastructure protection measures, stormwater and wastewater management improvements, advanced warning systems, hazard gauging systems, hazard education, and wildfire mitigation projects.	Multi- Hazards	High	On-going	N/A	City	On-going

Regional Strategy ID #	Mitigation Strategy	Hazard	Priority High Medium Low	Project Status Delayed On-going Completed	If Not Completed, Why?	Responsible Party	Time Frame
2.1 – 2.4	Maintain the community's compliance with the National Flood Insurance Program (NFIP) by engaging in various activities included in the three basic components of the NFIP program; 1. floodplain identification and mapping risk, 2. responsible floodplain management, and 3. flood insurance. Sample activities include but are not limited to: maintaining publicly accessible and accurate Flood Insurance Rate Maps (FIRMs), adopting and enforcing a compliant floodplain ordinance, and provide general assistance and education to community members regarding the flood insurance program.	Flood	High	On-going	N/A	City	On-going
5.1 – 5.4	Encourage the lessening of potential wildfires in our community and the region by; 1. Education and outreach to residents, especially those that live in woodland areas and the Wildland Urban Interface (WUI). 2. Reduction of hazardous fuels throughout the community. 3. Reduction of structural ignitability to limit injury, loss of life, and property and structural damage. 4. Having trained first responders with proper tools and equipment that will serve as a frontline defense against a wildfire.	Wildfire	Medium	On-going	N/A	City	On-going
13.1	Complete the Woods Creek Restoration Project to address water quality/quantity problems along Woods Creek, which runs through the City. The project includes establishing riparian buffers, control storm runoff, modify existing stormwater retention facilities and educate property owners about water quality/quantity issues.	Flood	Medium	On-going	N/A	N/A	N/A

Central Shenandoah Hazard Mitigation Plan: Local Mitigation Strategies

Community: **City of Staunton**
NFIP Community Number: **510155**

Regional Strategy ID #	Mitigation Strategy	Hazard	Priority High Medium Low	Project Status Delayed On-going Completed	If Not Completed, Why?	Responsible Party	Time Frame
14.1	Continue membership and participation in Shenandoah Valley Project Impact, the regional disaster preparedness and mitigation education program that was started in September 2000. Shenandoah Valley Project Impact educates citizens in the region about disaster preparedness and mitigation through public awareness campaigns, workshops and trainings, and an extensive resource library.	Multi- Hazards	High	On-going	N/A	CSPDC	On-going
14.1	Maintain a relationship with the Southern Shenandoah Chapter of Virginia Voluntary Organizations Active in Disaster (VOAD), to share knowledge and resources throughout the preparation, response, and recovery phases of a disaster.	Multi- Hazards	High	On-going	N/A	City	On-going
6.1 – 6.8 8.1, 8.2 10.1 – 10.4 12.1	Support implementation of structural and non-structural mitigation activities on private or public property to reduce exposure to and provide protection from natural and man-made hazards. Eligible projects include but are not limited to acquisition, elevation, minor structural flood control projects, relocation of structures, retrofitting of existing structures, infrastructure protection measures, stormwater and wastewater management improvements, advanced warning systems, hazard gauging systems, hazard education, and wildfire mitigation projects.	Multi- Hazards	High	On-going	N/A	City	On-going

Regional Strategy ID #	Mitigation Strategy	Hazard	Priority High Medium Low	Project Status Delayed On-going Completed	If Not Completed, Why?	Responsible Party	Time Frame
2.1 – 2. 4	Maintain the community's compliance with the National Flood Insurance Program (NFIP) by engaging in various activities included in the three basic components of the NFIP program; 1. floodplain identification and mapping risk, 2. responsible floodplain management, and 3. flood insurance. Sample activities include but are not limited to: maintaining publicly accessible and accurate Flood Insurance Rate Maps (FIRMs), adopting and enforcing a compliant floodplain ordinance, and provide general assistance and education to community members regarding the flood insurance program.	Flood	High	On-going	N/A	City	On-going
5.1 – 5.4	Encourage the lessening of potential wildfires in our community and the region by; 1. Education and outreach to residents, especially those that live in woodland areas and the Wildland Urban Interface (WUI). 2. Reduction of hazardous fuels throughout the community. 3. Reduction of structural ignitability to limit injury, loss of life, and property and structural damage. 4. Having trained first responders with proper tools and equipment that will serve as a frontline defense against a wildfire.	Wildfire	Medium	On-going	N/A	City	On-going
3.4	Complete construction of the Churchville Avenue storm sewer project that is vital to reducing and alleviating downstream flooding in the central business district.	Flood	High	Completed	N/A	City	N/A
3.2	Seek funding to prepare site-specific hydrologic and hydraulic studies that look at the downtown commercial/historic areas that have chronic and repetitive flooding problems. After study is completed, implement recommended mitigation strategies.	Flood	High	Delayed	Lack of funding	N/A	N/A

Regional Strategy ID #	Mitigation Strategy	Hazard	Priority High Medium Low	Project Status Delayed On-going Completed	If Not Completed, Why?	Responsible Party	Time Frame
9, 16	Increase expenditures for state-of the-art equipment, communication systems, and heavy equipment to respond to natural disasters in an effective and efficient manner.	Multi- Hazards	Low	Delayed	Lack of funding	N/A	N/A
8.2	Provide floodproofing measures to approximately 12 commercial structures in the downtown area that have been identified as at-risk of flooding. Six additional commercial structures needing floodproofing remain.	Flood	High	Completed	N/A	City State Federal	N/A
3.4	Demolish structures in floodplain on Central Avenue and complete process of "daylighting" a tributary of Lewis Creek.	Flood	High	Completed	N/A	City and Pvt. Citizen	N/A
10	Install emergency notification system with "Reverse 911" capability and notification by text. *City now has the "Staunton Alert Message" system.*	Multi- Hazards	High	Completed	N/A	N/A	N/A
6.3	Implement a floodproofing project throughout the City that will strap down above ground storage tanks in the floodplain.	Flood	High	Delayed	Lack of Funding	N/A	N/A
11.4	Install generators at all the designated emergency shelters in the City.	Multi- Hazards	High	Completed	N/A	N/A	N/A
7.10	Maintain an animal supply trailer and all the supplies needed to stock the mandated animal shelter which will be located at Augusta Expo.	Multi-Hazards	High	Completed	N/A	N/A	N/A
13	Create a retention pond in the western portion of the City and install other stormwater facilities throughout the City as needed to address stormwater issues.	Flood	High	Delayed	Lack of Funding	N/A	N/A
16	City departments will undergo an annual review of the planning process to evaluate their preparedness.	Multi- Hazards	High	On-going	N/A	City	N/A

Regional Strategy ID #	Mitigation Strategy	Hazard	Priority High Medium Low	Project Status Delayed On-going Completed	If Not Completed, Why?	Responsible Party	Time Frame
16	Create a regional Emergency Operations Plan (EOP) with the City of Waynesboro and Augusta County to more effectively and efficiently utilize the resources of the three localities.	Multi-Hazards	High	Completed	N/A	County and Cities	N/A
14.6	Maintain the Staunton-Augusta-Waynesboro Community Emergency Response Team (S-A-W CERT).	Multi-Hazards	High	On-going	N/A	County and Cities	On-going
11.1	Move the fire station located at 500 N. Augusta Street out of the floodplain.	Flood	High	Delayed	Lack of Funding	City	N/A
13	Consider mitigation actions in the City that are focused on natural systems protection.	Flood	High				On-going

Central Shenandoah Hazard Mitigation Plan: Local Mitigation Strategies

Community: **City of Waynesboro**
NFIP Community Number: **515532**

Regional Strategy ID#	Mitigation Strategy	Hazard	Priority High Medium Low	Project Status Delayed On-going Completed	If Not Completed, Why?	Responsible Party	Time Frame
14.1	Continue membership and participation in Shenandoah Valley Project Impact, the regional disaster preparedness and mitigation education program that was started in September 2000. Shenandoah Valley Project Impact educates citizens in the region about disaster preparedness and mitigation through public awareness campaigns, workshops and trainings, and an extensive resource library.	Multi-Hazards	High	On-going	N/A	CSPDC	On-going
14.1	Maintain a relationship with the Southern Shenandoah Chapter of Virginia Voluntary Organizations Active in Disaster (VOAD), to share knowledge and resources throughout the preparation, response, and recovery phases of a disaster.	Multi- Hazards	High	On-going	N/A	City	On-going
6.1 – 6.8 8.1,8.2 10.1 – 10.4 12.1	Support implementation of structural and non-structural mitigation activities on private or public property to reduce exposure to and provide protection from natural and man-made hazards. Eligible projects include but are not limited to acquisition, elevation, minor structural flood control projects, relocation of structures, retrofitting of existing structures, infrastructure protection measures, stormwater and wastewater management improvements, advanced warning systems, hazard gauging systems, hazard education, and wildfire mitigation projects.	Multi- Hazards	High	On-going	N/A	City	On-going

Regional Strategy ID#	Mitigation Strategy	Hazard	Priority High Medium Low	Project Status Delayed On-going Completed	If Not Completed, Why?	Responsible Party	Time Frame
2.1 – 2.4	Maintain the community's compliance with the National Flood Insurance Program (NFIP) by engaging in various activities included in the three basic components of the NFIP program; 1. floodplain identification and mapping risk, 2. responsible floodplain management, and 3. flood insurance. Sample activities include but are not limited to: maintaining publicly accessible and accurate Flood Insurance Rate Maps (FIRMs), adopting and enforcing a compliant floodplain ordinance, and provide general assistance and education to community members regarding the flood insurance program.	Flood	High	On-going	N/A	City	On-going
5.1 – 5.4	Encourage the lessening of potential wildfires in our community and the region by; 1. Education and outreach to residents, especially those that live in woodland areas and the Wildland Urban Interface (WUI). 2. Reduction of hazardous fuels throughout the community. 3. Reduction of structural ignitability to limit injury, loss of life, and property and structural damage. 4. Having trained first responders with proper tools and equipment that will serve as a frontline defense against a wildfire.	Wildfire	Medium	On-going	N/A	City	On-going
6.1	Complete the acquisition and relocation of tenants of the Race Ave. Trailer Park, a 33-unit trailer park that has been repetitively and seriously damaged in numerous flood events.	Flood	High	Completed	N/A	N/A	N/A
6.2	Continue city-wide residential flood mitigation project that calls for the acquisition, elevation, or floodproofing of more than 50 properties identified as at-risk for future flooding. Most of the houses are in the River Shores/Club	Flood	High	On-going	Lack of Funding	N/A	On-going

Regional Strategy ID#	Mitigation Strategy	Hazard	Priority High Medium Low	Project Status Delayed On-going Completed	If Not Completed, Why?	Responsible Party	Time Frame
	Court and adjacent to downtown areas of the City. Sixteen properties have been purchased and kept in "open space".						
6.1	Complete a project to elevate houses, floodproof utilities, and install flood vents for 12 properties located on residential areas adjacent to downtown area in the floodplain	Flood	High	On-going	Lack of Funding	State and Local	On-going
13	Implement greenways project along South River to keep floodplain in "Open Space".	Flood	High	Completed	N/A	N/A	N/A
3.4	Implement stormwater project for Wayne Hills Field in front of the Public Works Building by creating retention pond and connecting drop inlets with piping to travel to retention pond.	Flood	High	On-going	N/A	City	N/A
6.2	Seek funding to implement a flood mitigation project to provide floodproofing and retrofitting measures to Waynesboro's downtown commercial area.	Flood	Medium	On-going	Lack of Funding	N/A	N/A
3.1	Update a master stormwater study that identifies, analyzes, and prioritizes flooding in areas throughout the City. Hire a stormwater manager for the City.	Flood	Medium	On-going	N/A	Local	N/A
12	Install a flood control dam in Jones Hollow to address problem of ingress and egress of property owners near the mountain whose houses don't flood but people get trapped.	Flood	High	Completed	N/A	N/A	N/A
16	Create a regional Emergency Operations Plan (EOP) with the City of Staunton and Augusta County to more effectively and efficiently utilize the resources of the three localities.	Multi-Hazards	High	On-going	N/A	County and Cities	N/A

Regional Strategy ID#	Mitigation Strategy	Hazard	Priority High Medium Low	Project Status Delayed On-going Completed	If Not Completed, Why?	Responsible Party	Time Frame
14.6	Maintain the Staunton-Augusta-Waynesboro Community Emergency Response Team (S-A-W CERT)	Multi-Hazards	High	On-going	N/A	County and Cities	N/A

Central Shenandoah Hazard Mitigation Plan: Local Mitigation Strategies

Community: **Town of Bridgewater**
NFIP Community Number: **510134**

Regional Strategy ID #	Mitigation Strategy	Hazard	Priority High Medium Low	Project Status Delayed On-going Completed	If Not Completed, Why?	Responsible Party	Time Frame
14.1	Continue membership and participation in Shenandoah Valley Project Impact, the regional disaster preparedness and mitigation education program that was started in September 2000. Shenandoah Valley Project Impact educates citizens in the region about disaster preparedness and mitigation through public awareness campaigns, workshops and trainings, and an extensive resource library.	Multi - Hazards	High	On-going	N/A	CSPDC	On-going
14.1	Maintain a relationship with the Southern Shenandoah Chapter of Virginia Voluntary Organizations Active in Disaster (VOAD), to share knowledge and resources throughout the preparation, response, and recovery phases of a disaster.	Multi - Hazards	High	On-going	N/A	Town	On-going
6.1 – 6.8 8.1, 8.2 10.1 – 10.4 12.1	Support implementation of structural and non-structural mitigation activities on private or public property to reduce exposure to and provide protection from natural and man-made hazards. Eligible projects include but are not limited to acquisition, elevation, minor structural flood control projects, relocation of structures, retrofitting of existing structures, infrastructure protection measures, stormwater and wastewater management improvements, advanced warning systems, hazard gauging systems, hazard education, and wildfire mitigation projects.	Multi - Hazards	High	On-going	N/A	Town	On-going

Regional Strategy ID #	Mitigation Strategy	Hazard	Priority High Medium Low	Project Status Delayed On-going Completed	If Not Completed, Why?	Responsible Party	Time Frame
2.1 – 2.4	Maintain the community's compliance with the National Flood Insurance Program (NFIP) by engaging in various activities included in the three basic components of the NFIP program; 1. floodplain identification and mapping risk, 2. responsible floodplain management, and 3. flood insurance. Sample activities include but are not limited to: maintaining publicly accessible and accurate Flood Insurance Rate Maps (FIRMs), adopting and enforcing a compliant floodplain ordinance, and provide general assistance and education to community members regarding the flood insurance program.	Flood	High	On-going	N/A	Town	On-going
5.1 – 5.4	Encourage the lessening of potential wildfires in our community and the region by; 1. Education and outreach to residents, especially those that live in woodland areas and the Wildland Urban Interface (WUI). 2. Reduction of hazardous fuels throughout the community. 3. Reduction of structural ignitability to limit injury, loss of life, and property and structural damage. 4. Having trained first responders with proper tools and equipment that will serve as a frontline defense against a wildfire.	Wildfire	Medium	On-going	N/A	Town	On-going
6.2	Seek funding to complete the Bridgewater Flood Mitigation Project where structures have been identified at-risk of flooding and mitigation options such as acquisition, elevation, and/or floodproofing is recommended.	Flood	High	Completed	N/A	Federal State Local	N/A
3.4-3.5	Aggressively improve the Town's levee system. Maintain levee annually.	Flood	High	On-going	N/A	Federal Local	N/A

Regional Strategy ID #	Mitigation Strategy	Hazard	Priority High Medium Low	Project Status Delayed On-going Completed	If Not Completed, Why?	Responsible Party	Time Frame
3	Implement plans and regulations at the local level to meet revised storm water management regulations.	Flood	High	On-going	N/A	Local	N/A
13	Consider mitigation actions in the Town that are focused on natural systems protection.	Flood	High				On-going

Central Shenandoah Hazard Mitigation Plan: Local Mitigation Strategies

Community: **Town of Broadway**
NFIP Community Number: **510135**

Regional Strategy ID #	Mitigation Strategy	Hazard	Priority High Medium Low	Project Status Delayed On-going Completed	If Not Completed, Why?	Responsible Party	Time Frame
14.1	Continue membership and participation in Shenandoah Valley Project Impact, the regional disaster preparedness and mitigation education program that was started in September 2000. Shenandoah Valley Project Impact educates citizens in the region about disaster preparedness and mitigation through public awareness campaigns, workshops and trainings, and an extensive resource library.	Multi - Hazards	High	On-going	N/A	CSPDC	On-going
14.1	Maintain a relationship with the Southern Shenandoah Chapter of Virginia Voluntary Organizations Active in Disaster (VOAD), to share knowledge and resources throughout the preparation, response, and recovery phases of a disaster.	Multi - Hazards	High	On-going	N/A	Town	On-going
6.1 – 6.8 8.1, 8.2 10.1 – 10.4 12.1	Support implementation of structural and non-structural mitigation activities on private or public property to reduce exposure to and provide protection from natural and man-made hazards. Eligible projects include but are not limited to acquisition, elevation, minor structural flood control projects, relocation of structures, retrofitting of existing structures, infrastructure protection measures, stormwater and wastewater management improvements, advanced warning systems, hazard gauging systems, hazard education, and wildfire mitigation projects.	Multi - Hazards	High	On-going	N/A	Town	On-going

Regional Strategy ID #	Mitigation Strategy	Hazard	Priority High Medium Low	Project Status Delayed On-going Completed	If Not Completed, Why?	Responsible Party	Time Frame
2.1 – 2.4	Maintain the community's compliance with the National Flood Insurance Program (NFIP) by engaging in various activities included in the three basic components of the NFIP program; 1. floodplain identification and mapping risk, 2. responsible floodplain management, and 3. flood insurance. Sample activities include but are not limited to: maintaining publicly accessible and accurate Flood Insurance Rate Maps (FIRMs), adopting and enforcing a compliant floodplain ordinance, and provide general assistance and education to community members regarding the flood insurance program.	Flood	High	On-going	N/A	Town	On-going
5.1 – 5.4	Encourage the lessening of potential wildfires in our community and the region by; 1. Education and outreach to residents, especially those that live in woodland areas and the Wildland Urban Interface (WUI). 2. Reduction of hazardous fuels throughout the community. 3. Reduction of structural ignitability to limit injury, loss of life, and property and structural damage. 4. Having trained first responders with proper tools and equipment that will serve as a frontline defense against a wildfire.	Wildfire	Medium	On-going	N/A	Town	On-going
1.3	Complete a stream bank restoration project on the full length of Linville Creek to repair erosion that has already occurred and lessen future erosion. Linville Creek is the back-up water supply for the Town. The purpose of this project is to protect water and sewer lines, floodplain management, protect the water intake.	Multi-hazards		Delayed	Lack of Funding		N/A
6.1	Acquire structures in the floodplain in Town.	Flood		Delayed	Lack of Funding		N/A

Regional Strategy ID #	Mitigation Strategy	Hazard	Priority High Medium Low	Project Status Delayed On-going Completed	If Not Completed, Why?	Responsible Party	Time Frame
3.4	Remove a sewer line that is above grade	Multi-hazards		Delayed	Lack of Funding		N/A

Central Shenandoah Hazard Mitigation Plan: Local Mitigation Strategies

Community: **Town of Craigsville**
NFIP Community Number: **510014**

Regional Strategy ID #	Mitigation Strategy	Hazard	Priority High Medium Low	Project Status Delayed On-going Completed	If Not Completed, Why?	Responsible Party	Time Frame
14.1	Continue membership and participation in Shenandoah Valley Project Impact, the regional disaster preparedness and mitigation education program that was started in September 2000. Shenandoah Valley Project Impact educates citizens in the region about disaster preparedness and mitigation through public awareness campaigns, workshops and trainings, and an extensive resource library.	Multi- Hazards	High	On-going	N/A	CSPDC	On-going
14.1	Maintain a relationship with the Southern Shenandoah Chapter of Virginia Voluntary Organizations Active in Disaster (VOAD), to share knowledge and resources throughout the preparation, response, and recovery phases of a disaster.	Multi- Hazards	High	On-going	N/A	Town	On-going
6.1 – 6.8 8.1, 8.2 10.1 – 10.4 12.1	Support implementation of structural and non-structural mitigation activities on private or public property to reduce exposure to and provide protection from natural and man-made hazards. Eligible projects include but are not limited to acquisition, elevation, minor structural flood control projects, relocation of structures, retrofitting of existing structures, infrastructure protection measures, stormwater and wastewater management improvements, advanced warning systems, hazard gauging systems, hazard education, and wildfire mitigation projects.	Multi- Hazards	High	On-going	N/A	Town	On-going

Regional Strategy ID #	Mitigation Strategy	Hazard	Priority High Medium Low	Project Status Delayed On-going Completed	If Not Completed, Why?	Responsible Party	Time Frame
2.1 – 2.4	Maintain the community's compliance with the National Flood Insurance Program (NFIP) by engaging in various activities included in the three basic components of the NFIP program; 1. floodplain identification and mapping risk, 2. responsible floodplain management, and 3. flood insurance. Sample activities include but are not limited to: maintaining publicly accessible and accurate Flood Insurance Rate Maps (FIRMs), adopting and enforcing a compliant floodplain ordinance, and provide general assistance and education to community members regarding the flood insurance program.	Flood	High	On-going	N/A	Town	On-going
5.1 – 5.4	Encourage the lessening of potential wildfires in our community and the region by; 1. Education and outreach to residents, especially those that live in woodland areas and the Wildland Urban Interface (WUI). 2. Reduction of hazardous fuels throughout the community. 3. Reduction of structural ignitability to limit injury, loss of life, and property and structural damage. 4. Having trained first responders with proper tools and equipment that will serve as a frontline defense against a wildfire.	Wildfire	Medium	On-going	N/A	Town	On-going
3.4	Seek funding to replace and improve infrastructure in key locations throughout the town to reduce flood damage caused by the interior streams, as well as inadequate culverts and infrastructure. Coordinate project with VDOT.	Flood	High	Delayed	Lack of Funding	N/A	N/A
13	Consider mitigation actions in the Town that are focused on natural systems protection.	Flood	High				On-going

Central Shenandoah Hazard Mitigation Plan: Local Mitigation Strategies

Community: **Town of Dayton**
NFIP Community Number: **510136**

Regional Strategy ID#	Mitigation Strategy	Hazard	Priority High Medium Low	Project Status Delayed On-going Completed	If Not Completed, Why?	Responsible Party	Time Frame
14.1	Continue membership and participation in Shenandoah Valley Project Impact, the regional disaster preparedness and mitigation education program that was started in September 2000. Shenandoah Valley Project Impact educates citizens in the region about disaster preparedness and mitigation through public awareness campaigns, workshops and trainings, and an extensive resource library.	Multi- Hazards	High	On-going	N/A	CSPDC	On-going
14.1	Maintain a relationship with the Southern Shenandoah Chapter of Virginia Voluntary Organizations Active in Disaster (VOAD), to share knowledge and resources throughout the preparation, response, and recovery phases of a disaster.	Multi- Hazards	High	On-going	N/A	Town	On-going
6.1 – 6.8 8.1, 8.2 10.1 – 10.4 12.1	Support implementation of structural and non-structural mitigation activities on private or public property to reduce exposure to and provide protection from natural and man-made hazards. Eligible projects include but are not limited to acquisition, elevation, minor structural flood control projects, relocation of structures, retrofitting of existing structures, infrastructure protection measures, stormwater and wastewater management improvements, advanced warning systems, hazard gauging systems, hazard education, and wildfire mitigation projects.	Multi- Hazards	High	On-going	N/A	Town	On-going

Regional Strategy ID#	Mitigation Strategy	Hazard	Priority High Medium Low	Project Status Delayed On-going Completed	If Not Completed, Why?	Responsible Party	Time Frame
2.1 – 2.4	Maintain the community's compliance with the National Flood Insurance Program (NFIP) by engaging in various activities included in the three basic components of the NFIP program; 1. floodplain identification and mapping risk, 2. responsible floodplain management, and 3. flood insurance. Sample activities include but are not limited to: maintaining publicly accessible and accurate Flood Insurance Rate Maps (FIRMs), adopting and enforcing a compliant floodplain ordinance, and provide general assistance and education to community members regarding the flood insurance program.	Flood	High	On-going	N/A	Town	On-going
5.1 – 5.4	Encourage the lessening of potential wildfires in our community and the region by; 1. Education and outreach to residents, especially those that live in woodland areas and the Wildland Urban Interface (WUI). 2. Reduction of hazardous fuels throughout the community. 3. Reduction of structural ignitability to limit injury, loss of life, and property and structural damage. 4. Having trained first responders with proper tools and equipment that will serve as a frontline defense against a wildfire.	Wildfire	Medium	On-going	N/A	Town	On-going
11	Put fencing around water treatment plant with locked gates and surveillance equipment and alarms for water levels getting too low.	Multi-Hazards	N/A	Completed	N/A	N/A	N/A
14	Implement a fire education program to educate citizens on the fire code and burning permits.	Wildfire	N/A	Delayed	Lack of Funding and Staff	N/A	N/A

Regional Strategy ID#	Mitigation Strategy	Hazard	Priority High Medium Low	Project Status Delayed On-going Completed	If Not Completed, Why?	Responsible Party	Time Frame
3.2	Conduct a hydrologic study and floodplain analysis to determine vulnerable areas in the Town that receive flooding from Cook's Creek. Implement mitigation measures where needed.	Flood	N/A	Completed in part – Mill Street project	Priority area completed	N/A	N/A
3.4	Implement a stormwater drainage project to address the stormwater issues on Main Street and College Street.	Flood	N/A	Ongoing – to be completed in 2020	In progress	N/A	N/A
11	Add lightning protection to the Town's Water Plant.	Severe Storms	High	Completed	N/A	Town	N/A
13	Consider mitigation actions in the Town that are focused on natural systems protection.	Flood	High				On-going

Central Shenandoah Hazard Mitigation Plan: Local Mitigation Strategies

Community: **Town of Elkton**
NFIP Community Number: **510137**

Regional Strategy ID #	Mitigation Strategy	Hazard	Priority High Medium Low	Project Status Delayed On-going Completed	If Not Completed, Why?	Responsible Party	Time Frame
14.1	Continue membership and participation in Shenandoah Valley Project Impact, the regional disaster preparedness and mitigation education program that was started in September 2000. Shenandoah Valley Project Impact educates citizens in the region about disaster preparedness and mitigation through public awareness campaigns, workshops and trainings, and an extensive resource library.	Multi - Hazards	High	On-going	N/A	CSPDC	On-going
14.1	Maintain a relationship with the Southern Shenandoah Chapter of Virginia Voluntary Organizations Active in Disaster (VOAD), to share knowledge and resources throughout the preparation, response, and recovery phases of a disaster.	Multi - Hazards	High	On-going	N/A	Town	On-going
6.1 – 6.8 8.1, 8.2 10.1 – 10.4 12.1	Support implementation of structural and non-structural mitigation activities on private or public property to reduce exposure to and provide protection from natural and man-made hazards. Eligible projects include but are not limited to acquisition, elevation, minor structural flood control projects, relocation of structures, retrofitting of existing structures, infrastructure protection measures, stormwater and wastewater management improvements, advanced warning systems, hazard gauging systems, hazard education, and wildfire mitigation projects.	Multi - Hazards	High	On-going	N/A	Town	On-going

Regional Strategy ID #	Mitigation Strategy	Hazard	Priority High Medium Low	Project Status Delayed On-going Completed	If Not Completed, Why?	Responsible Party	Time Frame
2.1 – 2.4	Maintain the community's compliance with the National Flood Insurance Program (NFIP) by engaging in various activities included in the three basic components of the NFIP program; 1. floodplain identification and mapping risk, 2. responsible floodplain management, and 3. flood insurance. Sample activities include but are not limited to: maintaining publicly accessible and accurate Flood Insurance Rate Maps (FIRMs), adopting and enforcing a compliant floodplain ordinance, and provide general assistance and education to community members regarding the flood insurance program.	Flood	High	On-going	N/A	Town	On-going
5.1 – 5.4	Encourage the lessening of potential wildfires in our community and the region by; 1. Education and outreach to residents, especially those that live in woodland areas and the Wildland Urban Interface (WUI). 2. Reduction of hazardous fuels throughout the community. 3. Reduction of structural ignitability to limit injury, loss of life, and property and structural damage. 4. Having trained first responders with proper tools and equipment that will serve as a frontline defense against a wildfire.	Wildfire	Medium	On-going	N/A	Town	On-going
13	Consider mitigation actions in the Town that are focused on natural systems protection.	Flood	High				On-going

Central Shenandoah Hazard Mitigation Plan: Local Mitigation Strategies

Community: **Town of Glasgow**
NFIP Community Number: **515526**

Regional Strategy ID #	Mitigation Strategy	Hazard	Priority High Medium Low	Project Status Delayed On-going Completed	If Not Completed, Why?	Responsible Party	Time Frame
14.1	Continue membership and participation in Shenandoah Valley Project Impact, the regional disaster preparedness and mitigation education program that was started in September 2000. Shenandoah Valley Project Impact educates citizens in the region about disaster preparedness and mitigation through public awareness campaigns, workshops and trainings, and an extensive resource library.	Multi- Hazards	High	On-going	N/A	CSPDC	On-going
14.1	Maintain a relationship with the Southern Shenandoah Chapter of Virginia Voluntary Organizations Active in Disaster (VOAD), to share knowledge and resources throughout the preparation, response, and recovery phases of a disaster.	Multi- Hazards	High	On-going	N/A	Town	On-going
6.1 – 6.8 8.1, 8.2 10.1 – 10.4 12.1	Support implementation of structural and non-structural mitigation activities on private or public property to reduce exposure to and provide protection from natural and man-made hazards. Eligible projects include but are not limited to acquisition, elevation, minor structural flood control projects, relocation of structures, retrofitting of existing structures, infrastructure protection measures, stormwater and wastewater management improvements, advanced warning systems, hazard gauging systems, hazard education, and wildfire mitigation projects.	Multi-Hazards	High	On-going	N/A	Town	On-going

Regional Strategy ID #	Mitigation Strategy	Hazard	Priority High Medium Low	Project Status Delayed On-going Completed	If Not Completed, Why?	Responsible Party	Time Frame
2.1 – 2.4	Maintain the community's compliance with the National Flood Insurance Program (NFIP) by engaging in various activities included in the three basic components of the NFIP program; 1. floodplain identification and mapping risk, 2. responsible floodplain management, and 3. flood insurance. Sample activities include but are not limited to: maintaining publicly accessible and accurate Flood Insurance Rate Maps (FIRMs), adopting and enforcing a compliant floodplain ordinance, and provide general assistance and education to community members regarding the flood insurance program.	Flood	High	On-going	N/A	Town	On-going
5.1 – 5.4	Encourage the lessening of potential wildfires in our community and the region by; 1. Education and outreach to residents, especially those that live in woodland areas and the Wildland Urban Interface (WUI). 2. Reduction of hazardous fuels throughout the community. 3. Reduction of structural ignitability to limit injury, loss of life, and property and structural damage. 4. Having trained first responders with proper tools and equipment that will serve as a frontline defense against a wildfire.	Wildfire	Medium	On-going	N/A	Town	On-going
6.2	Seek funding to complete the Glasgow Residential Flood Mitigation Project that calls for the acquisition, relocation, and elevation of approximately 10 residential properties that have been severely damaged in the past flood events.	Flood	High	Delayed	Lack of Funding	N/A	N/A
3.4, 13.1	Seek funding to complete the Glasgow Interior Stream Drainage Project to prevent or reduce flooding along Sallings Mountain and Miller Mountain. The project calls for the construction of a debris basin, flood diversion wall,	Flood	High	Delayed	Lack of Funding	N/A	N/A

Regional Strategy ID #	Mitigation Strategy	Hazard	Priority High Medium Low	Project Status Delayed On-going Completed	If Not Completed, Why?	Responsible Party	Time Frame
	improved channelization, and replacement of several culverts throughout Town. To date ditches have been cleaned out but that is all.						
3.2	Complete a hydrologic, floodplain, and stormwater study to access new and continued vulnerable areas in the Town and to provide recommendations for improvements to be made to the Town's stormwater system.	Flood	High	Delayed	Lack of Funding	N/A	N/A
3.4	Create a stormwater retention pond in north Glasgow. i.e. 1st Street and Pocahontas.	Flood	High	Delayed	Lack of Funding	N/A	N/A
11	Implement a project to safeguard the Town's water system and 2 municipal wells through a wellhead protection project that includes proper abandonment of unused wells, fencing, and other security measures, routine inspections of utility lines, and education for property owners, business, industry, and railroad. Also create another well.	Multi-hazards	Medium	On-going	Lack of Funding	N/A	N/A
3.4	Implement check-valve system or other floodproofing option to prevent culverts from backing up as they enter the Maury River when rainwater inundates the stormwater drainage system as the river water simultaneously rises.	Flood	High	Delayed	Lack of Funding	N/A	N/A
11	Remove the Glasgow Fire Department from the location of its current building in the floodplain to a less vulnerable location.	Flood	High	Delayed	Lack of Funding	N/A	N/A
6.1	Implement a flood mitigation project to acquire, relocate, or elevate structures on 53 properties located in the floodplain in the Town.	Flood	High	Completed	N/A	Federal, State, and Local	N/A

Central Shenandoah Hazard Mitigation Plan: Local Mitigation Strategies

Community: **Town of Goshen**
NFIP Community Number: **510217**

Regional Strategy ID #	Mitigation Strategy	Hazard	Priority High Medium Low	Project Status Delayed On-going Completed	If Not Completed, Why?	Responsible Party	Time Frame
14.1	Continue membership and participation in Shenandoah Valley Project Impact, the regional disaster preparedness and mitigation education program that was started in September 2000. Shenandoah Valley Project Impact educates citizens in the region about disaster preparedness and mitigation through public awareness campaigns, workshops and trainings, and an extensive resource library.	Multi-Hazards	High	On-going	N/A	CSPDC	On-going
14.1	Maintain a relationship with the Southern Shenandoah Chapter of Virginia Voluntary Organizations Active in Disaster (VOAD), to share knowledge and resources throughout the preparation, response, and recovery phases of a disaster.	Multi- Hazards	High	On-going	N/A	Town	On-going
6.1 – 6.8 8.1, 8.2 10.1 – 10.4 12.1	Support implementation of structural and non-structural mitigation activities on private or public property to reduce exposure to and provide protection from natural and man-made hazards. Eligible projects include but are not limited to acquisition, elevation, minor structural flood control projects, relocation of structures, retrofitting of existing structures, infrastructure protection measures, stormwater and wastewater management improvements, advanced warning systems, hazard gauging systems, hazard education, and wildfire mitigation projects.	Multi- Hazards	High	On-going	N/A	Town	On-going

Regional Strategy ID #	Mitigation Strategy	Hazard	Priority High Medium Low	Project Status Delayed On-going Completed	If Not Completed, Why?	Responsible Party	Time Frame
2.1 – 2.4	Maintain the community's compliance with the National Flood Insurance Program (NFIP) by engaging in various activities included in the three basic components of the NFIP program; 1. floodplain identification and mapping risk, 2. responsible floodplain management, and 3. flood insurance. Sample activities include but are not limited to: maintaining publicly accessible and accurate Flood Insurance Rate Maps (FIRMs), adopting and enforcing a compliant floodplain ordinance, and provide general assistance and education to community members regarding the flood insurance program.	Flood	High	On-going	N/A	Town	On-going
5.1 – 5.4	Encourage the lessening of potential wildfires in our community and the region by; 1. Education and outreach to residents, especially those that live in woodland areas and the Wildland Urban Interface (WUI). 2. Reduction of hazardous fuels throughout the community. 3. Reduction of structural ignitability to limit injury, loss of life, and property and structural damage. 4. Having trained first responders with proper tools and equipment that will serve as a frontline defense against a wildfire.	Wildfire	Medium	On-going	N/A	Town	On-going
11	Seek funding to relocate the Goshen Town Hall out of the floodplain. This critical facility is located on Main Street in close proximity to Mill Creek in a low-lying area that receives repeated flooding and affects the operation of the Town. The Town has purchased 40 acres out of the floodplain that could be used as an alternative site.	Flood	Medium	Delayed	Lack of Funding	N/A	N/A
13	Consider mitigation actions in the Town that are focused on natural systems protection.	Flood	High				On-going

Central Shenandoah Hazard Mitigation Plan: Local Mitigation Strategies

Community: **Town of Grottoes**
NFIP Community Number: **510138**

Regional Strategy ID #	Mitigation Strategy	Hazard	Priority High Medium Low	Project Status Delayed On-going Completed	If Not Completed, Why?	Responsible Party	Time Frame
14.1	Continue membership and participation in Shenandoah Valley Project Impact, the regional disaster preparedness and mitigation education program that was started in September 2000. Shenandoah Valley Project Impact educates citizens in the region about disaster preparedness and mitigation through public awareness campaigns, workshops and trainings, and an extensive resource library.	Multi - Hazards	High	On-going	N/A	CSPDC	On-going
14.1	Maintain a relationship with the Southern Shenandoah Chapter of Virginia Voluntary Organizations Active in Disaster (VOAD), to share knowledge and resources throughout the preparation, response, and recovery phases of a disaster.	Multi - Hazards	High	On-going	N/A	Town	On-going
6.1 – 6.8 8.1, 8.2 10.1 – 10.4 12.1	Support implementation of structural and non-structural mitigation activities on private or public property to reduce exposure to and provide protection from natural and man-made hazards. Eligible projects include but are not limited to acquisition, elevation, minor structural flood control projects, relocation of structures, retrofitting of existing structures, infrastructure protection measures, stormwater and wastewater management improvements, advanced warning systems, hazard gauging systems, hazard education, and wildfire mitigation projects.	Multi - Hazards	High	On-going	N/A	Town	On-going

Regional Strategy ID #	Mitigation Strategy	Hazard	Priority High Medium Low	Project Status Delayed On-going Completed	If Not Completed, Why?	Responsible Party	Time Frame
2.1 – 2.4	Maintain the community's compliance with the National Flood Insurance Program (NFIP) by engaging in various activities included in the three basic components of the NFIP program; 1. floodplain identification and mapping risk, 2. responsible floodplain management, and 3. flood insurance. Sample activities include but are not limited to: maintaining publicly accessible and accurate Flood Insurance Rate Maps (FIRMs), adopting and enforcing a compliant floodplain ordinance, and provide general assistance and education to community members regarding the flood insurance program.	Flood	High	On-going	N/A	Town	On-going
5.1 – 5.4	Encourage the lessening of potential wildfires in our community and the region by; 1. Education and outreach to residents, especially those that live in woodland areas and the Wildland Urban Interface (WUI). 2. Reduction of hazardous fuels throughout the community. 3. Reduction of structural ignitability to limit injury, loss of life, and property and structural damage. 4. Having trained first responders with proper tools and equipment that will serve as a frontline defense against a wildfire.	Wildfire	Medium	On-going	N/A	Town	On-going
3.4	Complete the Grottoes Stormwater Drainage Improvement Project to address flooding caused by ponding and poor drainage along Miller Run and Dry Run. Project Improvements such as ditching, replacement of undersized culverts, and drainage piping will protect between 30 and 50 structures and eliminate water on roads, yards, and crawl spaces. Clean-up of Miller Run takes place every year.	Flood	High	Initial project completed and maintenance is on-going.	N/A	Local	N/A

Regional Strategy ID #	Mitigation Strategy	Hazard	Priority High Medium Low	Project Status Delayed On-going Completed	If Not Completed, Why?	Responsible Party	Time Frame
11	Extend earthen berm in Grottoes Town Park to provide protection to the park which periodically receives flooding from the South River.	Flood	High	Complete	N/A	N/A	N/A
11	Implement bank stabilization project at Grand Caverns to protect area from erosion and flooding.	Flood	High	On - going	N/A	State	N/A
13	Consider mitigation actions in the Town that are focused on natural systems protection.	Flood	High				On-going

Central Shenandoah Hazard Mitigation Plan: Local Mitigation Strategies

Community: **Town of Monterey**
NFIP Community Number: **510379**

Regional Strategy ID #	Mitigation Strategy	Hazard	Priority High Medium Low	Project Status Delayed On-going Completed	If Not Completed, Why?	Responsible Party	Time Frame
14.1	Continue membership and participation in Shenandoah Valley Project Impact, the regional disaster preparedness and mitigation education program that was started in September 2000. Shenandoah Valley Project Impact educates citizens in the region about disaster preparedness and mitigation through public awareness campaigns, workshops and trainings, and an extensive resource library.	Multi- Hazards	High	On-going	N/A	CSPDC	On-going
14.1	Maintain a relationship with the Southern Shenandoah Chapter of Virginia Voluntary Organizations Active in Disaster (VOAD), to share knowledge and resources throughout the preparation, response, and recovery phases of a disaster.	Multi- Hazards	High	On-going	N/A	Town	On-going
6.1 – 6.8 8.1, 8.2 10.1 – 10.4 12.1	Support implementation of structural and non-structural mitigation activities on private or public property to reduce exposure to and provide protection from natural and man-made hazards. Eligible projects include but are not limited to acquisition, elevation, minor structural flood control projects, relocation of structures, retrofitting of existing structures, infrastructure protection measures, stormwater and wastewater management improvements, advanced warning systems, hazard gauging systems, hazard education, and wildfire mitigation projects.	Multi- Hazards	High	On-going	N/A	Town	On-going

Regional Strategy ID #	Mitigation Strategy	Hazard	Priority High Medium Low	Project Status Delayed On-going Completed	If Not Completed, Why?	Responsible Party	Time Frame
2.1 – 2.4	Maintain the community's compliance with the National Flood Insurance Program (NFIP) by engaging in various activities included in the three basic components of the NFIP program; 1. floodplain identification and mapping risk, 2. responsible floodplain management, and 3. flood insurance. Sample activities include but are not limited to: maintaining publicly accessible and accurate Flood Insurance Rate Maps (FIRMs), adopting and enforcing a compliant floodplain ordinance, and provide general assistance and education to community members regarding the flood insurance program.	Flood	High	On-going	N/A	Town	On-going
5.1 – 5.4	Encourage the lessening of potential wildfires in our community and the region by; 1. Education and outreach to residents, especially those that live in woodland areas and the Wildland Urban Interface (WUI). 2. Reduction of hazardous fuels throughout the community. 3. Reduction of structural ignitability to limit injury, loss of life, and property and structural damage. 4. Having trained first responders with proper tools and equipment that will serve as a frontline defense against a wildfire.	Wildfire	Medium	On-going	N/A	Town	On-going
13	Consider mitigation actions in the Town that are focused on natural systems protection.	Flood	High				On-going

Central Shenandoah Hazard Mitigation Plan: Local Mitigation Strategies

Community: **Town of Mt. Crawford**
NFIP Community Number: **510224**

Regional Strategy ID #	Mitigation Strategy	Hazard	Priority High Medium Low	Project Status Delayed On-going Completed	If Not Completed, Why?	Responsible Party	Time Frame
14.1	Continue membership and participation in Shenandoah Valley Project Impact, the regional disaster preparedness and mitigation education program that was started in September 2000. Shenandoah Valley Project Impact educates citizens in the region about disaster preparedness and mitigation through public awareness campaigns, workshops and trainings, and an extensive resource library.	Multi-Hazards	High	On-going	N/A	CSPDC	On-going
14.1	Maintain a relationship with the Southern Shenandoah Chapter of Virginia Voluntary Organizations Active in Disaster (VOAD), to share knowledge and resources throughout the preparation, response, and recovery phases of a disaster.	Multi-Hazards	High	On-going	N/A	Town	On-going
6.1 – 6.8 8.1, 8.2 10.1 – 10.4 12.1	Support implementation of structural and non-structural mitigation activities on private or public property to reduce exposure to and provide protection from natural and man-made hazards. Eligible projects include but are not limited to acquisition, elevation, minor structural flood control projects, relocation of structures, retrofitting of existing structures, infrastructure protection measures, stormwater and wastewater management improvements, advanced warning systems, hazard gauging systems, hazard education, and wildfire mitigation projects.	Multi-Hazards	High	On-going	N/A	Town	On-going

Regional Strategy ID #	Mitigation Strategy	Hazard	Priority High Medium Low	Project Status Delayed On-going Completed	If Not Completed, Why?	Responsible Party	Time Frame
2.1 – 2.4	Maintain the community's compliance with the National Flood Insurance Program (NFIP) by engaging in various activities included in the three basic components of the NFIP program; 1. floodplain identification and mapping risk, 2. responsible floodplain management, and 3. flood insurance. Sample activities include but are not limited to: maintaining publicly accessible and accurate Flood Insurance Rate Maps (FIRMs), adopting and enforcing a compliant floodplain ordinance, and provide general assistance and education to community members regarding the flood insurance program.	Flood	High	On-going	N/A	Town	On-going
5.1 – 5.4	Encourage the lessening of potential wildfires in our community and the region by; 1. Education and outreach to residents, especially those that live in woodland areas and the Wildland Urban Interface (WUI). 2. Reduction of hazardous fuels throughout the community. 3. Reduction of structural ignitability to limit injury, loss of life, and property and structural damage. 4. Having trained first responders with proper tools and equipment that will serve as a frontline defense against a wildfire.	Wildfire	Medium	On-going	N/A	Town	On-going
11	Make improvements to the Town Hall property to include, but not limited to: 1. Public Park; 2. Public river access and landing This is to include floodplain management and environmental conservation and preservation.	Multi-Hazards	High	On-going	N/A	Town	On-going
13	Consider mitigation actions in the Town that are focused on natural systems protection.						

Central Shenandoah Hazard Mitigation Plan: Local Mitigation Strategies

Community: **Town of Timberville**
NFIP Community Number: **510139**

Regional Strategy ID #	Mitigation Strategy	Hazard	Priority High Medium Low	Project Status Delayed On-going Completed	If Not Completed, Why?	Responsible Party	Time Frame
14.1	Continue membership and participation in Shenandoah Valley Project Impact, the regional disaster preparedness and mitigation education program that was started in September 2000. Shenandoah Valley Project Impact educates citizens in the region about disaster preparedness and mitigation through public awareness campaigns, workshops and trainings, and an extensive resource library.	Multi-Hazards	High	On-going	N/A	CSPDC	On-going
14.1	Maintain a relationship with the Southern Shenandoah Chapter of Virginia Voluntary Organizations Active in Disaster (VOAD), to share knowledge and resources throughout the preparation, response, and recovery phases of a disaster.	Multi - Hazards	High	On-going	N/A	Town	On-going
6.1 – 6.8 8.1, 8.2 10.1 – 10.4 12.1	Support implementation of structural and non-structural mitigation activities on private or public property to reduce exposure to and provide protection from natural and man-made hazards. Eligible projects include but are not limited to acquisition, elevation, minor structural flood control projects, relocation of structures, retrofitting of existing structures, infrastructure protection measures, stormwater and wastewater management improvements, advanced warning systems, hazard gauging systems, hazard education, and wildfire mitigation projects.	Multi - Hazards	High	On-going	N/A	Town	On-going

Regional Strategy ID #	Mitigation Strategy	Hazard	Priority High Medium Low	Project Status Delayed On-going Completed	If Not Completed, Why?	Responsible Party	Time Frame
2.1 – 2.4	Maintain the community's compliance with the National Flood Insurance Program (NFIP) by engaging in various activities included in the three basic components of the NFIP program; 1. floodplain identification and mapping risk, 2. responsible floodplain management, and 3. flood insurance. Sample activities include but are not limited to: maintaining publicly accessible and accurate Flood Insurance Rate Maps (FIRMs), adopting and enforcing a compliant floodplain ordinance, and provide general assistance and education to community members regarding the flood insurance program.	Flood	High	On-going	N/A	Town	On-going
5.1 – 5.4	Encourage the lessening of potential wildfires in our community and the region by; 1. Education and outreach to residents, especially those that live in woodland areas and the Wildland Urban Interface (WUI). 2. Reduction of hazardous fuels throughout the community. 3. Reduction of structural ignitability to limit injury, loss of life, and property and structural damage. 4. Having trained first responders with proper tools and equipment that will serve as a frontline defense against a wildfire.	Wildfire	Medium	On-going	N/A	Town	On-going
3.1, 3.2	Conduct a stormwater management study to determine the effectiveness of the Town's stormwater system, highlight vulnerable areas to flooding, and provide recommendations for ways to improve the system.	Flood		Delayed	Lack of Funding	N/A	N/A
16	Complete a detailed Emergency Operations Plan written specifically for the Town.	Multi- hazards		Delayed	Lack of Funding	N/A	N/A

Regional Strategy ID #	Mitigation Strategy	Hazard	Priority High Medium Low	Project Status Delayed On-going Completed	If Not Completed, Why?	Responsible Party	Time Frame
11	Explore options with the Army Corps of Engineers for the feasibility of dredging the river.	Flooding	High	Delayed	Lack of Funding	Federal Local	N/A
11	Implement security measures to protect the Town's water source.	Multi- hazards	High	Delayed	Lack of Funding	Town	N/A

Central Shenandoah Hazard Mitigation Plan: Local Mitigation Strategies

Organization: James Madison University
Location (Town, City, or County): City of Harrisonburg

Regional Strategy ID #	Mitigation Strategy	Hazard	Priority High Medium Low	Project Status Delayed On-going Completed	If Not Completed, Why?	Responsible Party	Time Frame
14.1	Participate in Shenandoah Valley Project Impact, the regional disaster preparedness and mitigation education program that was started in September 2000. Shenandoah Valley Project Impact educates citizens in the region about disaster preparedness and mitigation through public awareness campaigns, workshops and trainings, and an extensive resource library.	Multi- Hazards	High	On-going	N/A	CSPDC	On-going
6.1 – 6.8 8.1, 8.2 10.1 – 10.4 12.1	Support implementation of structural and non-structural mitigation activities on our property, if needed to reduce exposure to and provide protection from natural and man-made hazards. Eligible projects include but are not limited to acquisition, elevation, minor structural flood control projects, relocation of structures, retrofitting of existing structures, infrastructure protection measures, stormwater and wastewater management improvements, advanced warning systems, hazard gauging systems, hazard education, and wildfire mitigation projects.	Multi - Hazards	High	On-going	N/A	Organization	On-going
13	Consider mitigation actions at the University that are focused on natural systems protection.	Flood	High				On-going

VI. CAPABILITIES ASSESSMENT

1. Capabilities Assessment

This portion of the Plan assesses the current capacity of the communities of the Central Shenandoah Valley Region to mitigate the effects of the natural hazards mentioned in Section IV, Hazard Identification Risk Assessment. Determining the ability of local governments to implement mitigation strategies and where potential opportunities to increase these abilities exist is the purpose of the Capabilities Assessment.

This Capabilities Assessment has two primary components: an inventory of the plans and programs that the local governments in the Central Shenandoah Valley Region possess, and an analysis of the government's abilities to implement mitigation strategies and measures based on this inventory. Table VI-1 provides an inventory of local plans for the Counties, Cities and Towns. Table VI-2 provides an inventory of the administrative and technical capabilities of local government staff for the Counties and Cities. Since Towns are considered part of the Counties where they are located and have access to County resources, Towns are not listed separately for this review.

**** Table VI-1: Local Plans (Augusta County) Please note: In 2013, Augusta County completed its own Community Wildfire Protection Plan (CWPP) that was adopted by the Board of Supervisors through a resolution. As part of the regional planning process, this plan was updated and included in the 2020 Central Shenandoah Wildfire Protection Plan (CSWPP). The CSWPP when completed will be included as Appendix H in the Central Shenandoah Hazard Mitigation Plan (CSHMP). The Wildfire Protection Plan will be adopted by the 5 Counties, 5 Cities, and 11 Towns of the Central Shenandoah Planning District through the local jurisdictions as part of the CSHMP.**

Table VI-1: Local Plans

Local Plans	Hazard Mitigation Plan	Comprehensive Land Use Plan	Wildfire Protection Plan	Emergency Operations Plan	SARA Title III Hazardous Materials Emergency Response Plan	Capital Improvement Plan
Augusta County**	Y	Y	Y	Y	Y	Y
Bath County	Y	Y	Y	Y	Y	Y
Highland County	Y	Y	Y	Y	U	U
Rockbridge County	Y	Y	Y	Y	N	Y
Rockingham County	Y	Y	Y	Y	Y	Y
City of Buena Vista	Y	Y	Y	Y	N	Y
City of Harrisonburg*	Y	Y	Y	Y	Y	Y
* Also has Stormwater Improvement Plan and Chesapeake Bay TMDL Action Plan						
City of Lexington	Y	Y	Y	Y	Y	Y
City of Staunton	Y	Y	Y	Y	Y	Y
City of Waynesboro	Y	Y	Y	Y	Y	Y
Town of Bridgewater	Y	Y	Y	Y	Y	Y
Town of Broadway	Y	Y	Y	Y	Y	Y
Town of Craigsville	Y	Y	Y	Y	Y	U
Town of Dayton	Y	Y	Y	Y	Y	U
Town of Elkton	Y	Y	Y	Y	Y	Y
Town of Glasgow	Y	Y	Y	Y	N	U
Town of Goshen	Y	Y	Y	Y	N	U
Town of Grottoes	Y	Y	Y	Y	Y	U
Town of Monterey	Y	Y	Y	Y	U	U
Town of Mount Crawford	Y	Y	Y	Y	Y	U
Town of Timberville	Y	Y	Y	Y	Y	N

Table Legend: Y = Yes; N = No; U = Unknown

Note: Towns are included in the County's Emergency Operations Plan and Hazardous Materials Emergency Response Plan where they are located.

Table VI-2: Administrative and Technical Capabilities of Local Government Staff

Administrative and Technical Capabilities of Local Government Staff	Augusta County	Bath County	Highland County	Rockbridge County	Rockingham County	City of Buena Vista	City of Harrisonburg	City of Lexington	City of Staunton	City of Waynesboro
Land use planners or planners with knowledge of land development and land management practices	Y	Y	U	Y	Y	Y	Y	Y	Y	Y
Engineers or professionals trained in construction practices related to buildings or infrastructure	Y	Y	U	Y	Y	Y	Y	Y	Y	Y
Staff with an understanding of natural or human caused hazards	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Emergency Manager	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Floodplain Manager	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Staff with the education and/or expertise to assess the community's vulnerability to hazards	Y	Y	Y	Y	Y	N	Y	N	Y	Y
Resource development and grant writing staff	N	N	N	N	Y	Y	Y	N	Y	N
Internet Access	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Fire and Rescue Paid or Volunteer Staff	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
The 11 towns in the Central Shenandoah Region: Bridgewater, Broadway, Craigsville, Dayton, Elkton, Glasgow, Goshen, Grottoes, Monterey, Mount Crawford, and Timberville use the resources of the County where they are located.										

Table Legend: Y = Yes; N = No; U = Unknown

2. Capabilities Assessment Findings

Existing Local Plans

Planning capability is based on the creation and implementation of plans that demonstrate a jurisdiction's commitment to guiding and managing growth in a responsible manner; encouraging public safety; preserving the local economy; protecting environmental, historic, and cultural resources; and maintaining the general welfare of the community. Planning initiatives present significant opportunity to integrate hazard mitigation principles and practices into the community. The jurisdictions of the Central Shenandoah Region have many planning mechanisms in place that include mitigation information and techniques including:

Hazard Mitigation Plan: A hazard mitigation plan represents a community's blue print for how it intends to reduce the impact of natural and human-caused hazards on people and the built environment. All twenty-one jurisdictions in the Region have adopted the 2013 update of the Central Shenandoah Hazard Mitigation Plan.

Comprehensive Land Use Plan: A comprehensive land use plan establishes the overall vision for what a community wants to be and serves as a guide to future governmental decision making. A comprehensive plan contains sections on demographic conditions, land use, natural resources, economic development, transportation, and community facilities. Community strategies included in these plans can encourage the achievement of risk reduction goals. The five Counties and Cities in the Region have Comprehensive Land Use Plans.

Community Wildfire Protection Plan (CWPP): The Healthy Forests Restoration Act (HFRA) of 2003 created the opportunities for local governments to prioritize goals and needs for the wildland areas in their communities through community wildfire protection plans. A CWPP addresses issues in a community such as wildfire response, hazard mitigation, community preparedness, and structure protection. Augusta County has adopted a Community Wildfire Protection Plan.

Emergency Operations Plan (EOP): An emergency operations plan outlines responsibilities and the means by which resources are deployed during and following an emergency or disaster. A section that specifically deals with mitigation is included in these plans. The five counties and five cities in the Region either have their own EOP or participate in regional EOPs.

SARA Title III Emergency Response Plan (ERP): Required by federal law under Title III of the Superfund Amendments and Re-authorization Act (SARA), these plans outline the procedures to be followed in the event of a chemical emergency such as the accidental release of toxic substances. The five counties and cities in the Region either have their own individual ERP or participate in regional ERPs.

Based on the types of planning initiatives by all of the jurisdictions in the Region, the opportunities to incorporate mitigation concepts into local planning processes is very possible for the Central Shenandoah Region. After the 2020 Central Shenandoah Hazard Mitigation Plan has been approved by FEMA and adopted by the 21 jurisdictions in the Region, CSPDC staff will contact the planning staff of each local jurisdiction to notify them of the updated HMP and discuss plan integration. CSPDC staff will prepare a fact sheet to give to local planning staff pertinent information about the useful elements of the HMP that could be included in local planning efforts such as for the Comprehensive Plan. During the annual review of the HMP, CSPDC staff will reach out to local planning and emergency management staff to discuss the community and emergency planning that will be done in the upcoming year and how integration of information from the HMP might occur.

Expertise of Local Planning Staff

As described previously, the Central Shenandoah Region consists of 21 jurisdictions (5 counties, 5 cities, and 11 towns). The Counties in the Region are led by an elected Board of Supervisors who appoints a County Administrator to manage the day to day operations of the government. In the Cities, a City Council are the elected officials and a City Manager, appointed by Council, manages the day to day operations.

Mitigation cuts across many disciplines. For a successful mitigation program, it is necessary to have a broad range of people involved with diverse backgrounds. Across the jurisdictions in the Central Shenandoah Valley Region, this expertise can be found in local government staff in the following areas or departments:

- Community Development and Building Inspection Departments have the ability to conduct land use planning based on knowledge of land development and land management practices. They may also possess expertise in resource development and grant writing. These departments may also house a community's floodplain manager and other staff with the ability to assess the natural hazards vulnerability of the community. As all of the communities are in good standing in the National Flood Insurance Program (NFIP), these departments may also enforce NFIP requirements.

- Engineering and Public Works Departments have the training in construction practices related to buildings and infrastructure. The Engineering Department may oversee the design and construction of infrastructure including roadways and stormwater facilities. The Public Works Department oversees the maintenance of the community's infrastructure, water treatment and sewer facilities.

- Emergency Management, Fire and Rescue Staff are involved with natural and man-made hazards and disasters and are closely involved with mitigation as it is one of the four cornerstones of the emergency management cycle. Fire and Rescue departments provide fire suppression and medical aid at the scene of disasters and may be involved with hazardous materials incidents.

This Capability Assessment illustrates the variety of staff and departments in local governments in the Central Shenandoah Region that possess the expertise to identify and implement mitigation activities.

The other resource that the 21 jurisdictions of the Region have is partnerships with private organizations, non-governmental organizations (NGOs), and neighboring jurisdictions. The Counties and Cities have Memorandums of Understanding and Mutual Aid agreements with these organizations and jurisdictions surrounding our Region for assistance in the event of emergencies and disasters for supplies, equipment, and manpower.

More informal partnerships also exist in non-disaster times between local government staff from all departments to their counterparts in neighboring jurisdictions for technical assistance and the sharing of resources. When applicable, these partners are often included in the mitigation planning process and other hazard mitigation activities to share their expertise. These partnerships only further the depth of capabilities that the local jurisdictions of the Central Shenandoah Region possess.

3. Local National Flood Insurance Program Surveys

All twenty-one jurisdictions in the Region participate in the National Flood Insurance Program (NFIP). As part of the Hazard Mitigation planning process, the Counties and Cities were asked to complete surveys providing information on floodplain identification and mapping, Floodplain Management, and Flood Insurance. Because much of the floodplain management for the Towns is done through the County where they are located, the information provided by the each County was relevant for the Towns in that County as well. The surveys are included in Appendix I.

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VII: PLAN MAINTENANCE

According to the Disaster Mitigation Act of 2000 (DMA2K), local plans are required to include a method and schedule of monitoring, evaluating, and updating the hazard mitigation plan within a five-year cycle as well as a description of continued public involvement in the hazard mitigation planning process.

The Central Shenandoah Valley Region will use its Hazard Mitigation Plan Steering Committee as the body responsible for the review, monitoring, and update of the Central Shenandoah Hazard Mitigation Plan. This group includes representatives from local government and other relevant organizations throughout the Region. The Steering Committee is staffed by the Central Shenandoah Planning District Commission. In the event that the Steering Committee shall dissolve, then each local jurisdiction will be responsible for the maintenance and update of the Plan.

Through the Hazard Mitigation Plan Steering Committee, the Central Shenandoah Hazard Mitigation Plan will be reviewed on an annual basis and updated when and where needed. Each local jurisdiction will be asked to review the Plan and submit a report when necessary that outlines any revisions, projects, or activities that impact the Plan. These annual reports will be reviewed by the Hazard Mitigation Plan Steering Committee, when necessary, and revisions will be made to the Plan by CSPDC staff. In addition, any local, state, or federal regulations that change or impact the Plan will be incorporated. Local governments will be apprised of any substantial changes to the Plan. An annual report will be developed and submitted as needed.

In addition to an annual review, local governments will asked to reference the Central Shenandoah Hazard Mitigation Plan in their Emergency Operations Plan (EOP). The Virginia Emergency Management and Disaster Law of 2000 requires that the State, and each County and City within the State develop and maintain a current Emergency Operations Plan (EOP) which addresses their planned response to extraordinary emergency situations. As part of the basic EOP, an appendix that addressees hazard mitigation activities is required. CSPDC staff will request that each of the Cities and Counties refer to the Central Shenandoah Hazard Mitigation Plan as a resource document as part of their EOP's Hazard Mitigation Annex and request local government review of the Hazard Mitigation Plan as part of their annual EOP review. In addition, a request will be made to each local jurisdiction to include the Hazard Mitigation Plan in other planning documents such as comprehensive plans and capital improvement plans.

The Plan will undergo a comprehensive review every 5 years. The Hazard Mitigation Plan Steering Committee will be the entity responsible for the review, evaluation, and update of the Plan. The criteria used to evaluate the Plan will be developed in accordance with the requirements of the Federal Emergency Management Agency (FEMA) as well as additional guidance documents provided by FEMA and Virginia Department of Emergency Management. The method used to update the Plan will include a request from each jurisdiction for a report that describe the progress of mitigation strategies identified in the Plan and any activities or projects that has been implemented. Other factors that could necessitate a revision to the Plan may include any new local, state, or federal regulations or requirements that impact the Plan; any Presidentially-declared disasters that have impacted the Region, or an increase or decrease in a community's vulnerability to a natural disaster. The 5-year update will be submitted to each of the local governments, the Virginia Department of Emergency Management, and FEMA as required. Significant changes to the Plan will include public input.

Public participation was an integral part of the development of this Plan and will continue through the course of its existence. Activities to involve the public in the maintenance, evaluation and revision of the Plan may include a yearly "Disaster Resistance Forum" meeting where the general public is invited, utilizing the websites of the Central Shenandoah Planning District Commission to notify the public of meetings, agendas, and revisions of the Plan, and employing the media to notify the public of any upcoming activities or public input sessions regarding the Plan and the Plan update.

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VIII. ADOPTION PROCESS AND DOCUMENTATION

The Central Shenandoah Hazard Mitigation Plan was developed as a multi-jurisdictional plan. Therefore, to meet the requirements of the Disaster Mitigation Act of 2000 (DMA2K), the Federal Emergency Management Agency (FEMA) Section 322 local hazard mitigation planning regulations, and Title 44 Code of Federal Regulations (CFR) §201.6, the 2020 update of the Plan will be adopted by each of the 21 municipalities in our Region. Resolutions from this adoption process for each of the jurisdictions in the Central Shenandoah Planning District will be included in Appendix J.

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IX. REFERENCES

1. Other Mitigation Plans

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D. Print Media

Newspaper	Date	Pages
Augusta Angus	2/14/1899	pg. 3
Augusta Angus	6/8/1897	pg. 4
Buena Vista News	3/27/1936	pg. 1
Buena Vista News	6/30/1972	Special Flood Section pg 1-12
Buena Vista News	12/6/1934	Cover
Harrisonburg Daily News Record	3/16/1936	pg. 5
Harrisonburg Daily News Record	3/18/1936	pg. 1, 6
Harrisonburg Daily News Record	3/19/1936	pg. 1, 7, 8
Harrisonburg Daily News Record	3/20/1936	pg. 1, 6
Harrisonburg Daily News Record	3/21/1936	pg. 1, 6
Harrisonburg Daily News Record	3/23/1936	pg. 1, 5, 7
Harrisonburg Daily News Record	6/18/1949	pg. 1, 2
Harrisonburg Daily News Record	6/20/1949	pg. 1, 2
Harrisonburg Daily News Record	6/21/1949	pg. 1, 9, 12
Harrisonburg Daily News Record	6/22/1949	pg. 1, 2, 4, 9
Harrisonburg Daily News Record	6/23/1949	pg. 1, 2, 12
Harrisonburg Daily News Record	6/24/1949	pg. 1, 16
Harrisonburg Daily News Record	6/27/1949	pg. 1, 2, 8, 10
Harrisonburg Daily News Record	8/21/1969	Cover, pg. 18, 19
Harrisonburg Daily News Record	8/22/1969	Cover, pg. 8
Harrisonburg Daily News Record	8/23/1969	Cover, pg. 8, 9
Harrisonburg Daily News Record	8/25/1969	pg. 2, 6
Harrisonburg Daily News Record	8/26/1969	Cover, pg. 2
Harrisonburg Daily News Record	6/22/1972	Cover, pg. 12
Harrisonburg Daily News Record	6/23/1972	Cover, pg. 2, 15
Harrisonburg Daily News Record	11/5/1985	pg. 14, 18
Harrisonburg Daily News Record	11/6/1985	Cover, pg. 2, 13
Harrisonburg Daily News Record	9/7/1996	pg. 19
Harrisonburg Daily News Record	9/9/1996	Cover, pg. 15, 17
Harrisonburg Daily News Record	9/10/1996	Cover
Harrisonburg Daily News Record	9/16/1996	Flood of 1996 Section pg.1-12
Harrisonburg Daily News Record	10/16/1954	Cover, pg. 13
Harrisonburg Daily News Record	8/13/1955	pg. 2
Harrisonburg Daily News Record	8/19/1955	Cover, pg. 2, 4
Harrisonburg Daily News Record	2/14/2007	Cover, A5
Harrisonburg Daily News Record	2/15/2007	Cover, A3
Harrisonburg Daily News Record	12/19/2009	Cover, A6
Harrisonburg Daily News Record	12/21/2009	Cover, A10
Harrisonburg Daily News Record	12/22/2009	Cover, A10

Harrisonburg Daily News Record	5/3/2009	Cover, pg. 6
Harrisonburg Daily News Record	5/4/2009	Cover, pg. 5
Harrisonburg Daily News Record	1/15/2010	Cover
Harrisonburg Daily News Record	11/25/1938	Cover
Harrisonburg Daily News Record	3/6/1962	Cover, pg. 2, 7
Harrisonburg Daily News Record	3/7/1962	pg. 12
Harrisonburg Daily News Record	3/8/1962	pg. 13
Harrisonburg Daily News Record	3/9/1962	pg. 8
Harrisonburg Daily News Record	3/27/1978	Cover, pg. 5, 15
Harrisonburg Daily News Record	3/28/1978	pg. 11
Harrisonburg Daily News Record	3/29/1978	pg. 6, 17
Harrisonburg Daily News Record	3/13/1993	pg. 2
Harrisonburg Daily News Record	3/15/1993	Cover, pg. 2, 5
Harrisonburg Daily News Record	2/12/1983	Cover, pg. 3, 11
Harrisonburg Daily News Record	2/13/1983	Cover
Harrisonburg Daily News Record	2/11/1994	Cover, pg. 2, 3
Harrisonburg Daily News Record	2/12/1994	Cover, pg. 2
Harrisonburg Daily News Record	1/8/1996	Cover
Harrisonburg Daily News Record	1/9/1996	Cover, pg. 2, 4
Harrisonburg Daily News Record	8/24/2011	Cover, A5
Lexington News-Gazette	3/20/1936	pg. 1, 8
Lexington News-Gazette	10/20/1954	Cover
Lexington News-Gazette	8/17/1955	pg. 7
Lexington News-Gazette	9/30/1959	Cover
Lexington News-Gazette	7/21/1842	pg. 2
Lexington News-Gazette	8/31/1893	
Lexington News-Gazette	5/16/2001	A12
Lexington News-Gazette	2/21/2007	Cover
Lexington News-Gazette	2/28/2007	C1
Lexington News-Gazette	5/7/1929	Cover
Lexington News-Gazette	1/17/1912	pg. 5
Lexington News-Gazette	3/7/1962	Cover
Lexington News-Gazette	3/29/1978	pg. 13
Lexington News-Gazette	2/16/1983	pg. 12
Lexington News-Gazette	3/17/1993	Cover, pg. 10, 11
News Virginian	6/28/2005	
News Virginian	6/29/2006	
News Virginian	2/13/2007	Cover, A5
News Virginian	2/15/2007	Cover, A5
News Virginian	12/20/2009	Cover, A2, A5
News Virginian	12/21/2009	Cover, A2

Newspaper	Date	Pages
News Virginian	12/22/2009	Cover, A3, A5
News Virginian	8/24/2011	Cover, A2, A3
NOAA Event Records	2/12/2007	Storm
NOAA Event Records	2/14-2/18/2003	Storm
NOAA Event Records	12/19/2009	Storm
NOAA Event Records	1/16/1996	Storm
NOAA Event Records	12/18-12/19/2009	Winter Storm
NOAA Event Records	2/5-2/10/2010	Winter Storm
Richmond Times Dispatch	8/21/1969	Cover, A4, A5, C3, pg. 5
Richmond Times Dispatch	8/22/1969	Cover, A5, B1, pg. 8
Richmond Times Dispatch	8/23/1969	Cover, A4
Richmond Times Dispatch	8/24/1969	Cover, A15, B1, B2
Richmond Times Dispatch	6/20/1972	Cover, pg. 2
Richmond Times Dispatch	6/21/1972	A3
Richmond Times Dispatch	6/22/1972	Cover, pg. 2
Richmond Times Dispatch	6/23/1972	Cover, A4, A16
Richmond Times Dispatch	6/24/1972	Cover, A4, pg. 5, 12
Rockbridge County News	2/16/1899	pg. 3
Rockbridge County News	6/3/1897	pg. 3
Rockingham Register	10/2/1896	pg. 2, 3
Rockingham Register	8/21/1906	Cover, pg. 3
Rockingham Register	2/10/1899	pg. 3
Rockingham Register	2/17/1899	pg. 3
Rockingham Register	2/24/1899	pg. 2, 3
Rockingham Register	6/4/1897	Cover
Staunton Daily News Leader	11/5/1985	Cover, A3
Staunton Daily News Leader	11/6/1985	Cover, A7
Staunton Daily News Leader	11/7/1985	Cover, A5
Staunton Daily News Leader	11/8/1985	Cover
Staunton Daily News Leader	6/23/1995	Cover
Staunton Daily News Leader	6/24/1995	Cover, A5
Staunton Daily News Leader	6/25/1995	Cover
Staunton Daily News Leader	6/29/1995	Cover, A2
Staunton Daily News Leader	6/30/1995	Cover
Staunton Daily News Leader	9/6/1996	Cover, A2
Staunton Daily News Leader	9/7/1996	Cover, A2, A3
Staunton Daily News Leader	9/8/1996	Cover, A2
Staunton Daily News Leader	9/9/1996	Cover, A2
Staunton Daily News Leader	10/18/1954	Cover, pg. 4
Staunton Daily News Leader	8/13/1955	Cover

Newspaper	Date	Pages
Staunton Daily News Leader	8/14/1955	pg. 4
Staunton Daily News Leader	10/1/1959	Cover, pg. 3
Staunton Daily News Leader	8/18/1955	Cover, pg. 2
Staunton Daily News Leader	8/20/1955	pg. 7
Staunton Daily News Leader	6/28/2006	
Staunton Daily News Leader	4/27/1937	Cover
Staunton Daily News Leader	5/12/2007	B8
Staunton Daily News Leader	1/2/2010	A5
Staunton Daily News Leader		(1881 Storm)
Staunton Daily News Leader	2/14/2007	Cover, A Back Page
Staunton Daily News Leader	2/15/2007	Cover, A5
Staunton Daily News Leader	4/16/2005	B6
Staunton Daily News Leader	2/5/2010	A3
Staunton Daily News Leader	2/6/2010	Cover, A3, A6, A10
Staunton Daily News Leader	2/7/2010	Cover, A4, A12
Staunton Daily News Leader	2/8/2010	Cover, A4, A5
Staunton Daily News Leader	2/9/2010	Cover, A8
Staunton Daily News Leader	12/20/2009	Cover, A3, A4, A5, A12
Staunton Daily News Leader	12/21/2009	Cover, A8
Staunton Daily News Leader	12/22/2009	Cover, A3, A8
Staunton Daily News Leader	6/5/1911	Cover
Staunton Daily News Leader	6/7/1911	Cover, pg. 3
Staunton Daily News Leader	5/3/1929	Cover
Staunton Daily News Leader	4/4/1974	Cover, pg. 2
Staunton Daily News Leader	1/5/1912	Cover
Staunton Daily News Leader	3/6/1962	Cover
Staunton Daily News Leader	3/7/1962	Cover
Staunton Daily News Leader	3/27/1978	Cover, pg. 2
Staunton Daily News Leader	3/28/1978	Cover
Staunton Daily News Leader	2/13/1983	Cover, pg. 2
Staunton Daily News Leader	3/14/1993	Cover
Staunton Daily News Leader	3/15/1993	Cover
Staunton Daily News Leader	1/9/1996	Cover, pg. 3
Staunton Daily News Leader	1/13/1996	Cover
Staunton News Leader	8/24/2011	Cover, A3
Staunton Spectator	10/4/1870	Cover
Staunton Spectator	9/30/1896	Cover
Staunton Spectator	8/10/1896	
Staunton Vindicator	9/23/1870	Cover
Staunton Vindicator	10/7/1870	Cover
Staunton Vindicator	2/16/1899	pg. 2
Staunton Vindicator	6/3/1897	pg. 3

Newspaper	Date	Pages
The Recorder	11/?/1985	Cover, pg. 3
The Recorder	1/26/1996	Cover, pg. 2
The Recorder	2/9/2001	pg. 17
The Recorder	4/9/1993	pg. 9
Washington Post	12/24/2009	Cover, A8
Washington Post	12/20/2009	Cover, A8, A10
Yosts Weekly	10/2/1896	Cover
Staunton News Leader	3/7/2013	A1-A3, A8
Staunton News Leader	3/9/2013	A1
Staunton News Leader	2/13/2014	A1, A5, A6
Staunton News Leader	2/14/2014	A1, A5, A8
Staunton News Leader	1/27/2016	A3
Staunton News Leader	1/25/2016	A1, A6
The News-Gazette	11/21/2018	A2
Daily News Record	3/7/2013	A1-A3
Daily News Record	2/13/2014	A1, A6
Daily News Record	2/14/2014	A1, A2, A5, A6
The News-Virginian	3/9/2013	
The News-Virginian	3/7/2015	A1, A4

E. Other Resources

- Annals of Augusta Co Va from 1726-1871. Waddel. Pg. 441-449
- Buena Vista News: Hurricane Camille - A Review
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Appendix A – Planning Process and Public Engagement

Steering Committee Meetings

Attendance and Agenda Packets

Central Shenandoah Valley Hazard Mitigation Plan
Steering Committee Meeting
April 3, 2019
Sign-In Sheet

Name	Locality or Organization	Email Address	Phone
KEITH TAYLOR	HOLTZMAN OIL CORP	KTAYLOR@HOLTZMANCORP.COM	540-477-3131
Calvin LoKey	Holtzman Oil Corp	calvinl@holtzmancorp.com	540-477-3131
Kevin Moore	Rockbridge County	kmoore@rockbridgecounty.va.gov	540-319-9878
Kevin Moore	Town of Glasgow	kmoore@rockbridgecountyva.gov	540-319-9878
Carl Williams	Highland County	cwilliams@highlandrescue.net	540-632-7331
Anthony Foretich	JMU	foretiae@dukes.jmu.edu	703-638-5972
Alex Cherney	JMU	cherneax@dukes.jmu.edu	703-785-9798
Joe Ziegler	JMU	ziegljm@dukes.jmu.edu	443-766-9485
Megan Deel	Town of Goshen	townofgoshen_va@yahoo.com	540-997-5515
Steven Craig	Dixie Gas and Oil Corp.	craigs@dixiegas.com	540-248-6273
Harley Gardner	Highland Co	hgardner@yahoo	540 2920456

Central Shenandoah Valley Hazard Mitigation Plan
Steering Committee Meeting
April 3, 2019
Sign-In Sheet

Name	Locality or Organization	Email Address	Phone
Scott Mosinkup	Sentara RMH Medical Ctr	BXMASINC@sentara.com	540-292-3762
Gary Crawn	SHD Airport	gwcrawn@flyshd.com	540-607-4000
Robbie Symons	JMU	symonsrx@jmu.edu	540-476-1192
Pat Cherfund	JMU	cherfndlc@jmu.edu	540 568 7606
Jennifer Welch	DEQ	jennifer.welch@deq.virginia.gov	540-574-7854
Dr. Richard Robinson	Monterey	DOT Robin1@gmail	540-290-5842
Paul Helmuth	Harrisonburg	paul.helmuth@harrisonburg.va.gov	540-476-0860
Trent Roberts	Lexington	TRoberts@lexingtonva.gov	463 3240
Tom Roberts	Buena Vista	troberts@bvcity.org	540 319 8004
Waylon Miller	Buena Vista	bv25@bvcity.org	540 917 1442
Colter Lotts	Staunton	lottscre@ci.staunton.va.us	540-332-3868

Central Shenandoah Valley Hazard Mitigation Plan
Steering Committee Meeting
April 3, 2019
Sign-In Sheet

Name	Locality or Organization	Email Address	Phone
Jon Ellestad	Glasgow	jellestad@glasgowvirginia.org	540-258-2246
Corey Wood	Craigsville	woodca.craigsvillepd@outlook.com	540-987-5814
David Williams	VMI	williamsdp@vmi.edu	(540) 464-7095
Milton Franklin	Bridgewater College	mfranklin@bridgewater.edu	540 830 5807
Austin Garber	Town of Timberville	townmanager@townoftimberville.com	540-896-7058
Keith Hartman	Buena Vista PD	KHartman@BUCity.org	540-261-6174
Paul Burns	Washington & Lee Univ	pburns@wlu.edu	540-460-6207
Roger Ramsey	Valley Community Services	RRamsey@vesb.org 540 480-0667	
Donna Good	Augusta ECC	dgood@co.augusta.va.us	540 245-5503
Anthony Ramsey	Augusta ECC	abramsey@co.augusta.va.us	946-245-5508
Laura Dwyer	Blue Ridge CC	dwyerl@brcc.edu	540-453-2533

Central Shenandoah Valley Hazard Mitigation Plan
Steering Committee Meeting
April 3, 2019
Sign-In Sheet

Name	Locality or Organization	Email Address	Phone
William Wilkerson	Blue Ridge Community College	wilkersonw@brcc.edu	804 939-8909
Brett Sinclar	ACSA	bsinclar@co.augusta.va.us	540-430-3437
Deane Dozier	Cherry Orchard Homeowner	deanedozier@gmail.com	540-949-8853
Philip Davis	USDA-NRCS	philip.davis@va.usda.gov	540-433-2653 x:117
Amy Carter	Waynesboro DEM/EMS	carterg@ci.waynesboro.va.us	540 942 6698
Penny Weller	Staunton Fire-Rescue	wellerpw@ci.staunton.va.us	540-332-3720
Beky Putney	Town of Bridgewater	bputney@bridgewater.town	540-908-3397
Patrick Wilcox	"	pwilcox@ "	"
Chris Bruce	VDEM	chris.bruce@vdem.virginia.gov	804-516-5796
Karen Clark	Augusta Health	kclark@augustahealth.com	5403324540
Jeremy Holloway	Rockingham County	JHolloway@rockinghamcountyva.gov	540-564-3175

Central Shenandoah Valley Hazard Mitigation Plan
Steering Committee Meeting
April 3, 2019
Sign-In Sheet

Name	Locality or Organization	Email Address	Phone
Jeff Michael	Rockingham County F/R	jmichael@rockinghamcountyva.gov	540-476-3242
Sharon Foley	Harrisonburg-Rockingham RSA	sfoley@hrrsa.org	540-820-0498
Anita Riggleman	HRRSA	ariggleman@hrrsa.org	540-434-1053
David Mawyer	Western State	mawyerd@gmail.com	540.569-0479
Patrick Robertson	WSH	patrick.robertson@dbhds.virginia.com	540-332-7368
Dan Jenkins	HRCSB	djenkins@hrcsb.org	540-434-1441
Ross Clem	Town of Broadway	rclem@town.broadway	540-578-0486
Sherry Ryder	Bath Co.	bathbpz@tds.net	540-839-7236
Hilary Crowin	Central Shenandoah Health District - VDH	Hilary.Crowin@vdh.virginia.gov	540-290-4100
Brendan Perry	Washington and Lee Univ	bperry@wlu.edu	540-958-4467
Nathan Garrison	Town of Grottoes	ngarrison@ci.grottoes.va.us	540-249-5896

Central Shenandoah Valley Hazard Mitigation Plan
Steering Committee Meeting
April 3, 2019
Sign-In Sheet

Name	Locality or Organization	Email Address	Phone
Daniel Hanlon	Dayton PD	dhanlon@daytonva.us	540-879-2161 ext 317
Chris Ellis	Harrisonburg Chambe	christopher.ellis@BBandT.com	540/292-3940
Patti Nylander	Va. Dept. of Forestry	patricia.nylander@dof.virginia.gov	434-962-8172
Doug Wolfe	County of Augusta	dwolfe@co.augusta.va.us	540 245 5700
Tracy Hibbitts	CSPDC		
Rebecca Joyce	CSPDC		
Hunter Moore	CSPDC		

Central Shenandoah Valley Hazard Mitigation Plan
Steering Committee Meeting
BRITE Transit Facility Meeting Room, Fishersville
Wednesday, April 3, 2019
10 a.m. – 12 p.m.

Agenda

10:00 a.m. **Welcome and Introductions**

- Ms. Rebecca Joyce, Community Program Manager, CSPDC

10:15 a.m. **Regional Hazard Identification**

- Ms. Hunter Moore, Regional Planner/GIS Coordinator, CSPDC
- Ms. Tracy Hibbitts, Regional Planner, CSPDC

11:00 a.m. **Break**

11:10 a.m. **Regional/Local Mitigation Goals and Strategies**

- Ms. Rebecca Joyce, Community Program Manager, CSPDC

11:40 a.m. **Public Outreach**

- Ms. Rebecca Joyce, Community Program Manager, CSPDC
- Ms. Tracy Hibbitts, Regional Planner, CSPDC
- Ms. Hunter Moore, Regional Planner/GIS Coordinator, CSPDC

11:55 a.m. **Closing and Adjournment**

- Ms. Tracy Hibbitts, Regional Planner, CSPDC

Central Shenandoah Valley Hazard Mitigation Plan
2019 Steering Committee Members

Administrative

Central Shenandoah Planning District Commission
Virginia Department of Emergency Management

Local Government

City of Buena Vista
City of Harrisonburg
City of Lexington
City of Staunton
City of Waynesboro
County of Augusta
County of Bath
County of Highland
County of Rockbridge
County of Rockingham
Town of Bridgewater
Town of Broadway
Town of Craigsville
Town of Dayton
Town of Elkton
Town of Glasgow
Town of Goshen
Town of Grottoes
Town of Monterey
Town of Mount Crawford
Town of Timberville

Other Organizations or Government Agencies

Augusta County Service Authority
Augusta Health
Blue Ridge Community College
Bridgewater College
Central Shenandoah Health District, Virginia Department of Health
Cherry Orchard Homeowners Association
Dixie Gas and Oil Corporation
Greater Augusta Regional Chamber of Commerce
Harrisonburg-Rockingham Chamber of Commerce
Harrisonburg-Rockingham Community Services Board
Harrisonburg-Rockingham Regional Sewer Authority
Holtzman Oil Corp.
James Madison University
Sentara Rockingham Memorial Hospital
Shenandoah National Park, National Park Service
Shenandoah Valley Project Impact
Shenandoah Valley Regional Airport
USDA- Natural Resources Conservation Service
Valley Community Services Board
Virginia Department of Environmental Quality
Virginia Department of Forestry
Virginia Military Institute
Washington and Lee University
Western State Hospital

FEMA

Fact Sheet

Federal Insurance and Mitigation Administration

LOCAL HAZARD MITIGATION PLANNING

Hazard Mitigation Planning for Resilient Communities

Disasters can cause loss of life; damage buildings and infrastructure; and have devastating consequences for a community's economic, social, and environmental well-being. Hazard mitigation is the effort to reduce loss of life and property by lessening the impact of disasters. In other words, hazard mitigation keeps natural hazards from becoming natural disasters.

Hazard mitigation is best accomplished when based on a comprehensive, long-term plan developed before a disaster strikes. Mitigation planning is the process used by state, tribal, and local leaders to understand risks from natural hazards and develop long-term strategies that will reduce the impacts of future events on people, property, and the environment.

The Local Mitigation Planning Process

The mitigation plan is a community-driven, living document. The planning process itself is as important as the resulting plan because it encourages communities to integrate mitigation with day-to-day decision making regarding land use planning, floodplain management, site design, and other functions. Mitigation planning includes the following elements:

Public Involvement – Planning creates a way to solicit and consider input from diverse interests, and promotes discussion about creating a safer, more disaster-resilient community. Involving stakeholders is essential to building community-wide support for the plan. In addition to emergency managers, the planning process involves other government agencies, businesses, civic groups, environmental groups, and schools.

Risk Assessment – Mitigation plans identify the natural hazards and risks that can impact a community based on historical experience, estimate the potential frequency and magnitude of disasters, and assess potential losses to life and property. The risk assessment process provides a factual basis for the activities proposed in the mitigation strategy.

Mitigation Strategy – Based on public input, identified risks, and available capabilities, communities develop mitigation goals and objectives as part of a strategy for mitigating hazard-related losses. The strategy is a community's approach for implementing mitigation activities that are cost-effective, technically feasible, and environmentally sound as well as allowing strategic investment of limited resources.

Disaster Mitigation Act of 2000

The Robert T. Stafford Disaster Relief and Emergency Assistance Act, as amended by the Disaster Mitigation Act of 2000, is intended to "reduce the loss of life and property, human suffering, economic disruption, and disaster assistance costs resulting from natural disasters."

Under this legislation, state, tribal, and local governments must develop a hazard mitigation plan as a condition for receiving certain types of non-emergency disaster assistance through the Hazard Mitigation Assistance Programs. The regulatory requirements for local hazard mitigation plans can be found at Title 44 Code of Federal Regulations §201.6.

For more information about FEMA's Hazard Mitigation Assistance Grants, visit: www.fema.gov/hazard-mitigation-assistance.

"FEMA's mission is to support our citizens and first responders to ensure that as a nation we work together to build, sustain, and improve our capability to prepare for, protect against, respond to, recover from, and mitigate all hazards."

Benefits of Hazard Mitigation

Mitigation is an investment in your community's future safety and sustainability. Mitigation planning helps you take action now, before a disaster, to reduce impacts when a disaster occurs. Hazard mitigation planning helps you think through how you choose to plan, design, and build your community and builds partnerships for risk reduction throughout the community. Consider the critical importance of mitigation to:

- Protect public safety and prevent loss of life and injury.
- Reduce harm to existing and future development.
- Maintain community continuity and strengthen the social connections that are essential for recovery.
- Prevent damage to your community's unique economic, cultural, and environmental assets.
- Minimize operational downtime and accelerate recovery of government and business after disasters.
- Reduce the costs of disaster response and recovery and the exposure to risk for first responders.
- Help accomplish other community objectives, such as capital improvements, infrastructure protection, open space preservation, and economic resiliency.

Having a hazard mitigation plan will increase awareness of hazards, risk, and vulnerabilities; identify actions for risk reduction; focus resources on the greatest risks; communicate priorities to state and federal officials; and increase overall awareness of hazards and risks.

Mitigation Activities for Risk Reduction

Possible mitigation activities may include:

Adoption and enforcement of regulatory tools, including ordinances, regulations, and building codes, to guide and inform land use, development, and redevelopment decisions in areas affected by hazards.

Acquisition or elevation of flood-damaged homes or businesses retrofit public buildings, schools, and critical facilities to withstand extreme wind events or ground shaking from earthquakes.

Creating a buffer area by protecting natural resources, such as floodplains, wetlands, or sensitive habitats. Additional benefits to the community may include improved water quality and recreational opportunities.

Implement outreach programs to educate property owners and the public about risk and about mitigation measures to protect homes and businesses.

Mitigation Plan Implementation & Monitoring

History shows that hazard mitigation planning and the implementation of risk reduction activities can significantly reduce the physical, financial, and emotional losses caused by disasters. Putting the plan into action will be an ongoing process that may include initiating and completing mitigation projects and integrating mitigation strategies into other community plans and programs. Monitoring the plan's implementation helps to ensure it remains relevant as community priorities and development patterns change.

Planning Guidance, Tools, and Resources

FEMA provides a variety of guidance, tools, and resources to help communities develop hazard mitigation plans. These resources and more can be found online at: www.fema.gov/hazard-mitigation-planning-resources.

- Hazard mitigation planning laws, regulations, and policies guide development of state, local, and tribal FEMA-approved hazard mitigation plans.
- The Local Mitigation Planning Handbook is the official guide for governments to develop, update, and implement local plans. The Handbook includes guidance, tools, and examples communities can use to develop their plans.
- Mitigation Ideas: A Resource for Reducing Risk to Natural Hazards provides ideas for mitigation actions.
- Visit www.fema.gov/hazard-mitigation-planning-training for more information on available online and in-person mitigation planning training.

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Central Shenandoah Valley Hazard Mitigation Plan
2019 Hazard Identification Ranking

Name: _____

Locality/Organization: _____

Please select one ranking category below for each identified hazard. Please rank the hazards based upon what impact you feel they have on your community. An other category is provided if you have additional identified hazards you would like included.

	Significant	High	Medium	Low	None
Flooding					
Drought					
Hurricane					
Severe Winter Weather					
Land Subsidence/Karst					
Tornado					
Wildfire					
Landslide					
Terrorism					
Earthquake					
Other: _____					

Please select all dates that you might be available to attend a Steering Committee meeting. One meeting will be held in June and one meeting will be held in October. The meeting dates will be announced soon.

June:

Wednesday, June 5, 10 a.m. - 12 p.m. _____

Wednesday, June 12, 10 a.m. - 12 p.m. _____

Thursday, June 13, 10 a.m. - 12 p.m. _____

October:

Wednesday, October 2, 10 a.m. - 12 p.m. _____

Monday, October 7, 10 a.m. - 12 p.m. _____

Thursday, October 10, 10 a.m. - 12 p.m. _____

Goal 1: Improve local government planning, zoning, land use regulations and code enforcement to reduce impact of natural disasters.

Hazard: All Hazards
Location: Region-wide
Category: Prevention

Goal Statement: Perhaps the most cost-effective way to reduce damages due to natural hazards is to incorporate mitigation measures into planning, zoning ordinances, land use regulations, and code enforcement as described in the strategies below. Most of the hazards that impact our region can be reduced by addressing them upfront in planning and prevention and through code enforcement and regulatory activities.

Strategies

1.1 For flood hazards, strengthen current floodplain, zoning and site development ordinances by adopting higher standards that provide additional protection and limit or restrict further development in the floodplain, i.e. additional freeboard, flood protection setbacks, limitation on fill, minimization of hydrostatic pressure, protection for mechanical and utility systems, etc. For drought hazards, utilize growth management tools like zoning and land use regulations to encourage low-impact development and forest preservation. For land subsidence hazards, strengthen enforcement of land use, zoning regulations and building ordinances that regulate construction in areas susceptible to landslides and sinkholes i.e. steep slopes, intermittent stream channels, and karst topography.

1.2 Provide funds for water supply planning and ground water protection projects and seek and research alternative water supplies for communities. Improve forecasting and monitoring of drought conditions.

1.3 Ensure that floodplain ordinances and building codes are clearly understood by staff, property owners, developers, bankers and insurance companies.

1.4 Implement zoning tools that steer development away from hazardous areas or natural areas deserving preservation. Include Department of Forestry personnel in subdivision review for new development in woodland-urban interface areas.

1.5 Provide for tax incentives, donated easements, and other approaches that can assist in preserving land in the floodplain and other environmentally sensitive areas for agricultural, environmental, recreational or educational uses.

1.6 Rezone to open space or acquire undeveloped portions of floodplain to prohibit future residential building.

1.7 Limit government expenditures for public infrastructure such as roads and water and sewer service in hazard-prone areas.

1.8 Provide necessary staff and staff training to enforce floodplain regulations and building codes.

1.9 Provide training and appropriate equipment/tools for local fire fighters to respond to woodland fires.

1.10 Sponsor workshops for Building Officials that focus on floodplain ordinances and FEMA regulations.

Goal 2: Promote the Community Rating System (CRS).

Hazard: Flood/Hurricane
Location: Region-wide
Category: Prevention

Goal Statement: The National Flood Insurance Program (NFIP) administers a program called the Community Rating System (CRS) whereby the cost of flood insurance is reduced in those jurisdictions which carry out floodplain management activities which are more protective than the minimum requirements of the NFIP. Examples include public outreach, mapping and regulations, damage reduction, and preparedness activities. The benefit of CRS participation, other than the reduced cost of flood insurance premiums to policyholders, is the increased overall awareness of flood hazards in the community and decreased flood damages in the future.

Strategy

2.1 Introduce local jurisdictions to the Community Rating System (CRS) and assist them in applying for CRS certification for their communities.

Goal 3: Improve storm water management throughout the region.

Hazard: Flood/Hurricane
Location: Region-wide
Category: Prevention

Goal Statement: Development, whether in or out of the floodplain, has the potential to increase flooding throughout the watershed. Without due consideration of storm water management, development can increase runoff, causing areas previous unaffected by flooding to become flooded and flood depths to increase in other areas.

Strategies

3.1 Consider conducting a Regional Storm Water Management Study which would guide the localities in developing the most cost-effective storm water management system, not only within the political boundaries of each locality, but within the locality's watershed.

3.2 All communities benefiting from a regional storm water management plan could share in the cost of preparing the plan.

3.3 Seek funding to prepare site-specific hydrologic and hydraulic studies that look at areas that have chronic and repetitive flooding problems.

3.4 Consider utilizing special utility assessment districts where property owners who directly benefit from a specific public improvement are charged a fee that is proportional to the benefits received.

Goal 4: Implement watershed planning programs and conduct watershed analysis studies.

Hazard: Flood/Hurricane, Karst/Sinkholes
Location: Region-wide
Category: Prevention

Goal Statement: While it is important for communities to plan and take responsibility for the land uses that occur in their own floodplains, it must be recognized that flooding and water quality can be affected by land use activities that occur elsewhere. In order to address the wide range of water quality, water quantity, and stream stability problems that exist in our Region an integrated approach is needed. Watershed planning allows localities to look holistically at water resource problems beyond jurisdictional lines.

Strategies

4.1 Develop a regional, broad-based watershed plan among localities within a watershed in order to achieve effective and long-term flood protection and a healthy riverine environment.

4.2 Develop a watershed partnership, i.e. watershed roundtable to coordinate planning and program activities among natural resource agencies and stakeholders.

4.3 Conduct a site analysis mapping study to determine and understand the karst topography in our region.

Goal 5: Increase awareness of flood insurance and the National Flood Insurance Program (NFIP).

Hazard: Flood/Hurricane
Location: Region-wide
Category: Prevention

Goal Statement: Insurance does not prevent disaster damage, but it provides financial protection to support recovery, repairs, and reconstruction. All 21 localities in the Region participate and are in good standing with the National Flood Insurance Program (NFIP). This program is designed to provide flood insurance at affordable rates to policyholders. In return, the local jurisdictions agree to adopt and administer local floodplain management measures directed at protecting lives, existing property, and future construction from future flooding. Only about 25% of the structures in our region that are in the floodplain are covered by flood insurance.

Strategies

5.1 Encourage communities to remain active and compliant with the NFIP program.

5.2 Encourage citizens to purchase flood insurance. Partner with insurance companies, lenders, and real-estate agents to market the NFIP program.

5.3 Conduct NFIP training workshops for insurance providers.

Goal 6: Reduce the impact of natural disasters on private residential properties.

Hazard: Flood/Hurricane, Wildfires, Tornado/Wind, Winterstorms
Location: Region-wide
Category: Property Protection

Goal Statement: There are hundreds of residential structures located in hazardous areas, particularly the floodplain, throughout our region. Most of these structures were built in the floodplain or other vulnerable areas before the enactment of zoning ordinances and other regulations that prohibited building in these areas. For these existing as well as new structures, there are numerous measures that can be taken to reduce the impact of disasters.

Strategies

6.1 Develop a program to elevate, relocate, floodproof or acquire flood-prone houses in order to provide protection to these homes and reduce future damages.

6.2 Continue residential buyout and elevation projects of identified structures most at risk of future flooding with priority given to houses that are repetitively flooded.

6.3 For properties where elevation, relocation or acquisition is not feasible, introduce retrofitting measures to protect existing structures from flood damage. Retrofitting is relatively inexpensive and can include dry floodproofing, wet floodproofing, installing sewer backflow valves, berms, and sump pumps.

6.4 Design and landscape structures with wildfire safety in mind by utilizing fire-resistant materials when building especially in the urban-wilderness interface areas. Create safety and defensible space around structures. Provide adequate water resources/dry hydrants nearby woodland communities. Improve access for fire trucks and equipment. Increase knowledge of controlled burns and use of fire-retardant vegetations.

6.5 Include in local building codes a requirement for manufactured home tie downs and hurricane straps in high wind hazard and flood prone areas.

6.6 Offer financial incentives such as tax abatements, conservation easements, and low-interest loans to encourage property owners to elevate, relocate or floodproof buildings.

6.7 Encourage property owners to take advantage of NFIP's Increased Cost of Compliance (ICC). ICC helps pay for the cost of mitigation, including demolition and relocation, up to $15,000 for a flood- insured structure that sustains a flood loss and is declared to be substantially or repetitively damaged.

6.8 Provide guidance and technical assistance to citizens about measures they can take on their own to protect their properties.

6.9 For properties located in known karst and landslide areas, use corrective measures recommended by a professional site analysis (geotechnical or structural engineer) to protect homes.

6.10 Encourage developers to integrate mitigation techniques into new construction and renovation.

Goal 7: Improve disaster education and planning services for persons with special needs.

Hazard: All Hazards
Location: Region-wide
Category: Public Education and Awareness

Goal Statement: Our region is home to many persons with special needs. A number of state-run facilities, assisted living facilities, group homes, retirement communities, nursing homes, and other agencies that serve persons with special needs are also in our region. Persons with special needs are dramatically affected by disasters and include persons with medical issues, physical and mental disabilities, visual and hearing impairments, and the elderly. Non-English speaking citizens and pet owners are also considered to have special needs as well. Education programs and planning are essential to helping persons with special needs minimize the effects of disasters on their lives and homes.

Strategies

7.1 Educate persons with special needs on disaster preparedness and mitigation methods at community events and through public awareness campaigns.

7.2 Provide disaster preparedness and mitigation materials in alternate formats such as large print, audio-cassette, and languages other than English to make materials accessible for a wider audience in the community. Also provide sign language interpreters at community events, workshops, and other educational programs.

7.3 Work with the first responder community to educate them about the special needs that people may have during a disaster.

7.4 Encourage persons with special needs to contact their local emergency management office so their needs can be noted in the 911 system.

7.5 Offer emergency sheltering for persons with disabilities that can provide accommodations that take into account their special needs including the use of medical equipment requiring electrical power, etc.

7.6 Provide training in emergency operations planning and preparedness to organizations that serve persons with special needs to reduce down-time in service provision, to protect lives of staff and clients, and to reduce damage to facilities.

7.7 Work with emergency managers to make sure that weather alerts and warnings are in accessible formats for all citizens to receive essential information during a disaster.

7.8 Ensure that emergency vehicles are accessible for persons with special needs and available to assist in evacuation if needed.

7.9 Educate pet owners and farmers so they will include their pets and livestock in their family's preparedness planning.

7.10 Work with local animal welfare organizations to provide emergency sheltering for pets and livestock.

Goal 8: Reduce the impact of natural disasters on commercial property and businesses.

Hazard: Flood/Hurricane
Location: Region-wide
Category: Property Protection

Goal Statement: Many of the Region's older commercial districts, downtowns, and factories were built near the water. In particular are the Cities of Waynesboro and Buena Vista, in which businesses and industry have been flooded many times costing millions of dollars in property damage, lost revenue, and jobs. Projects that provide funds to floodproof and retrofit commercial buildings would not only provide protection from future flooding but could also preserve the downtown commercial districts.

Strategies

8.1 Identify and seek funding to provide engineering and design services that would determine the most cost-effective mitigation option for each business.

8.2 Seek funding to floodproof and retrofit commercial buildings where acquisition and elevation are not feasible.

8.3 Sponsor workshops that educate local business and industry about mitigation measures they can install to protect their structures and inventory during a disaster.

8.4 Develop a program to assist local business and industry in developing emergency and business continuity plans.

Goal 9: Improve community warning systems in the region.

Hazard: Flood/Hurricane, Wildfire, Winter Storms Tornadoes/Wind
Location: Region-wide
Category: Emergency Services

Goal Statement: Many of localities participate in a flood warning system developed by the National Weather Service called the Integrated Flood Observing and Warning System (IFLOWS). There are numerous IFLOW stream and rain gauges located throughout our Region. Two of our jurisdictions (Rockingham County and the City of Waynesboro) have "Reverse 911" systems installed. This system allows the locality to alert property owners, businesses, and industry of impending emergencies such as a chemical leak, tornado, flood, etc. through a recorded telephone message. Both the IFLOW and Reverse 911 systems are excellent and effective means to warn citizens of impending disasters. However, not all areas of our Region are covered sufficiently and effectively by this technology.

Strategies

9.1 Identify areas with recurring flood problems and request additional IFLOW stream/rain gauges to ensure that these areas are adequately covered and monitored. Areas that would benefit from an early warning system include the Greenlee Bridge on the James River near Natural Bridge Station in Rockbridge County.

9.2 Develop Emergency Action Plans for specific sites such as mobile home parks, apartment complexes, assisted living facilities, industrial facilities, and essential public facilities within disaster-prone areas and develop specific warning or notification plans for each identified site. These plans should include the designation of a point of contact or resident coordinator, with alternates, to receive warnings, the dispatch of police, sheriff, fire rescue units to these sites to issue warnings and pre-designation of routes. These specific warnings will supplement the general television or radio warnings, which most people receive.

9.3 Seek funding to purchase, install, and maintain Reverse 911 emergency warning systems and other state-of-the-art disaster response and recovery equipment.

9.4 Encourage businesses and public facilities located in high hazard areas to purchase NOAA Weather Radios. By receiving early notification of potential inclement weather, businesses and public facilities can benefit from additional time to prepare for natural disasters. Local governments may be eligible for grants to purchase equipment to be distributed in public facilities, businesses, and industries through out their jurisdictions.

9.5 Utilize emergency preparedness and evacuation plans for people living in high-hazard areas, especially people with special needs and mobility impairments.

Goal 10: Increase protection of public utilities and critical facilities.

Hazard: Flood/Hurricane, Wildfire, Winter Storms, Tornados/Wind
Location: Region-wide
Category: Structural Protection

Goal Statement: Most communities provide some public utility service such as water, sewer, and stormwater systems. Most of these facilities have been upgraded to meet environmental protection design criteria and to remain operational during a disaster. However, in some instances these facilities have failed or services have been disrupted.

Strategies

10.1 Evaluate and provide retrofit measures to prevent disruption of services. Measures can include elevating electrical controls and equipment and installing watertight doors where practicable at water and wastewater treatment plants.

10.2 Bury underground lines deeper and further away from waterways with stronger encasements in floodprone areas with erodible soils.

10.3 Increase the number of wind-secured critical facilities including schools, daycares, hospitals, and shelters.

10.4 Increase number of functional backup generators at critical facilities.

10.5 Establishing routine schedule for trimming trees/limbs around power lines to prevent power outages during wind events and ice storms.

10.6 Limit government spending on infrastructure in high hazard areas.

10.7 Conduct vulnerability assessments and develop security plans on public utility systems in accordance with the Bioterrorism Act of 2002.

Goal 11: Improve dam safety throughout the region.

Hazard: Flood/Hurricane, Land Subsidence
Location: Region-wide
Category: Structural Protection

Goal Statement: There are 28 flood control dams in the Region built between 1954 and 1980. Many are at or near the end of their planned design life and may pose a threat to public safety. The Soil and Water Conservation Districts have the responsibility for the operation and maintenance of most of these dams. Many of the dams in our Region require significant and costly rehabilitation and maintenance.

Strategies

11.1 Examine the risks posed by dams in watersheds that drain in the Region and consider adopting ordinances to restrict development around these dams because of the potential flooding danger in areas below and behind the dams.

11.2 Consider local government funding to maintain and upgrade these dams. Require regular inspection and maintenance schedules.

Goal 12: Improve storm drainage systems in the region.

Hazard: Flood/Hurricane
Location: Region-wide
Category: Structural Protection

Goal Statement: Much of the flooding problems in our Region are a result of poor drainage and inadequate infrastructure. Drainage systems are designed to provide a certain level of protection when maintained in proper condition. Systems that are not maintained on a regular basis may become clogged with debris caused by either natural events or dumping of lawn debris, appliances, and other materials. To minimize the amount of debris accumulation in the drainage system, a combination of public education, regulation, and maintenance programs are needed.

Strategies

12.1 Support projects that call for improved ditching, replacement of inadequate and undersized culverts, enlargements of bridge openings, and drainage piping needed to minimize flooding.

12.2 Develop regular maintenance programs and standard operation procedures and budget accordingly.

12.3 Encourage routine maintenance of creek beds and culverts to allow more water to be carried with special emphasis placed on culverts where there are repeated problems.

12.4 Notify property owners living along interior streams to keep the creek beds clear of debris, weeds, and high grass.

Goal 13: Implement stream remediation projects where needed.

Hazard: Flood/Hurricane
Location: Region-wide
Category: Structural Protection

Goal Statement: Local communities in the Region recognize the importance of protecting existing bank lines and bridge substructures. This can be accomplished with rip rap or gabion revetments, flood retarding structures, bulkheads and berms, and riparian buffers that have been properly designed or constructed.

Strategies

13.1 When implementing stream remediation projects consideration should be given when designing these structures and take into account stream characteristics that influence the selection of these measures such as channel width, bank height, bend radii, storm event, channel velocities and flood depth, and floodplain configuration.

13.2 Obtain maintenance and access easements from property owners for annual maintenance work.

13.3 Coordinate with and support the Region's Soil and Water Conservation Districts' Emergency Watershed Protection Programs.

Goal 14: Implement a disaster preparedness and mitigation education program.

Hazard: All Hazards
Location: Region-wide
Category: Public Education and Awareness

Goal Statement: There are many ways that citizens and business owners can protect themselves and reduce their losses caused by natural disasters. However, many citizens, even recent victims are unaware of these measures. Listed below are a number of activities that can be implemented in the Region to increase public awareness to the hazard and mitigation actions that can be taken to reduce future damage, injury, and death caused by the natural disasters.

Strategies

14.1 Develop comprehensive public information and education programs on disasters, including preparedness, recovery, mitigation and prevention. This can be accomplished through presentations, workshops and marketing materials for citizens, business, schools, local staff and elected officials in the Region. Much of this has been and can be accomplished through Shenandoah Valley Project Impact.

14.2 Develop a public education program to educate citizens about water conservation, to use of water-conserving appliances, and irrigation practices in agricultural areas. Written materials could be developed to teach developers and home owners about native and/or drought-tolerant grasses, shrubs, and trees to be planted around residential structures.

14.3 Increase public education and awareness regarding the dangers of winter storms including driving/traveling during a winter storm event. (Automobile accidents are the leading cause of death during a winter storm event.). Also, increase public awareness to health risks associated with winter storms including exposure, hypothermia, frostbite, overexertion, and accidents from falling/slipping.

14.4 Encourage communities to become involved with the Department of Forestry's Firewise program. Its goal is to encourage and acknowledge action that minimizes home loss to wildfire by preparing for a fire before it occurs.

14.5 Encourage communities to become involved in the National Weather Service program "Storm Ready". This program assists communities with local safety, planning, education, and communication programs needed to save lives and property before and during weather- related disasters.

14.6 Provide Community Emergency Response Team (CERT) training to citizens and maintain a CERT organization. Having an active CERT program will not only educate citizens about preparedness and mitigation measures, it will also provide a pool of trained volunteers that can assist during an emergency or disaster.

14.7 Develop a media campaign to educate the general public throughout the year about disasters when they may be likely to occur. For example a Spring campaign on tornado safety, winter storm preparedness in the Fall, and hurricane safety prior to the start of Hurricane Season. This holistic campaign would be designed to reach a multi-generational audience and would include mitigation and preparedness information.

14.8 Increase the number and use of NOAA weather radios or battery-powered radios or TVs. Improve the effectiveness of NOAA weather radios in the valley.

14.9 Utilize the services of amateur radio operators in the region.

14.10 Sponsor Hazard Mitigation Workshops designed to give information to contractors, property owners, and business owners on mitigation strategies such as acquisition, relocation, elevation, and floodproofing.

14.11 Develop Hazard Awareness programs with the local schools, youth programs, and libraries to disseminate information on natural hazards and mitigation actions. Utilize student environmental clubs to volunteer for projects.

14.12 Notify renters of homes, mobile homes, and apartments that they are located in an area that is subject to flooding and should consider purchasing flood insurance for their contents. Notification could be done via lease agreements.

14.13 Establish and maintain Hazard Resource Library/ Self Help Programs on natural hazards, mitigation and safety and related topics in a central location and available to or disseminated to property owners and businesses.

14.14 Strategically place flood elevation reference markers throughout the Region in an effort to educate and remind people of historical floods. The markers could show the elevation of the high water from previous floods as well as the 100-year flood levels in a particular area.

14.15 Notify potential homebuyers of flood hazards and requirements for flood insurance. Programs should be developed with the cooperation of banks, real estate agents, and insurance agents as well as community development staff.

14.16 Implement programs to provide property owners with flood elevation certificates in order to alert them to the fact that they their property is in the floodplain.

14.17 Provide appropriate local government staff with technical expertise and training on flood protection measures, retrofitting, flood insurance, flood warning and response, etc. in order to help citizens meet and understand floodplain requirements and flood hazards.

Goal 15: Improve hazard data collection and GIS for region.

Hazard: All Hazards
Location: Region-wide
Category: Public Information

Goal Statement: Many of the Flood Insurance Rate Maps (FIRM) produced by FEMA are outdated - most over 15 years old - and unreliable. These maps do not always reflect man-made alterations to floodplains caused by development that can change drainage patterns and increase flood hazards. Accurate and dependable maps are critical in helping the Region develop floodplain management strategies aimed at limiting the devastation caused by floods to area businesses and residents. Improved mapping, along with GIS, a computerized mapping and analysis tool, aids in the administration of building codes, land use plans, and efforts to identify risk areas and develop mitigation actions.

Strategies

15.1 Encourage communities to participate in FEMA's Cooperating Technical Partners (CTP) Program. This FEMA initiative establishes partners with local jurisdictions to develop and maintain up-to-date flood maps and other flood hazards. Mapping activities may include hydrologic and hydraulic analysis, floodplain mapping, preparation of digital FIRMs, and refinement of floodplain boundaries.

15.2 Consider creating a consortium of communities to tackle the problem of outdated FIRM maps and how to update the FIRM maps on a regional basis.

15.3 Ensure that all localities have digitized FIRM maps.

15.4 Acquire technology to assist in managing storm water, floodplain, and other land-based resources.

15.5 Utilize GIS technology to inventory at-risk infrastructure and public and private structures within at-risk areas.

15.6 Determine and map landslide/land subsidence, karst, and sinkhole vulnerable areas in the region. Archive events in a database to monitor trends and recurring sites. Coordinate with VDOT on sites impacting transportation infrastructure.

15.7 Identify and map assisted living centers, nursing homes, and facilities that serve people with special needs that require additional services during disasters.

Central Shenandoah Valley Hazard Mitigation Plan
Steering Committee Meeting
June 5, 2019
Sign-In Sheet

Name	Locality or Organization	Email Address	Phone
Kevin Moore	Rockbridge County	kmoore@rockbridgecountyva.gov	540-319-9878
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Kirk Taylor	Mt. Jackson, VA.	KTAYLOR@KOLTZMAN.COM	540-477-3131
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Steven Craig	Dixie Gas and Oil Corporation	Craigs@dixiegas.com	540-248-6273
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Richard Robinson	Monterey	DOT Robin1@gmail.com	540-290-5542
Steve Strawderman	SVPDC	strawderman@juno.com	540-209-5919
Patti Nylander	Va. Dept. of Forestry	patricia.nylander@dof.virginia.gov	434-962-8172
Sharon Angle	City of Staunton	—	—
Dan Hanlon	Town of Dayton		

Central Shenandoah Valley Hazard Mitigation Plan
Steering Committee Meeting
June 5, 2019
Sign-In Sheet

Name	Locality or Organization	Email Address	Phone
Ross E. Clem	Town of Broadway	reclem@town.broadway.va.us	540-578-0486
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Deane Dozier	CHERRY ORCHARD HOMEOWNERS ASSOC.	deanedozier@gmail.com	540-949-8853
Betsy Putney	Town of Bridgewater	bputney@bridgewater.town	540-908-3397
Patrick Wilcox	Town of Bridgewater	pwilcox@ " "	" " 4205
Perry Weller	City of Staunton	wellerpw@ci.staunton.va.us	540-332-3720
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JAY WILLIAMS	VMI	WILLIAMSJL@VMI.EDU	540 464 7119
Paul Helmuth	Harrisonburg	paul.helmuth@harrisonburgva.gov	540-476-0860
COREY WOOD	CRAIGSVILLE	WOODCA.CRAIGSVILLE@OUTLOOK.COM	540 997-5935
Dave Robinson	NPS-Shenandoah NP	david_robinson@nps.gov	928-606-2694

Central Shenandoah Valley Hazard Mitigation Plan
Steering Committee Meeting
June 5, 2019
Sign-In Sheet

Name	Locality or Organization	Email Address	Phone
ANITA RIGGLEMAN	HRRSA	ariggleman@hrrsa.org	(540)434-1052
Donna Good	Augusta Co.	dgood@co.Augusta.VA.US	540 245-5503
Gaither Hurt	TOWN OF ELKTON	ghurt@townofelkton.com	540 528-0563
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Central Shenandoah Valley Hazard Mitigation Plan
Steering Committee Meeting
June 5, 2019
Sign-In Sheet

Name	Locality or Organization	Email Address	Phone
Tom Roberts	City of Buena Vista	troberts@bvcity.org	

Central Shenandoah Valley Hazard Mitigation Plan
Steering Committee Meeting
Augusta Health, Augusta Community Care Building
Conference Room 3
Wednesday, June 5, 2019
10 a.m. – 12 p.m.

Agenda

I. **Welcome** - Rebecca Joyce, Community Program Manager

II. **Regional Hazard Identification 2019 Ranking Results**

   a. **Ranking of Prior Hazards** - Tracy Hibbitts, Regional Planner

   b. **Consideration of Other Hazards** - Hunter Moore, Regional Planner/GIS Coordinator

III. **Break**

IV. **Regional/Local Mitigation Goals and Strategies** - Rebecca Joyce, Community Program Manager

V. **Public Input and Outreach** - Rebecca Joyce, Community Program Manager

VI. **Closing and Adjournment** - Tracy Hibbitts, Regional Planner

   a. **Next Meeting: Monday, October 7, 10 a.m. – 12 p.m. – Augusta Health, Augusta Community Care Building, Conference Rooms 1 & 2**

Central Shenandoah Valley Hazard Mitigation Plan

2019 Steering Committee Members

Administrative

Central Shenandoah Planning District Commission

Virginia Department of Emergency Management

Local Government

City of Buena Vista
City of Harrisonburg
City of Lexington
City of Staunton
City of Waynesboro
County of Augusta
County of Bath
County of Highland
County of Rockbridge
County of Rockingham
Town of Bridgewater
Town of Broadway
Town of Craigsville
Town of Dayton
Town of Elkton
Town of Glasgow
Town of Goshen
Town of Grottoes
Town of Monterey
Town of Mount Crawford
Town of Timberville

Other Organizations or Government Agencies

Augusta County Service Authority
Augusta Health
Blue Ridge Community College
Bridgewater College
Central Shenandoah Health District, Virginia Department of Health
Cherry Orchard Homeowners Association
Dixie Gas and Oil Corporation
Greater Augusta Regional Chamber of Commerce
Harrisonburg-Rockingham Chamber of Commerce
Harrisonburg-Rockingham Community Services Board
Harrisonburg-Rockingham Regional Sewer Authority
Holtzman Oil Corp.
Lexington-Rockbridge Chamber of Commerce
James Madison University
Sentara Rockingham Memorial Hospital
Shenandoah National Park, National Park Service
Shenandoah Valley Project Impact
Shenandoah Valley Regional Airport
USDA- Natural Resources Conservation Service
Valley Community Services Board
Virginia Department of Environmental Quality
Virginia Department of Forestry
Virginia Military Institute
Washington and Lee University
Western State Hospital

Hazard Identification Results		
Hazard Type	**2013 Rank**	**2019 Rank**
Flooding	Significant	Significant
Drought	High	High
Hurricane	High	High
Severe Winter Weather	High	High
Land Subsidence/Karst	Medium	Medium
Tornado	Medium	Medium
Wildfire	Medium	Medium
Landslide	Low	Low
Earthquake	Low	Low
Terrorism	Low	Low

Central Shenandoah Valley Hazard Mitigation Plan

2019 Other Hazard Identification Ranking

Name: _____

Locality/Organization: _____

Please select one ranking category below for each identified hazard. Please rank the hazards based upon what impact you feel they have on your community.

	Significant	High	Medium	Low	None
Transportation of Hazardous Materials / Industrial Event					
Dam Failure					
Livestock / Poultry Disease					
Derecho					
Opioids/Drugs					
Civil Unrest					
Infectious Disease / Pandemic Emergency					
Criminal Behavior					
Power Outages					
Environmental/ Water Quality					

Central Shenandoah Hazard Mitigation Plan - Mitigation Goals

2020 Mitigation Goals
2013 Mitigation Goals

Goal 1: Improve local government planning, zoning, land use regulations, and code enforcement to reduce the impact of natural and man-made hazards and disasters.

Goal 1: Improve local government planning, zoning, land use regulations, and code enforcement to reduce the impact of natural disasters.

Goal 2: Increase awareness of the National Flood Insurance Program (NFIP) and the Community Rating System (CRS) in local communities in the Region.

Goal 2: Promote the Community Rating System (CRS).
Goal 5: Increase awareness of flood insurance and the National Flood Insurance Program (NFIP).

Goal 3: Continue to improve stormwater management and infrastructure throughout the Region.

Goal 3: Improve stormwater management throughout the region.
Goal 12: Improve storm drainage systems in the region.

Goal 4: Conduct planning and studies and implementation of stormwater and flood mitigation projects at the watershed level when applicable.

Goal 4: Implement watershed planning programs and conduct watershed analysis studies.

Goal 5: Conduct planning and studies and implementation of wildfire mitigation projects in wildland areas, across communities, or at a regional level to address vulnerabilities of the Wildland Urban Interface in the Region.

Goal 6: Reduce the impact of natural and man-made hazards and disasters on private residential structures and properties.

Goal 6: Reduce the impact of natural disasters on private residential properties.

Goal 7: Assist with emergency planning, preparedness education, and hazard mitigation to individuals with special needs and service providers.

Goal 7: Improve disaster education and planning services for persons with special needs.

Goal 8: Reduce the impact of natural and man-made hazards and disasters on commercial structures and properties and businesses.

Goal 8: Reduce the impact of natural disasters on commercial property and businesses.

Goal 9: Improve access to systems that alert local emergency management officials of impending disasters from natural hazards such as rain and river gauges that alert to impending flooding that then allow for more advanced and informed warning to the public in the Region.

Goal 9: Improve community warning systems in the region.

Goal 10: Increase protection of public utilities, infrastructure, and critical facilities.

Goal 10: Increase protection of public utilities and critical facilities.

Goal 11: Improve dam safety throughout the Region.

Goal 11: Improve dam safety throughout the region.

Goal 12: Implement natural systems protection actions that not only minimize damage and losses but also preserve and restore these systems.

Goal 13: Implement natural stream remediation projects where needed.

Goal 13: Implement a disaster preparedness and mitigation and education program.

Goal 14: Implement a disaster preparedness and mitigation and education program.

Remove this goal.

~~*Goal 15: Improve hazard data collection and GIS for the region.*~~

Goal 14: Implement activities that promote resilience in the Region by enabling communities to better prepare, adapt to changing conditions, and become stronger to withstand and recover rapidly from stresses, shocks, and adverse situations.

Central Shenandoah Valley Hazard Mitigation Plan
Steering Committee Meeting
October 3, 2019
Sign-In Sheet

Name	Locality or Organization	Email Address	Phone
Corey Wood	Craigsville	woodca.craigvillepd@outlook.com	540-292-9133
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Sharon Angle	CSPDC	ladystaunton@verizon.net	540-480-4566
Steven Craig	Dixie Gas and Oil Corporation	Craigs@dixiegas.com	(540) 294-1328
Gary Cintora	City of Waynesboro	Cintorag@ci.waynesboro.va.us	540 241 2298
Scott Masincup	Sentara RMH	BXMASINC@Sentara	540-292-3762
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Dennis Driver	Mt. Crawford	doubledfour@comcast.net	540-421-2349
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Steve Strawderman	VDOT	strawdermans@vdot.com	540.209-5919
Carl Williams	Highland County	cwilliams@highlandrescue.net	540-632-7331

Central Shenandoah Valley Hazard Mitigation Plan
Steering Committee Meeting
October 3, 2019
Sign-In Sheet

Name	Locality or Organization	Email Address	Phone
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Brittney Hurt	TOWN OF ELKTON	ghurt@townofelkton.com	540-578-0563
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Chris Bruce	VDEM	Chris.Bruce@vdem.virginia.gov	804-516-5796
Jonathan T. Simmons	VDEM RG	jonathan.simmons@vdem.virginia.gov	804-314-1053
Ross E. Clem	Town of Broadway	rclem@Town.broadway.va.us	540-578-0486
JAMES L WILLIAMS	VMI	WILLIAMSJL@VMI.EDU	540-464-7109
Richard Robinson	Monterey	DOTRobinrl at Gmail	540-468-3923
Michael Keirns	VDH	michael.keirns@vdh.virginia.gov	540 280 2473
Keith Hartman	Buena Vista	KHartman@buenavista.org	540-817-0009

Central Shenandoah Valley Hazard Mitigation Plan
Steering Committee Meeting
October 3, 2019
Sign-In Sheet

Name	Locality or Organization	Email Address	Phone
Chris Cary	Shenandoah Valley Airport	ccary@flyshd.com	540-414-4056
Jeff Michael	Rockingham County	jmichael@rockinghamcountyva.gov	540-476-3241
Chrissy Snyder	Augusta Health	jsnyder@augustahealth.com	540-245-7337
Donna Good	Augusta ECC	dgood@co.augusta.va.us	540 245-5503
Anthony Ramsey	Augusta EMS	abramsey@co.augusta.va.us	540-245-5508
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Cory Smith	City of Staunton	smithcs@ci.staunton.va.us	540 3323720
Betsy Putney	Town of Bridgewater	bputney@bridgewater.town	540-908-4212
Patricia Wilcox	" " "	pwilcox@ " . "	" " "
Kevin Moore	Rockbridge County	Kmoore@rockbridgecountyva.gov	540-319-9878
Andy Sorrells	Bath County	bathcodeofficial@tds.net	540-839-7236

Central Shenandoah Valley Hazard Mitigation Plan
Steering Committee Meeting
October 3, 2019
Sign-In Sheet

Name	Locality or Organization	Email Address	Phone
Brett Sinclair	ACSA	bsinclair@co.augusta.va.us	540-430-3437
Dewy Wolfe	Augusta Co	dwolfe@co.augusta.va.us	245-5700
Keith Taylor	Holtzman Oil	KTAYLOR@HOLTZMANOILCORP.COM	477-3131
Nathan Garrison	Town of Grottoes	ngarrison@ci.grottoes.va.us	271-4584
Anita Riggleman	HRRSA	ariggleman@hrrsa.org	540-434-1053
Frances Cancelo	Augusta Health	fcancelo@augustahealth	540-332-4788
Laura Dwyer	Blue Ridge Community College	dwyerl@brcc.edu	540-453-2533
Chief William Wilkerson	BRCC	wilkersonw@brcc.edu	540-453-2310
Deane Dozier	CHERRY ORCHARD HOMEOWNERS	deanedozier@gmail.com	540-949-8853
Tracy Hibbitts	CSPDC		
Rebecca Joyce	CSPDC		
Hunter Moore	CSPDC		

Central Shenandoah Valley Hazard Mitigation Plan
Steering Committee Meeting
Augusta Health, Augusta Community Care Building
Conference Rooms 1 & 2
Monday, October 7, 2019
10 a.m.

Agenda

I. **Welcome** - Sharon Angle, Chair, Shenandoah Valley Project Impact

II. **Project Status Update and Timeline -** Rebecca Joyce, Community Program Manager

III. **Update on HIRA and Critical Facilities Maps** – Hunter Moore, Regional Planner/GIS Coordinator

IV. **Damage Assessments** – Tracy Hibbitts, Regional Planner

V. **Regional Strategies** - Rebecca Joyce, Community Program Manager and Tracy Hibbitts, Regional Planner

VI. **Local Strategies** - Rebecca Joyce, Community Program Manager

VII. **VDEM and FEMA Review Process** - Tracy Hibbitts, Regional Planner

VIII. **Locality Adoption Process** - Rebecca Joyce, Community Program Manager

IX. **Closing**- Sharon Angle, Chair, Shenandoah Valley Project Impact

Central Shenandoah Valley Hazard Mitigation Plan

2019 Steering Committee Members

Administrative

Central Shenandoah Planning District Commission

Virginia Department of Emergency Management

Local Government

City of Buena Vista
City of Harrisonburg
City of Lexington
City of Staunton
City of Waynesboro
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County of Bath
County of Highland
County of Rockbridge
County of Rockingham
Town of Bridgewater
Town of Broadway
Town of Craigsville
Town of Dayton
Town of Elkton
Town of Glasgow
Town of Goshen
Town of Grottoes
Town of Monterey
Town of Mount Crawford
Town of Timberville

Other Organizations or Government Agencies

Augusta County Service Authority
Augusta Health
Blue Ridge Community College
Bridgewater College
Central Shenandoah Health District, Virginia Department of Health
Cherry Orchard Homeowners Association
Dixie Gas and Oil Corporation
Greater Augusta Regional Chamber of Commerce
Harrisonburg-Rockingham Chamber of Commerce
Harrisonburg-Rockingham Community Services Board
Harrisonburg-Rockingham Regional Sewer Authority
Holtzman Oil Corp.
Lexington-Rockbridge Chamber of Commerce
James Madison University
Sentara Rockingham Memorial Hospital
Shenandoah National Park, National Park Service
Shenandoah Valley Project Impact
Shenandoah Valley Regional Airport
USDA- Natural Resources Conservation Service
Valley Community Services Board
Virginia Department of Environmental Quality
Virginia Department of Forestry
Virginia Military Institute
Washington and Lee University
Western State Hospital

Goal 1: Improve local government operations, planning, zoning, land use regulations, and code enforcement to reduce the impact of natural and man-made hazards and disasters.

Strategies

1.1 For flood hazards, strengthen current floodplain, zoning and site development ordinances by adopting higher standards that provide additional protection and limit or restrict further development in the floodplain, i.e. additional freeboard, flood protection setbacks, limitation on fill, minimization of hydrostatic pressure, protection for mechanical and utility systems, etc. For drought hazards, utilize growth management tools like zoning and land use regulations to encourage low-impact development and forest preservation. For land subsidence hazards, strengthen enforcement of land use, zoning regulations and building ordinances that regulate construction in areas susceptible to landslides and sinkholes i.e. steep slopes, intermittent stream channels, and karst topography.

1.2 Encourage water supply planning and ground water protection projects. Seek and research alternative water supplies for communities. Improve forecasting and monitoring of drought conditions.

1.3 Ensure that floodplain ordinances and building codes are clearly understood by staff, property owners, developers, bankers and insurance companies.

1.4 Implement zoning tools that steer development away from hazardous areas or natural areas deserving preservation. Include Department of Forestry personnel in subdivision review for new development in woodland-urban interface areas.

1.5 Provide for tax incentives, donated easements, and other approaches that can assist in preserving land in the floodplain and other environmentally sensitive areas for agricultural, environmental, recreational or educational uses.

1.6 Rezone to open space or acquire undeveloped portions of floodplain to prohibit future residential building.

1.7 Limit government expenditures for public infrastructure such as roads and water and sewer service in hazard-prone areas.

1.8 Provide necessary staff and staff training to enforce floodplain regulations and building codes.

1.9 Provide training and appropriate equipment/tools for local fire fighters to respond to woodland fires.

1.10 Sponsor workshops for Building Officials that focus on floodplain ordinances and FEMA regulations.

Goal 2: Increase awareness of the National Flood Insurance Program (NFIP) and the Community Rating System (CRS) in local communities in the Region.

Strategies

2.1 Introduce local jurisdictions to the Community Rating System (CRS) and assist them in applying for CRS certification for their communities.

2.2 Encourage communities to remain active and compliant with the NFIP program.

2.3 Encourage citizens to purchase flood insurance. Partner with insurance companies, lenders, and real-estate agents to market the NFIP program.

2.4 Conduct NFIP training workshops for insurance providers.

Goal 3: Continue to improve stormwater management for the infrastructure throughout the Region.

Strategies

3.1 Consider conducting a Regional Storm Water Management Study which would guide the localities in developing the most cost-effective storm water management system, not only within the political boundaries of each locality, but within the locality's watershed.

3.2 Seek funding to prepare site-specific hydrologic and hydraulic studies that look at areas that have chronic and repetitive flooding problems.

3.3 Consider utilizing special utility assessment districts where property owners who directly benefit from a specific public improvement are charged a fee that is proportional to the benefits received.

3.4 Support projects that call for improved ditching, replacement of inadequate and undersized culverts, enlargements of bridge openings, and drainage piping needed to minimize flooding.

3.5 Develop regular maintenance programs and standard operation procedures and budget accordingly.

3.6 Encourage routine maintenance of creek beds and culverts to allow more water to be carried with special emphasis placed on culverts where there are repeated problems.

3.7 Notify property owners living along interior streams to keep the creek beds clear of debris, weeds, and high grass.

Goal 4: Conduct planning and studies for the implementation of stormwater and flood mitigation projects at the watershed level when applicable.

Strategies

4.1 Develop a regional, broad-based watershed plan among localities within a watershed in order to achieve effective and long-term flood protection and a healthy riverine environment.

4.2 Develop a watershed partnership, i.e. watershed roundtable to coordinate planning and program activities among natural resource agencies and stakeholders.

4.3 Conduct a site analysis mapping study to determine and understand the karst topography in our region.

Goal 5: Conduct proactive planning focused on developing mitigation strategies and projects that focus on wildfire mitigation at the landscape scale in wildland areas across communities or at a regional level; to address vulnerabilities of the Wildland Urban Interface in the Region.

Goal 6: Reduce the impact of natural and man-made hazards and disasters on private residential structures and properties.

Strategies

6.1 Develop a program to elevate, relocate, floodproof or acquire flood-prone houses in order to provide protection to these homes and reduce future damages.

6.2 Continue residential buyout and elevation projects of identified structures most at risk of future flooding with priority given to houses that are repetitively flooded.

6.3 For properties where elevation, relocation or acquisition is not feasible, introduce retrofitting measures to protect existing structures from flood damage. Retrofitting is relatively inexpensive and can include dry floodproofing, wet floodproofing, installing sewer backflow valves, berms, and sump pumps.

6.4 Design and landscape structures with wildfire safety in mind by utilizing fire-resistant materials when building especially in the urban-wilderness interface areas. Create safety and defensible space around structures. Provide adequate water resources/dry hydrants nearby woodland communities. Improve access for fire trucks and equipment. Increase knowledge of controlled burns and use of fire-retardant vegetations.

6.5 Include in local building codes a requirement for manufactured home tie downs and hurricane straps in high wind hazard and flood prone areas.

6.6 Offer financial incentives such as tax abatements, conservation easements, and low-interest loans to encourage property owners to elevate, relocate or floodproof buildings.

6.7 Provide guidance and technical assistance to citizens about measures they can take on their own to protect their properties.

6.8 For properties located in known karst and landslide areas, use corrective measures recommended by a professional site analysis (geotechnical or structural engineer) to protect homes.

6.9 Encourage developers to integrate mitigation techniques into new construction and renovation.

Goal 7: Assist with emergency planning, preparedness education, and hazard mitigation to individuals with special needs and service providers. Special needs include but are not limited to physical, sensory, cognitive, or emotional disabilities; medical issues, and communication barriers.

Strategies

7.1 Educate persons with special needs on disaster preparedness and mitigation methods at community events and through public awareness campaigns.

7.2 Provide disaster preparedness and mitigation materials in alternate formats such as large print, digitally, and languages other than English to make materials accessible for a wider audience in the community. Also provide sign language interpreters at community events, workshops, and other educational programs.

7.3 Work with the first responder community to educate them about the special needs that

people may have during a disaster.

7.4 Encourage persons with special needs to contact their local emergency management office so their needs can be noted in the 911 system.

7.5 Offer emergency sheltering for persons with disabilities that can provide accommodations that consider their special needs including the use of medical equipment requiring electrical power, etc.

7.6 Provide training in emergency operations planning and preparedness to organizations that serve persons with special needs to reduce down-time in service provision, to protect lives of staff and clients, and to reduce damage to facilities.

7.7 Work with emergency managers to make sure that weather alerts and warnings are in accessible formats for all citizens to receive essential information during a disaster.

7.8 Ensure that emergency vehicles are accessible for persons with special needs and available to assist in evacuation if needed.

7.9 Educate pet owners and farmers so they will include their pets and livestock in their family's preparedness planning.

7.10 Work with local animal welfare organizations to provide emergency sheltering for pets and livestock.

Goal 8: Reduce the impact of natural and man-made hazards and disasters on commercial and industrial structures, properties, and businesses.

8.1 Identify and seek funding to provide engineering and design services that would determine the most cost-effective mitigation option for each business.

8.2 Seek funding to floodproof and retrofit commercial buildings where acquisition and elevation are not feasible.

8.3 Sponsor workshops that educate local business and industry about mitigation measures they can install to protect their structures and inventory during a disaster.

8.4 Develop a program to assist local business and industry in developing emergency and business continuity plans.

Goal 9: Improve access to systems that alert local emergency management officials of impending severe weather, emergencies, and disasters.

Goal 10: Improve community warning systems in the region.

Strategies

10.1 Identify areas with recurring flood problems and request additional IFLOW stream/rain gauges to ensure that these areas are adequately covered and monitored. Areas that would benefit from an early warning system include the Greenlee Bridge on the James River near Natural Bridge Station in Rockbridge County.

10.2 Develop Emergency Action Plans for specific sites such as mobile home parks, apartment complexes, assisted living facilities, industrial facilities, and essential public facilities within disaster-prone areas and develop specific warning or notification plans for each identified site. These plans should include the designation of a point of contact or resident coordinator, with alternates, to receive warnings, the dispatch of police, sheriff, fire rescue units to these sites to issue warnings and pre-designation of routes. These specific warnings will supplement the general television or radio warnings, which most people receive.

10.3 Seek funding to purchase, install, and maintain Reverse 911 emergency warning systems and other state-of-the-art disaster response and recovery equipment.

10.4 Encourage businesses and public facilities located in high hazard areas to purchase NOAA Weather Radios. By receiving early notification of potential inclement weather, businesses and public facilities can benefit from additional time to prepare for natural disasters. Local governments may be eligible for grants to purchase equipment to be distributed in public facilities, businesses, and industries throughout their jurisdictions.

10.5 Utilize emergency preparedness and evacuation plans for people living in high-hazard areas, especially people with special needs and mobility impairments.

Goal 11: Reduce the impact of natural and man-made hazards on public utilities, critical infrastructure, and public properties/lands.

Strategies

11.1 Evaluate and provide retrofit measures to prevent disruption of services. Measures can include elevating electrical controls and equipment and installing watertight doors where practicable at water and wastewater treatment plants.

11.2 Bury underground lines deeper and further away from waterways with stronger encasements in floodprone areas with erodible soils.

11.3 Increase the number of wind-secured critical facilities including schools, daycares, hospitals, and shelters.

11.4 Increase number of functional backup generators at critical facilities.

11.5 Establishing routine schedule for trimming trees/limbs around power lines to prevent power outages during wind events and ice storms.

11.6 Limit government spending on infrastructure in high hazard areas.

11.7 Conduct vulnerability assessments and develop security plans on public utility systems in accordance with the Bioterrorism Act of 2002.

Goal 12: Improve dam safety throughout the Region.

Strategies

12.1 Examine the risks posed by dams in watersheds that drain in the Region and consider adopting ordinances to restrict development around these dams because of the potential flooding danger in areas below and behind the dams.

12.2 Consider local government funding to maintain and upgrade these dams. Require regular inspection and maintenance schedules.

Goal 13: Implement natural systems protection actions that not only minimize damage and losses but also preserve and restore these systems.

Strategies

13.1 When implementing stream remediation projects consideration should be given when designing these structures and consider stream characteristics that influence the selection of these measures such as channel width, bank height, bend radii, storm event, channel velocities and flood depth, and floodplain configuration.

13.2 Obtain maintenance and access easements from property owners for annual maintenance work.

13.3 Coordinate with and support the Region's Soil and Water Conservation Districts' Emergency Watershed Protection Programs.

Goal 14: Implement a disaster preparedness and mitigation education program.

Strategies

14.1 Develop comprehensive public information and education programs on disasters, including preparedness, recovery, mitigation and prevention. This can be accomplished through presentations, workshops and marketing materials for citizens, business, schools, local staff and elected officials in the Region. Much of this has been and can be accomplished through Shenandoah Valley Project Impact.

14.2 Develop a public education program to educate citizens about water conservation, to use of water-conserving appliances, and irrigation practices in agricultural areas. Written materials could be developed to teach developers and homeowners about native and/or drought-tolerant grasses, shrubs, and trees to be planted around residential structures.

14.3 Increase public education and awareness regarding the dangers of winter storms including driving/traveling during a winter storm event. (Automobile accidents are the leading cause of death during a winter storm event.). Also, increase public awareness to health risks associated with winter storms including exposure, hypothermia, frostbite, overexertion, and accidents from falling/slipping.

14.4 Encourage communities to become involved with the Department of Forestry's Firewise program. Its goal is to encourage and acknowledge action that minimizes home loss to wildfire by preparing for a fire before it occurs.

14.5 Encourage communities to become involved in the National Weather Service program "Storm Ready". This program assists communities with local safety, planning, education, and communication programs needed to save lives and property before and during weather- related disasters.

14.6 Provide Community Emergency Response Team (CERT) training to citizens and maintain a CERT organization. Having an active CERT program will not only educate citizens about preparedness and mitigation measures, it will also provide a pool of trained volunteers that can assist during an emergency or disaster.

14.7 Develop a media campaign to educate the general public throughout the year about disasters when they may be likely to occur. For example a Spring campaign on tornado safety, winter storm preparedness in the Fall, and hurricane safety prior to the start of Hurricane Season. This holistic campaign would be designed to reach a multi-generational audience and would include mitigation and preparedness information.

14.8 Increase the number and use of NOAA weather radios or battery-powered radios or TVs. Improve the effectiveness of NOAA weather radios in the valley.

14.9 Utilize the services of amateur radio operators in the region.

14.10 Sponsor Hazard Mitigation Workshops designed to give information to contractors, property owners, and business owners on mitigation strategies such as acquisition, relocation, elevation, and floodproofing.

14.11 Develop Hazard Awareness programs with the local schools, youth programs, and libraries to disseminate information on natural hazards and mitigation actions. Utilize student environmental clubs to volunteer for projects.

14.12 Notify renters of homes, mobile homes, apartments that they are in an area that is subject to flooding and should consider purchasing flood insurance for their contents. Notification could be done via lease agreements.

14.13 Establish and maintain Hazard Resource Library/ Self Help Programs on natural hazards, mitigation and safety and related topics in a central location and available to or disseminated to property owners and businesses.

14.14 Strategically place flood elevation reference markers throughout the Region to educate and remind people of historical floods. The markers could show the elevation of the high water from previous floods as well as the 100-year flood levels.

14.15 Notify potential homebuyers of flood hazards and requirements for flood insurance. Programs should be developed with the cooperation of banks, real estate agents, and insurance agents as well as community development staff.

14.16 Implement programs to provide property owners with flood elevation certificates in order to alert them to the fact that they their property is in the floodplain.

14.17 Provide appropriate local government staff with technical expertise and training on flood protection measures, retrofitting, flood insurance, flood warning and response, etc. in order to help citizens meet and understand floodplain requirements and flood hazards.

Goal 15: Improve hazard data collection and GIS for the region.

Strategies

15.1 Encourage communities to participate in FEMA's Cooperating Technical Partners (CTP) Program. This FEMA initiative establishes partners with local jurisdictions to develop and maintain up-to-date flood maps and other flood hazards. Mapping activities may include hydrologic and hydraulic analysis, floodplain mapping, preparation of digital FIRMs, and refinement of floodplain boundaries.

15.2 Consider creating a consortium of communities to tackle the problem of outdated FIRM maps and how to update the FIRM maps on a regional basis.

15.3 Ensure that all localities have digitized FIRM maps.

15.4 Acquire technology to assist in managing storm water, floodplain, and other land-based resources.

15.5 Utilize GIS technology to inventory at-risk infrastructure and public and private structures within at-risk areas.

15.6 Determine and map landslide/land subsidence, karst, and sinkhole vulnerable areas in the region. Archive events in a database to monitor trends and recurring sites. Coordinate with VDOT on sites impacting transportation infrastructure.

15.7 Identify and map assisted living centers, nursing homes, and facilities that serve people with special needs that require additional services during disasters.

Goal 16: Implement activities that promote resilience in the Region by enabling communities to better prepare, adapt to changing conditions, and become stronger to withstand and recover rapidly from stresses, shocks, and adverse situations.

Goal 17: Review Mitigation and Community Improvement Plans in the aftermath of an event in order to encourage the implementation of mitigation projects during the recovery process.

Central Shenandoah Hazard Mitigation Plan: Local Mitigation Strategies

Community:
NFIP Community Number:

Regional Goals FEMA/VDEM Goals Required To Be Included In Plan Regional Wildfire Mitigation Plan Goals

Mitigation Strategy	Hazard	Priority High Medium Low	Project Status Delayed On-going Completed	If Not Completed, Why?	Responsible Party	Time Frame
Continue membership and participation in Shenandoah Valley Project Impact, the regional disaster preparedness and mitigation education program that was started in September 2000. Shenandoah Valley Project Impact educates citizens in the region about disaster preparedness and mitigation through public awareness campaigns, workshops and trainings, and an extensive resource library.	All Hazards	High	On-going	N/A	CSPDC	On-going
Maintain a relationship with the Southern Shenandoah Chapter of Virginia Voluntary Organizations Active in Disaster (VOAD), to share knowledge and resources throughout the preparation, response, and recovery phases of a disaster.	All Hazards	High	On-going	N/A	County City Town	On-going
Support implementation of structural and non-structural mitigation activities on private or public property to reduce exposure to and provide protection from natural and man-made hazards. Eligible projects include but are not limited to acquisition, elevation, minor structural flood control projects, relocation of structures, retrofitting of existing structures, infrastructure protection measures, stormwater and wastewater management improvements, advanced warning systems, hazard gauging systems, hazard education, and wildfire mitigation projects.	All Hazards	High	On-going	N/A	County City Town	On-going

Mitigation Strategy	Hazard	Priority High Medium Low	Project Status Delayed On-going Completed	If Not Completed, Why?	Responsible Party	Time Frame
Maintain the community's compliance with the National Flood Insurance Program (NFIP) by engaging in various activities included in the three basic components of the NFIP program; 1. floodplain identification and mapping risk, 2. responsible floodplain management, and 3. flood insurance. Sample activities include but are not limited to: maintaining publicly accessible and accurate Flood Insurance Rate Maps (FIRMs), adopting and enforcing a compliant floodplain ordinance, and provide general assistance and education to community members regarding the flood insurance program.	Flood	High	On-going	N/A	County City Town	On-going
Encourage the lessening of potential wildfires in our community and the region by; 1. Education and outreach to residents, especially those that live in woodland areas and the Wildland Urban Interface (WUI). 2. Reduction of hazardous fuels throughout the community. 3. Reduction of structural ignitability to limit injury, loss of life, and property and structural damage. 4. Having trained first responders with proper tools and equipment that will serve as a frontline defense against a wildfire.	Wildfire	High Medium	On-going	N/A	County City Town	On-going

Public Survey and Survey Results

2019 Central Shenandoah Valley Natural Hazards Survey

The Central Shenandoah Planning District Commission is in the process of updating its Central Shenandoah Valley Hazard Mitigation Plan. Hazard mitigation is the effort to reduce loss of life and property by lessening the impact of disasters before it happens. Mitigation plans allow a community to assess its risks, vulnerabilities and create strategies to reduce damage to structures, infrastructure, and properties. These plans help communities to become more resilient. By completing this survey, you will help the hazard mitigation planning team gain a better understanding of the public's perceptions and opinions regarding natural hazards.
Thank you for your help!

* 1. **Have you or someone in your household experienced any of the natural disasters below?** *(Please check ALL that apply)*

- ☐ Coastal Erosion
- ☐ Drought
- ☐ Dust Storm
- ☐ Earthquake
- ☐ Flood
- ☐ Household Fire
- ☐ Hurricane/Tropical Storm
- ☐ Landslide/Debris Flow
- ☐ Tsunami
- ☐ Volcanic Eruption
- ☐ Wildfire
- ☐ Windstorm
- ☐ Winter Storm/Blizzard

* 2. **How concerned are you about the following natural hazards affecting our area?** *(Please check only ONE box for each hazard)*

	Extremely Concerned	Very Concerned	Concerned	Somewhat Concerned	Not Concerned
Drought	○	○	○	○	○
Earthquake	○	○	○	○	○
Flood	○	○	○	○	○
Household Fire	○	○	○	○	○
Hurricane	○	○	○	○	○
Ice Storm	○	○	○	○	○
Landslide/Debris Flow	○	○	○	○	○
Wildfire	○	○	○	○	○
Wind Storm/Derecho	○	○	○	○	○
Winter Storm/Blizzard	○	○	○	○	○
Tornado	○	○	○	○	○

Other (please specify)

* 3. For each activity below please select: what you have done, plan to do in the near future, have not done, or are unable to do, in your household. *(Please check ONE answer per activity)*

	Have Done	Plan To Do	Not Done	Unable To Do
Attend meetings or received written information on natural disasters or emergency preparedness?	○	○	○	○
Developed a plan for what everyone would do in the event of a household emergency?	○	○	○	○
Prepared a "Disaster Supply Kit" (Stored extra food, etc.)?	○	○	○	○
In the last year, has anyone in your household trained in first aid or CPR?	○	○	○	○
Purchased Flood Insurance?	○	○	○	○
Implemented fire-resistance or floodproofing techniques on your home or business?	○	○	○	○
Installed smoke detectors and fire extinguishers in your home or business?	○	○	○	○

* 4. How concerned are you of an occurrence of a natural hazard on your property?

- ○ Extremely Concerned
- ○ Very Concerned
- ○ Concerned
- ○ Somewhat Concerned
- ○ Not Concerned

* 5. How much money are you willing to spend to better protect your family and home from natural disasters? *(Please check only ONE)*

- ◯ $50- 99
- ◯ $100-$999
- ◯ $1,000-$4,999
- ◯ $5,000 and above
- ◯ None

* 6. What modifications have you made or would you consider making to protect your home from natural disasters? *(Please check ALL that apply)*

- ☐ Anchor bookcases, cabinets to wall
- ☐ Secure water heater to wall
- ☐ Install latches on drawers/cabinets
- ☐ Fit gas appliances with flexible connections
- ☐ Purchase flood insurance
- ☐ Keep culverts, ditches, and gutters free of debris
- ☐ Elevate utilities and move appliances out of basements
- ☐ Seal basement walls and windows with waterproofing compounds
- ☐ Install check valves to keep sewer lines from backing up
- ☐ Secure home to its foundation
- ☐ Brace un-reinforced masonry and concrete walls and foundations
- ☐ Find out if you live in a floodplain
- ☐ Avoid building in a floodplain
- ☐ Elevate your house at least one foot above the 100-year flood elevation
- ☐ Relocate your home outside of the floodplain
- ☐ Select fire-resistant materials to build your home such as flame-retardant roof shingles
- ☐ Landscape your yard with fire-resistant vegetation
- ☐ Keep gutters clean
- ☐ Dispose of stove, grill and fireplace ashes properly
- ☐ Stack firewood at least 30 feet away and uphill from your home and clear combustible materials around it
- ☐ Place metal screens over structure openings
- ☐ None

* 7. Which of the following incentives, if any, would motivate you to take additional steps to better protect your family and home from a natural disaster? *(Please check ALL that apply)*

- ☐ Insurance discount
- ☐ Free (brief) training on preparation and prevention of property disaster
- ☐ Low interest rate loan
- ☐ Lower new home construction costs
- ☐ Free wildfire mitigation home assessment
- ☐ Other (please specify)
- ☐ Mortgage discount
- ☐ Federal or state grant
- ☐ Tax break or incentive
- ☐ None

8. In what county, city, or town do you live?

9. Do you own or rent your dwelling?

- ◯ Own
- ◯ Rent

10. Additional Comments:

11. Thank you for your participation!

This survey may be submitted anonymously; however, if you would like to receive information regarding upcoming public meetings for the hazard mitigation plan update, please provide your name and contact information:

Name	
Address	
Address 2	
City/Town	
State/Province	
ZIP/Postal Code	
Email Address	

Thank you for your time and providing this information!

For more information about the survey, please contact:

Rebecca Joyce, Community Program Manager
Central Shenandoah Planning District Commission
112 MacTanly Place
Staunton, Virginia 24401

by phone: (540)885-5174
e-mail: rebecca@cspdc.org

Central Shenandoah Valley All Hazards Mitigation Plan – 2020 Update
Natural Hazards Survey Report

Summary

Beginning in April 2018 with the Central Shenandoah Regional Wildfire Protection Plan until October 2019, the CSPDC conducted a survey of the citizens of the twenty-one jurisdictions in the Region. The purpose of this survey was to receive public input regarding perceptions about natural hazards experienced by individuals in the Central Shenandoah Region, their knowledge regarding mitigation techniques, and their willingness to implement mitigation measures.

Distribution of the survey was purposely widespread throughout the Region. Individuals had the option to complete the survey on-line, as a paper copy, or by telephone interview. A press release explaining the survey and how citizens could obtain a copy was distributed in a mass e-mail to contacts throughout the Region and to various media outlets such as newspapers and local television stations.

Five hundred and fifty-seven (557) people completed the survey. The majority of completed surveys were from Augusta County, 156; the City of Staunton, 65; and Rockingham County, 54 based on the responses of the 478 people who answered the question regarding where they live.

Results

- The survey asked respondents which natural disasters they had experienced. The top four natural disasters were; winter storms (82%), windstorms (49%), hurricanes/tropical storms (48%), and floods (44%). With the survey done for the last update of the Plan, windstorms were not included as a top category. This change may be the result of the 2012 Derecho and several smaller, localized windstorms we have had since the last update.

- Respondents were asked to state their concerns about natural hazards affecting the Shenandoah Valley. The largest percentages for each disaster fell in the middle of the rating scale in the *Concerned* category: with the largest being household fire (35%), windstorm/derecho (32%), winter storm (32%), drought (31%), and hurricanes (30%). The *Very Concerned* or *Extremely Concerned* categories did not receive a majority for any hazard. In the survey for the 2013 update, respondents were *Very Concerned* about winter storms/ blizzards (35%) and ice storms (33%). Hurricanes (31%), drought (32%), and floods (30%) had respondents *Concerned* in their response to that survey.

- The survey listed several mitigation activities and asked respondents which of these they had completed. Answers for this survey are in **bold.** Answers from the previous survey are in *italics*. Completed activities included:

    - Installed smoke detectors. **(90%)** *(88%)*
    - Attended meetings or received information about natural disasters or emergency preparedness. **(67%)** *(54%)*
    - Trained in First Aid or CPR in the last year. **(49%)** *(53%)*
    - Prepared a disaster supply kit. **(46%)** *(37%)*
    - Developed a household emergency plan. **(50%)** *(34%)*
    - Implemented fire-resistance or floodproofing techniques. **(27%)** *(19%)*
    - Purchased flood insurance. **(7%)** *(8%)*

- Less than 20% of respondents are *Very Concerned* or *Extremely Concerned* about an occurrence of a natural hazard on their property.

- When asked how much money would respondents be willing to spend to better protect their family and homes from natural disasters; forty-seven percent (47%) said they would spend up to one thousand dollars ($1,000), twenty-five percent (25%) said they would spend up to five thousand dollars ($5,000), and seven percent (7%) would spend five thousand dollars ($5,000) or above.

- The survey listed several types of modifications people have made or would make to protect their home from natural disasters. The three most popular modifications were:

    - Eighty-seven percent (87%) of respondents would keep gutters clean.
    - Sixty-nine percent (69%) of respondents would keep culverts, ditches, and gutters free of debris to allow the free flow of potential floodwaters.
    - Sixty-six percent (66%) of respondents would dispose of stove, grill, and fireplace ashes properly.

- Respondents were asked what incentives would motivate them to take additional steps to better protect their family and homes from a natural disaster. The three incentives that received the most responses were:

    - Seventy-three percent (73%) of respondents said an insurance discount would be a motivating factor.

    - Fifty percent of respondents (50%) said a tax break or incentive would be a motivating factor.

    - Forty-seven percent (47%) of respondents said a federal or state grant would be a motivating factor.

Conclusions

What conclusions can be drawn by examining the responses of the five hundred and fifty-seven (557) individuals that completed the survey?

- The most common natural disasters that respondents have experienced are the ones that have happened most frequently. Windstorms/Derechos are new to this list.

- The disasters respondents expressed the most concern about are the ones that occur the most frequently. Windstorms/Derechos are new to this list. House fires are more of a concern than in the past.

- Mitigation and preparedness information is being distributed and received by citizens throughout the Central Shenandoah Region.

- Since the last HMP update more respondents are doing the three most essential tasks needed to prepare for emergencies and disasters; creating a family plan, assembling a disaster supply kit, and receiving information about hazards preparedness.

- Fire safety education in the Central Shenandoah Valley continues to be extremely effective as illustrated by 90% of respondents having installed smoke detectors. This has stayed consistent since the previous update of the HMP.

- Yard work and home maintenance activities that reduce combustible debris and assist with the proper drainage of stormwater are simple mitigation methods a majority of respondents are willing to undertake to prevent damage to their property.

- Not more than one thousand dollars ($1,000.00) is the amount of financial resources that the majority of respondents are willing to spend to protect their families and properties from natural hazards. This trend has not changed since the previous HMP.

- Financial incentives whether through insurance discounts, tax breaks, or grants are the most motivating factors to respondents in order to implement steps to protect their homes and families. The most motivating factor is now insurance discounts compared to the last HMP where tax breaks were the most popular incentive.

In conclusion, while the Central Shenandoah Valley continues to make strides in its progress towards disaster-resistance and resilience there is still much work to be done.

Appendix B -

James Madison University

Climate Adaptation Chapter

CLIMATE ADAPTATION

Submitted to the Central Shenandoah Planning District Commission

Raven Brubach, Macon Thompson, Alex Cherney, Anton Foretich, Jake Rehm, Joe Ziegler, Jesse Faas

James Madison University

April 29, 2019

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Introduction

The impacts of climate change have the potential to be hazardous to the communities and environment of the Central Shenandoah Valley. As the impacts from climate change increase, the region will face more frequent, severe storms and natural disasters. These threaten local commercial and agricultural industries and infrastructure, as well as the safety and well-being of residents within the Central Shenandoah Planning District Commission (CSPDC) region. As population continues to grow, the risk of supplementary physical damage and economic loss will rise, as well.

Population

The population of the individual cities and counties of the CSPDC region vary considerably (Table 1). Rockingham and Augusta counties have the highest populations as well as the highest median household income, median property value, and number employed (Data USA, 2019-h; Data USA, 2019-b). Each locality is expected to see an increase in population except for Bath County, Highland County and the City of Buena Vista, where the populations are slowly declining (Data USA, 2019-b; Data USA, 2019-d; Data USA, 2019-c). The city of Harrisonburg has a population growth rate of 2.09%, the fastest growing within the region; it also has the third highest median property value behind Rockingham and Augusta counties (Data USA, 2018-e; Data USA, 2019-h). Amongst the most common occupations within the localities are administrative, sales and management positions; however, there are comparatively high numbers of residents working within the farming, fishing, and forestry occupations as well as firefighting and prevention, and other protective service jobs. (Data USA, 2019-a-j). As people continue to move into the area, prompting further infrastructure and development, the risk of economic and social losses will increase unless additional hazard mitigation measures are taken to match the threat of increasingly destructive weather.

Land Use

The Central Shenandoah Valley region consists of 3,439 square miles located in western Virginia between the Blue Ridge and Allegany Mountains (Central Shenandoah Valley Region, 2015). According to each county's latest comprehensive plan, the majority of Central Shenandoah Valley land is dominated by forest and agriculture. The region's growing

Table 1. Population Data for Central Shenandoah Region (Data USA, 2019).

County/City	Population	Population Growth Rate (Between 2015-2016)	Median Household Income	Median Property Value	Number of Employees
Augusta	74,330	0.37%	$56,802	$199,700	34,486
Bath	4,558	-0.55%	$44,985	$146,400	2,209
Highland	2,230	-0.62%	$44,877	$160,800	982
Rockbridge	22,450	0.03%	$52,478	$193,300	10,184
Rockingham	78,427	0.83%	$55,029	$200,900	38,083
Buena Vista	6,495	-1.74%	$33.672	$111,700	2,806
Lexington	7,113	1.09%	$37,309	$252,500	2,257
Harrisonburg	53,064	2.09%	$43,009	$196,200	26,008
Staunton	24,273	0.161%	$46,435	$162,500	11,848
Waynesboro	21,620	1.19%	$42,112	$161,600	9,976

recreational and agricultural industries are supported by such land use. All five counties within the CSDPC region have over 10% of land use devoted to agriculture; however, the largest percentages are in Rockbridge and Rockingham counties that respectively utilize 73% and 46% of their land for agriculture. State and Federal lands such as Shenandoah National Park, George Washington National Forest, and Jefferson National Forest are located within the CSPDC bounds and are a significant attraction to the area (Figure 1). Within the region, efforts to increase lands dedicated to conservation and recreation purposes are being made with intent to preserve their intrinsic value.

Changes to Weather and Climate Patterns

"Climate" describes the long-term weather patterns in a specific region. Regions with the same climate are likely to have similar averages of precipitation, temperature, wind, insolation, and humidity. These averages are referred to as "climate normals" (NOAA, 2018). Earth's climate goes through periodic cycles that normally take place over a span of

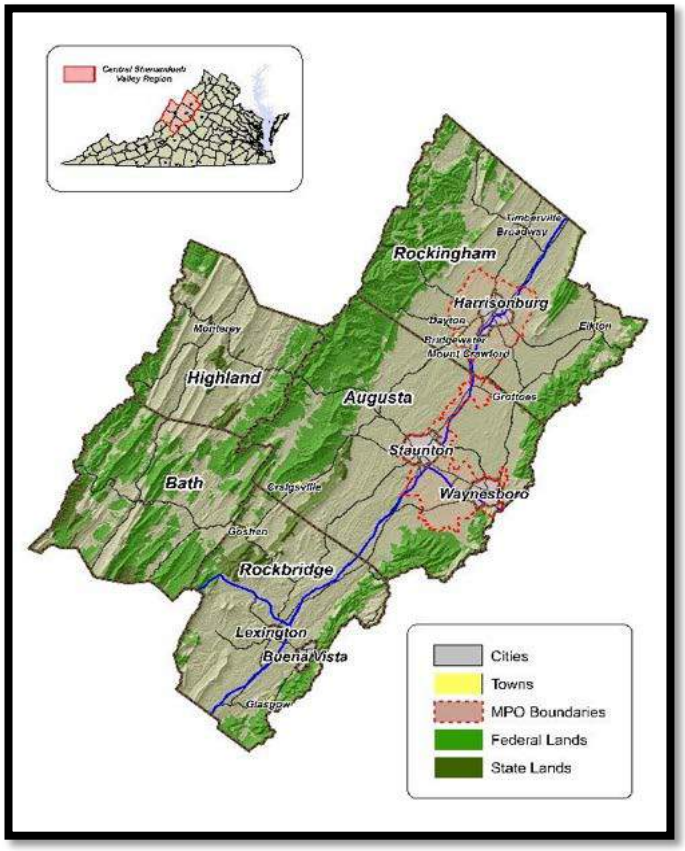

Figure 1. Map of Localities in Central Shenandoah Valley Region (CSDPC, 2019).

thousands of years (NASA, 2014). However, this process is accelerated due to anthropogenic causes (environmental pollution caused by humans), such as the increase of carbon dioxide and other greenhouse gases in the atmosphere. The rapid rate at which climate change is taking place is concerning and increasingly impacting world economies and human health. Within the past 100 years, Earth's average temperature has risen one-degree Fahrenheit and is expected to increase up to 10 degrees over the next 100 years (NASA, 2014). Climate change can increase the frequency and severity of hazardous weather events such as hurricanes, tornadoes, winter storms, droughts, wildfires, and floods. In the Central Shenandoah Valley, climate change will present hazards to the sustainability of the agricultural, commercial, residential, urban, and recreation sectors. It is important for local communities to be aware of these hazards in order to plan for resilience and adaptation.

The effects of climate change on local weather are seen throughout the Central Shenandoah Valley, which displays varied topography and elevation. Data compiled by the National Oceanic and Atmospheric Administration (NOAA) clearly demonstrates that local, regional and national trends in temperature, extreme climate variations, as well as natural disaster frequency have increased over the past century (NOAA, 2019-b; NOAA, 2019-c; NOAA, 2019-e). The southeast region of the United States has been experiencing a recent increase in climate extremes. NOAA (2019-e) quantifies extreme variations of climate cycles

using the Climate Extremes Index (CEI). The regional CEI consists of five indicators compiled to create an annual timeline from 1910 to 2018. The indicators, called steps, include: extremes in maximum temperature, minimum temperature, Palmer Drought Severity Index (PDSI), 1-day precipitation, as well as days with and without precipitation. In the Southeast (Figure 2), there is a sharp increase in the percentage of indicators per year within the past decade (NOAA 2019-e). The green trendline, or 9-point binomial filter, reached past 40% for the first time in 1990, doubling the overall average of 19.7%. This occurs in five other instances within a 20-year span from 1998-2018. Extreme changes have taken place in a short time period, increasing in frequency as the graph approaches present day. It is likely that this trend will continue and the southeast, including Virginia, will experience more drastic weather patterns and potentially more dangerous and destructive hazards as a result (National Climate Assessment, 2014; States at Risk-Virginia, 2019; United States Environmental Protection Agency, 2016).

NOAA's graph (2019-b) of billion-dollar weather climate disasters for Virginia reveals a trend similar to that of seen in the Southeast's extreme climate variations. Within the past 20 years, the number of natural disasters that caused a billion or more dollars in damage has increased drastically within Virginia (Figure 3). The brightly colored trendlines, representing years with the highest costs for disaster events, are all located above the black trendline, representing the average number of events from 1980-2018. The most expensive year for Virginia took place in 2018, where all 12 months exceeded the average, and some months tripled the average cost of disasters per month.

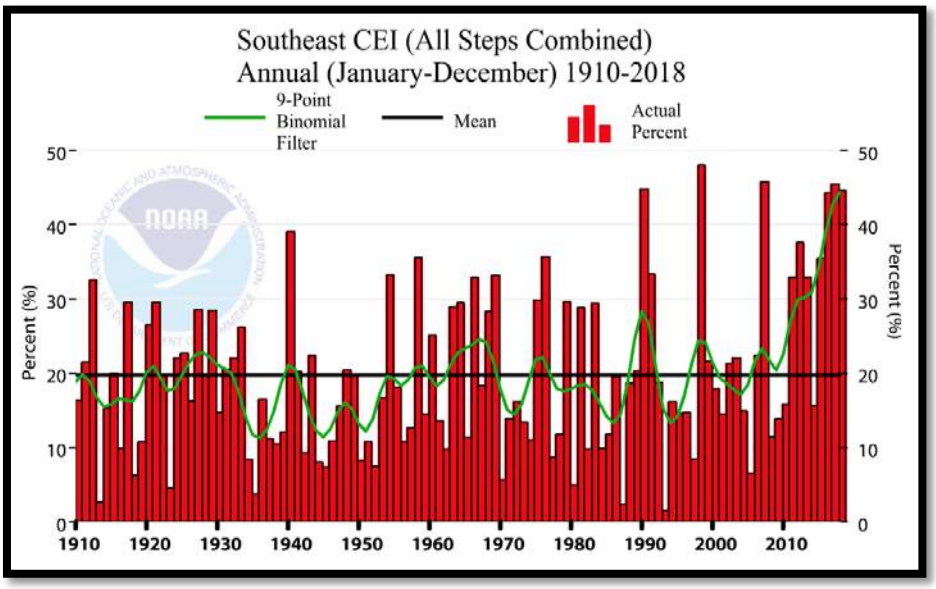

Figure 2. Graph of Climate Extremes Index for southeast (NOAA, 2019-e).

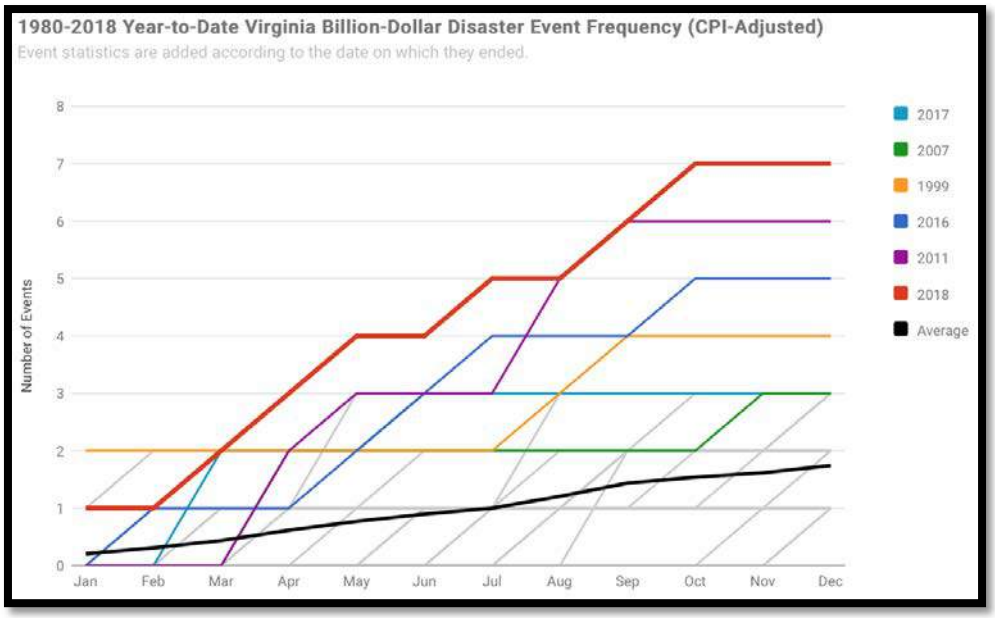

Figure 3. 1980-2018 Year-to-Date Billion-Dollar Disaster Event Frequency (CPI-Adjusted), (NOAA, 2019-b).

The Central Shenandoah Valley has witnessed an increase in precipitation and temperature throughout the last century. According to NASA's (2019) description of the patterns expected as climate change continues, dry areas will become drier, wet areas are expected to face an increase in precipitation brought on by higher average temperatures, and storms are expected to become more intense. Rockingham and Rockbridge counties have experienced an overall increase in the annual average temperature since 1896 (Figures 4, 5) (NOAA, 2019-c; NOAA, 2019-d). This tendency is observed throughout the remaining counties within CSPDC, as well.

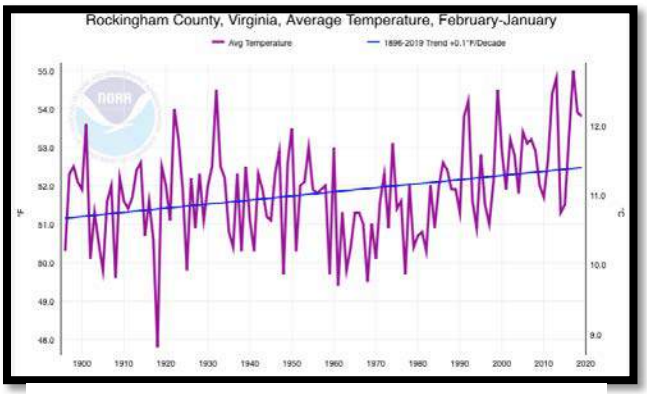

Figure 4. Rockingham County's annual average temperature from 1896-2019 (NOAA, 2019-d).

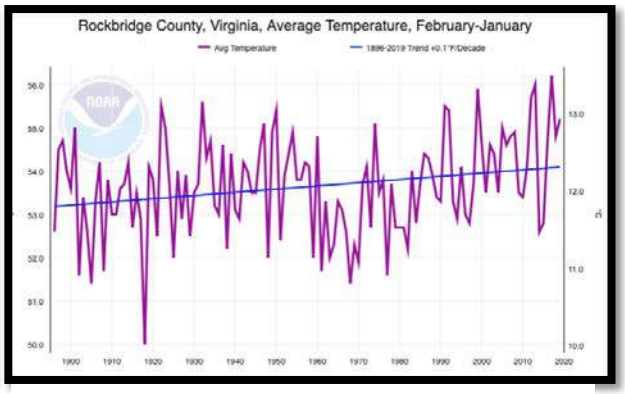

Figure 5. Rockbridge County's annual average temperature from 1896-2019 (NOAA, 2019-c).

As of February 2019, the entirety of Virginia has experienced higher amounts of precipitation than normal (Figure 6). While Rockingham, Highland, and Augusta counties have had above

average precipitation, both Bath and Rockbridge counties have had well above average precipitation, according to NOAA (2019-c; 2019-d).

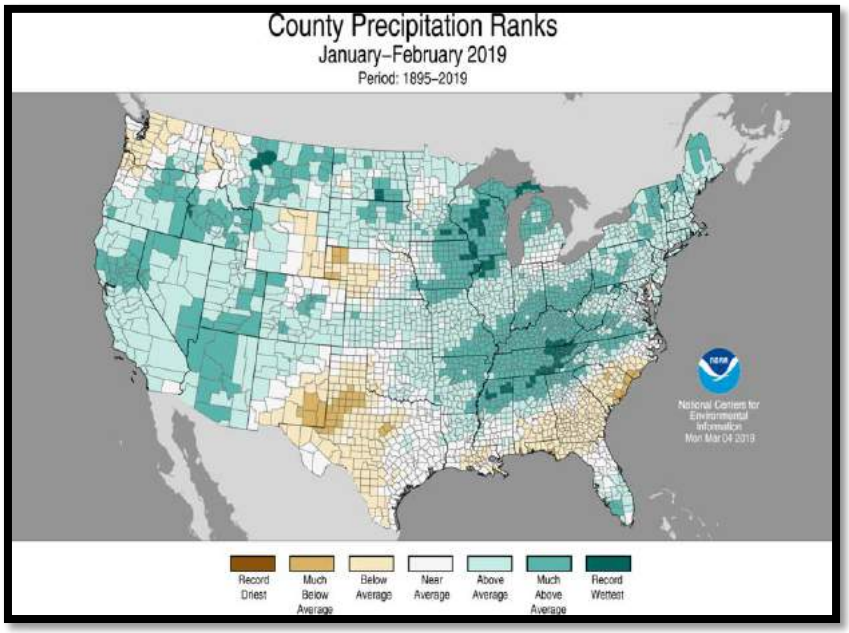

Figure 6. United States County Precipitation Ranks as of January-February 2019 (NOAA, 2019-f)

While the region is experiencing higher amounts of rain than normal and increased probability of flooding, there is still the possibility of severe drought due to the Central Shenandoah's geographic location. Bath and Highland counties sit within the Allegheny Mountains, with Rockingham, Rockbridge, and Augusta counties bordering on the Allegheny Mountains to the west and the Blue Ridge Mountains to the east. (Central Shenandoah Valley Region, 2015). Even with more frequent storms, if the Central Shenandoah Valley becomes drought stricken, rain will not alleviate the symptoms. Once soil moisture evaporates the ground becomes hard and dense, making it difficult for it to absorb any water. When it does rain, the water ends up running off into rivers and streams instead of infiltrating into the soil (Climate Reality Project, 2016).

Hazard Profile

Agriculture: Livestock

The agriculture industry is among the most important sectors of the economies of the five counties (data not available on the cities) within Central Shenandoah. With a large economic output of $959,013,000 collectively amongst the counties, the importance of mitigating the hazards to the industry into the future of climate change is apparent (U.S. Agricultural Census, 2012). In all five counties, livestock production provides far greater economic output than that of crop production. Therefore, livestock production must be a priority in terms of allocating resources to hazard mitigation programs. Data on the agricultural industry within the five counties for analysis of the hazards particular to it is provided in (Table 2).

Table 2. ***Data on the number of farms, their average acreage, economic output for livestock and crop production, the types of livestock with top economic output, and the quantity of the top livestock within the county presented. The data was retrieved from the Virginia Community Profile websites for each of the respective counties within the jurisdiction of the CSPDC. The websites are maintained by the Virginia Employment Commission (Virginia Employment Commission, 2019) (U.S. Agricultural Census, 2012).***

Variable	Rockingham	Rockbridge	Bath	Augusta	Highland	Total
Number of Farms	1902	833	116	1,706	261	4,818
Land in Farms (acres)	222,049	168,376	41,332	360,137	93,080	884,974
Average Size of Farm	117	202	356	152	357	1,184
Crop Sales (dollars)	47,606,000	6,974,000	1,340,000	27,685,000	1,362,000	84,967,000
Livestock Sales (dollars)	611,389,000	24,804,000	4,717,000	204,432,000	28,705,000	874,047,000
Total Value of Agricultural Products Sold	658,995,000	31,778,000	6,057,000	232,117,000	30,067,000	959,014,000
Top Livestock Inventory Item	Broilers/meat-type Chickens	Turkeys	Cattle/calves	Broilers/meat-type Chickens	Turkeys	N/A
Quantity of Top Livestock Item Within County	12,879,488	49,376	5,707	3,496,853	152,165	16,583,589
Ratio of Men to Women within Agricultural Industry	7.05	6.57	7.92	7	7.41	AVG= 7

Temperature increases related to climate change increasingly threaten the livestock sector by decreasing feeding efficiency, water availability, milk production, egg production, and livestock reproduction. It also simultaneously degrades the industry by increasing industry water demands, pest related illnesses, lignin (a complex organic polymer which makes the cell walls of many plants rigid and difficult to digest) in plants, and pathogen

contact (Harrigan, 2017). Every hazard represents threats to the economic viability of the livestock industry within the Central Shenandoah Valley region. Nationwide, heat stress (which is the hazard of most concern to the livestock industry here) is already responsible for annual economic losses between 1.69 and 2.36 billion dollars, of which 50% occurs in the dairy industry supported by livestock (Harrigan, 2017).

Livestock have a "thermal neutral zone," the range of temperatures to which the animals can be subjected before physiologically responding negatively (Harrigan, 2017). Each species of livestock has a different thermal neutral zone; however, lighter fur color and smaller size favor higher temperature thresholds (Renaudeau, 2012). When livestock are subjected to temperatures above this thermal neutral zone, the response to heat stress includes reductions to feed intake, increases to water intake, and changes in respiration rate (Johnson, 2018). The reduced feed intake means a reduction in weight, making livestock less valuable. Additionally, heat stresses also cause a reduction in milk production, egg production, and the efficiency of feed conversion, all of which reduce the economic output of the livestock (Harrigan, 2017). Heat stress can also reduce reproductive rates in livestock (Johnson, 2018). With the general increases in temperatures (Figures 4, 5), it is projected that heat stress will increasingly threaten the economy of the Central Shenandoah and its agricultural industries.

A reduction in nutrient intake rate (the amount of nutrients livestock intake from eating in a given time) will be a critical climate change hazard to the livestock industry. The relationship between increased temperatures and average nutrient intake for growing pigs along with daily bodyweight gain (Figure 7) reveals a steep drop off in energy intake and body weight gain as temperatures exceeded 22 degrees Celsius.

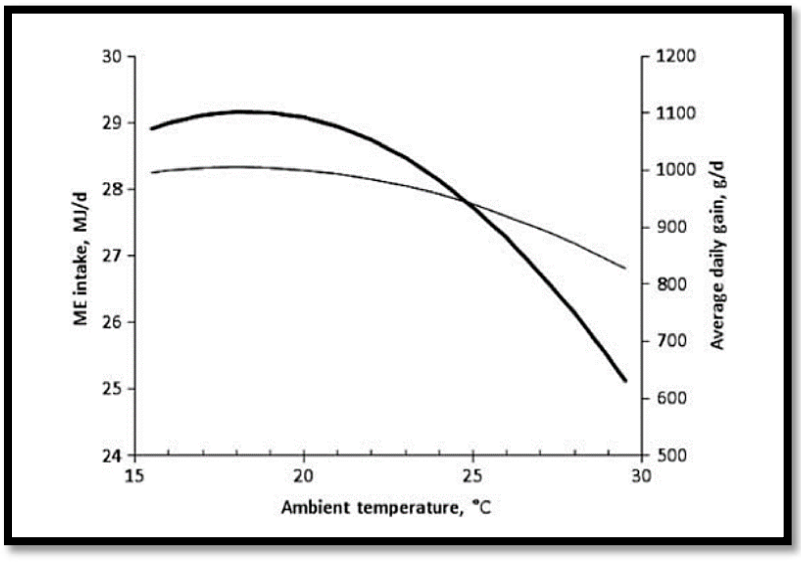

Figure 7: The increasing effect of ambient temperatures between 15-30 degrees Celsius on growing pigs and their daily nutrient intake (Renaudeau, 2012).

The poultry industry in Rockingham County, which includes almost thirteen million broilers, will be more vulnerable to the hazards associated with climate change (U.S. Agricultural Census, 2012). In Rockingham County alone (where agricultural economic output is greatest), $611,389,000 of the $658,995,000 total agricultural economic output comes from livestock production, and most of that from broilers/meat-type chickens. Temperatures higher than 30 degrees Celsius (86ºF) can subject the poultry to heat stress (Harrigan, 2017), which means reduced weight gain, feed intake, carcass weight, and protein/muscle calorie content. Egg production from poultry can also be compromised with increased temperatures, as ovulation can be interrupted. Heat stress can reduce egg numbers, total weight, shell weight, and shell thickness (Harrigan, 2017). Feed intake has been shown to be reduced in chickens by 1-1.5% per degree of ambient temperature rise from 20-30 degrees Celsius (68 ºF-86ºF) and by 5% per degree from 32-38 degrees Celsius (89.6 ºF-100.4ºF) (Renaudeau, 2012). Egg production is decreased heavily at temperatures higher than 30 degrees Celsius. From 15-30 degrees Celsius, there are steep reductions in egg laying rate and egg weight (Figure 8).

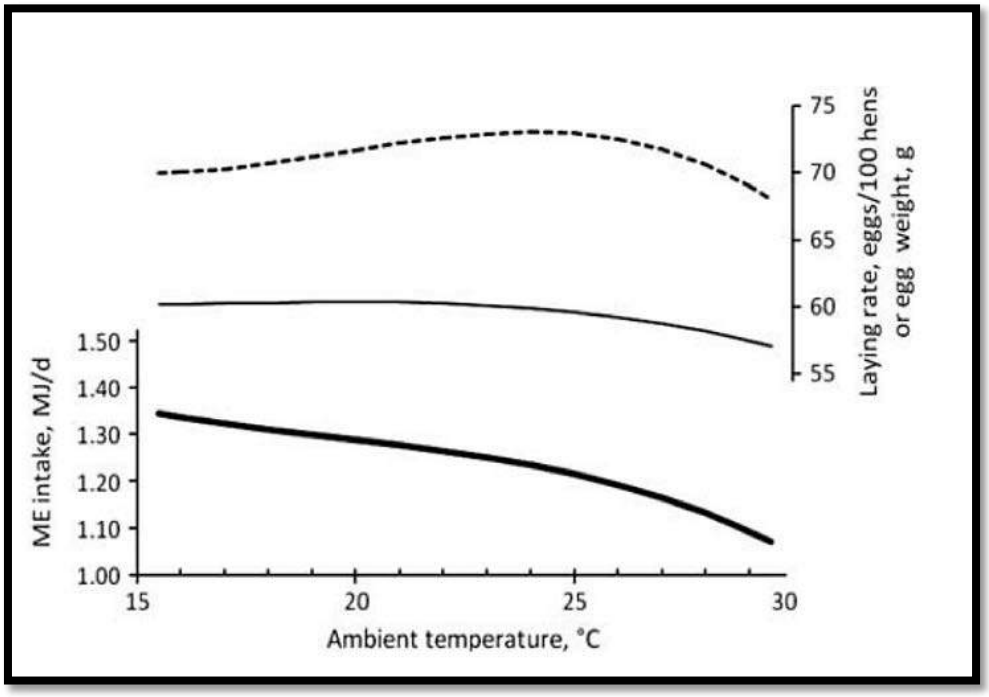

Figure 8: The effect of increasing temperature on hen egg laying rate and average egg weight (Renaudeau, 2012).

The dairy industry will also be threatened by climate change. Rockingham County is the largest milk producing county in the Central Shenandoah, with an annual economic

output of more than $53 million (U.S. Agricultural Census, 2012). The economic output of milk production within the five counties in the Central Shenandoah is quantified in Table 3.

Table 3. Provides data on the economic output from milk production in each county (U.S. Agricultural Census, 2012). Bath county data on countywide milk production not available.

County	Rockingham	Rockbridge	Bath	Augusta	Highland	Total
Annual (Dollars)	53,563,000	6,792,000	N/A	27,640,000	12,518,000	100,513,000

The reduction in nutrient intake caused by heat stress has been linked in cattle to reduced milk production (Renaudeau, 2012). For every one-degree Celsius increase past the thermal neutral zone, an 0.85 kg reduction in cattle feed intake occurs, resulting in a ~36% reduction in milk production (Pragna, 2017).

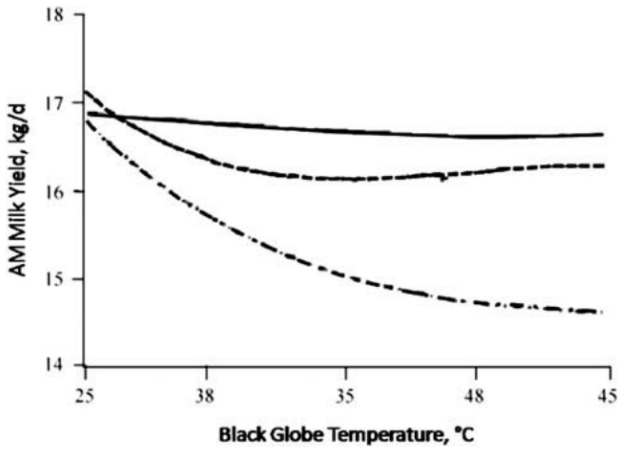

Figure 9. The effect of ambient temperature on dairy cow performance during lactation. Milk yield in units of kg/d was plotted against increasing temperatures from 25-45 degrees Celsius. The effect of cows subjected to heat stress, both two days prior (—**—), and 1 day prior to (— —), and the day of (—) is shown for milk production. (Renaudeau, 2012).

Reproductive rates of livestock are known to be reduced when temperatures exceed the thermal neutral zone. When the temperature humidity index exceeds 72.9 for beef cows in pasture, a reduction in pregnancy rates can be witnessed (Bernabucci, 2010). In summertime, conception rate already drops by 24% due to the higher temperatures (Renaudeau, 2012). As climate change and global temperatures increase, breeders of cattle in the Central Shenandoah must be aware of these threats to their reproducing livestock.

In the last few decades as the global climate has changed, rates of pest related diseases have increased greatly in the US (CDC, 2019). Nine new germs spread by mosquitoes were discovered during the last 13 years. In addition to these, Zika, West Nile, Lyme, and chikungunya are among the diseases increasingly being spread by pests (CDC, 2019). These diseases pose hazards to both humans and livestock alike. The US as a whole is witnessing a large increase in pest populations and related illnesses, and Virginia happens to be in among the states most heavily impacted. The nationwide increase in pest related illnesses is described (Figure 10). These nationwide phenomena are of special concern to Virginia as the state ranks in the top 20% in the US for the sheer number of reported disease cases from ticks and other pests at 16,454 between 2004-2016 (CDC, 2019).

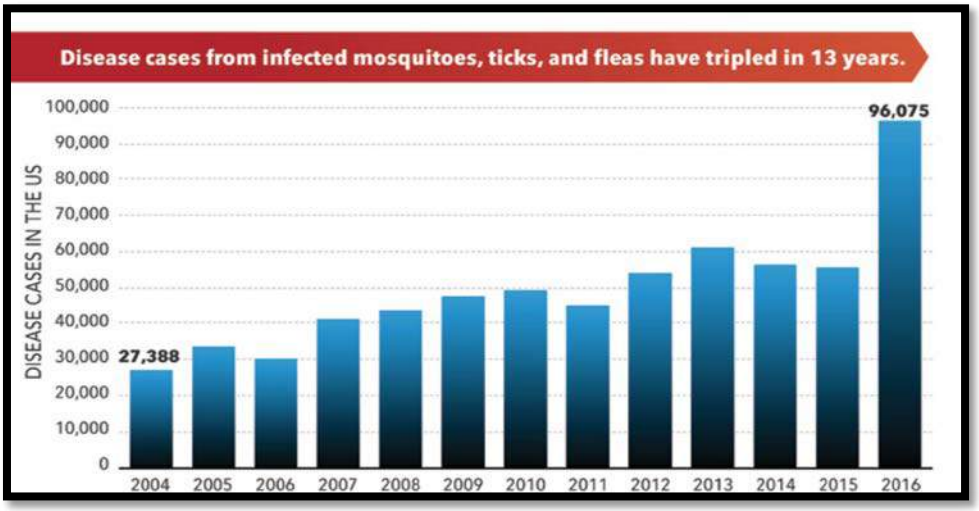

Figure 10: The number of reported mosquito, tick, and flea bite related illnesses (CDC, 2019).

Livestock Recommendations

Farmers should be familiar with the thermal neutral zones for all their livestock breeds. When temperatures exceed those thermal neutral zones, farmers should take measures to cool livestock. Creating a dependable water infrastructure for livestock to utilize as they acclimate to warmer temperatures is perhaps one of the most obvious and important adaptations for the industry into the future of climate change (Korthaus, 2015). Providing shade for livestock is also critically important, as it keeps them out of the sun's hottest rays. Planting trees is a cost-effective method for providing such shade and also serves to help with flooding and water infrastructure (Korthaus, 2015).

On hot days, working cattle should only be working in the early morning or later in the day in order to mitigate the chances of subjecting the cattle to heat stress. Other methods

include selecting livestock for purchase that are adapted to warmer climates. Having a lighter hide color and thickness are advantageous traits in warmer conditions. As calves are the most susceptible to heat stress, it is recommended that calving be started around May as to not have them born in the hottest part of the year (Korthaus, 2015).

Feeding livestock and specifically broiler high fat diets can help to reduce the hazard of heat stress (Renaudeau, 2012). Under heat-stress conditions of 35-36 degrees Celsius, broilers that receive a high-fat diet of 5 to 10 percent fat were able to gain more body weight than those with low fat diets. Such a switch can, in hens, increase the thermal neutral zone upper range from 22-24 degrees Celsius to 25-29 degrees Celsius (Renaudeau, 2012). Additionally, reducing the stocking density of hens can help to reduce the temperature in their facilities as radiant from the animals would be reduced. Increasing ventilation within the facilities can also help to reduce temperature (Renaudeau, 2012).

The typical systematic approach to pest control must also be revolutionized, as increased temperatures are likely to increase pest abundance (EPA, 2016). Increasing the amount of pesticides used to deal with the increased pests will result in increased bio-magnification (the increasing concentration of a substance within higher levels of the food chain) and our food will become more toxic (EPA, 2016). The CDC advises that adapting to the increased hazards of pest diseases involves “Reducing the spread of these diseases and responding to outbreaks effectively will require additional capacity at the state and local level for tracking, diagnosing, and reporting cases; controlling mosquitoes and ticks; and preventing new infections; and for the public and private sector to develop new diagnostic and vector control tools” (CDC, 2019). Additional recommendations for mitigating pest related hazards include improving coordination between federal, state, and local officials for pest control programs and to use modeling to predict and pinpoint the likelihoods of pest-related disease outbreaks. (Renaudeau, 2012). Managers of livestock can also find and remove ticks from their livestock daily to further reduce pest-related hazards.

Agriculture: Crops

Climate change has the potential to impact the economy and the health of the people in the Central Shenandoah Valley by affecting crop agriculture through plant dehydration from longer and more severe droughts, physical damage from extreme storms, damage to soil health from increased carbon dioxide and temperatures, and increased insecticide use on crops (U.S. EPA, 2019).

A major concern of the impact of climate change on crop production is the degradation of cropland soil (Islam, 2017). Elevated levels of carbon dioxide cause an increase in the weathering of rocks and minerals, which disrupts carbon biotic cycles in the soil and reduces the productivity of plants (Islam, 2017). Increased frequencies of extreme weather patterns such as droughts, floods, and heat waves can also have negative effects on agricultural soils by changing the drying and rewetting cycles of the soil (Islam, 2017). This disturbance of the drying and rewetting cycles reduces nutrient uptake by plants and increases nutrient competition, resulting in a decline in productivity and yield (Islam, 2017).

Droughts will be an increasing threat to crop production in the Central Shenandoah Valley. It is predicted that drought frequency will increase by 100% by the mid-21st century and by 200% at the end of the 21st century for most regions (Sheffield, 2008). Agriculture accounts for 80% of the total water use in the United States; therefore, the agricultural industry is most affected by drought (Chou, 2016). Droughts cause significant yield reductions for rain-fed and irrigated crops and can cause complete loss of crops (Ray, 2018). Water helps move nutrients from the soil throughout the plant and is critical to the production of plant food through photosynthesis (UCSB, 2012).

Central Shenandoah Valley farmers will increasingly encounter extreme storms and flooding. Heavy downpours from storms are increasing in the amount of precipitation and frequency by more than 30% of the average from 1901-1960 (Figure 11). This correlates to an increase in floods because these areas are getting a large amount of water in a short amount of time (National Climate Assessment, 2014). The greatest danger to crops from flooding is oxygen deprivation. Roots in plants do not photosynthesize, unlike the rest of the plant, requiring the roots to consume oxygen and respire (UCSB, 2004). Water contains less oxygen than the air pockets in the soil, so when flooded, the crops do not receive enough oxygen. This reduces yield production and can cause plant death through deprivation of oxygen (U. Missouri, 2015). Another consequence of a low-oxygen environment is the performance of anaerobic respiration (similar to fermentation) by crops. Anaerobic respiration has a byproduct of lactic acid, which can be harmful to plants as it changes the pH of the cells, resulting in tissue damage and reduced productivity (U. Missouri, 2015).

An increasing impact of climate change on agricultural crops is an increase in pests such as harmful insects and funguses, all associated with longer growing seasons from increased temperatures and a warmer climate (Conrow, 2018). To combat this issue, farmers are likely to use more pesticides, which will not only add to the costs of farming but may

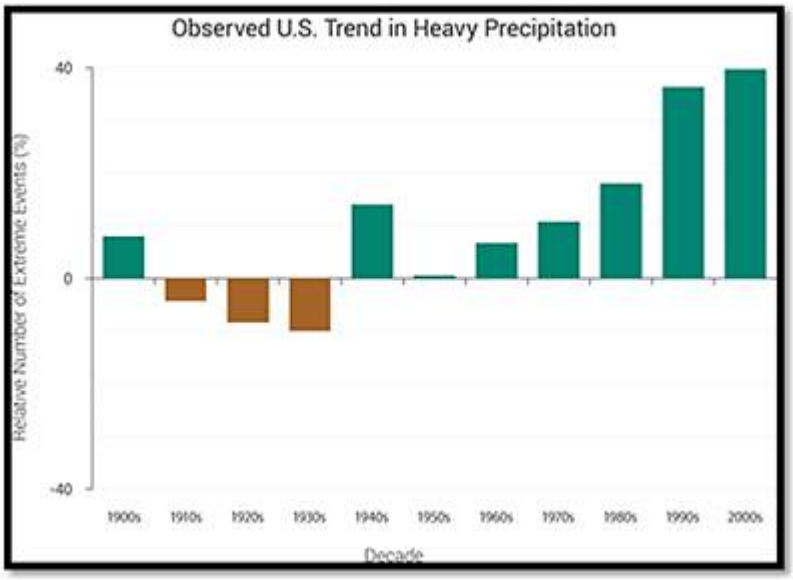

Figure 11. Heavy precipitation trends in the U.S. (National Climate Assessment, 2014).

also pose a danger to the farmers and consumers. Negative effects generally present themselves over a long period of exposure from the bioaccumulation of these chemicals (Miller, 2005).

The total net income of all the farms in the CSPDC was $959 million in 2012. (U.S. Census of Agriculture, 2012) (Table 2). Approximately $85 million of this was associated with crop production, and this is a significant amount of income that has the potential to negatively affect the economy if profits drop (U.S. Census of Agriculture, 2012). Even though the number of farms in the CSPDC region remained relatively stable from 2007 to 2012, the income from farms is still increasing (Table 2), underscoring the potential for loss.

Despite the potential for climate change to reduce yields due to extreme weather events, overall yields are still increasing as a result of new technologies and better farming techniques that raise the production of farms (EPA, 2016). Even with the increased yield trend, though, climate change has already set production back by almost 30% in some years due to droughts and extreme weather events (EPA, 2016; Figure 12).

The most common crops in the CSPD are corn, soybeans, and barley (U.S. Census of Agriculture, 2012). All of these crops are sensitive to environmental stresses such as droughts and floods because they were chosen for high yield capacity, not resiliency (Mustroph, 2018). In a Stanford study (Lobell 2016), it was determined that corn and soybean crops are especially sensitive to drought. At the current rate of sensitivity increase, it is predicted that crop yields could decline by 15% over the next 50 years, even though yields are increasing because of better farm practices (Lobell, 2016).

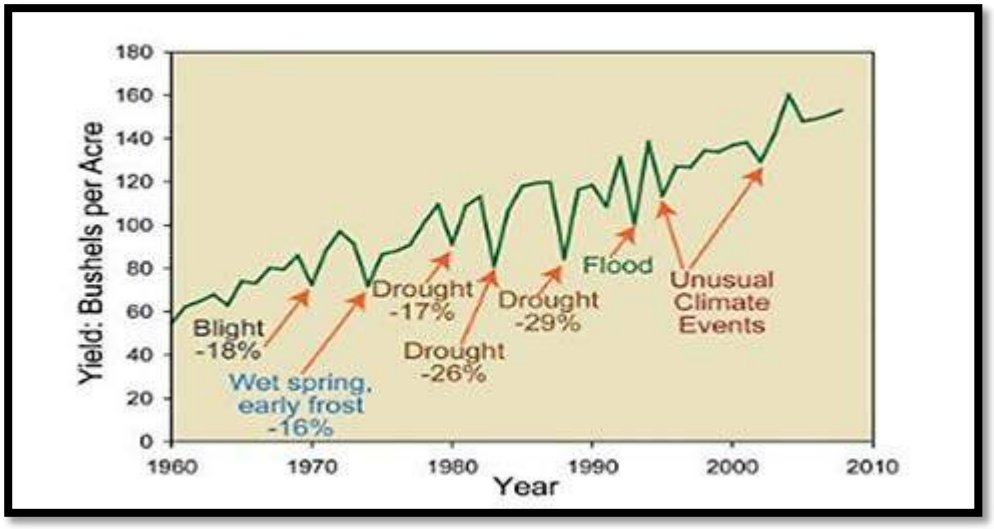

Figure 12. Crop yield fluctuations from extreme weather events 1960-2009 (EPA, 2016).

Yield reduction of crops has economic impacts on farmers and the people who buy crops from them, as food prices will increase if the farmers experience a decline in yield (Sherony et al, 1991).

The CSPDC region has already seen effects of crop loss in recent years. In 2017, the USDA's Farm Service Agency (FSA) had corn indemnity payment rates of $45.83 to $63.60 per acre in Rockingham, Augusta, and Rockbridge counties. These payments were distributed to farmers as compensation for corn losses that reduced their revenue below the guaranteed crop revenue set by the FSA (USDA, 2019). In the same year, the FSA distributed even more indemnity payments in the range of $23.71 to $33.85 per acre for wheat losses in the same counties and including Highland County (USDA, 2019). In 2015, the FSA's soybean indemnity payment rates to Augusta County reached the maximum range of $51.71 to $76.10 per acre (USDA, 2019). Indemnity payments to farmers have been increasing over the past decade and are expected to further increase into the future (USDA, 2018). As a result, farm insurance payments are likely to rise, which can negatively affect the economic status of farmers in the Central Shenandoah Valley (USDA, 2018).

Crops Recommendations

There are many strategies for adaptation to climate-related impacts on the Central Shenandoah Valley, including regulation, planning, information/education, tax incentives, ecosystem management, and community engagement tools (City of Lewes, 2011). The main strategies for the adaptation to agricultural crop impacts revolve around the events that influence production the most, such as droughts, floods, and increased pests from higher temperatures. Although droughts cannot be prevented, local governments can regulate the

water consumption during periods of drought to reduce the impacts on farmers. To discourage large quantities of water usage during droughts the government can also tax excess water use heavily, which will make more water available to farmers (City of Lewes, 2011). To adapt for more frequent flooding, farmers should consider identifying areas on the farm that are prone to flooding and possibly create runoff ponds on their farm to limit the damage. This strategy can also be used along with rain gardens on areas near impervious surfaces that could potentially be adding more runoff to farms. Farmers might also consider loosening soil to allow more water to seep through the ground to prevent high levels of flooding. To manage increased pests on the farm, investment by farmers and local governments into genetically modified crops that are resistant to damages from pests are a promising way to reduce health effects from pesticides. They can also invest in safer and cheaper pesticides to decrease the effect of pests on crop production and human health.

Built Environment: Commercial Areas

The commercial sector of the Central Shenandoah Valley will be affected by climate change. The history of flooding in the region is well-documented (CSPDC 2013), but with the predicted increase in precipitation and severe weather, property damage will increase. Many of the region's commercial districts, downtowns, and factories can be found near water in vulnerable flooding areas. The cities of Waynesboro and Buena Vista have already experienced millions of dollars in flood losses by property damage, lost revenue and jobs (Figure 13; FEMA, 2017). These losses are due to combination of vulnerabilities found in building structures, in addition to their proximity to a hazard prone area. The monetary value of the built environment exposure throughout the CSPDC (Table 4) is an indication of potential losses.

If a business or residence is in a FEMA-designated flood area, it is important to take precautions to avoid unnecessary additional damages. For example, without flood insurance, any flood damage costs will likely come out of pocket and be catastrophic to local businesses and their employees. Insurance can be expected to cost more in areas that are vulnerable to flooding. In many cases, relocation out of a flood zone is the most fiscally responsible long-term option. Another line of defense is retrofitting and flood-proofing existing buildings to be more flood resistant (FEMA, 2017). In the coming years, businesses and residences not previously located in an established flood zone must take precautions. Even structures located in a low or moderate flood risk area, are five times more likely to experience a

.

Table 4. Monetary vulnerability of structures within the CSPDC, organized by building occupancy (CSPDC, 2013)

Community	Residential	Commercial	Industrial	Agri.	Religion	Gov't	Ed.	Total
Augusta County	$3,217,697	$326,175	$194,572	$20,448	$35,973	$3,908	$8,845	$3,807,618
* Craigsville, Town of	$48,009	$4,867	$2,903	$305	$537	$58	$132	$56,811
Bath County	$452,878	$21,892	$7,852	$907	$4,392	$2,607	$3,971	$494,499
Buena Vista City	$332,182	$25,453	$9,893	$0	$5,015	$1,265	$724	$374,532
Harrisonburg City	$1,820,119	$527,791	$135,296	$14,926	$39,652	$3,703	$116,243	$2,657,730
Highland County	$206,296	$12,188	$2,437	$1,790	$1,335	$1,099	$213	$225,358
* Monterey, Town of	$12,853	$759	$152	$112	$83	$68	$13	$14,040
Lexington City	$384,287	$88,390	$1,165	$259	$8,293	$3,875	$25,032	$511,301
Rockbridge County	$1,098,775	$76,022	$54,564	$7,212	$15,469	$4,433	$3,267	$1,259,742
* Glasgow, Town of	$55,234	$3,822	$2,743	$363	$778	$223	$164	$63,326
* Goshen, Town of	$21,439	$1,483	$1,065	$141	$302	$86	$64	$24,580
Rockingham County	$3,308,546	$242,667	$106,619	$52,367	$47,450	$5,857	$9,211	$3,772,717
* Bridgewater, Town of	$254,180	$18,643	$8,191	$4,023	$3,645	$450	$708	$289,840
* Broadway, Town of	$107,085	$7,854	$3,451	$1,695	$1,536	$190	$298	$122,108
* Dayton, Town of	$65,658	$4,816	$2,116	$1,039	$942	$116	$183	$74,869
* Elkton, Town of	$99,757	$7,317	$3,215	$1,579	$1,431	$177	$278	$113,753
* Grottoes, Town of	$103,275	$7,575	$3,328	$1,635	$1,481	$183	$288	$117,763
* Mt. Crawford, Town of	$12,409	$910	$400	$196	$178	$22	$35	$14,149
* Timberville, Town of	$84,955	$6,231	$2,738	$1,345	$1,218	$150	$237	$96,873
Staunton City	$1,348,576	$213,605	$16,783	$1,884	$22,150	$8,174	$15,886	$1,627,058
Waynesboro City	$1,039,554	$153,293	$23,731	$5,156	$13,249	$57	$1,198	$1,236,238
TOTAL	$14,073,764	$1,751,752	$583,213	$117,381	$205,108	$36,702	$186,988	$16,954,907
								All values are in thousands of dollars

*Denotes town values that are also included in totals for the perspective County.

flood than a fire over the next 30 years (FEMA, 2017). It is also important to note that properties not in a designated flood zone may also purchase flood insurance for their protection and often at a much lower rate. As the severity and frequency of storms increase, flooding is possible outside of designated flood zones as well.

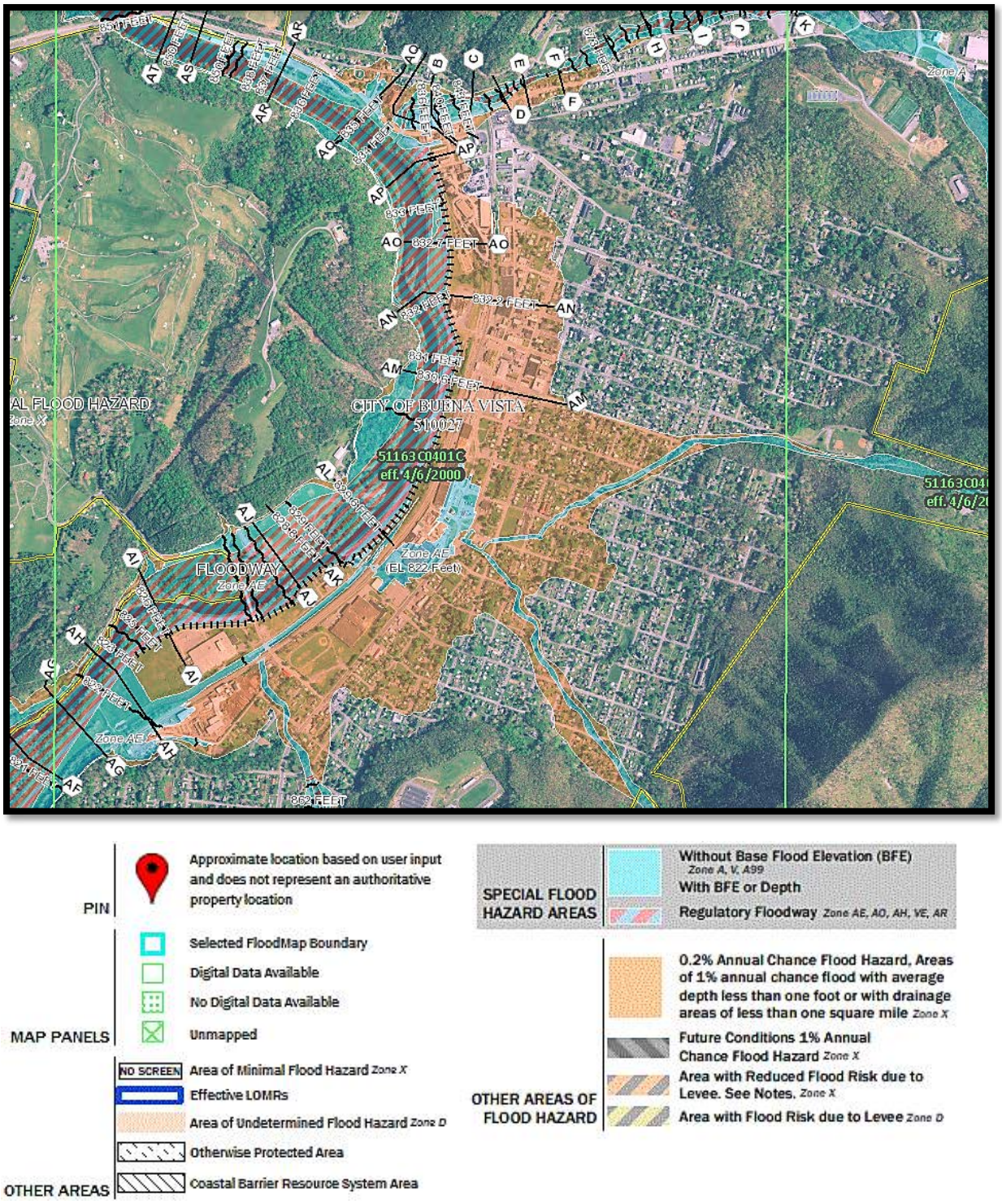

Figure 13. Flood prone areas in the City of Buena Vista. (FEMA, 2017).

Commercial Areas Recommendations

Strategies for the commercial sector adaptations to climate change-related events include discouraging new construction in flood-prone areas; as flooding worsens, damage and higher insurance rates will follow. An effort should be made to inform businesses about

FEMA's flood map tool, as flood zones will continue to increase. Businesses should be encouraged to invest in flood insurance to protect assets, and to avoid paying for damages out of pocket. The National Flood Insurance Program can cost less than $400 a year (FEMA, 2017). Businesses in flood-prone areas should be encouraged to invest in retrofitting and flood proofing buildings to limit damages. Businesses in areas that are shown to be extremely vulnerable by FEMA's flood map tool should consider moving to an area less prone to flooding. New buildings being constructed should be built to be both wind and flood resistant, as the frequency of hurricanes and high wind storms in the area is expected to increase.

Built Environment: Residential Areas

The most likely climate change impacts to residential areas in the Central Shenandoah Valley are the increased frequencies of natural hazards such as flooding, hurricanes, and wildfires (CSPDC, 2013). Homeowners whose properties that have been damaged in a severe weather event have the option to claim recovery compensation. As outlined the 2005 CSPDC Hazard Mitigation plan, "recovery activities include rebuilding homes, businesses and public facilitates; clearing debris; repairing roads and bridges; and restoring water, sewer and other essential services" (Central Shenandoah Valley All Hazards Mitigation Plan, 2005). In 2003, when the Hurricane Isabel recovery option was widely used, homeowners in the Central Shenandoah Valley had $12,114,793 worth of repair/building claims compared to $36,434,940 worth of total building value. $7,600,258 of those fees were devoted to building repair payments, while $4,514,535 were devoted to contents compensation payments (Central Shenandoah Valley All Hazards Mitigation Plan, 2005). A strong mitigation plan for dealing with natural hazards can help to reduce the need of such recovery plans. At least 10% of the housing units in the CSPDC's member counties are at risk from flooding (CSPDC, 2013). Increased precipitation that comes with climate change will most likely increase that number. The structural vulnerability value estimates and total loss estimates per the localities within the Central Shenandoah (Table 5, 6) are indicators of these impacts.

Augusta and Rockingham counties could see $2.5 million in structural losses to flooding (CSPDC, 2013), while Bath, Highland, and Rockbridge counties combined could see less than 300 thousand. These numbers have the possibility to increase or decrease depending on both the variability in weather conditions and the manner in which the counties address flooding problems. Even though there is some investment in flood insurance,

Table 5. Structures at Risk due to Flooding 2013 (CSPDC, 2013).

Community	Houses at Risk	Housing Units	% of Housing Units
Augusta County	2,608	24,818	10.51%
Bath County	250	2,053	12.18%
*Bridgewater, Town of	*70*	*1,850*	*3.78%*
*Broadway, Town of	*100*	*976*	*10.25%*
*Glasgow, Town of	*138*	*494*	*28%*
*Goshen, Town of	*64*	*214*	*30%*
*Grottoes, Town of	*40*	*894*	*4.47%*
Rockbridge County	703	8,486	8.28%
Rockingham County	5,017	25,355	19.79%
Staunton City	200	9,676	2.07%
Waynesboro City	958	8,332	11.50%
Total	**9,736**	**78,720**	**12.37%**

Table 6. Structure vulnerability and losses due to flooding (CSPDC, 2013).

Community	Flood Policies	Total Housing Units	Medium Home Value	Total Structure Value Vulnerability	Total Loss Estimate
Augusta County	261	24,818	$110,900	$289,227,200	$926,612
*Craigsville, Town of	*28*	*474*	*$64,800*	*$2,495,117*	*$7,994*
Bath County	32	2,053	$79,700	$19,925,000	$63,835
Buena Vista City	91	2,547	$72,900	$22,817,700	$73,159
Harrisonburg City	88	13,133	$122,700	$87,239,700	$279,525
Highland County	12	1,131	$83,700	$1,841,400	$5,899
*Monterey, Town of	*5*	*141*	*$84,200*	*$2,105,000*	*$6,744*
Lexington City	8	2,232	$131,900	$19,785,000	$63,571
Rockbridge County	273	8,486	$92,400	$64,957,200	$208,107
*Glasgow, Town of	*40*	*494*	*$66,400*	*$9,163,200*	*$29,357*
*Goshen, Town of	*13*	*214*	*$59,100*	*$3,782,400*	*$12,118*
Rockingham County	489	25,355	$107,700	$540,330,900	$1,731,085
*Bridgewater, Town of	*57*	*1,850*	*$126,300*	*$8,841,000*	*$28,324*
*Broadway, Town of	*19*	*976*	*$101,100*	*$10,110,000*	*$32,390*
*Dayton, Town of	*10*	*565*	*$120,600*	*$10,502,628*	*$33,648*
*Elkton, Town of	*25*	*919*	*$94,800*	*$14,362,028*	*$46,012*
*Grottoes, Town of	*29*	*894*	*$90,500*	*$3,620,000*	*$11,598*
*Mt. Crawford, Town of	*2*	*109*	*$96,700*	*$1,741,441*	*$5,579*
*Timberville, Town of	*8*	*770*	*$82,300*	*$7,966,640*	*$25,523*
Staunton City	114	9,676	$87,500	$17,500,000	$56,066
Waynesboro City	185	8,332	$89,300	$85,549,400	$274,079
Total	**1,789**	**97,763**		**$1,149,173,500**	**$3,681,938**

*Denotes town values that are also included in totals for the perspective County.

vulnerable areas can still suffer great losses in the case of a severe storm. Residential areas impacted by climate hazards are in need of adaptation programs. The CSPDC hosted a Floodplain Management Workshop to provide updated training on floodplain management requirements for localities (CSPDC, 2018). As identified in the workshop, the main issue in residential areas is flood risk.

Table 7. Building Stock Loss by General Occupancy (From HAZUS-MH) Hurricane Model (CSPDC, 2013).

Community	Residential	Commercial	Industrial	Agriculture	Religion	Government	Education	Total
Augusta County	$219.57	$11.76	$9.75	$0.89	$0.99	$0.16	$0.27	$243.39
*Craigsville, Town of	$3.28	$0.18	$0.15	$0.01	$0.01	$0.00	$0.00	$3.63
Bath County	$18.66	$0.39	$0.14	$0.03	$0.07	$0.05	$0.06	$19.41
Buena Vista City	$28.27	$1.22	$0.84	$0.00	$0.20	$0.06	$0.03	$30.62
Harrisonburg City	$121.09	$20.34	$8.56	$0.81	$1.26	$0.19	$4.66	$156.91
Highland County	$10.19	$0.25	$0.05	$0.05	$0.02	$0.03	$0.00	$10.60
*Monterey, Town of	$0.63	$0.02	$0.00	$0.00	$0.00	$0.00	$0.00	$0.66
Lexington City	$34.69	$5.31	$0.06	$0.02	$0.39	$0.24	$1.47	$42.17
Rockbridge County	$76.78	$2.79	$3.00	$0.34	$0.47	$0.24	$0.11	$83.73
* Glasgow, Town of	$3.86	$0.14	$0.15	$0.02	$0.02	$0.01	$0.01	$4.21
* Goshen, Town of	$1.50	$0.05	$0.06	$0.01	$0.01	$0.00	$0.00	$1.63
Rockingham County	$210.67	$7.35	$3.57	$2.31	$1.27	$0.25	$0.31	$225.72
* Bridgewater, Town of	$16.18	$0.56	$0.27	$0.18	$0.10	$0.02	$0.02	$17.34
* Broadway, Town of	$6.82	$0.24	$0.12	$0.07	$0.04	$0.01	$0.01	$7.31
* Dayton, Town of	$4.18	$0.15	$0.07	$0.05	$0.03	$0.00	$0.01	$4.48
* Elkton, Town of	$6.35	$0.22	$0.11	$0.07	$0.04	$0.01	$0.01	$6.81
* Grottoes, Town of	$6.58	$0.23	$0.11	$0.07	$0.04	$0.01	$0.01	$7.05
* Mt. Crawford, Town of	$0.79	$0.03	$0.01	$0.01	$0.00	$0.00	$0.00	$0.85
* Timberville, Town of	$5.41	$0.19	$0.09	$0.06	$0.03	$0.01	$0.01	$5.80
Staunton City	$105.78	$8.84	$0.82	$0.10	$0.80	$0.46	$0.67	$117.48
Waynesboro City	$95.88	$7.95	$1.45	$0.29	$0.56	$0.00	$0.07	$106.21
Total	$977.16	$68.20	$29.38	$5.39	$6.36	$1.76	$7.73	$1,095.99
All values are in thousands of dollars								

The metric of stock loss (how much value each area's buildings have declined since bought value) is an indication of the impacts of severe weather on valuation. Predicted stock loss (per $1000) associated with hurricanes (Table 7) is significant for the Central Shenandoah Valley.

Wildfire is also a concern for the region. Most of the high potential wildfire risk to communities and homes are in Rockbridge, Augusta and Rockingham counties because they

have higher populations and have more communities closer to forested lands. 71% of woodland homes are considered to have high potential for a wildfire, while 63% of woodland communities in the Central Shenandoah Valley are considered at high risk for wildfire (Tables 8, 9; CSPDC, 2013). This could increase as cycles of prolonged drought become common in this region.

Table 8. Woodland Communities Wildfire Risk (CSPDC, 2013).

County	Low Potential	Medium Potential	High Potential	Total	% High Risk
Augusta	0	21	19	**40**	**48%**
Bath	0	4	4	**8**	**50%**
Highland	N/A	N/A	N/A	**N/A**	**N/A**
Rockbridge	1	6	9	**16**	**56%**
Rockingham		1	25	**26**	**96%**
Total	**1**	**32**	**57**	**90**	**63%**

Table 9. Woodland Homes Wildfire Risk (CSPDC, 2013)

County	Low Potential	Medium Potential	High Potential	Total	% High Risk
Augusta	0	493	580	**1,073**	**54%**
Bath	0	120	65	**185**	**35%**
Highland	0	20	10	**30**	**33%**
Rockbridge	300	82	458	**840**	**55%**
Rockingham	0	25	1,523	**1,548**	**98%**
Total	**300**	**761**	**2,636**	**3,697**	**71%**

Residential Recommendations

The well-being of communities should be a major priority in catastrophic situations. At issue is the lack of knowledge pertaining to important response procedures for each hazard. To address this, residential areas within each locality should have meetings that address past impacts and plan for hazards. The hazard most impactful to residential areas within all localities within the CSPDC region is flooding. What is needed is an up-to-date

response unit in case of floods and other hazards. An example is the Community Emergency Response Team (CERT), a national program offered through FEMA. "The goal of CERT is for emergency personnel to train members of neighborhoods, community organizations or workplaces in basic response skills like disaster preparedness, fire safety, emergency first aid and crime prevention" (CSPDC, 2013). CSPDC began offering CERT classes to the Staunton, Augusta and Waynesboro communities in September 2003. Since then, there have been 25 courses held resulting in a total of 423 trained volunteers (CSPDC, 2013). This program should be encouraged in all localities within the Central Shenandoah Valley with the goal of training as many people as possible

Built Environment: Urban Areas

The CSPDC works with the cities of Buena Vista, Harrisonburg, Lexington, Staunton, and Waynesboro. Urban areas are at high risk for climate-induced hazards because of their dense populations and high levels of activity. There is a parallel between high populations with high levels of energy usage and climate hazard potential (U.S. EPA, 2014). Cities experience increased temperatures due to the amount of heat and emissions produced in a given day, creating urban heat islands. Energy is needed for heating/cooling buildings, electricity, and transportation. Along with the high levels of energy use comes a high level of waste heat which is released from sources such as buildings and cars. It is important for cities to monitor their energy usage and make economically and environmentally suitable decisions.

Table 10. **Expected Increase in Population (Virginia Population Projections, 2019)**

Geography Name	2010 Census	Projected Population		
		2025	2035	2045
Buena Vista	6,650	7,089	7,298	7,455
Harrisonburg	48,914	62,920	70,837	78,204
Lexington	7,042	7,898	8,145	8,333
Staunton	23,746	25,378	25,480	25,403
Waynesboro	21,006	23,167	24,339	25,332

According to the U.S. Census Bureau (2017), all the urban areas in the CSPDC's jurisdiction except Buena Vista are expected to continue increasing in population (Table 10). As population increases, more heat will be produced through the movement of people and goods. And, as the temperatures outside rise, so does the need for cooler temperatures inside.

This means the energy to heat buildings is in high demand: about 1.5-2% more for every 1°F increase in air temperatures (U.S. EPA, 2014). This not only leads to high energy bills but can also bring with it climate hazards that can have impacts on the community. Extreme heat can cause health related illnesses in the population, higher levels of pollution and harmful chemicals, poor water quality from heated storm water runoff and in some cases can even cause death (U.S. EPA, 2014). According to the Centers for Disease Control and Prevention, more than 600 people in the U.S. alone are killed by extreme heat in cities every year (CDC, 2019). With proper adaptation and changes made to the infrastructure of the city, the increase of temperatures in cities can be slowed to improve the general health and wellness of its people.

High temperatures not only increase the likelihood of heat waves, but they can even cause more rain, which can lead to flooding. The heat causes pockets of air to rise and change the normal wind patterns, while the humidity pulls moisture into the air, forming rain clouds (NASA/Goddard Space Flight Center, 2002). Excess rain, especially in a city, can lead to flooding and put the urban area at greater risk. In turn, this can lead to power outages, destruction of buildings, sickness/disease from flooded sewage, injury, and potentially even death (U.S. EPA, 2014). Fortunately, these outcomes can be avoided with the correct precautions and preparations.

Low-lying areas that are prone to flooding under normal conditions will see an increased threat as precipitation rates increase with climate change. In the Central Shenandoah Valley, urban areas that have grown up around prolific springs and streams are especially at risk. For example, the City of Staunton's West End community, with its low base flood elevation, is the focus of a flood probability study for the Lewis Creek floodplain (Fair, 2018). A flood insurance study of Augusta County (FEMA, 2014) identified runoff from impervious surfaces and inadequate drainage structures as sources of flooding in the City of Staunton, a problem that will be exacerbated by climate change-related precipitation. The same study identified the downtown area of the City of Waynesboro as vulnerable, due to the development of the large floodplains of the South River. In promoting flood protection measures, the Natural Resources Conservation Service (NRCS, 2005) described the impacts of four streams that flow through the City of Buena Vista, including ponding problems and overland flooding. At that time, NRCS predicted that a 100-year storm would flood 245 residences, 70 commercial properties, and infrastructure, resulting in $9.5 million in urban damages. Urban areas within the CSPDC region will be affected by flooding, making the

availability of online mapping tool especially important for residents who must make decision about flood protection.

It is easy to overlook the slight increase in temperature in the Central Shenandoah Valley and its impacts on urban areas because the effects have not yet become detrimental to residents. However, as the temperature rises and populations continue to rise, so too will hazardous conditions (McCarthy, 2010).

There are many options for an urban area to change the way it combats and prepares for the increasing hazards, including green rooftops, LED lighting, insulation, and changing the color of the city's surfaces so that they reflect (and not absorb) the sun's rays (Hawken, 2018). These adaptations not only influence the environment of the cities, but also have potential to be economically beneficial to the urban development (Hawken, 2018).

Urban Recommendations

One practice that can help to lower temperatures in the atmosphere of urban areas and help to absorb some of the rainfall is planting vegetation on the roofs of buildings. The foliage helps to protect the roof from the sun's rays, while at the same time sequestering carbon and filtering the air. Plants also need a lot of water to survive, so instead of the rain water going down a storm water system, it can be absorbed by the plants. Not only are green roofs helpful to the environment of the urban area, but they can also have economic benefits. It is estimated that if 30% of the roofs in cities around the world were vegetated, the cities would not only reduce the temperature of rooftops and cool buildings, but also produce $988.5 billion dollars in net savings (Hawken, 2018). Green roofs are just one of the many measures that can be taken to help a city lower its risk of hazards induced by high temperatures, all the while saving money by reducing the amount of energy needed to heat the inside of buildings.

Insulation is another important development that can help an urban area reduce the amount of waste heat it produces as well as save money in the long run. Pockets of temperature move from warm to cold and vice versa depending on the time of year and the temperature inside and outside (McCarthy, 2010). Without enough insulation, heat will escape the building in the winter and the cool air will leave through the cracks of the building in the summer, causing the heaters and air conditioners to work harder and expend more energy. It is easy to determine whether a building is insulated properly. If it is not, insulation can be added to structures under construction or standing buildings. Insulating a building is

relatively cheap and can save money on utility bills, help to keep moisture out of the air, and improve overall air quality (Hawken, 2018).

The final measure that can be taken to not only help the cities in the Shenandoah Valley reduce the amount of waste heat, but also save money in the long run is painting the rooftops of buildings or the pavement white. Cities are typically black and grey in color, absorbing heat from the sun and increasing temperatures within these buildings. By painting the surfaces of the pavement and rooftops white, the sun's rays are reflected into the atmosphere, keeping the building cooler than if the surface were black. One of the biggest reasons that cities have higher temperatures than the surrounding suburbs is that the buildings trap the heat in overnight (Hawken, 2018). Night time temperatures in cities have been recorded to be as high as 22°F warmer than the surrounding suburban neighborhoods (U.S. EPA, 2014). Painting the rooftops or city walkways white will help to lower the temperature of that individual buildings and the city overall.

Recreation

People travel from all over the country to visit Shenandoah National Park (SNP) each year and in return stimulate the economy. The counties within the CSPDC region that have lands included in SNP, Augusta and Rockingham, especially benefit from its visitation. The National Park Service (NPS) reported that in 2017 over 1.45 million patrons

Figure 14. Entrance to George Washington National Forest (USDA Forest Service)

visited Shenandoah National Park, which contributed over $125 billion to the local economy (Comer, 2018). This economic boost has been felt across widely the Valley. The NPS claims that within 60 miles of SNP, economic effects include over $18 billion in spending across the local community, over $35 billion to the national economy, and the creation of hundreds of thousands of jobs nationally (Comer, 2018). Tourism is an essential economic sector for the Central Shenandoah region, which means that the impacts of climate change on these natural and cultural settings will reverberate through communities. In areas where recreation spending is a large share of the economy, as in rural communities, climate-induced changes in economic impacts will be significant (Askew & Bowker, 2018). Impacts to the tourism industry will be detrimental to the economy of the area because so many families are financially dependent on business generated from tourists and recreation-centered activities.

National Parks are an important source of revenue for the areas surrounding park boundaries. In the United States in 2018, more than 318 million people visited parks across the nation. One of the top grossing US National Parks falls within the CSPDC region: The Blue Ridge Parkway, which competes with parks like Grand Canyon National Park, Yosemite National Park, and Yellowstone. The Blue Ridge Parkway, which extends through portions of Augusta and Rockbridge counties, was surpassed by the Golden Gate Bridge and was ranked number two in 2018 (NPS, 2019). George Washington and Jefferson National Forests are important recreation areas for the Central Shenandoah Valley (Figure 14). Within the four Ranger Districts included in the CSPDC region (Glenwood-Pedlar Ranger District that serves Augusta and Rockbridge counties; Lee Ranger District serving Rockingham County; North River Ranger District serving Augusta, Highland, and Rockingham counties; and Warm Springs Ranger District serving Bath and Highland counties), both developed and undeveloped campsites are spread through the forest. There are opportunities for four-wheeling and off-roading, horseback riding, hiking, fishing, hunting, and more (USDA, 2019). The U.S. Forest Service has 6 recreation areas around Lake Moomaw that are enjoyed by the general public. Lake Moomaw is stocked with over 14 types of fish which has grown to make the lake and surrounding recreation areas a draw for sport fishing (DGIF, 2019). Changes to the local climate will impact fish populations in Lake Moomaw, among other lakes, rivers, and streams across the region, because of the sensitivity of cold water fish species to warmer waters and changes in water pH (CSPDC, 2015).

As this region gets warmer and wetter, winter recreation activities like skiing, snowboarding, and snow tubing will suffer from shorter seasons, a rise in artificial snow use, and higher costs to the tourism industry because of more measures being taken to provide for

a cold, snow-filled season (U. of Arizona, 2019). At Massanutten Ski Resort, located in Rockingham County, the natural snow season is estimated to be only a day or two in length because of a warming climate, and the Resort relies on a "snow gun" to provide enough snow for all the ski and tubing slopes for the rest of the winter recreation season (Jenner, 2018). According to the State Climatology Office, every 10 years the number of cold winter days has dropped by more than 7 days which reveals that this region of the state is seeing fewer freezing days and nights and a rising average temperature (Jenner, 2018). Resorts like the Homestead Ski Area in Bath County are becoming proactive in the climate change discussion as one of several hundred organizations supporting the "We Are Still In" coalition and taking measures to limit carbon dioxide and greenhouse gas emissions (CTA, 2013; Ceres Policy Network, 2019).

The unique conditions of the Shenandoah Valley such as its topography, highly variable precipitation across short distances, and a wide variety of soil types all contribute toward variation in climate-related impacts, both in intensity and frequency (Nash, 2019). As this region becomes more vulnerable to climate change, more financial strains will be placed on the region, its workers, and public lands resources. The impacts most likely to affect Shenandoah National Park, the Blue Ridge Parkway, George Washington and Jefferson National Forests, or neighboring public lands include heavy precipitation and flood events, wildfire, extreme winds, and debris flows (Nash 2019). Also, shifts in seasonal patterns associated with climate change will impact tourism tied to the well-known four-season climate of the Virginia uplands (Nash, 2019). A comparison of the Blue Ridge Parkway to other well-known parks in the U.S., in terms of income from human labor, number of jobs created, the economic output stimulated by the parks, the amount of spending by visitors to the park, and total value added to the economy (Table 11) shows that the Central Shenandoah Valley benefits from these resources.

Unfortunately, severe weather events can cause closures of recreation areas, loss of tourism, loss of public lands, and alterations to public spaces many Virginians use for recreational purposes year-round (U. of Arizona, 2019). As the climate shifts and temperatures continue to rise, changes in available land use and shifting population centers will begin to impact the Valley. Targeting specific recreation locations helps officials focus adaptation strategies on public lands and natural resources that are most vulnerable.

Table 11. Comparison of popular sites from ranking of The Top 15 US National Parks by economic contributions across different categories (Visitor Spending Effects NPS, 2019).

Park Name	Labor Income (USD)	Jobs	Economic Output (USD)	Visitor Spending (USD)	Value Added (USD)
Blue Ridge Parkway	$459 million	15.4 k	$1.4 billion	$1 billion	$786 million
Grand Canyon	$329 million	9,420	$938 million	$667 million	$582 million
Yosemite	$205 million	6,670	$589 million	$452 million	$336 million

Recreation Recommendations

Conservation efforts that focus on protecting lands for future generations should be at the forefront of any climate adaptation strategy applied to recreational areas. Conservation of public lands and forested areas are essential when planning for the future of Virginia in terms of climate adaptation. The management of resources, specifically the creation of long-term plans for all different land use areas, will result in long-term benefits to the Central Shenandoah region. Programs that combine efforts from government, non-governmental organizations, academic institutions, and the general public will result in more thorough plans, increased outreach and education among local citizens which will result in better, more informed policy as an outcome (NWF, 2018).

Additionally, there are technical solutions that can be implemented to at risk areas to prevent future devastation, including storm water treatment, the addition of Green Infrastructure to urban and rural areas, raising roads, and flood buffer technology. Specifically, employing a technique like Green Infrastructure can guide floodplain management strategies and reduce the stress on local water supplies by integrating rain gardens or “green streets” (Green Infrastructure, 2016). Benefits to implementing Green Infrastructure techniques include reduced incidents of flooding, increased preparedness for times of drought, lessened heat island effect in cities, reductions in energy demands and indoor air temperature from adding shading to buildings, and reductions in water pumping/treatment that will lessen spending on water management (Green Infrastructure, 2016).

Climatic variations caused by increasing global temperatures are already impacting the Shenandoah Valley and will have a widespread impact on recreational and economic activity across the region. The Shenandoah Valley is rich in natural beauty, outdoor attractions, millions of acres of public land, and outdoor recreation including hunting, fishing, and boating. Historically, this region has been vulnerable to flooding, drought, and severe weather events that can have a lasting impact on outdoor recreation spaces and increase financial resources required to manage impacts from these events (CSPDC, 2013). Droughts impact communities directly by straining crop production, lowering the viability of livestock, and stressing local water supplies. Droughts also have secondary effects, such as fewer opportunities to participate in water recreation activities which will have a lasting negative impact on tourism as well as the local economy and livelihoods of local residents (U. of Arizona, 2019). Another hazard relevant to the region is flooding which could result in property loss or heavily polluted storm water. Secondary impacts from higher-than-average water levels allow for more opportunities for warm weather water recreation but with fewer opportunities for winter recreational activities, like skiing and snowboarding, because of less below-freezing days as well as a shorter winter season (U. of Arizona, 2019).

Forestry

Forests are highly productive ecosystems that can be used for raw materials and ecosystem services such as filtering air pollutants, sequestering carbon, and protecting water, (Paul, 2011). Over half (62%) of Virginia's lands are forestland and most of that forested land is owned privately, with only a small percentage owned by forestry related companies. If impacts of a changing climate force people from their homes and more humans migrate to the CSPDC region there will be changes for the forests and land use across the region. Rising populations have a negative effect on land availability because more residents must have more space to support the population growth. Farmland, forested lands, and rural spaces are the undergo development to meet the need for more housing complexes, businesses, and infrastructure. Over 1 million acres of undeveloped land in Virginia has been developed since 1987 (Paul, 2011). While this number is expected to continue to rise, conservation efforts have been increasing to protect ecosystem services, resources, as well as public, forested, and other lands that could be degraded or destroyed by construction projects and development.

Wildfires are another hazard that poses a significant risk to this region. Each year from 2008 to 2017, The Virginia Department of Forestry (VDOF), put out hundreds of fires

that resulted in approximately 12,000 acres of burned lands annually. Most of these fires are set by humans and cause loss of life, resources, and land (NPS, 2015). Within the Central Shenandoah Valley, the Ranger Districts are responsible for National Forest management, projects, and planning. Much of the area under the jurisdiction of the Ranger Districts is remote, which has made it a popular recreation destination having over 3 million visitors come to George Washington and Jefferson National Forests every year (USDA, 2019). As climate change hazards intensify over the coming years, the 1.8 million acres of public forest land will be at a higher risk (USDA(b), 2019). Additionally, the most vulnerable species and habitats are Appalachian (hemlock)/northern hardwood forests, large stream floodplain, riparian forests, small stream riparian forests, and spruce/fir forests (Butler, 2015). Whether future population growth will result in land clearing and development, or tree species will off from climate-induced hazards, the region's forests are at risk.

Forestry Recommendations

Forestland conservation efforts are driven because the forestry industry is credited with providing $21.5 billion in revenue for Virginia (DOF, 2018). Educating landowners about the value of passing their land down to the next generation of foresters, through programs like Generation NEXT, is one way to improve conservation efforts statewide (VDOF, 2018). Educating residents about the environmental and economic benefits forestlands provide will help grow additional efforts of conservation.

Water Availability

As a result of warmer days, warmer water temperatures will be measured in streams and rivers of the region, and less vegetation will shade river areas, which will lead to declines in local populations of freshwater fish native to the region, including brook trout, which is a staple to the Blue Ridge Mountains and Shenandoah Valley (CSPDC, 2015). In addition to threats posed to wildlife, rising temperatures will also put more stress on how Virginians access and allocate available fresh water. Virginia's Department of Environmental Quality (DEQ) has several measures in place that protect water across the state and aims to provide clean water for years into the future for residents. Specifically, the Water Supply Planning Program plans for water availability, the use of alternate sources of water, and protection of water across Virginia (DEQ, 2019). In the natural environment, the presence of wetlands, forested lands, and reservoirs are ecosystem resources that are highly undervalue. It is estimated that reservoirs in Virginia are valued at over $200 million in ecosystem services.

These reservoirs play a crucial role in regulating the water supply and storing water naturally that can be used for human consumption and industrial operations, among other sectors (Paul, 2011).

Water Availability Recommendations

As water resources become more strained across the Central Shenandoah Valley region, alternate sources of water must be identified to help ease planning efforts. Incentives will be applied to limit/decrease water use in the area, and innovative solutions will need to be promoted to guarantee that every locality has a nearby water supply equipped for a growing population. Plans for the future of that supply must consider projected population values so each locality can plan accordingly for necessary changes (DEQ, 2019). A Virginia State University College of Agriculture research project predicted that as climate change impacts intensify, they will bring more precipitation and more extreme temperatures. As a result, the availability of good quality, clean water supplies for the region may be compromised (Logan, 2019).

Social Impacts

Environmental Justice

"Environmental justice is the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income, with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. This goal will be achieved when everyone enjoys: the same degree of protection from environmental and health hazards, and equal access to the decision-making process to have a healthy environment in which to live, learn, and work" (US EPA, 2019).

As more frequent and severe weather events occur in the Shenandoah Valley, it will become necessary to consider the ways in which these impacts differentially affect communities. Citizens of the respective localities will be impacted differently because of variations in geography (e.g., low-lying, flood-prone areas) and in the ability to respond. The evaluation of issues of environmental justice requires an understanding of differences in economic well-being, resource allocation, and education, especially during the aftermath of an environmental disaster or severe weather event. Statistically, low income communities take longer to recover from environmental catastrophes than economically prosperous areas,

(Jones, 2011). Rural communities are often geographically isolated and suffer a greater impact of environmental hazards than other communities in more heavily populated and industrialized areas. Rural communities in Virginia are not guaranteed the same protections, access to federal aid, and are controlled frequently by outside corporations that drive the local economy from which they profit (Jones, 2011). The added vulnerability to environmental degradation is sometimes attributed to the residents' choice to live in a rural community, instead of long-term inequities that are magnified by environmentally hazardous conditions (Jones, 2011). These areas can be identified using data on about poverty rates, income, and percentage risk of suffering from local hazards. With this information, planners can suggest changes to policies and budgets to close gaps and protect more citizens' lives and livelihoods.

United Way of Northern Shenandoah Valley, the local program of the national organization, created an acronym, A.L.I.C.E. or "Asset Limited, Income Constrained, Employed," which serves residents in the Central Shenandoah region who fall just above the poverty line but are not considered financially stable. An interactive ALICE Map has compiled research from across Virginia and enumerates at the county and city level the specific areas that have fallen below the ALICE threshold. Specifically, this tool can map the "Geographic Distribution of Vulnerable Populations" and pinpoint the exact locations of increased vulnerability within every county and city in the Commonwealth of Virginia (ALICE, 2019). Specific "Places" within each county and city that fall below the ALICE Threshold are shown for the CSPDC region (Table 12).

Regionally, one of the most important issues to address is equality of opportunity, meaning that all citizens in these localities, regardless of race, income, and location are entitled to the same coverage under any regulations and policies and are treated fairly when enduring physical and economic losses (EPA, 2019). In New Orleans, Louisiana after Hurricane Katrina in 2005, low income communities suffered for over 10 years after the storm hit. More recently, Hurricane Harvey in 2017 caused millions of dollars of devastation to poor communities because of insufficient federal aid, under-preparedness by local entities, and lack of infrastructure. These disadvantaged groups were systematically stunted and recovery efforts slowed or stopped altogether because many homeowners did not have flood insurance to protect them from damages incurred from hurricane destruction or the financial stability to afford the costs of natural disasters. Additionally, low-income groups tend to be pushed toward the floodplain and other damage prone areas because of exceedingly high property costs in more advantageous and better prepared areas because of their

Table 12. ALICE Map Data for CSPDC Region (ALICE, 2019).

	Augusta	Bath	Highland	Rockbridge	Rockingham	Staunton City	Lexington	Buena Vista City	Harrison-burg City	Waynes-boro City
Total House-holds	29,664	2,104	1,121	9,277	31,186	10,383	1,856	2,709	16,626	9,044
% Poverty	9	11	12	12	10	14%	19%	26%	26%	14%
% ALICE	29	25	27	31	29	34%	25%	38%	38%	31%
% above ALICE Thresh-old	62	64	61	57	61	52%	56%	36%	36%	55%

affordability (Krause, 2017).

Since the Central Shenandoah region is agriculturally-centered and rural in nature, it poses its own unique issues of environmental justice. Understanding how environmental justice shapes community planning, legislation, funding, and recovery is crucial because it will help these counties improve their adaptation strategies to benefit the greatest number of citizens when climate occurrences disturb daily life.

Environmental Justice Recommendations

When addressing issues of environmental justice, it is important that planning efforts are at the forefront. More detailed comprehensive plan hazard mitigation and adaptation strategies, planning for possible situations, and covering all necessary bases are the best way to be adequately prepared for the pending impacts of climate change. Since many citizens may not understand their associated risks of living in the Central Shenandoah Valley region, they also may not know how to prepare themselves, their homes, businesses, and communities for disaster. As a result, increasing outreach and education across the community will ensure that citizens do more on their own to protect themselves as well as become more informed.

Food Deserts

Food Deserts are defined by the U.S. Department of Agriculture as “areas where people cannot access affordable and nutritious food” (Virginia Tech, 2014). Food deserts are

an issue of environmental justice because they are usually located in rural regions that have higher rates of poverty and low-income residents (Virginia Tech, 2014; CDC, 2019). Within CSPDC's service area, there are several pockets within the counties and most of the cities where residents do not have equal access to healthy food that meets all nutritional requirements (Dutko, 2012; Virginia Tech, 2014). Factors that contribute the most to the prevalence of food deserts are the lack of public transportation (or transportation, in general), lack of available retail food locations within a 10-mile vicinity in rural communities, and low incomes of resident in those communities (Dutko, 2012; Virginia Tech, 2014).

Food Desert Recommendations

Food deserts formed because inequalities across space, lacking grocery infrastructure, and little/no access to adequate transportation. Recommendations for reducing food deserts include: creating shared resources like a community garden, hosting local farmer's markets where residents can buy affordable, fresh produce and meat, establishing food banks/food pantries for in-need community members, starting a garden, and growing your own food. (CDC, 2019, Virginia Tech, 2014). Additionally, a program could be implemented to grant money to areas designated as food deserts to decrease the amount of Virginian's who are considered food insecure. Addressing food deserts could provide healthy food to community members across the CSPDC's jurisdiction who are suffering adverse health effects (including increased rates of obesity) from inadequate food availability (Hall & Berti, 2019; Virginia Tech, 2014).

Coastal Migration and Future Population

Sea level rise will impact many urban areas across the globe. For example, in the United States, nearly 40% of citizens live in "high population-density coastal areas" (Lindsey, 2018). Around the world there are large numbers of people who will be at risk of displacement over the coming years due to sea level rise. People displaced by sea level rise are known as environmental refugees, a term coined in the 1970s for people who could no longer inhabit their land due to dangerous environmental conditions (Doran, 2015). However, environmental refugees do not fall into the traditional definition of refugee, which has allowed for debate around the legitimacy of climate refugees (Doran, 2015). For this reason, there is not an international infrastructure set in place for this type of refugee to find a place

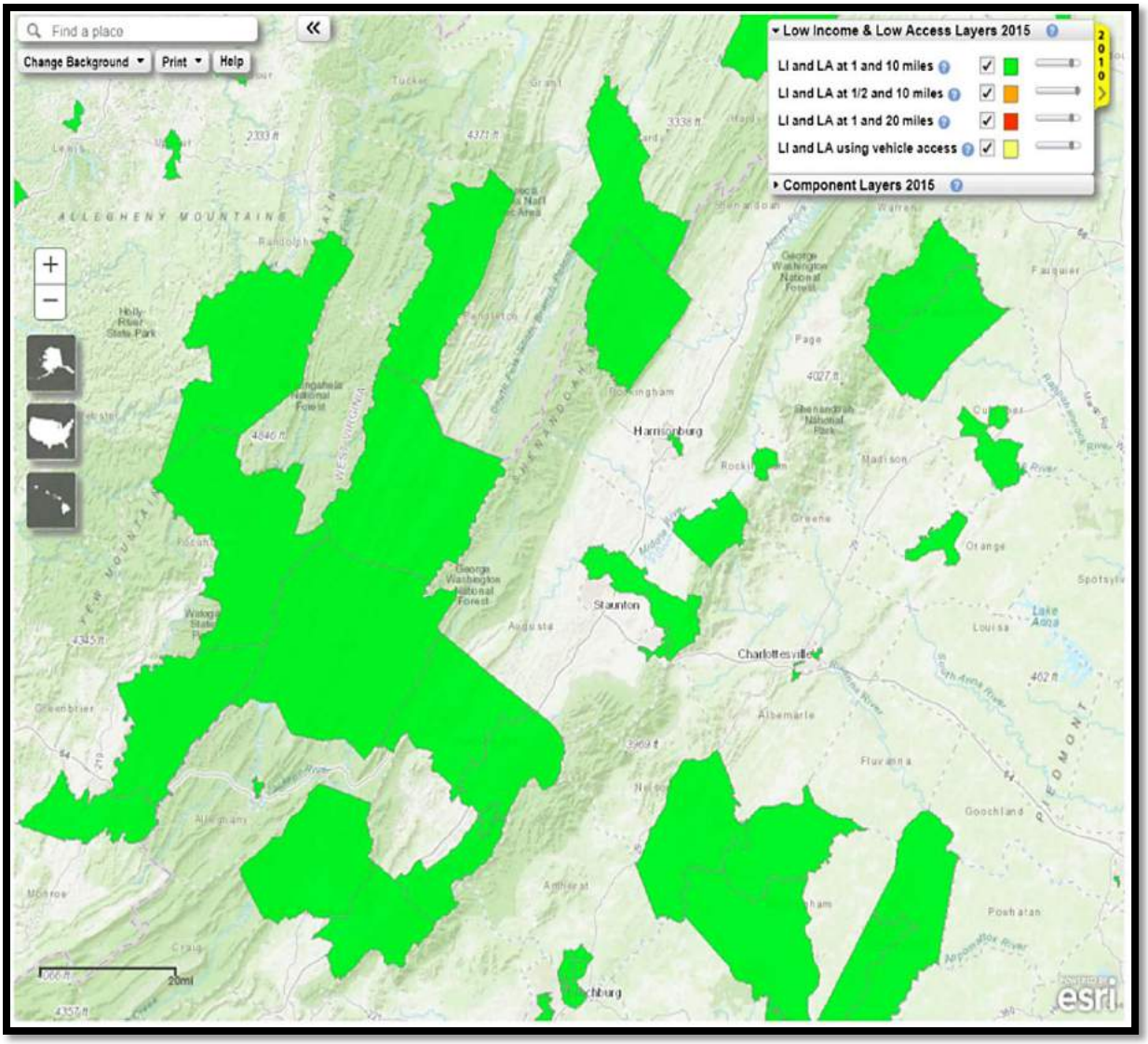

Figure 15. Food Deserts showing Low Income & Low Access Areas in the CSPDC region (Ploeg, 2017).

of asylum. Nevertheless, 25 million climate refugees currently exist, and this number is expected to increase to 200 million by 2065 (Doran, 2015).

The largest city in Virginia is Virginia Beach. This coastal city has 35 miles of shoreline (City of Virginia Beach, 2017) and an estimated 450,435 citizens within the 248-square mile radius (U.S. Census Bureau, 2018). Here, sea level rise has the potential to displace thousands of people within this city alone. Other coastal or tidewater cities within Virginia will face an important question in the coming years: where will environmental refugees go?

Climate change will also exacerbate the frequency and intensity of natural disasters, including floods and hurricanes. Along with other natural disasters, the number of environmental refugees is expected to spike in coming years causing a global crisis. The

CSPDC has population projections for the next 25 years (Table 13). However, the uncertainty that comes with this issue makes it hard to predict just how much population in the area may grow due to environmental refugees. Current projections place the growth in climate migrants for Augusta, Bath, and Rockingham, anywhere between 1 and 50,000 new residents, while in Rockbridge and Highland there is no significant expected increase (Hauer, 2017).

Table 13. Projected populations in the Central Shenandoah Planning District (CSPDC, 2013).

Geography Name	2010 Census	Projected Population		
		2025	2035	2045
Virginia	8,001,024	9,145,616	9,874,244	10,528,817
CSPDC	286,781	319,248	340,290	358,808
Augusta County	73,750	78,582	83,570	87,939
Bath County	4,731	4,592	4,318	4,016
Highland County	2,321	2,140	1,941	1,730
Rockbridge County	22,307	22,365	22,944	23,359
Rockingham County	76,314	85,116	91,418	97,037
Buena Vista city	6,650	7,089	7,298	7,455
Harrisonburg city	48,914	62,920	70,837	78,204
Lexington city	7,042	7,898	8,145	8,333
Staunton city	23,746	25,378	25,480	25,403
Waynesboro city	21,006	23,167	24,339	25,332

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Appendix C –

Flood History and
Dam Risk Assessment and Inventory

C-I. FLOOD HISTORY

Flood	Description and Damages*
July 13, 1842	• Occurred in Rockbridge County and also affected Covington, Buchanan, Lynchburg. • Floods in Rockbridge affected Irish Creek, Mill Creek, Jackson Run, North River (now known as the Maury River), and James River. • Furnaces, forges, mills, and bridges washed away. • Caused by a week of heavy rains. • Destroyed crops: corn, wheat, oats, and hay. • Fences along rivers washed away. • Flooding along James River did not reach Scottsville. • Canal seriously damaged in Lynchburg. *"The heavy rains of last week were succeeded by the most disastrous freshet with which our county has ever been visited."* *- Lexington Gazette July 21, 1842*
1846	*"… a stranger walking thru the business portion of Staunton, would not imagine that the place was liable to be devastated by floods, there being no water force visible to the eye. Yet the town had several times suffered severely from the cause. "* - Annals of Augusta County, Virginia from 1726 to 1871 by Jos. A. Waddel
January 1854	• Heavy rains caused the James River to flood Balcony Falls and Glasgow in Rockbridge County. • On January 21, 1854, the canal boat Clinton and its passengers became stranded in the raging waters. Frank Padget, a skilled boatman and an enslaved person, led four other men to rescue them. As Padget was trying to save the last passenger, he drowned in the rushing current. Capt. Edward Echol's, who witnessed the rescue, was so moved he commissioned the construction of a granite monument which now stands in Glasgow's Centennial Park.
August 4, 1860	• Flashflood in City of Staunton caused by a severe thunderstorm. • Sidewalks were pulled up along Augusta Street. • Many stores in downtown Staunton received thousands of dollars of damages. • A chimney at St. Francis church was blown down. • A stable was lifted off it's foundation and destroyed. "*It is sufficient to arouse our citizens to the absolute necessity of arming themselves against a recurrence of the disastrous results which have followed this freshet."* - Staunton Spectator, August 10, 1896

Description and Damages*: Please note that in this section where stated, dollar amounts were calculated for inflation and shown in 2019 dollars in most instances. Some amounts were kept in dollars for the year they occurred either due to how long ago the event occurred or that the large size of the number didn't make an inflation calculation easy to report.

Flood	Description and Damages
September 28 - 30, 1870	The flood of September 28-30, 1870 was one of the earliest floods in the history of the Shenandoah Valley where written accounts are widely available. The flood event occurred throughout the central Valley from the north in Rockingham County and to the south in Rockbridge. The rain was first welcomed after a period of drought and a summer where rivers had been running below normal. As the rain continued, rivers rose to swirling torrents. The Shenandoah River with its expanded and rapid course carried away houses, trees, and bridges in Rockingham County and northward. The Village of Port Republic was reportedly under 15 feet of water at one time during the event. An example of destruction caused by this flood could be seen in Harper's Ferry, West Virginia, the confluence of the Shenandoah and Potomac Rivers where 47 people died. In Augusta and Rockbridge Counties, extensive damage occurred. Some reports measured nine inches of rain with this storm. In Staunton, flooding along Lewis Creek caused damage to its downtown and washed away a railroad bridge and wood and brick houses. The C & O railroad was damaged, including another bridge that washed away in Waynesboro. In Rockbridge County, Lexington was particularly hard hit in The Point area where several houses were swept away. Also in Rockbridge County, farms, crops, and fences, were destroyed by the flood event. Throughout the Shenandoah Valley, communication lines and transportation routes were blocked. With images of the Civil War still fresh in the minds of people, rebuilding from the flood of September 1870, became another challenge in the recovery they were already experiencing. *"… some idea may be obtained of the immense destruction which has spread over many portions of our beloved old State, greater, by far, than the devastations of four years war. Our people however, have exhibited in the past a wonderful recuperative power. They will not be downcast now, but will bow with humble resignation to the will of Heaven, and will still hope and strive for the best."* – Staunton Vindicator, October 7, 1870
August 28, 1893	• Flood caused by heavy rainfall affected Rockbridge County. • Rain started at around 9 a.m. in the morning and continued until midnight. • The North River (now known as the Maury River) before the rainfall had been so low there wasn't enough electricity to run the electric plant. As a result of the storm, water was 3 feet over the roadway at The Point.

Flood	Description and Damages
September 29, 1896	On the twenty-sixth anniversary to the day of the flood of 1870, the Shenandoah Valley was hit by another significant flood event. This flood most likely occurred as a result of a tropical storm that was tracking through Virginia during this time. The rain, which fell steadily all day on September 30, 1896, increased in volume through the evening and culminated in torrential flooding that night. *"The gentle, soaking rain which gladdened the hearts of Rockingham farmers Tuesday morning, continuing its steady downpour all day long, at night became a raging equinoctial storm which carried death and destruction in its wake."* *– Rockingham Register, October 2, 1896* The City of Staunton was the hardest hit locality in the region. Lewis Creek and its tributaries overflowed their banks, devastating Staunton's downtown. Houses, sheds, and stables were swept away. Thirty - forty horses drowned. This flood caused significant damage to the downtown business district. The archway under Augusta Street and the arch bridge over Middlebrook Road survived but nearby buildings in the vicinity of both were severely undermined and many homes were washed off their foundations. The dam at the Fair Grounds broke. Six lives were lost in Staunton. While the Flood of 1896 was the most dramatic flood in Staunton's history, flooding also occurred in other parts of the region, though not at such a level. In Rockingham County, three lives were lost, crops destroyed, and railroad and telegraph lines were damaged. In Rockingham, flooding hit Bridgewater, Elkton, and Keezletown. It was estimated that damages to public roads and bridges reached $600,000 (2019 dollars) in Rockingham County. In Harrisonburg, houses along Black's Run were flooded. Damage estimates for Harrisonburg were a few thousand dollars (2019 dollars). At the weather station at Dale Enterprise, six and a half inches of rain reportedly fell over an 18-hour period in Rockingham County. The Flood of 1896, believed to be part of a tropical system, was short lived but during its brief period was able to drop much rain in the northern part of the Central Shenandoah Region during its visit. The heavy, localized flooding was swift and its damage was difficult to grasp. The Flood of 1896 is the flood of record for the City of Staunton.

City of Staunton, September 1896

Farm Land In Highland County

Flood	Description and Damages
August 15, 1906	August 1906 was a wet month in the Central Shenandoah Valley. For a period of three to four weeks, rain fell daily in the northwestern part of the Region. The steady rainfall combined with a storm system that stalled against the mountains, caused heavy flooding in Highland County on August 15, 1906. *"The damage to growing crops, public roads, farmland, etc. cannot be given nor even intelligently estimated, but the loss of one human life, reported from, Forks of Water, seven miles north of town, is the saddest feature of the storm" - The Recorder, August 17, 1906.* The storm started with a sustained cloudburst that caused small, mountain streams to rage and overflow their banks. Throughout the Valley, residents coped with the dampness brought on by the repetitive rainfall that month. Farmers, building contractors, and other businesses faced losses because of the long period of rainy weather. In Highland County, and in particular the Town of Monterey, they also faced flood damages including a foot and a half of water in the Monterey Hotel Stables. The Flood of 1906 is an excellent example of a flash flood, where intense rainfall from a stalled storm system causes tremendous damage over a geographically concentrated area. A flash flood event, like other types of flooding, may cause just as much damage and can be just as deadly.
November-December 1934	• Flooding in Rockbridge County, including Long Hollow Road where damage was estimated at over $28,000 (2019 dollars). • A week later, water still surrounded many homes and flooded basements.
March 16 - 17, 1936 "The Great Spring Flood" "The Great St. Patrick's Day Flood"	The winter of 1935-1936 was a brutal one in Virginia. Across the State that winter, low temperatures and heavy snowfalls were common. March began with milder temperatures, but in mid-March, storms tracked across the eastern parts of the United States, dumping heavy snowfalls and torrential rains in its path. Up to 200 deaths nationwide were attributed to this storm. Damage estimates for the United States reached millions of dollars. In Virginia, the James, Potomac, Rappahannock, Shenandoah, and York River watersheds were flooded. Much of the Central Shenandoah Valley suffered the effects of this storm. In Rockingham County, 3.10 – 6.25 inches of rain fell over a two-day period. In the Shenandoah Watershed, streams and creeks reached record depths in Bridgewater, Brock's Gap, Rawley Springs, Lynwood, Keezletown, and Port Republic. The Town of Elkton was cut off as roads were blocked and bridges washed out. The City of Harrisonburg lost power as Black's Run flooded areas surrounding Main Street. Much of the Central Shenandoah Valley suffered the effects of this storm. In Rockingham County, 3.10 – 6.25 inches of rain fell over a two-day period. In the Shenandoah Watershed, streams and creeks reached record depths in Bridgewater, Brock's Gap, Rawley Springs, Lynwood, Keezletown, and Port Republic. The Town of Elkton was cut off as roads were blocked and bridges washed out. The City of Harrisonburg lost power as Black's Run flooded areas surrounding Main Street. *(Continued On Next Page)*

Flood	Description and Damages
(Continued From Previous Page) March 16 - 17, 1936 "The Great Spring Flood" "The Great St. Patrick's Day Flood"	In Augusta County, Waynesboro's DuPont Plant was forced to close due to flooding by the South River. Torrential rains along with the melting of 18 inches of snow quickly filled Back Creek and the South River beyond their banks. In Waynesboro, many homes were flooded and cars washed away. Staunton reported heavy rainfall, at one point recording 2.5 inches of rain in a twelve-hour period. Craigsville reported flooding six feet in depth at an underpass on the Craigsville Fordwick Highway. Flooding along the James River watershed, hit Rockbridge County, Lexington, Buena Vista, and Glasgow. Lexington escaped heavy damage, but several residents were forced to evacuate their homes and oil company storage plants were flooded. Buena Vista suffered significant damage. In Buena Vista several industries were damaged by the flood including the Columbia Paper Company, the Majestic Silk Mills, the Buena Vista Throwing Company, and the W.V. Darling Manufacturing Company. *"Buena Vista was the scene of a bad flood causing one death and costing the factories, townspeople, it is estimated, about three million dollars [$55.5 million in 2019 dollars] in goods and property."* *– Lexington Gazette, March 20, 1936* In Glasgow, its major manufacturer, the Blue Ridge Company, rug makers, remained dry while Locher and Company, brick manufacturers, did get some water but had little damage. The residential area of Glasgow wasn't as lucky; many people had to be rescued by boat from their homes. It was reported that water reached between eight and ten feet on the main road through Town. In March of 1936, flooding, thunderstorms, landslides, and deep snows caused devastation up and down the East Coast of the United States. A harsh winter that was followed by an equally challenging spring wreaked havoc over many states. The Central Shenandoah Region was not exempt from the storms of 1936 that caused what would come to be known as "The Great Spring Flood".

Flood	Description and Damages
April 1937	• Flooding in six states caused numerous rivers to overflow their banks. • There were reports of high water on all roads leading into Staunton. Drainage systems were taxed with the large amounts of rainfall.
October 1942	• Prolonged rainfall over several days caused flooding. • The rain gauge just below Afton mountain recorded 11.27" of rainfall. • City of Waynesboro was hardest hit in the Central Shenandoah Valley. The amount of water was 3.5 inches higher at the Chestnut Avenue gauge that it had ever been recorded, and up to two feet higher in the Rife-Loth Plant and 17 inches higher at the Main Street service than ever before. • Damages across Augusta County, including the Cities of Staunton and Waynesboro, were estimated at over $30,000,000 (2019 dollars).
June 18, 1949	In the Summer of 1949, when the rest of the Central Shenandoah Valley was experiencing the post-World War II economic boom, the Town of Bridgewater was forced to focus its energy and resources on re-building itself after flash flooding ravaged the Town. Parts of Rockingham and Augusta Counties were also struck hard by this storm. On June 17th, rain fell steadily throughout the day and into the night. Rising waters turned into floodwaters in the early hours of June 18th. Rising floodwaters filled Mossy Creek, Dry River, and Briery Branch. These rivers passed along their floodwaters to the already swollen North River. The Town of Bridgewater faced the worst flood event in its history. Floodwaters reached the second story in many houses. "A News-Record Reporter covering the story, reported that the roar of the raging river could be heard in the extreme northern end of Bridgewater. 'It sounds like the roar of Niagara Falls,' he said." – Harrisonburg Daily News Record, June 18, 1949. In Bridgewater, three lives were lost, one home was completely washed away, approximately 100 homes and many businesses damaged, and between 25-30 cars were smashed or washed away. Damage estimates were reported to range from $1,076,000 to $11 million (2019 dollars). (Continued On Next Page)

1949 Flood - Stokesville - Alan Cramer Collection

1949 Flood - Stokesville - Alan Cramer Collection

Flood	Description and Damages
(continued from previous page) June 18, 1949	One of the saddest events of the Flood of 1949, was the three deaths that occurred in Bridgewater, including Mrs. C.R. Bowman, Margaret Bricker, and her nine-year-old daughter, Frances. The Bricker's were killed when their house was washed off its foundation in a fifteen-foot wave of water. Mrs. Bricker's twelve-year-old daughter, Betty, who had also been in the house, was rescued from a submerged tree. *"This two-story frame house was hit by the flood at midnight, and, at 1:30 Saturday morning, was lifted from its foundations, carried a quarter of a mile, and smashed to bits, it's tin roof being all that [was left] of it against a tree on College Street."* *- Harrisonburg Daily News Record, June 20, 1949.* Ironically, the day the house washed away was also Frances' ninth birthday. It took a week for Frances Bricker's body to be recovered. The lengthy search to recover her body and the senseless death of "little" Frances Bricker, as she was known, personified the loss that the whole Town felt in the aftermath of this horrific flood. To the west, along the North River, parts of Rockingham and Augusta Counties were also hard hit by severe flooding. Up to 15 bridges were removed by flooding. Small roads covering the area were washed out leaving residents stranded. Aerial views of fields revealed that tons of topsoil had been washed away, leaving only red clay to be exposed. Damage to the George Washington National Forest was estimated at $1.6 million (2019 dollars). In Augusta County, Stokesville experienced a great deal of flood damage. Fortunately, there was no loss of life in Stokesville but more than 12 homes were completely demolished as a result of the flood and many others were heavily damaged. Because of the loss of topsoil, many small farmers were unable to replant crops. Poultry in the thousands and heads of livestock in the hundreds were destroyed in the Stokesville area. In the immediate aftermath of the flood, Stokesville was unable to rebound as quickly as Bridgewater because they faced a tremendous shortage of resources and an inability to get tools and materials needed to clean and make repairs. The flash flood of June 1949 left the Town of Bridgewater, the community of Stokesville, and parts of Rockingham and Augusta Counties forever changed.

Flood	Description and Damages
September 10, 1950	• Flash flood after 24 hour period of rainfall. • 3.8" of rain at Dale Enterprise and 3.86" of rain at Timberville in Rockingham County. • 5.81" of rainfall near Balcony Falls in Rockbridge County. • 3.9" of rainfall in Augusta Springs in Augusta County. • Black's Run overflowed in Harrisonburg on Main Street. • In Rockbridge County two people drowned; the Town of Glasgow was completely cut off; Buena Vista flooded; Buffalo Creek and Whistle Creek left their banks. Many homes and hundreds of cars were washed away. 35 bridges and 50 bridge approaches were washed away. • Rockbridge County damages were estimated at $21 million (2019 dollars) with $369,000 of that in damage to secondary roads and over $421,000 of that in damage to primary roads. "At Whistle Creek Carl H. 'Doc' Collett… got up at 4:45 a.m. to close a window against the rain and saw his refrigerator float by downstairs. Within 10 minutes water rose downstairs from two feet to five feet downstairs and the Colletts were trapped upstairs." - Lexington News-Gazette May 16, 2001 Page A12
October 15, 1954 "Hurricane Hazel"	• Hazel struck land as a Category 4 hurricane on October 15, 1954. • The storm caused a national total of 95 deaths and $2.6 billion in damages (2019 dollars) and was considered the worst storm of the 1954 hurricane season. • Observers in Washington, D.C. reported 78mph wind gusts. • Twelve people were killed in Virginia, including four crewmembers of the tugboat Indian, which sank in the James River as a result of the turbulent wind and water. • Turkey growers in the Shenandoah Valley lost between 150,000 and 250,000 turkeys when poultry sheds were wrecked. • The Staunton/Augusta area received five to six inches of rain, and roofs, roadways, and bridges throughout the area sustained significant damage.

Flood	Description and Damages
August 1955 "Hurricanes Connie and Diane"	Hurricanes Connie and Diane teamed up to spin a relentless one-two punch on the eastern portion of the United States, causing widespread flooding in numerous states. Hurricane Connie struck South Carolina as a Category 1 hurricane on August 12, 1955, inflicting flooding and high winds that killed 41 people and resulted in $144 million in damages (2019 dollars). Connie caused extensive damage to Virginia tobacco and corn crops, and flooded low-lying areas throughout the state, but caused little to no damage locally. Hurricane Diane, also a Category 1 storm, made landfall in North Carolina on August 17, 1955. With the ground already saturated from Connie's rain, Diane caused intense flooding, resulting in 184 to 200 deaths and $31.2 billion (2019 dollars) in damages, making it the sixth most costly U.S. hurricane of the 20th century. Virginia received about three inches of rain from Diane. The storm also caused widespread flooding throughout Augusta County, an automobile accident, a backup of Harrisonburg's flood and sewer systems into homes and businesses, and a 4 by 200 foot chunk of concrete to be swept away from the Harrisonburg hydroelectric dam.

Flood	Description and Damages
August 19, 1969 "Hurricane Camille"	**Camille.** In the western part of Virginia this name is synonymous with unequalled destruction. The remnants of Hurricane Camille caused flooding during the evening hours of August 19, 1969 and the morning hours of August 20, 1969 that broke all flooding records in modern history along the James and Maury Rivers. On August 17, 1969, Hurricane Camille made landfall on the gulf coast of Mississippi as a Category Five Hurricane – the deadliest type of hurricane. Gusts of up to two hundred miles an hour were reported. The storm surge was the highest ever recorded in the United States. One hundred and forty-three people died as a result of this hurricane on the gulf coast of the United States. Hurricane Camille had weakened to a tropical depression by the time it had reached the Mississippi/Tennessee border. Rain was forecast for the western part of Virginia but it was the combination of three factors that caused the rain to turn into torrential downpours of unparalleled amounts. *"As Camille reached Virginia, it ran into three influences—a westerly flow of cold air, an 'orthographic lifting' of air over the mountains, and a stationary cold front over the northern part of the state. The counter clockwise flow of air created by the storm drew moisture, apparently in great amounts, from the Atlantic Ocean into the center of the storm. The 'orthographic lifting' or updrafts of air created by the mountains, forced the moisture up to the westerly flow of cold air, where it was cooled to a 'release point' and then came down in torrents of rain. The cold front acted as a blocking force, causing the storm to move eastward over the mountains where the updrafts of air continued to force the moisture upward."* *– excerpt from the Richmond Times-Dispatch in Hurricane Camille: A Review.* Nelson County was the hardest hit in all of Virginia receiving from between 27 to 31 inches of rain, most of which fell in a five-hour period during the middle of the night while people were sleeping. Homes in Massie's Mill and Lovingston were washed off their foundations and completely destroyed. Whole families died either in their homes or as they tried to escape the floodwaters. As the land became saturated, tons of topsoil streamed down the mountainsides, toppling trees and creating mammoth landslides. An example of this devastation could be seen after the flood where for a five-mile stretch of Davis Creek, logs were piled 30 feet high. One hundred and seventeen people died in Virginia and a majority of those people were in Nelson County. In the Central Shenandoah Region, three localities– Augusta, Bath and Rockbridge Counties were included in the federal major disaster declaration (DR-274). Rockbridge County was severely impacted by Hurricane Camille. For the City of Buena Vista and the Town of Glasgow, Camille would become their flood of record. Up to eight inches of rain fell in the southeastern part of Rockbridge County. Twenty-three people died in Rockbridge County including three members of the Rion family of Glasgow, and eight members of the Clark family in Cornwall. In Buena Vista, 69 year-old Hansford Odell Allen died in Camille also. *(Continued On Next Page)*

Nelson County in the aftermath of Hurricane Camille.

Flood	Description and Damages
(*continued from previous page)* August 19, 1969 "Hurricane Camille"	Both Buena Vista and Glasgow's business districts were flooded with six feet and fourteen feet of water respectively. At least 75 homes were damaged in Buena Vista, and in Glasgow a quarter of the residences were damaged by the floodwaters. In Goshen, the Stillwater plant was inundated with water. Not only were lives lost, homes destroyed, and businesses devastated, but agriculture in Rockbridge County was also affected. One hundred and fifty head of cattle were lost, crops were ravished, and fertile topsoil washed away. Damages in Rockbridge County exceeded $208 million (2019 dollars). Hurricane Camille affected both Mississippi and Virginia. Two hundred and sixty lives were lost as the result of the hurricane and the flash flooding it created. Camille caused over 3 billion dollars (2019 dollars) in damages throughout Virginia. The year following Hurricane Camille was full of loss and a struggle to recover for thousands of residents in western Virginia. This struggle is best illustrated through the words on a plaque given by the Lion's Club to the citizens of the City of Buena Vista, "To the citizens of Buena Vista and their good friends from far and near, in grateful recognition of their collective efforts and achievements in the rebuilding of Buena Vista following the flood which came in the wake of Hurricane Camille on August 20, 1969. This plaque expresses appreciation for the labors, moneys, services, supplies, equipment, leadership, and the spirit of cooperation which were extended by individuals, organizations, agencies, and companies; both local and throughout the nation; to relieve the flood devastation and to restore order to our city. In unity lies our strength." Camille, its colossal rainfall, and the total destruction it left in its wake have yet to be surpassed and will be imprinted in the memories of many for a lifetime. The stories of Camille will be passed on for generations.

Glasgow's business district flooded by Hurricane Camille. Photo by Ralph Ogden

Rising water in Waynesboro from Hurricane Camille.

Flood	Description and Damages
June 19, 1972 "Hurricane Agnes"	On June 19, 1972 Hurricane Agnes, a weak disorganized hurricane, made landfall in Florida. Barely able to reach hurricane status, it quickly disintegrated to a tropical storm, and quickly a depression. Although it was a weak hurricane, it was a large storm with a diameter of 1,000 miles. It made its way up the Appalachians and exited back out to sea off the coast of North Carolina. Sponging up moisture from the Atlantic Ocean, it regained strength. On June 21, 1972, Agnes now back to tropical storm status reached the Virginia coast and made its way up the Eastern seaboard. Several states received record flooding. From Virginia to New York, several places received rainfall totaling 15 inches or more. An example of the devastation was witnessed in Wilkes-Barre, Pennsylvania where they had built a dike, 37 feet high, to protect them from floods similar to the Flood of 1936, their flood of record, where the Susquehanna River crested at 33 feet above its normal levels. As a result of Agnes, the river crested at 40 feet, pouring water over the dike and flooding the Town. In Kingston, Pennsylvania, only 20 of its 6,600 homes were above water." 'Agnes re-wrote the book on inland flooding and the impact a tropical storm can have hundreds of miles from the coast.' – Sol Summer, National Weather Service, from Storms of the Century, www.weather.com". Damage from Hurricane Agnes in the United States was over $19 billion (2019 dollars), the second costliest hurricane in U.S. history and caused 120 deaths. In Virginia, 13 lives were lost and damages equaled over $1 billion (2019 dollars). Rivers surpassed their banks throughout the State including the Appomattox, Dan, James, Potomac, and Roanoke Rivers. Like other parts of the State, the Central Shenandoah Region received flooding but not to the levels that had occurred three years earlier with Hurricane Camille. Eight localities (Bath, Buena Vista, Harrisonburg, Lexington, Rockbridge, Rockingham, Staunton and Waynesboro) were included in the federal major disaster declaration (DR-339) following the storm. Waynesboro was one of the hardest areas hit in the Region. Waynesboro's downtown and Club Court areas were evacuated. At the time, damages to homes and businesses were estimated to be in the hundreds of thousands of dollars. In Rockbridge County, both Buena Vista and Glasgow received flooding. Glasgow, at the confluence of the James and Maury Rivers, received the greatest amount of flooding in Rockbridge County. In Glasgow, damages reached approximately $925,500 (2019 dollars) and 50 families were evacuated in the small town. In Buena Vista, many homeowners and businesses were evacuated. Hurricane Agnes was one of the costliest and damaging tropical storms to hit the Eastern United States. In the Central Shenandoah Region, because of the recent memories of Camille, many residents took steps early to evacuate and remove property from homes and businesses. While Agnes did bring along floodwaters, Valley residents were prepared.

Hurricane Agnes in the Town of Glasgow

Flood	Description and Damages
October 7, 1972	Severe storms resulted in flooding. Buena Vista was included in a federal major disaster declaration (DR-358).
October 10, 1972	Severe storms resulted in flooding. Augusta, Buena Vista, Rockbridge and Rockingham were included in a federal major disaster declaration (DR-359).
November 4 - 7, 1985 "Hurricane Juan" "Election Day Flood"	The Flood of November 1985 will be remembered in Virginia for its flash flooding. Flooding was caused when a slow-moving low pressure system, possibly containing remnants of Hurricane Juan, moved northeasterly through West Virginia and Virginia dumping torrential rains over a four-day period. Known as the "Election Day Flood", because it occurred during election day, the storm caused 22 deaths. Damages across the state reached nearly $1.8 billion (2019 dollars). This flood was the worst flood for the City of Roanoke, where the Roanoke River rose seven feet in one hour and eighteen feet in six hours. Areas all across the Central Shenandoah Region were affected by the flooding. Nine localities– Augusta, Bath, Buena Vista, Harrisonburg, Highland, Lexington, Rockbridge and Rockingham- were included in the federal major disaster declaration (DR-755). In Rockingham County, the western part of the County was hardest hit. A railroad bridge built in 1896 was washed out in Elkton. The Town of Bridgewater experienced limited damage because of a levy built after the disastrous flood of 1949. Bridgewater did receive damage to roads, their hydroelectric plant, and the athletic field at Bridgewater College. In Highland County, at least 50 homes and 300 farms received damages from the flooding. In Highland County, road damage was estimated at a little over $4.7 million (2019 dollars). In Bath County, bridges were washed out, and property damage was estimated in the thousands of dollars. Communities in Augusta County were inundated by floodwater. The swollen Middle River damaged homes, property, and roads in areas like Frank's Mill, Fort Defiance, and Verona. Buffalo Creek washed away bridges and roads in the Buffalo Gap area. Damages to roads in Augusta County were estimated at $18 million (2019 dollars) and homes, businesses, and public facilities at $16.5 million (2019 dollars). The rains had minimal affects on the City of Staunton except for the water treatment plant that was damaged and the evacuation of residents of the Beverly Hotel where the flooded basement caused concerns. The City of Waynesboro, on the other hand, experienced significant damages. Waynesboro's South River created record flood levels and caused damages to 140 homes, 32 mobile homes, and 41 businesses. The City's sewage treatment plant was also severely damaged. Damage estimated for the City of Waynesboro directly after the flood exceeded $7 million (2019 dollars). *(Continued On Next Page)*

Flood	Description and Damages
(*continued from previous page)* November 4 - 7, 1985 "Hurricane Juan" "Election Day Flood"	In Rockbridge County, Goshen, Glasgow, and Buena Vista were the areas most affected by the flooding. Goshen experienced the heaviest damage due to the swiftness of the floodwaters. Damages in Buena Vista and Glasgow equaled or surpassed what they had experienced during Hurricane Camille in 1969. In Buena Vista, three to six feet of water flooded homes and businesses. In Glasgow, almost half of the homes and two-thirds of the businesses were hit by floodwaters. In Lexington, the waste water treatment plant was covered by the waters of the Maury River. Damages in Rockbridge County were estimated at $236 million (2019 dollars), well exceeding the cost of Hurricane Camille. In the 1985 Flood, 584 homes and 32 businesses were damaged in Rockbridge County. The November 1985 Flood reached its watery fingers throughout the Central Shenandoah Region, grasping homes, public facilities, and businesses. The three-day period of sustained rains caused flash flooding all over the Region. It is no doubt that the Election Day Flood created one of the lowest poll turnouts in history.
May 19, 1992	Severe storms resulted in flooding. Six localities- Augusta, Bath, Buena Vista, Lexington, Rockbridge and Rockingham- were included in a federal major disaster declaration.
April 1993	· Flooding in Bath and Highland Counties caused by heavy, localized rainfall. Between 1 and 6 inches of rain fell. · A corridor running north-south from Pendleton County, WVA into Bath County, between the east side of Lantz Mountain and the west sides of Jack and Warm Springs Mountains, sustained the most damage. · Streams were inundated along U.S. 220 and Rt. 642 and culverts, small bridges, and fences washed out. · Livestock had to escape floodwaters on many farms. · Some areas experienced more damage then they did in 1985. · Gardens including all their topsoil were washed away.
March 10, 1994	Severe ice storms resulted in flooding. Bath, Buena Vista and Rockbridge were included in a federal major disaster declaration.

Flood	Description and Damages
June 22 - 28, 1995	A week-long period of ground saturating rains fell over the western part of Virginia, causing flash floods and landslides. Madison and Greene Counties were the most devastated in the State, when an intense rainfall stalled over the mountains. On June 27, 1995, in a fifty mile area of Madison County, 30 inches of rain fell in a 16-hour period, with as much as 25 inches falling in a five-hour period in some areas. This caused debris flows and mudslides that uprooted trees, removed topsoil, and caused extensive altercations in the landscape. Rainfall had not been seen there in such a concentrated level over such a short duration since pre-historic times. In the Central Shenandoah Region, six localities– Augusta, Bath, Buena Vista, Lexington, Rockbridge and Staunton were included in a federal major disaster declaration (DR-1059). The week of rains caused flash flooding in Augusta and Rockbridge Counties. In Augusta County, the Town of Craigsville was flooded when 12 inches of rain fell over an 11-hour period. Trees were uprooted in yards, basements caved it, and 40 people were forced to evacuate their homes. Damage estimates exceeded $843,000 (2019 dollars) for the Town. *"Craigsville Mayor Herbert Campbell called Thursday's flood much worse than the 1985 flood which caused damage that some residents believed would never be equaled." – Staunton Daily News Leader, June 24, 1995.* In the Town of Glasgow, flooding from interior mountain streams became more of a problem than river flooding with this event. At least 42 homes in Glasgow experienced flooding on the first floor of their homes and 64 homes had flooded basements or crawl spaces. In the City of Staunton, Gypsy Hill Park was flooded when Lewis Creek overflowed its banks. The Park's duck pond also overflowed causing sinkholes and creating other problems.
January 13, 1996	Severe winter weather resulted in a blizzard, followed by two additional snowstorms bringing over a foot of snow. Snowpack was on the ground for an extended period of time. It was thawed by higher temperatures and heavy rain, resulting in severe flooding. Ten localities- Augusta, Bath, Buena Vista, Harrisonburg, Highland, Lexington, Rockbridge, Rockingham, Staunton and Waynesboro- were included in a federal major disaster declaration (DR-1086).
January 27, 1996	Flooding was caused by melting snow. Eight localities- Augusta, Bath, Buena Vista, Harrisonburg, Highland, Rockbridge, Rockingham and Waynesboro- were included in a federal major disaster declaration (DR- 1098).

Town of Goshen Flood of June 1995

Flood	Description and Damages
September 6, 1996 "Hurricane Fran"	Hurricane Fran made landfall in North Carolina as a Category Three hurricane on September 6, 1996. In the Central Shenandoah Region, ten localities– Augusta, Bath, Buena Vista, Harrisonburg, Highland, Lexington, Rockbridge, Rockingham, Staunton and Waynesboro were included in the federal major disaster declaration (DR-1135). The Counties of Augusta and Rockingham were most affected by Fran. Fran dropped eight inches of rain in parts of the Valley and up to thirteen inches of rain in the Big Meadows area of the Shenandoah National Park. Hurricane Fran broke almost all flood records along the Shenandoah River and its tributaries, including those set in 1972 with Hurricane Agnes and in 1985. Damages in the Shenandoah Valley were estimated at over $97 million (2019 dollars). The Naked Creek area in Rockingham County, north of Elkton, sustained severe damage by the flood. The flood carved new channels and filled yards and homes with debris. Areas in the Town of Bridgewater were flooded when the North River overflowed its banks. Broadway, Mount Crawford, and Dayton were among the other communities in Rockingham County that experienced flooding. The City of Harrisonburg received flooding along Blacks Run but damage was minimal in comparison to other areas in Rockingham. More than 125 roads were closed in Rockingham as a result of the floods. In the County, 16 homes and 18 mobile homes were completely destroyed by Fran, and 334 additional structures received damage. In Augusta County, National Guard troops evacuated people in the Mount Solon and Churchville areas. Buffalo Gap, Augusta Springs, and Sherando were also vulnerable to the high waters caused by the heavy tropical rains. Twenty-nine roads were closed in Augusta County. Two deaths resulted in Augusta County when people tried to cross the flood-swollen Middle River in two separate incidents. In the City of Staunton, much of downtown was closed due to flooding in the Wharf parking lot area and damage was done to roads at the Frontier Culture Museum. The City of Waynesboro also experienced flooding in their downtown business area when the South River reached flood stage. Waynesboro streets became clogged with debris and tree limbs as the storm progressed. In Virginia, damage from Hurricane Fran was estimated at $466 million (2019 dollars) and caused eight deaths. Two hundred and thirty-three homes were destroyed and over seven thousand homes were damaged in Virginia.

Hurricane Fran in Rockingham County

Flood	Description and Damages
July 8-August 21, 2001	Severe Storms caused flooding. Bath County was included in a federal major disaster declaration (DR-1386).
February 15 – February 28, 2003	A severe winter storms brought snowfall, heavy rain, flooding and mudslides. Highland County was included in a federal major disaster declaration (DR-1458).
August 8, 2003	Flooding occurred in the City of Staunton after a thunderstorm cell stalled out over Staunton's downtown area, dropping between 4-6 inches of rain in an hour. This heavy rainfall caused structures downtown to fill with 2 - 7 feet of water. Floodwaters receded within several hours leaving $1.8 million (2019 dollars) in damages to 55 businesses and up to 70 homes. Gypsy Hill Park and the City's Johnson Street parking garage also sustained damage. In Augusta County, countywide impacts occurred from the storm.
September 18, 2003 "Hurricane Isabel"	Hurricane Isabel made landfall on September 18, 2003, along the Outer Banks of North Carolina. Isabel made landfall as a Category 2 Hurricane. It moved northwestward through Virginia and Maryland, finally dissipating near Erie, Pennsylvania. In Virginia, as Isabel passed through, some areas had sustained winds of 100 mph. Also, for twenty-nine hours tropical storm winds lasted throughout Virginia. Communities located along either the Chesapeake Bay or the Atlantic Coast felt the effects of a storm surge of 5-8 feet. In the Central Shenandoah Region, seven localities– Augusta, Buena Vista, Harrisonburg, Highland, Rockbridge, Rockingham, Staunton and Waynesboro- were included in a federal major disaster declaration (DR-1491). Augusta County received the most rainfall and Rockbridge County received the most damage due to severe flooding along the South River. In Augusta County, the heaviest rain occurred in the Sherando area, which is located at the foothills of the Blue Ridge Mountains. The Upper Sherando monitoring station recorded a rainfall total of 20.6 inches. In Augusta County, damage estimates equaled $2.2 million (2019 dollars). For the City of Waynesboro, damages equaled $1.39 million (2019 dollars). The South River at Waynesboro crested at 13.46 feet, above flood stage of 9.5 feet. In Staunton, damages were minimal but one death occurred as a result of carbon monoxide poisoning from the improper use of a generator. In Rockingham County, damage was mainly confined to roads, downed trees, and agricultural lands. Two deaths were caused a few days after the storm, when a man and his daughter tried to cross a swollen stream in a horse and buggy. In Harrisonburg, downed trees were the major problem as a result of rain soaked soil. A JMU student drowned when his canoe overturned in Black's Run the morning after the storm. *(Continued On Next Page)*

The Wharf District in Staunton's downtown

Flood	Description and Damages
(*continued from previous page)* September 18, 2003 "Hurricane Isabel"	The northeastern part of Rockbridge County sustained the most damage when the South River flooded along Rt. 608. The South River is fed by the St. Mary's, Big Mary's, and Little Mary's Creeks which flow down the west side of the Blue Ridge Mountains. During Isabel, the South River began rising by 9 p.m. and the River jumped its bank by 11 p.m. Significant damage to property and infrastructure occurred from the northern Rockbridge County border down stream to the South River's confluence with the Maury River. Rt. 608, which parallels the South River was washed out or undermined in several places. Three permanent bridges over the South River were destroyed. An abandoned C&O railroad bridge, that was part of the Chessie trail system, was washed off its supports as well. In Rockbridge County, property damages were estimated at $9.3 million (2019 dollars), damage to South River Road was estimated at $5.5 million (2019 dollars), and agricultural losses were estimated at $6.9 million (2019 dollars) (which included the loss of 25-30 head of livestock). Amazingly, there were no serious injuries or fatalities in Rockbridge County as a result of this flood event. In the U.S., forty deaths were attributed to Hurricane Isabel and damages were estimated at over $4.17 billion (2019 dollars). It was one of the top thirty most expensive storms in U.S. history.

Hurricane Isabel - South River in Rockbridge County

Flood	Description and Damages
August 9-August 15, 2004 Hurricane Charley	Impacts from Hurricane Charley were felt countywide in Augusta County.
August 24—September 10, 2004 Hurricane Frances	Hurricane Frances resulted in flooding in Augusta County.
September 2—September 25, 2004 Hurricane Ivan	Hurricane Ivan brought flooding to Augusta County and resulted in road closures in the Staunton area.
September 13-September 26, 2004 Hurricane Jeanne	Hurricane Jeanne resulted in flooding countywide in Augusta.
July 3-July 12, 2005 Hurricane Cindy	Hurricane Cindy brought countywide flooding to Augusta County and resulted in road closures in Western Augusta.
November 29, 2005	Flooding occurred in the Sherando area.

Flood	Description and Damages
June 23 - July 6, 2006 "Mid-Atlantic United States Flood"	The Mid-Atlantic United States Flood of 2006 affected much of the Mid-Atlantic region of the eastern U.S. It is widely considered the worst flooding in the region since Hurricane David in 1979. At least 16 deaths in the U.S. were caused by this flood event. The flooding occurred because of a stalling of the jet stream just west of the Appalachian Mountains, a "Bermuda high" over the Atlantic Ocean, and the influence of a tropical low off the coast of North Carolina. The National Weather Service stated that rain events of this size take place in the region only once every 200 years. In Virginia, flooding occurred in the northern regions and mudslides were also witnessed in the mountainous regions. In the Central Shenandoah Valley, flooding occurred countywide in Augusta County. In the Brand Flats area along U.S. 250 when Christians Creek spilled over its banks. Residents of 50 trailers in Knox Mobile City were cut off by the flooding. The American Red Cross assisted 1,600 citizens during the week, providing food, clothing, and shelter.
August 28-September 12, 2008 Hurricane Hanna	Hurricane Hanna resulted in flooding impacts countywide in Augusta County.
January 25, 2010	Storms brought flash flooding to Augusta County, resulting in impacts county wide with evacuations and water rescues. Flooding impacted the Pastures District, bringing streams out of their banks and washing out roads. The South River at Waynesboro crested at 10.01 feet, above flood stage of 9.5 feet, resulting in minor flooding.
April 11—April 12, 2011	Heavy rains caused mud and rock slides in Bath County, downing trees and blocking roads. The Cowpasture River crossed Rt 42, and flooding, rock slides and mudslides occurred in areas near Burnsville, Williamsville, Bacova and Bolar. No homes were damaged, but several road washouts occurred. Flooding occurred in northern Augusta County.

Flood	Description and Damages
April 16 , 2011	An EF1 tornado reached wind speeds in excess of 95 mph traveling 4.1 miles in Augusta County. The tornado damaged 37 structures and downed numerous trees and powerlines. Preliminary damage estimates from Augusta County listed storm damage to 12 residences, 3 businesses, 15 outbuildings, 2 mobile structures and 5 barns. Preliminary damage cost is estimated at over 2.5 million (2019 dollars). An EF0 tornado touched down near Vesuvius in Rockbridge County causing minor damage to a barn and a house, and slightly moving another barn off its foundation. The twister left a path about 100 yards wide and 1.3 miles in length. Wind speeds were estimated at 80 mph. Rockbridge also experienced 3.5 inches of rain and reports of quarter size hail. Numerous trees were reported downed in Lexington and countywide in Rockbridge. In Glasgow, the Maury River reached near flood stage at 18 feet. As many as 33 roads were closed due to high waters and fallen trees, the worse being Rt. 631, Furrs Mill Road. A swift water rescue was required to retrieve two women and two small children stranded in a van. 350 Dominion Power customers lost power. In Bath County, downtown Hot Springs flooded. Flooding, mud and rock slides also occurred in other areas of Bath County damaging roads, driveways, homes and the Warm Springs Pools at the Homestead. Highland County experienced power outages, downed trees and flooded roadways. Highland County Supervisors declared the County a disaster area.
April 27-April 28, 2011	Four tornados touched down in Augusta County and Rockingham County. The strongest was an EF-2 that started in Fulks Run and traveled 33.3 miles into Shenandoah County, damaging homes and farm buildings; downing trees and causing 2 injuries. An EF-1 Tornado occurred in Churchville in Augusta County, and traveled for 4 miles damaging homes, downing trees and destroying outbuildings. Two EF-1 tornados occurred in Rockingham. A tornado in Keezletown was on the ground for 2.7 miles causing tree damage and damage to two homes, farms buildings and outbuildings. A tornado in Linville traveled for 0.9 miles causing tree damage. Other reported storm damage from the region included reports of downed trees in Bath County, Rockbridge County, Augusta County and Rockingham County. A tree fell on a trailer in the Colen Hollow area of Rockbridge and damage was reported to houses in Rockingham. The storm brought heavy rains and flooding in Bath County, causing downed trees and powerlines, washing debris into the roads, and damaging roads in Burnsville and Williamsville. Rt. 614 Muddy Run Road in front of the Burnsville Volunteer Fire Department and Rescue Squad was washed out. Flooding damaged a home in Williamsville.
October 22-November 2, 2012 Hurricane Sandy	Hurricane Sandy brought rain to the Central Shenandoah Valley region, resulting in flooding. Governor McDonnell declared a State of Emergency for Virginia. A transmission line serving the Monterey substation failed due to high winds, resulting in a widespread, extended power outage to 90% of Highland County. County officials declared a state of emergency. Following the storm, Highland County was deemed eligible for FEMA public assistance funding in DR-4092 due to damage to public infrastructure. The countywide per capita impact for Highland County was $7.26 (2012 dollars)
May 9, 2013	A slow moving low pressure system caused rain to fall over saturated ground from previous rainfall. The storm resulted in flash flooding, closing roads, delaying schools systems and causing accidents. More than 40 sections of roadways were flooded in Augusta County.

Flood	Description and Damages
June 17, 2013	Rain and thunderstorms brought flooding to the Dooms area in eastern Augusta County. Route 340 was closed in several locations, and several cars were swept away. No injuries were reported.
April 15-16, 2018	A severe storm moved through the region with moderate to heavy rain, strong winds and hail, causing flooding. The South River crested at 11.38 feet, above flood stage of 9.5 feet. A tornado warning was issued for southeastern Augusta County. While the Central Shenandoah Valley was spared and a tornado touchdown did not occur in the region, the same storm system produced an EF3 tornado which touched down in neighboring Amherst County earlier in the evening. Rockingham County, Augusta County and Harrisonburg were included in a agricultural disaster declaration (S4493).
May 14, 2018	A series of thunderstorms with high winds, heavy rain and hail caused flash flooding in the central Shenandoah Valley, resulting in downed trees and power outages. Several homes or businesses in the region were damaged. In Verona, a family was displaced when flooding caused their basement wall to collapse leading to the condemnation of their home. Homeowners insurance denied the claim since the property was not covered by flood insurance. Strong winds struck a local bank branch during business hours, damaging the building, while employees and customers took shelter in the bank vault. A tree fell damaging a home in Waynesboro. Hail was reported in Verona, and half dollar size hail was reported in Rockbridge County. Trees were reported downed in other areas of Augusta County, Rockingham County and the City of Staunton. 21,000 Dominion Power customers were without power in the region.
May 21, 2018	Five inches of rain were estimated to have fallen in less than 2 hours causing flooding in Bath County. Flooding closed roads on Jackson River Turnpike, Douthat Park State Park and Route 687. Damages were reported to three homes, an auto shop, roads, private driveways and a vehicle. One structure (a garage) had significant damage. Flash flooding in Rockingham County occurred, washing out or temporarily closing roads in Fulks Run, Harrisonburg and other areas of the County. Flooding in Fulks Run damaged houses, farm buildings and roads. Augusta County also experienced county-wide flooding impacts.
May 28-June 3, 2018	A line of thunderstorms brought heavy rains and flash flooding to western and central Virginia. In Rockingham County, including the areas of Harrisonburg, Dayton, and Bridgewater, 2 inches of rain fell in a short amount of time. During the heaviest deluge, rain fell at a rate of 6 inches per hour. The storm stranded vehicles and resulted in several swift water rescues of stranded drivers. Flooding closed several roadways in Augusta County and Rockingham County, including Route 11 in Harrisonburg and Route 42 in Dayton. Route 33 near Swift Run Gap was closed due to a series of mudslides. Businesses in downtown Harrisonburg, as well as City parks flooded. In Dayton, the Cargill Poultry Plant suspended operations when it flooded. A daycare center in Broadway flooded, impacting 95 families, when the center temporarily closed to clean up. Augusta, Highland and Rockingham were included in an agricultural disaster declaration (4378).

Flood	Description and Damages
June 21-22, 2018	A stalled out front caused flooding and damage in Rockingham County and the City of Staunton. In Staunton, a flash flood damaged two homes, four businesses, two vehicles and park amenities at Gypsy Hill Park. The Bergton area of Rockingham County was hit the hardest leading to flooding in low-lying areas. Flooding and downed trees caused road closures in Augusta County and Rockingham County.
June 27-28, 2018	Flooding occurred in the Augusta County area.
August 30, 2018	Severe thunderstorms caused flooding and damages including downed trees, power outages and closed roads in Augusta and Rockingham Counties. The storms included wind gusts of at least 60 mph. Over three inches of rain fell in the area, with the Mount Solon area in northwestern Augusta County being the hardest hit and receiving over four inches. Damaging winds and pea-sized hail were reported.
September 9-September 28, 2018 Hurricane Florence	Hurricane Florence, a category 4 hurricane which downgraded to a tropical depression, widespread flooding in Staunton, Waynesboro and Augusta County closing roads and causing property damage. In Grottoes, the Middle River exceeded the 12 foot flood stage, cresting at 17 feet. The Jennings Branch area and Churchville area experienced flooding, including at Churchville Community Park. Basements and a vehicle flooded in Waynesboro. Staunton declared a local emergency. Augusta and Waynesboro provided sandbags to residents and businesses, and opened emergency shelters. In the Bridgewater area of Rockingham County, Wildwood Park flooded. Rockbridge County was included in an agricultural disaster declaration (4401).
June 29-June 30, 2019	Severe storms resulted in flooding, landslides and mudslides. Augusta, Highland, Rockingham, Harrisonburg, Staunton and Waynesboro were included in an agricultural disaster declaration (4455).

C-II. DAM RISK ASSESSMENT AND INVENTORY

Information in the Dam Risk Assessment and Inventory is taken from the Commonwealth of Virginia Hazard Mitigation Plan, Chapter 3 - HIRA, Section 3.11 Flooding.

Dam Failure

Flooding following a dam failure may occur due to any one or a combination of the following causes:

- *Prolonged periods of rainfall and flooding;*
- *Inadequate spillway capacity;*
- *Internal erosion caused by embankment or foundation leakage or piping;*
- *Improper maintenance, including failure to remove trees and/or woody vegetation, repair internal seepage problems, replace lost material from the cross section of the dam and abutments, failure to clean and remove debris or obstructions, or maintain gates, valves, or other operational components;*
- *Improper design, including the use of improper construction materials and incorrect construction practices or methods;*
- *Improper operation, including failure to remove or open gates or valves during high flow periods;*
- *Failure of upstream dams on the same waterway (dams in serious condition);*
- *High winds, which can cause significant wave action and result in substantial erosion; or Intentional terrorism or criminal acts*

Historic Occurrence

There are no comprehensive databases of historical dam failures, breaches, or dam related flooding in Virginia. Most dam related failures occur due to lack of maintenance, overtopping events, seismic situations, seepage or internal erosion issues, major precipitation events such as hurricanes and thunderstorms, or a combination of any of these factors.

There are not any known historic, catastrophic dam failures in the Central Shenandoah Region to include in this plan.

Risk Assessment

Virginia uses its hazard classification system to determine the level of risk a regulated impounding structure may pose to life and property. According to Virginia law and regulations adopted by the Virginia Soil and Water Conservation Board, hazard classification is based on the potential for loss of life and damage to downstream structures, including but not limited to residences, businesses, occupied structures or roadways. Under this regulatory structures, dams are given a classification in the following manner: High Hazard – "probable loss of life or serous economic damage"; Significant Hazard - "may cause loss of life or appreciable economic damage"; Low Hazard – "no expected loss of life and cause no more than minimal economic damage." As a result, when determining the "risk" of any particular dam, Virginia relies on the determined hazard classification.

Virginia Impounding Structure Regulations require predictive modeling related to dam failure risk under specified conditions. In addition, as part of determining the hazard classification, engineering analyses that result in inundation zone maps include detailed information about potential downstream impacts. These analyses offer predictions of the downstream consequences if a dam were to fail during a storm event or on a "sunny day." These analyses also include maps which aid emergency personnel in warnings and evacuations of downstream homes, schools, or businesses.

The Code of Virginia and the Impounding Structure Regulations can also, on a case by case basis, determine which structures, by virtue of their condition have some greater risk than others. For example, a "Conditional Operation and Maintenance Certificate" defines those elements of the impounding structure that are not in compliance with the regulations and may identify situations where risk factors are increased. Deficiencies can be expressed in inspection reports that follow incidents or other activities on or around the structure. Further, the Department can unilaterally take action under authority granted in §10.1 -608 and §10.1 – 609 for unsafe dams presenting imminent or non-imminent failure. Although in all cases, the hazard classification of the dam is the foundation for any analysis by the Department.

To aid in the implementation of mitigation actions and activities for state regulated dams, especially high hazard dams that pose an unacceptable risk to the public, the Commonwealth of Virginia has available the Virginia Dam Safety, Flood Prevention and Protection Assistance Fund to local governments and private entities for specified dam safety and floodplain management issues. The fund was established to provide matching grants to local governments, including local Soil and Water Conservation Districts, and to private entities owning regulated dams to improve dam safety. This

includes matching grants to local governments for orphan-type dams that are within their jurisdiction. State-owned and federally-owned dams, or dams not regulated pursuant to the Virginia Dam Safety Act are ineligible. The fund also provides matching grants to any local government for the purposes of assisting the local government with improvements to flood prevention or protection. Grants are awarded through a competitive application process, as spelled out in a yearly issued Grant Manual and awards are approved by the Virginia Soil and Water Conservation Board. Scoring criteria for dam safety projects, as outlined in Appendix C of the Grant Manual provides for higher point value assignments for high hazard potential classification dams with unacceptable risks to the public. This includes but is not limited to those high hazard potential classified dams with confirmed spillway deficiencies, large dams with no hazard classification determinations, dams with high numbers of residential units within the dam's probable dam break/inundation zone, and proposed grant projects which focus on critical dam safety program elements such as hazard potential classification analysis, (PMP) impact analysis and certification, and emergency plan (EAP-emergency action plan or EPP-emergency preparedness plan) development.

The Virginia DSFPM also consistently seeks opportunities for assistance from established federal and industry association dam safety grant opportunities that implement mitigation actions and measures for high hazard potential classification dams. Such examples include the Notice of Funding Opportunity (NOFO), Department of Homeland Security (DHS), Rehabilitation of High Hazard Potential Dams (HHPD) and initiatives by the Association of State Dam Safety Officials (ASDSO).

Probability

Predicting the probability of flooding due to dam failure requires a detailed, site-specific engineering analysis for each dam in question. Failure may result from hydrologic and hydraulic design limitations, from geotechnical or operational factors, or from force majeure weather events. The data and time necessary to perform a probabilistic failure analysis for each dam in Virginia is beyond the scope of this plan and regulatory capabilities of Virginia DSFPM. The probability of dam failure due to hydrologic and hydraulic design limitations is related to the regulatory standards for dam spillway design in Virginia. Dams are required to safely pass a spillway design flood (SDF) without failure based on their assigned hazard potential classification, as indicated below in Table 3.11-2.

Table 3.11-2: Performance Standards for Dams

Hazard Potential	Spillway Design Flood (SDF)	Spillway Design Flood (SDF) for Existing Impounding Structures	Minimum Threshold for Incremental Damage Analysis (IDA)
High	PMF	0.9 PMP	100-YR
Significant	0.50 PMF	0.50 PMF	100-YR
Low	100-YR	100-YR	50-YR

PMF = Probable Maximum Flood; PMP = Probable Maximum Precipitation; YR = Year

Note that a dam may be designed to a slightly lower standard than the spillway design flood based on a detailed incremental damage analysis showing that designing the dam to a higher spillway design flood does not further protect the public downstream of the impoundment (i.e. infrastructure downstream already under water / destroyed before any danger from a dam failure were to develop). Low hazard dams expected to result in no loss of human life and no economic damage to any property, except the dam owners, may qualify for a Special Low Hazard rating lowering the required spillway design flood to the 50-year event as well as possibly being exempt from other standards required by the regulations.

Impact and Vulnerability

Failure of dams may result in catastrophic localized damages at both the dam location and downstream areas. Vulnerability to dam failure is dependent on dam operations planning and the nature of downstream development. Depending on the elevation and storage volume of the impoundment, the impact of flooding due to dam failure may include loss of human life, economic losses such as property damage and infrastructure disruption, and environmental impacts such as destruction of habitat. Evaluation of vulnerability and impact is highly dependent on site-specific conditions; no broad-brush approach can be applied at a statewide level.

Owners of impounding structures are required to have dam break inundation zone maps that meet the standards of the Virginia Impounding Structure Regulations. The properties that are identified within the dam break inundation zone are recorded in the dam safety Emergency Plan (EAP – Emergency Action plan or EPP - Emergency Preparedness Plan) for that impoundment. Please note that due to the overall limitations of this Report, the impact and vulnerability to downstream state facilities and critical facilities due to dam failure was not estimated.

Dams with known deficiencies continue to create an ever-growing public safety issue for downstream residents, communities, and overall infrastructure. Virginia DSFPM's main goals are to protect public safety and ensure regulated dams within the Commonwealth of Virginia adhere to the current Impounding Structure Regulations. Virginia DSFPM's yearly Grant Program provides potential financial

aid through a 50% match to dam owners looking to work on their regulated dams to keep them in compliance. In addition, Virginia DSFPM provides dam focused educational trainings to the public to help dam owners understand their dam related regulatory / maintenance responsibilities and to ensure private engineers understand dam related requirements.

As dam related infrastructure continues to age, Virginia DSFPM continues to look into ways to keep dams safe, continues to work to bring newly located dams into compliance, and continues to offer the yearly Grant Program to dam owners. Avenues are being considered to help increase the Virginia DSFPM staff to better manage existing workloads and staff are looking into creative ways to institute online video based training centered around dam related information / dam ownership.

Virginia DSFPM has implemented a new online database called DSIS which continues to be populated with dam related data for dams. By continuing to maintain and populate DSIS with important data such as inundation studies and Emergency Plans, Virginia DSFPM has real-time access to critical dam information which is invaluable during emergencies and helpful in planning situations (development downstream). Access to a system like DSIS helps to reduce long term dam related vulnerabilities within the Commonwealth and decrease the ever-growing unacceptable risk to the general public.

Risk

As of May 2019, Virginia DSFPM is aware of approximately 3,590 dams within the Commonwealth based on information provided in DSIS (see previous discussions within this section regarding DSIS (Dam Safety Inventory System)) and the 2018 National Inventory of Dams data from the US Army Corps of Engineers. Out of those 3,590 known dams, Virginia DSFPM is known to regulate approximately 2,034 dams (57%). When evaluating the 2,034 dams; it is know that there are approximately 313 high hazard (15%), 166 significant hazard (8%), 262 low hazard (13%), and 1,293 unknown hazard (64%) dams regulated by Virginia DSFPM. At this time Virginia DSFPM has decided to utilize the label "unknown hazard potential classification" for dams where an inundation study is required to be performed by the dam owner's engineer and submitted, reviewed, and approved (confirmed) by Virginia DSFPM prior to assignment of a final hazard potential classification.

Dam related data including geographically based information is constantly being revised and updated within the Commonwealth of Virginia as better data / technology becomes available. As a result, latitude / longitude coordinates were provided for all included high hazard dams (see above) for the use by the public to locate high hazard dams rather than pre-made geographic maps. Please contact either the Virginia Department of Emergency Management (VDEM) GIS section or Virginia DSFPM if geographically based maps are required. This approach regarding geographic based maps will ensure that the most up-to-date dam related information is being provided at the time of the mapping request.

Please note that it is recommended by Virginia DSFPM that the dam related information presented in Section 3.11 of the Virginia Hazard Mitigation Plan be reviewed annually and updated as necessary to ensure accurate information is provided for planning, public safety, and emergency management purposes.

Future Conditions Considerations

As precipitation amounts fluctuate and extreme weather events become more common, the flood control and impoundment infrastructure in Virginia becomes more of a concern. Like most of the country, the infrastructure in Virginia is overwhelmingly privately owned and maintained, and it is aging – in many cases, to the end of its design life. The occurrence of more frequent high intensity rainfall events may create conditions that exceed the original design criteria of these aging facilities.

During the 20-year period of January 1, 1996 to December 31, 2016, the NCEI (National Centers for Environmental Information) recorded 1,154 heavy rain events in Virginia. This equates to an average of 57.7 heavy rain events per year. A review of the individual records suggests that this type of event is increasing in both frequency and intensity over time. While a 20-year data set is too limited to establish a long-term outlook, it does indicate a trend. If this trend continues, it could be detrimental to flood control and impoundment infrastructure throughout Virginia. More frequent and/or more intense rain events may increase the risk of potential failure, which increases the risk to downstream properties and residents.

Table C-1: Known High Hazard Potential Classification Dams Regulated by Virginia Dam Safety and Floodplain Management

VDEM Region	VA ID #	Dam Name	Regulatory	Owners	Hazard	City/County	Latitude	Longitude
3	165001	Lower North River #80	VA DSFPM	Shenandoah Valley SWCD	High	Rockingham County	38.4717	-79.0613
3	165002	Lower North River #78	VA DSFPM	Shenandoah Valley SWCD	High	Rockingham County	38.45	-79.1598
3	165003	Lower North River #83	VA DSFPM	Shenandoah Valley SWCD	High	Rockingham County	38.4707	-79.1428
3	165004	Lower North River #22B	VA DSFPM	Shenandoah Valley SWCD	High	Rockingham County	38.562	-79.0904
3	165005	Lake Shenandoah Dam	VA DSFPM	VA DGIF	High	Rockingham County	38.3789	-78.8326
3	165006	Lower North River #81C	VA DSFPM	City of Harrisonburg	High	Rockingham County	38.5718	-79.1377
3	165007	Lower North River #82	VA DSFPM	Shenandoah Valley SWCD	High	Rockingham County	38.5885	-79.1219
3	165009	Shoemaker River #1A	VA DSFPM	Shenandoah Valley SWCD	High	Rockingham County	38.5589	-78.9696
3	165010	Shoemaker River #4C	VA DSFPM	Shenandoah Valley SWCD	High	Rockingham County	38.6108	-78.9711
3	165011	Shoemaker River #3B	VA DSFPM	Shenandoah Valley SWCD	High	Rockingham County	38.592	-78.9738
3	660001	Newman Lake Dam	VA DSFPM	James Madison	High	City of Harrisonburg	38.4314	-78.8748

Table C-1: Known High Hazard Potential Classification Dams Regulated by Virginia Dam Safety and Floodplain Management

VDEM Region	VA ID #	Dam Name	Regulatory Agency	Owners	Hazard Class	City/County	Latitude	Longitude
3	015001	South River Dam #26	VA DSFPM	Headwaters SWCD	High	Augusta County	38.0144	-78.9241
3	015002	South River Dam #25	VA DSFPM	Headwaters SWCD	High	Augusta County	37.9641	-78.9479
3	015004	South River Dam #10A	VA DSFPM	Augusta County	High	Augusta County	37.9532	-79.0006
3	015005	Upper North River Dam #10	VA DSFPM	Headwaters SWCD	High	Augusta County	38.3639	-79.2058
3	015006	Upper North River Dam #76	VA DSFPM	City of Staunton	High	Augusta County	38.3266	-79.2234
3	015007	Upper North River Dam #77	VA DSFPM	Headwaters SWCD	High	Augusta County	38.3938	-79.1602
3	015008	South River Dam #23	VA DSFPM	Headwaters SWCD	High	Augusta County	38.0046	-78.9202
3	015009	South River Dam #6	VA DSFPM	Headwaters SWCD	High	Augusta County	37.9911	-79.1221
3	015011	South River Dam #4	VA DSFPM	Headwaters SWCD	High	Augusta County	37.9627	-79.1502
3	015012	South River Dam #11	VA DSFPM	Headwaters SWCD	High	Augusta County	37.9925	-78.9905
3	015014	South River Dam #19	VA DSFPM	Headwaters SWCD	High	Augusta County	38.0133	-78.9695

Table C-1 : Known High Hazard Potential Classification Dams Regulated by Virginia Dam Safety and Floodplain Management

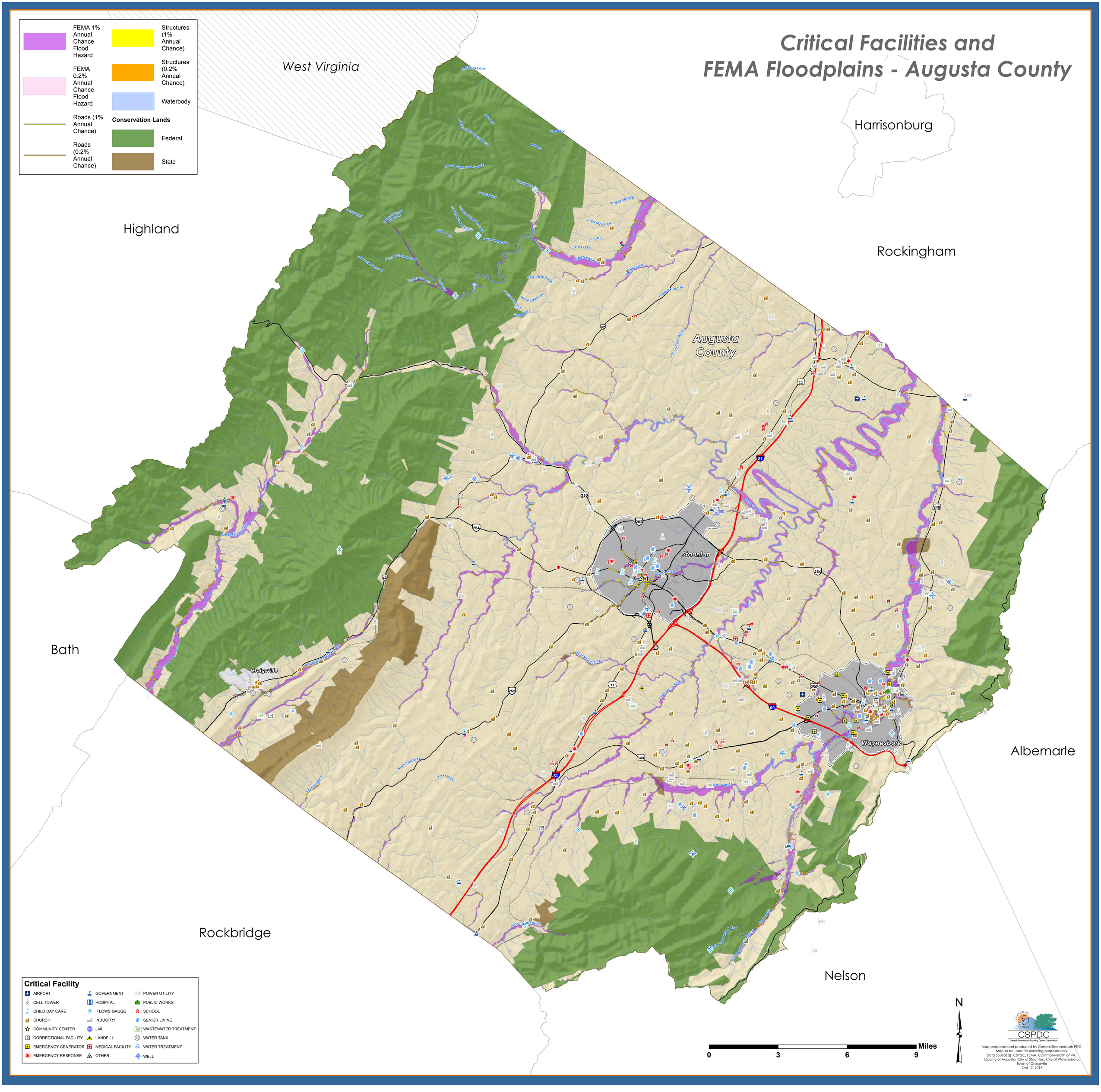
VDEM Region	VA ID #	Dam Name	Regulatory	Owners	Hazard	City/County	Latitude	Longitude
3	015018	Staunton Dam	VA DSFPM	City of Staunton	High	Augusta County	38.3333	-79.2065
3	015019	Coles Run Dam	VA DSFPM	Augusta County	High	Augusta County	37.9761	-79.0303
3	015022	South River Dam #7	VA DSFPM	Headwaters SWCD	High	Augusta County	38.0175	-79.0962
3	820001	South River Dam #8A	VA DSFPM	City of Waynesboro	High	City of Waynesboro	38.0526	-78.8732
6	163001	Goshen Dam	VA DSFPM	B.S.A., National	High	Rockbridge County	37.9597	-79.4592
6	163002	Robertson Dam	VA DSFPM	VA DGIF	High	Rockbridge County	37.8015	-79.6053
6	163003	Moore's Creek Dam	VA DSFPM	City of Lexington	High	Rockbridge County	37.7473	-79.6462
6	163007	Turner Pond Dam	VA DSFPM	VCLF Land Trust & DCR State Parks	High	Rockbridge County	37.6416	-79.5413
6	163013	Natural Bridge Dam #5	VA DSFPM	VCLF Land Trust & DCR State Parks	High	Rockbridge County	37.624	-79.543
6	017001	Douthat Lake Dam	VA DSFPM	Virginia DCR - State Parks	High	Bath County	37.9037	-79.8039

Table C-2: Known High Hazard Potential Classification Dams NOT Regulated by Virginia Dam Safety and Floodplain Management

VDEM Region	VA ID #	Dam Name	Regulatory Agency	Owners	Hazard Class	City/County	Latitude	Longitude
6	017006	Bath County Pumped Storage - Upper Dam	FERC	Dominion Energy, Bath County LLC, and Allegheny Power	High	Bath County	38.2266	-79.823
6	017007	Bath County Pumped Storage - Lower Dam	FERC	Dominion Energy, Bath County LLC, and Allegheny Power	High	Bath County	38.1973	-79.8065

Appendix D - Critical Facilities Maps

Critical Facilities and FEMA Floodplains - Augusta County



CSPDC
Central Shenandoah Planning District Commission

Map prepared and produced by Central Shenandoah PDC.
Map to be used for planning purposes only.
Data Source(s): CSPDC, FEMA, Commonwealth of VA,
County of Augusta, City of Staunton, City of Waynesboro,
Town of Craigsville
Oct 17, 2019

Critical Facilities and FEMA Floodplains - Bath County

- FEMA 1% Annual Chance Flood Hazard
- Structures (1% Annual Chance)
- Roads (1% Annual Chance)
- Waterbody

Conservation Lands

- Federal
- State

Highland

West Virginia

Augusta

Bath County

Rockbridge

Alleghany

Covington

Critical Facility

AIRPORT	GOVERNMENT	POWER UTILITY
CHILD DAY CARE	HOSPITAL	SCHOOL
CHURCH	INDUSTRY	SENIOR LIVING
COURTHOUSE	JAIL	UTILITY
EMERGENCY RESPONSE	LANDFILL	WASTEWATER TREATMENT

N

0 2.5 5 7.5 Miles

CSPDC
Central Shenandoah Planning District Commission

Map prepared and produced by Central Shenandoah PDC.
Map to be used for planning purposes only.
Data Source(s): CSPDC, FEMA, Commonwealth of VA, Bath County
October 18, 2019

Critical Facilities and FEMA Floodplains - Highland County

FEMA 1% Annual Chance Flood Hazard

Roads (1% Annual Chance)

Structures (1% Annual Chance)

Waterbody

Conservation Lands

Federal

State

West Virginia

West Virginia

Highland County

Monterey

Augusta

Bath

Critical Facility

CHURCH | EMERGENCY RESPONSE | SCHOOL

COURTHOUSE | GOVERNMENT | WASTEWATER TREATMENT

0 2 4 6 Miles

N

CSPDC

Central Shenandoah Planning District Commission

Map prepared and produced by Central Shenandoah PDC.
Map to be used for planning purposes only.
Data Source(s): CSPDC, FEMA, Commonwealth of VA, Highland County, Town of Monterey
Sept. 25, 2019

Critical Facilities and FEMA Floodplains - Rockbridge County

FEMA 1% Annual Chance Flood Hazard

FEMA 0.2% Annual Chance Flood Hazard

Roads (1% Annual Chance)

Roads (0.2% Annual Chance)

Structures (1% Annual Chance)

Structures (0.2% Annual Chance)

Waterbody

Conservation Lands

Federal

State

Augusta

Bath

Alleghany

Nelson

Amherst

Botetourt

Bedford

Rockbridge County

Goshen

Lexington

Buena Vista

Glasgow

Critical Facility

- CHILD DAY CARE
- CHURCH
- COMMUNITY CENTER
- CORRECTIONAL FACILITY
- COURTHOUSE
- EMERGENCY RESPONSE
- EOC AND COMMUNICATION
- GOVERNMENT
- HOSPITAL
- INDUSTRY
- JAIL
- LANDFILL
- MEDICAL FACILITY
- POWER UTILITY
- SCHOOL
- SENIOR LIVING
- SUBSIDIZED HOUSING
- TRAVEL CENTER
- VISITOR'S CENTER
- WASTEWATER TREATMENT
- WATER TANK
- WATER TREATMENT
- WELL

0 2.5 5 7.5 Miles

N

CSPDC
Central Shenandoah Planning District Commission

Map prepared and produced by Central Shenandoah PDC.
Map to be used for planning purposes only.
Data Source(s): CSPDC, FEMA, Commonwealth of VA, Rockbridge County, City of Buena Vista, City of Lexington, Town of Glasgow, Town of Goshen
Sept. 24, 2019

Critical Facilities and FEMA Floodplains - Rockingham County

- FEMA 1% Annual Chance Flood Hazard
- FEMA 0.2% Annual Chance Flood Hazard
- FEMA Area with reduced flood risk due to levee
- Roads (1% Annual Chance)
- Roads (0.2% Annual Chance)
- Structures (1% Annual Chance)
- Structures (0.2% Annual Chance)
- Water Body

Conservation Lands

- Federal
- State

Warren

Shenandoah

West Virginia

Page

Rockingham County

Madison

Harrisonburg

Timberville

Broadway

Dayton

Bridgewater

Mt. Crawford

Elkton

Grottoes

Greene

Augusta

Albemarle

Critical Facility

CHILD DAY CARE	INDUSTRY	POWER UTILITY	TOWN HALL
CHURCH	JAIL	PUBLIC WORKS	WASTEWATER PUMP STATION
COMMUNITY CENTER	LANDFILL	RETAIL	WASTEWATER TREATMENT
EMERGENCY RESPONSE	MEDICAL FACILITY	SCHOOL	WATER TANK
GOVERNMENT	OTHER	SENIOR LIVING	WATER TREATMENT
HOSPITAL	POLICE DEPT	SPRING	WELL

N

0 3 6 9 Miles

CSPDC
Central Shenandoah Planning District Commission

Map prepared and produced by Central Shenandoah PDC.
Map to be used for planning purposes only.
Data Source(s): CSPDC, FEMA, Commonwealth of VA, County of Rockingham, City of Harrisonburg, Towns of Broadway, Bridgewater, Timberville, Grattoes, Mt. Crawford, Elkton and Dayton.
Sept. 20, 2019

Critical Facilities and FEMA Floodplains - City of Buena Vista

FEMA 1% Annual Chance Flood Hazard
FEMA 0.2% Annual Chance Flood Hazard
Structures (1% Annual Chance)
Structures (0.2% Annual Chance)
Roads (1% Annual Chance)
Roads (0.2% Annual Chance)

Rockbridge County

City of Buena Vista

JORDAN RD
DUCK PONL
LONGHOLLOW RD
REIDS HILL RD
BRAE HAVEN L
SBURG RD
HILLSIDE DR
LONG HOLLOW RD
CATALPA AVE
34TH ST
60
28TH ST
RIDGE AVE
FORGE RD
PAXTON HOUSE DR
VISTA LINKS DR
GLEN MAURY PARK RD
WALNUT AVE
24TH ST
23RD ST
22ND ST
21ST ST
South Fork Chalk Run
19TH ST
MAPLE AVE
BIRCH AVE
Indian Gap Run
18TH ST
ROCKSPRING LN
10TH ST
FOREST AVE
CEDAR AVE
WHEATLAN DR
KEYES MILL RD
Maury River
OAK AVE
HAWTHORN AVE
PINE AVE
13TH ST
4TH ST
WOODLAND AVE
DICKINSON LN
HAZEL AVE
Noels Run
ROBINSON GAP RD
BEVERLY HOLLOW LN

Critical Facility

CHILD DAY CARE
CHURCH
EMERGENCY RESPONSE
EOC AND COMMUNICATION
GOVERNMENT
INDUSTRY
SCHOOL
SENIOR LIVING
VISITOR'S CENTER
WASTEWATER TREATMENT
WELL

N

0 0.3 0.6 Miles

Celebrating 50 Years
CSPDC
Central Shenandoah Planning District Commission

Map prepared and produced by Central Shenandoah PDC.
Map to be used for planning purposes only.
Data Source(s): CSPDC, FEMA, Commonwealth of VA, City of Buena Vista
Sept. 20, 2019

Critical Facilities and FEMA Floodplains - City of Harrisonburg

FEMA 1% Annual Chance Flood Hazard
FEMA 0.2% Annual Chance Flood Hazard
Roads (1% Annual Chance)
Roads (0.2% Annual Chance)
Structures (1% Annual Chance)
Structures (0.2% Annual Chance)

City of Harrisonburg

Rockingham County

Critical Facility
EMERGENCY RESPONSE
HOSPITAL
JAIL
SENIOR LIVING
GOVERNMENT
INDUSTRY
LANDFILL
WATER TANK
SCHOOL

N

0 0.5 1 Miles

Map prepared and produced by Central Shenandoah PDC.
Map to be used for planning purposes only.
Data Source(s): CSPDC, FEMA, Commonwealth of VA, City of Harrisonburg
Sept. 18, 2019

Celebrating 50 Years
CSPDC
Central Shenandoah Planning District Commission

Critical Facilities and FEMA Floodplains - City of Lexington

FEMA 1% Annual Chance Flood Hazard
FEMA 0.2% Annual Chance Flood Hazard
Structures (1% Annual Chance)
Structures (0.2% Annual Chance)
Roads (1% Annual Chance)
Roads (0.2% Annual Chance)

Rockbridge County
City of Lexington

ALPHIN LN
GREENHOUSE RD
64
FURRS MILL RD
HUNTER HILL RD
11
60
DENNY CIR
Woods Creek
Maury River
OLD BUENA VISTA RD
Mill Creek
BORDEN RD
LIME KILN RD
ENFIELD RD
PRESTON ST
LEWIS ST
MCCORKLE DR
SCOTLAND DR
RIVERBEND DR
JACKSON AVE
ROSS RD
HOUSTON ST
MCCORKLE EXT DR
FLOWER LN
251
SHENANDOAH RD
OLD FARM RD
MEMORIAL LN
JACOBS LDR
Gordons Run
POPLAR HILL RD

Critical Facility

- CHILD DAY CARE
- CHURCH
- COMMUNITY CENTER
- COURTHOUSE
- EMERGENCY RESPONSE
- GOVERNMENT
- HOSPITAL
- INDUSTRY
- JAIL
- MEDICAL FACILITY
- SCHOOL
- SENIOR LIVING
- SUBSIDIZED HOUSING
- WASTEWATER TREATMENT
- WATER TANK
- WATER TREATMENT

N

0 0.25 0.5 Miles

Map prepared and produced by Central Shenandoah PDC.
Map to be used for planning purposes only.
Data Source(s): CSPDC, FEMA, Commonwealth of VA, City of Lexington
October 17, 2019

Celebrating 50 Years
CSPDC
Central Shenandoah Planning District Commission

Critical Facilities and FEMA Floodplains - City of Staunton

FEMA 1% Annual Chance Flood Hazard
FEMA 0.2% Annual Chance Flood Hazard
Structures (1% Annual Chance)
Structures (0.2% Annual Chance)
Roads (1% Annual Chance)
Roads (0.2% Annual Chance)

Augusta County

City of Staunton

SHUTTERLEE MILL RD
ANDERSON SCHOOL LN
SPRING HILL RD
BERRY LN
LIMESTONE RD
QUICKS MILL RD
MAURY MILL RD
RIVER VIEW DR
MIDDLE RIVER
PLEASANT VIEW RD
BERRY FARM RD
GALENA RD
FARMINGTON DR
EDGEFIELD LN
BALDWIN LN
SHADY HOLLOW LN
BON LEA DR
CEDAR LN
TECHNOLOGY DR
FROG POND RD
250
262
11
RAINBOW DR
BALDWIN DR
COLLEGE CIR
WOODLEE RD
WOODLAND DR
SPRINGHILL RD
COUNTRY CLUB RD
BELLS LN
MORRIS MILL RD
GRUBERT AVE
THIRD ST
SELMA BLVD
THORNROSE AVE
COALTER ST
BEVERLEY ST
LEWIS CREEK
254
BUTTERMILK SPRING RD
MONTGOMERY AVE
STUART ST
JOHNSON ST
NATIONAL AVE
81
64
STATE ROUTE 1426
BALSLEY RD
SANGERS LN
RITCHIE BLVD
FRONTIER DR
BARTERBROOK RD
LARIAT CIR
EQUESTRIAN DR
HEATHER LN
OLD GREENVILLE RD
SR 218
MAINE CIR
CHRISTIANS CREEK
OLD GOOSE CREEK RD
HAMMOND
TISDALE FARM LN

Critical Facility

- CELL TOWER
- CHILD DAY CARE
- CHURCH
- EMERGENCY RESPONSE
- GOVERNMENT
- IFLOWS GAUGE
- INDUSTRY
- JAIL
- MEDICAL FACILITY
- OTHER
- POWER UTILITY
- PUBLIC WORKS
- SCHOOL
- SENIOR LIVING
- WATER TANK
- WATER TREATMENT
- WELL

N

0 0.5 1 Miles

Celebrating 50 Years
CSPDC
Central Shenandoah Planning District Commission

Map prepared and produced by Central Shenandoah PDC.
Map to be used for planning purposes only.
Data Source(s): CSPDC, FEMA, Commonwealth of VA, City of Staunton
Sept. 19, 2019

Critical Facilities and FEMA Floodplains - City of Waynesboro

FEMA 1% Annual Chance Flood Hazard
FEMA 0.2% Annual Chance Flood Hazard
Structures (1% Annual Chance)
Structures (0.2% Annual Chance)
Roads (1% Annual Chance)
Roads (0.2% Annual Chance)

Conservation Lands

Federal
State

Augusta County

City of Waynesboro

Nelson

Critical Facility

AIRPORT
CELL TOWER
CHILD DAY CARE
CHURCH
EMERGENCY GENERATOR
EMERGENCY RESPONSE
GOVERNMENT
IFLOWS GAUGE
INDUSTRY
POWER UTILITY
PUBLIC WORKS
SCHOOL
SENIOR LIVING
WASTEWATER TREATMENT
WATER TANK
WATER TREATMENT
WELL

N

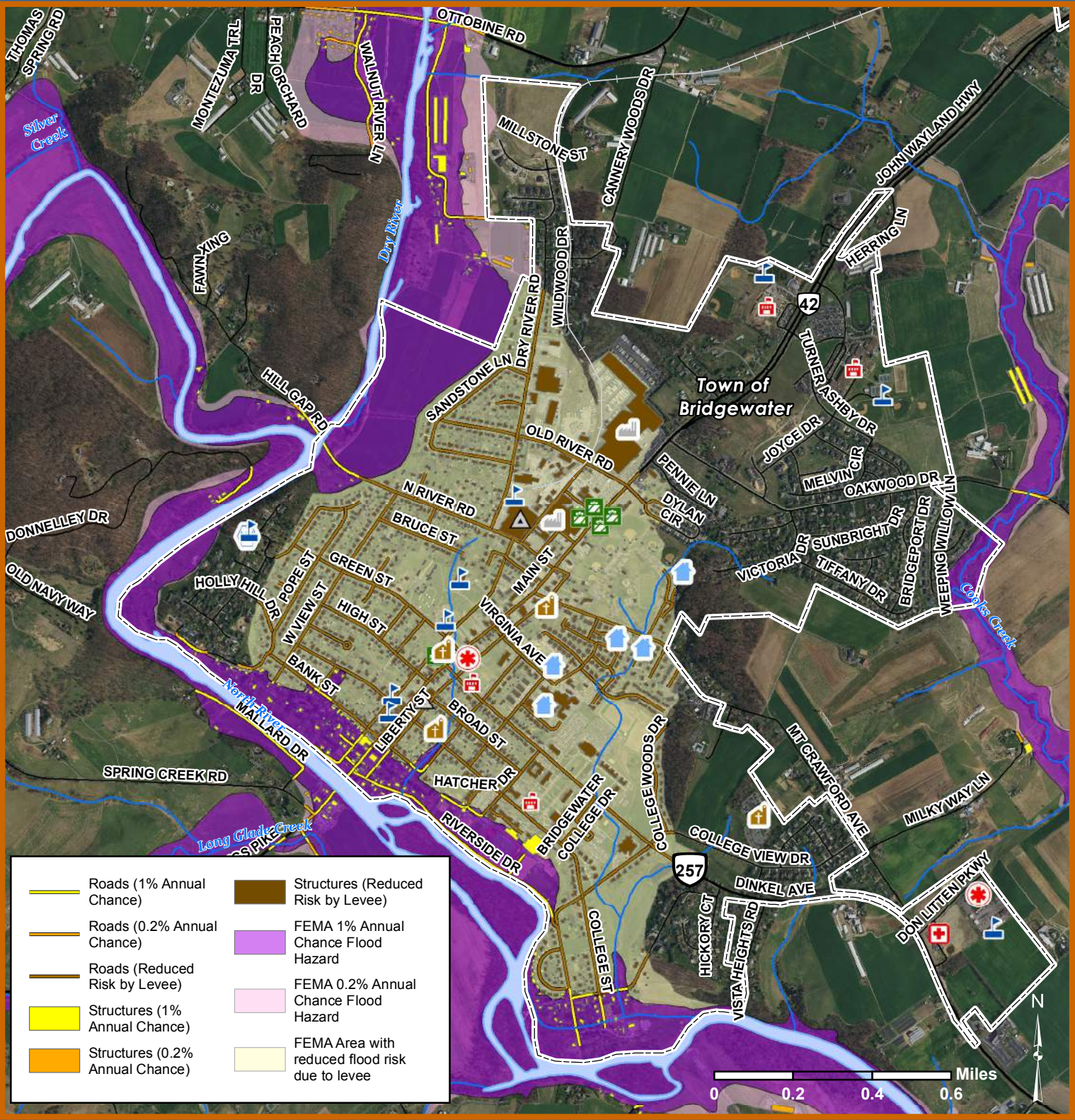
0 0.5 1 Miles

CSPDC
Central Shenandoah Planning District Commission

Map prepared and produced by Central Shenandoah PDC.
Map to be used for planning purposes only.
Data Source(s): CSPDC, FEMA, Commonwealth of VA, City of Waynesboro
Sept. 19, 2019

Central Shenandoah Planning District

Critical Facilities and FEMA Floodplains - Town of Bridgewater



CSPDC

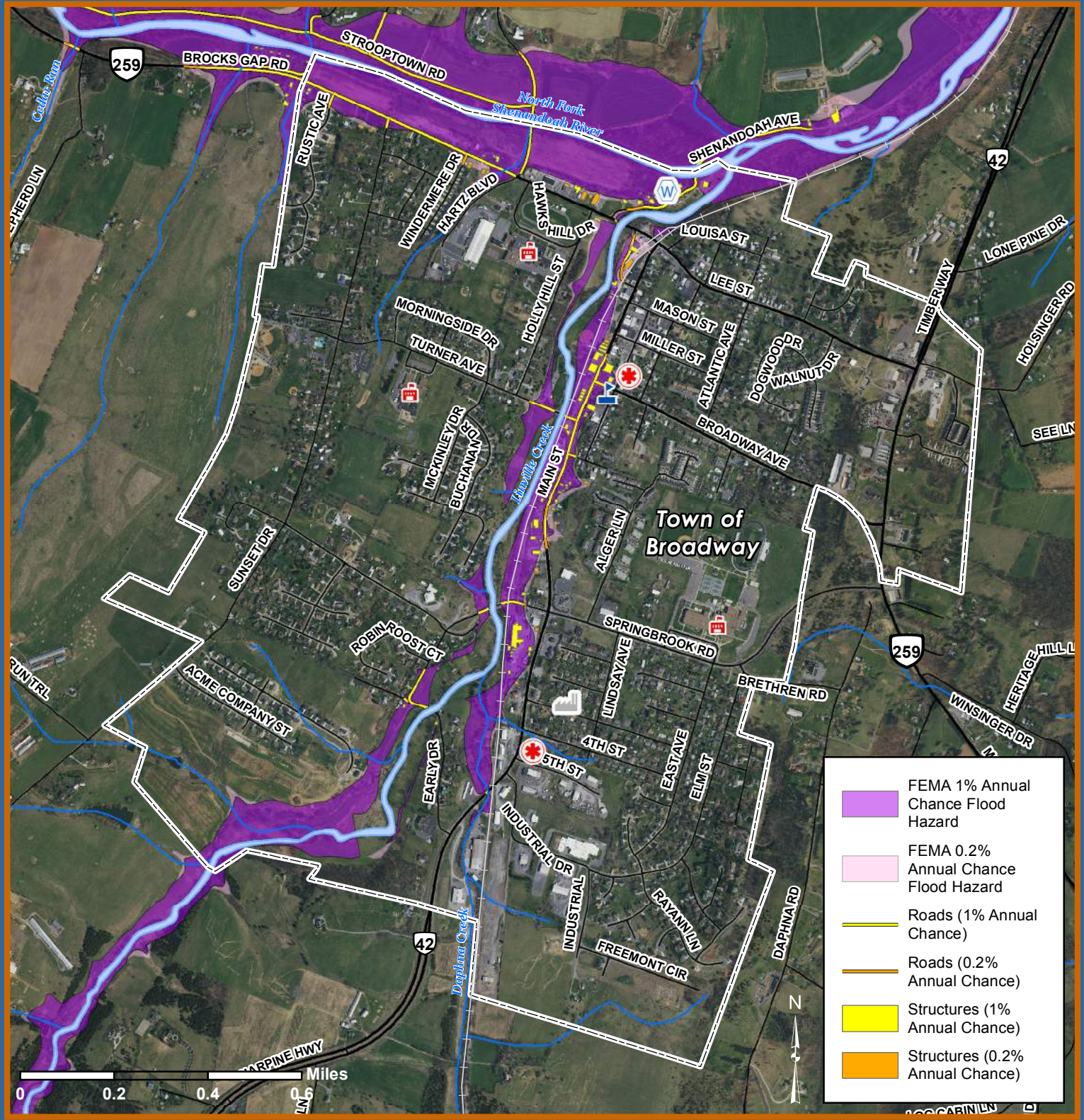
Map prepared and produced by Central Shenandoah PDC.
Map to be used for planning purposes only.
Data Source(s): CSPDC, FEMA, Commonwealth of VA, Town of Bridgewater
Sept. 16, 2019

Critical Facility

- CHURCH
- EMERGENCY RESPONSE
- GOVERNMENT
- INDUSTRY
- MEDICAL FACILITY
- OTHER
- RETAIL
- SCHOOL
- SENIOR LIVING
- WATER TREATMENT

Central Shenandoah Planning District

Critical Facilities and FEMA Floodplains - Town of Broadway



CSPDC

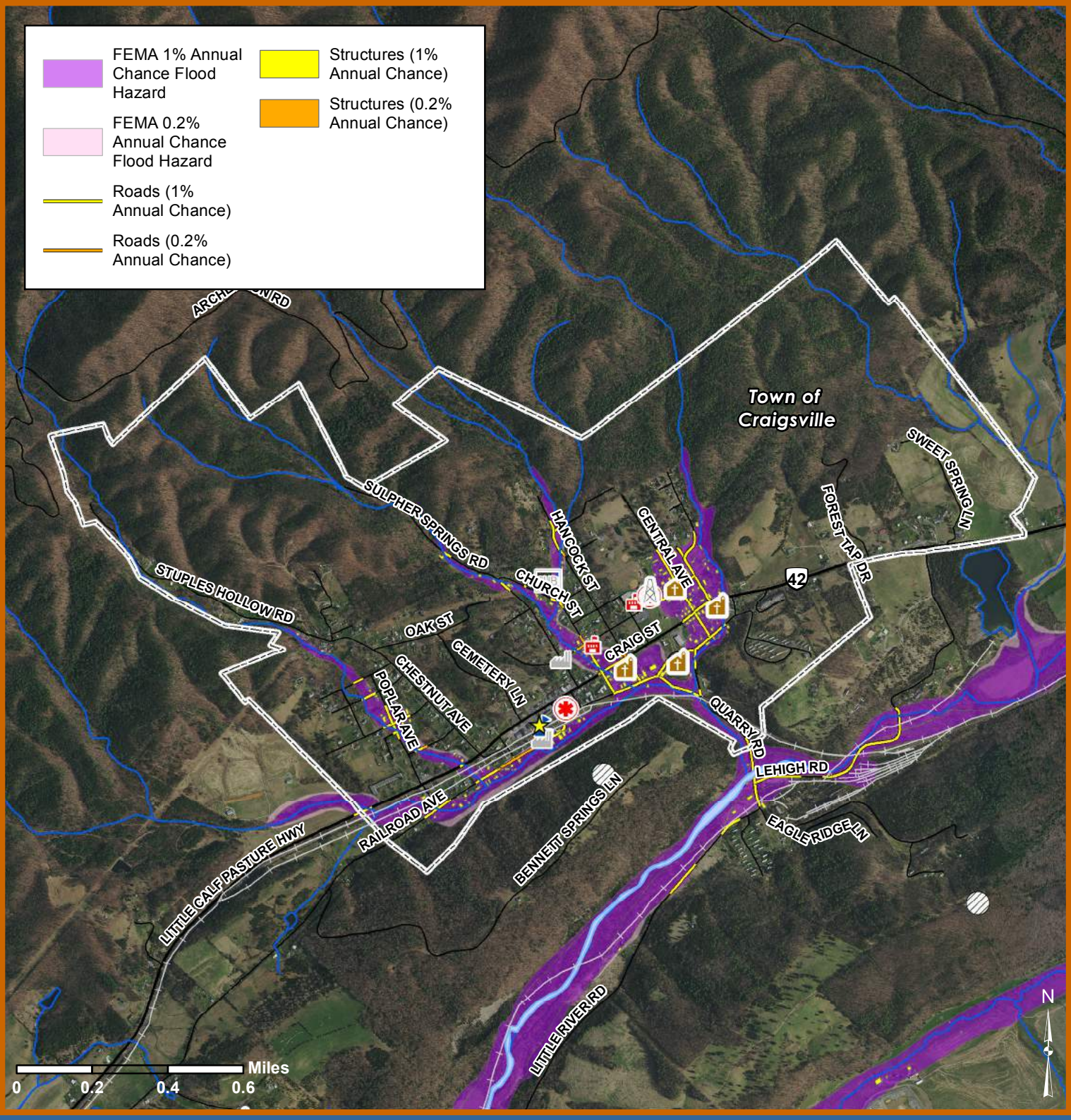
Map prepared and produced by Central Shenandoah PDC.
Map to be used for planning purposes only.
Data Source(s): CSPDC, FEMA, Commonwealth of VA, Town of Broadway
Sept. 17, 2019

Critical Facility

- EMERGENCY RESPONSE
- INDUSTRY
- GOVERNMENT
- SCHOOL
- WATER TREATMENT

Central Shenandoah Planning District

Critical Facilities and FEMA Floodplains - Town of Craigsville



CSPDC

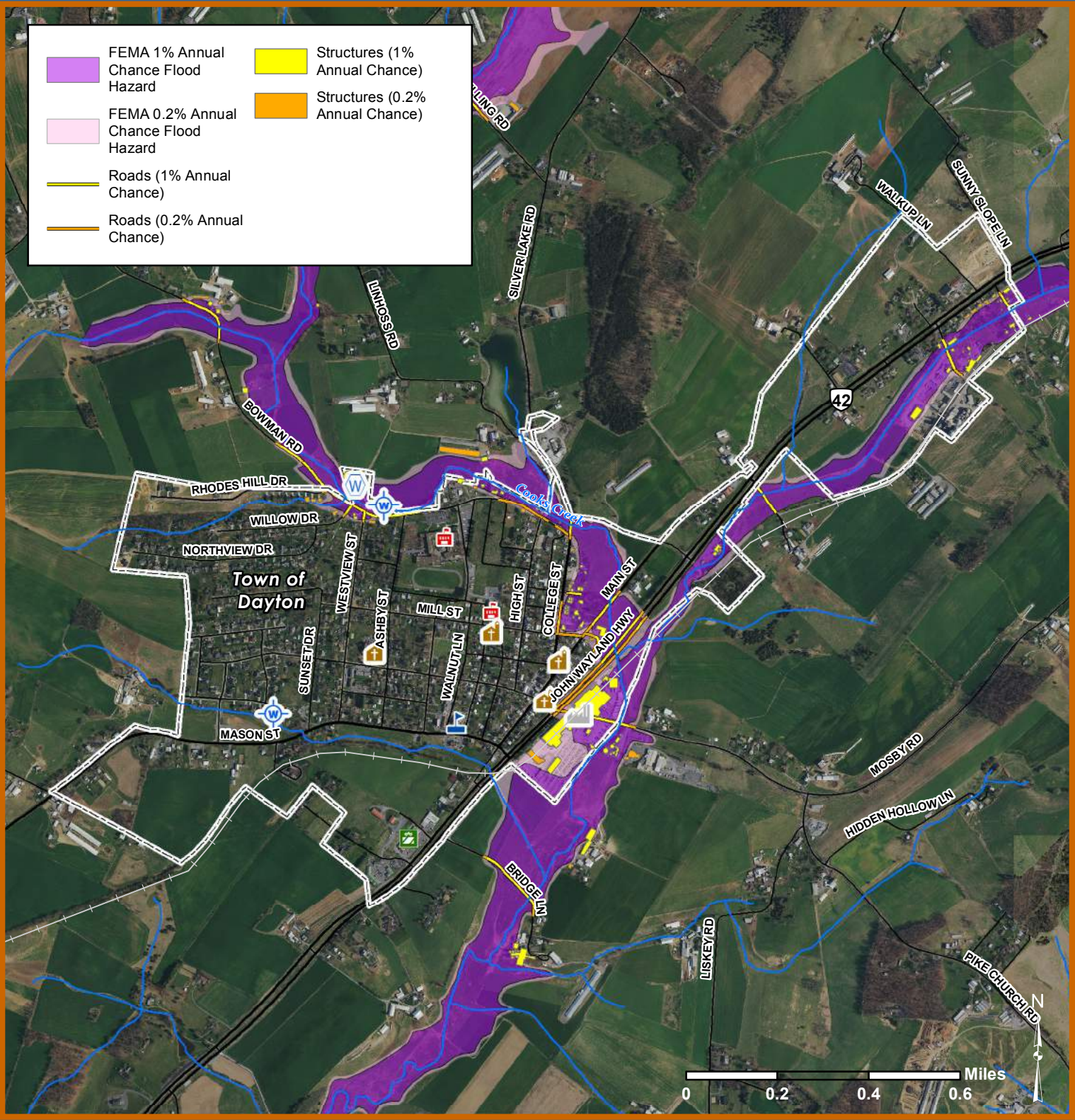
Map prepared and produced by Central Shenandoah PDC.
Map to be used for planning purposes only.
Data Source(s): CSPDC, FEMA, Commonwealth of VA, Town of Craigsville
October 17, 2019

Critical Facility

- CELL TOWER
- CHURCH
- COMMUNITY CENTER
- EMERGENCY RESPONSE
- GOVERNMENT
- IFLOWS GAUGE
- INDUSTRY
- POWER UTILITY
- SCHOOL
- WATER TANK

Central Shenandoah Planning District

Critical Facilities and FEMA Floodplains - Town of Dayton



CSPDC

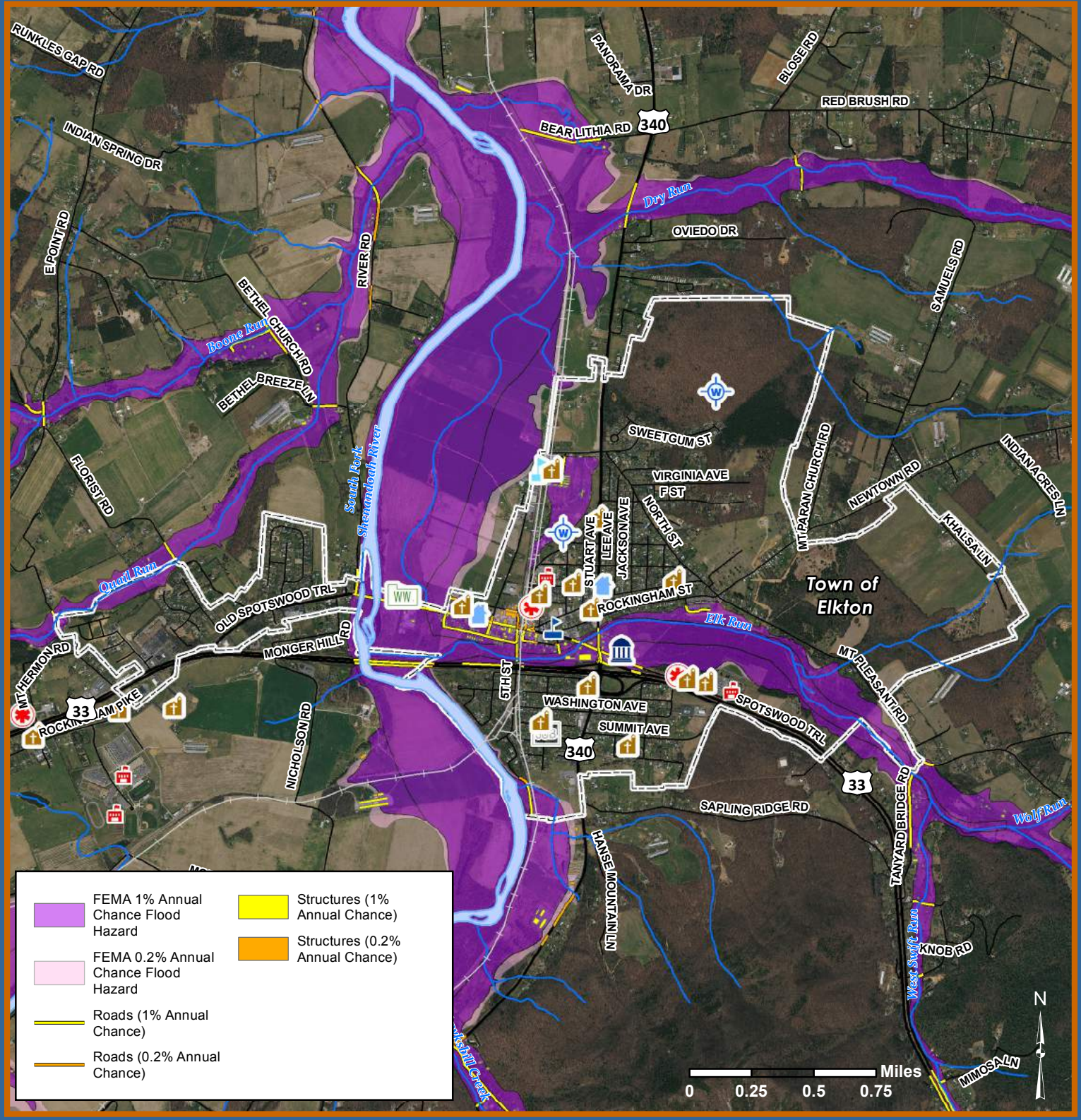
Map prepared and produced by Central Shenandoah PDC.
Map to be used for planning purposes only.
Data Source(s): CSPDC, FEMA, Commonwealth of VA, Town of Dayton
Sept. 18, 2019

Critical Facility

- CHURCH
- GOVERNMENT
- INDUSTRY
- RETAIL
- SCHOOL
- WATER TREATMENT
- WELL

Central Shenandoah Planning District

Critical Facilities and FEMA Floodplains - Town of Elkton



CSPDC

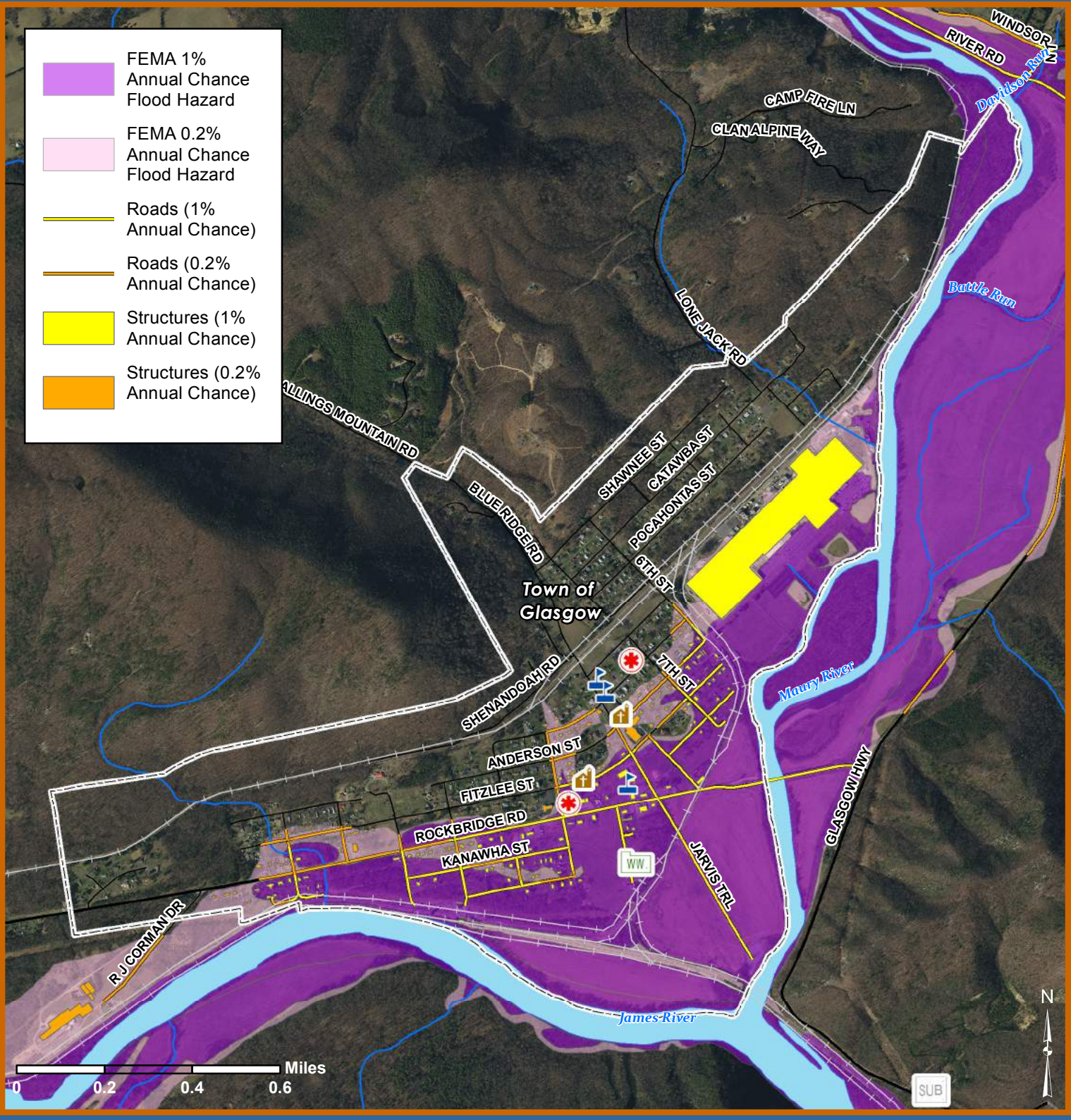
Map prepared and produced by Central Shenandoah PDC.
Map to be used for planning purposes only.
Data Source(s): CSPDC, FEMA, Commonwealth of VA, Town of Elkton
October 17, 2019

Critical Facility

- CHILD DAY CARE
- CHURCH
- EMERGENCY RESPONSE
- GOVERNMENT
- POWER UTILITY (SUB)
- SCHOOL
- SENIOR LIVING
- TOWN HALL
- WASTEWATER TREATMENT (WW)
- WELL

Central Shenandoah Planning District

Critical Facilities and FEMA Floodplains - Town of Glasgow



CSPDC

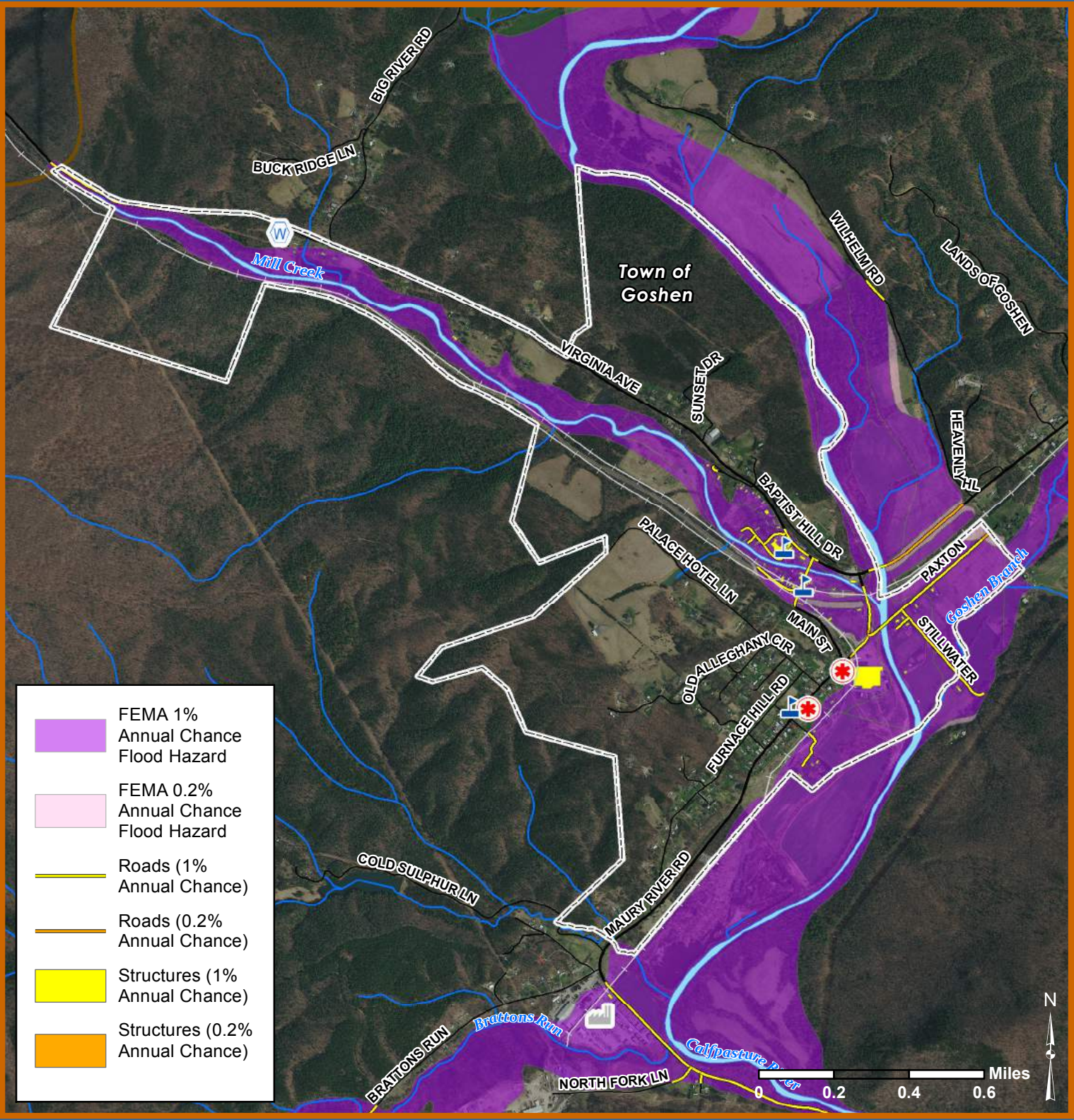
Map prepared and produced by Central Shenandoah PDC.
Map to be used for planning purposes only.
Data Source(s): CSPDC, FEMA, Commonwealth of VA, Town of Glasgow
Sept. 18, 2019

Critical Facility

- CHURCH
- EMERGENCY RESPONSE
- GOVERNMENT
- SUB POWER UTILITY
- WW WASTEWATER TREATMENT

Central Shenandoah Planning District

Critical Facilities and FEMA Floodplains - Town of Goshen



CSPDC

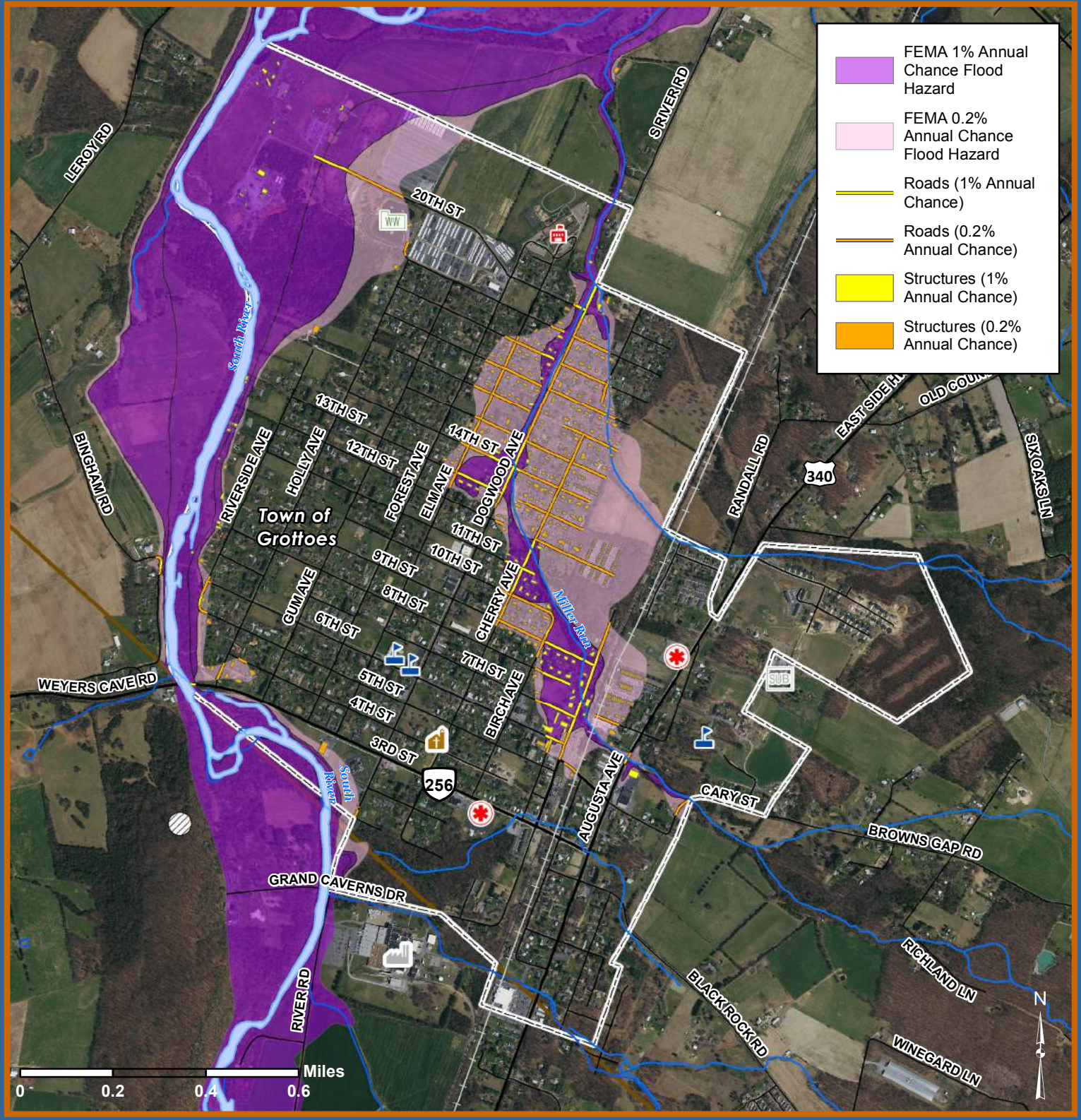
Map prepared and produced by Central Shenandoah PDC.
Map to be used for planning purposes only.
Data Source(s): CSPDC, FEMA, Commonwealth of VA, Town of Goshen
Sept. 18, 2019

Critical Facility

- EMERGENCY RESPONSE
- INDUSTRY
- GOVERNMENT
- WATER TREATMENT

Central Shenandoah Planning District

Critical Facilities and FEMA Floodplains - Town of Grottoes



CSPDC

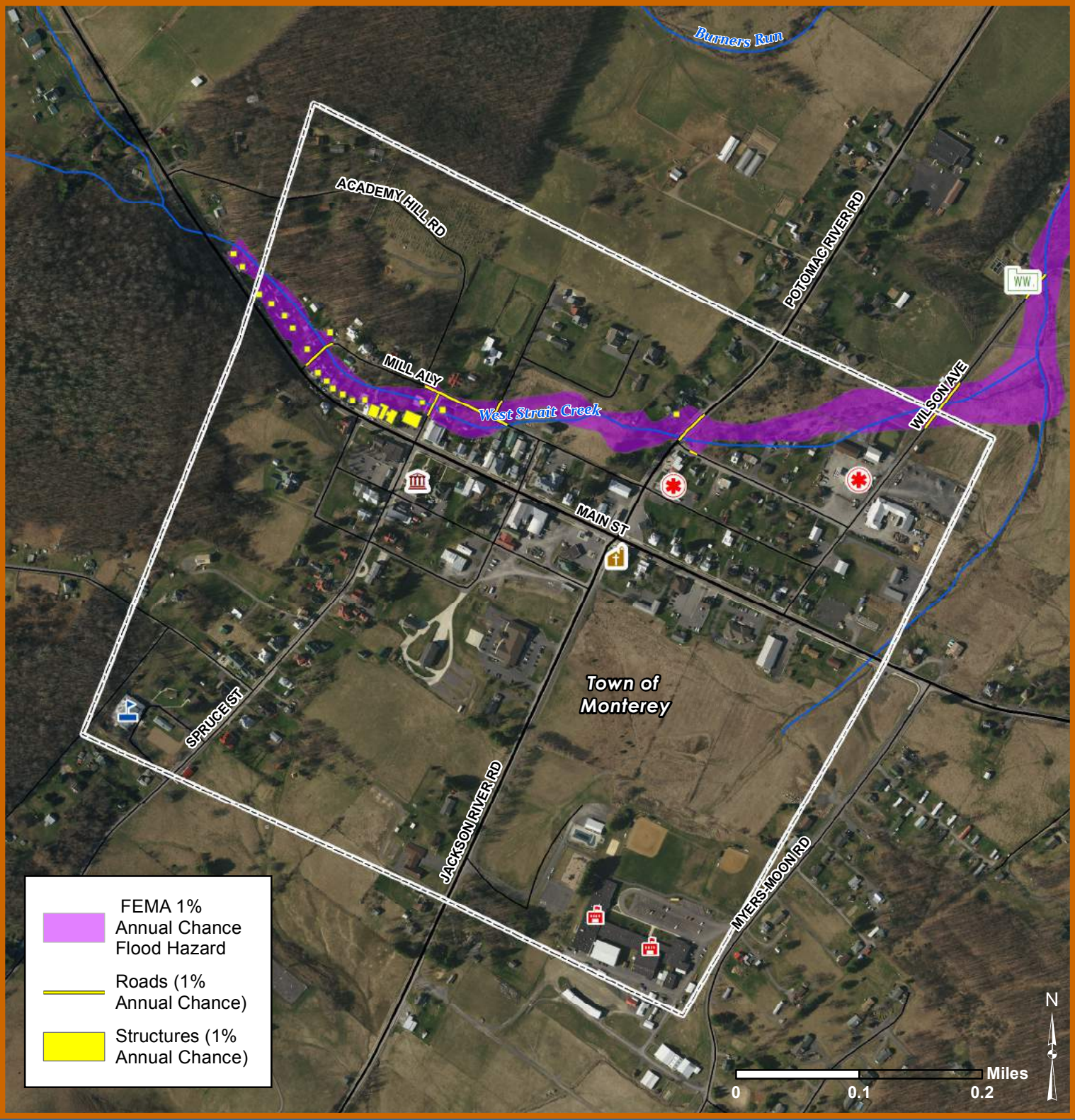
Map prepared and produced by Central Shenandoah PDC.
Map to be used for planning purposes only.
Data Source(s): CSPDC, FEMA, Commonwealth of VA, Town of Grottoes
October 17, 2019

Critical Facility

- CHURCH
- EMERGENCY RESPONSE
- GOVERNMENT
- INDUSTRY
- POWER UTILITY
- SCHOOL
- WASTEWATER TREATMENT
- WATER TANK

Central Shenandoah Planning District

Critical Facilities and FEMA Floodplains - Town of Monterey



CSPDC

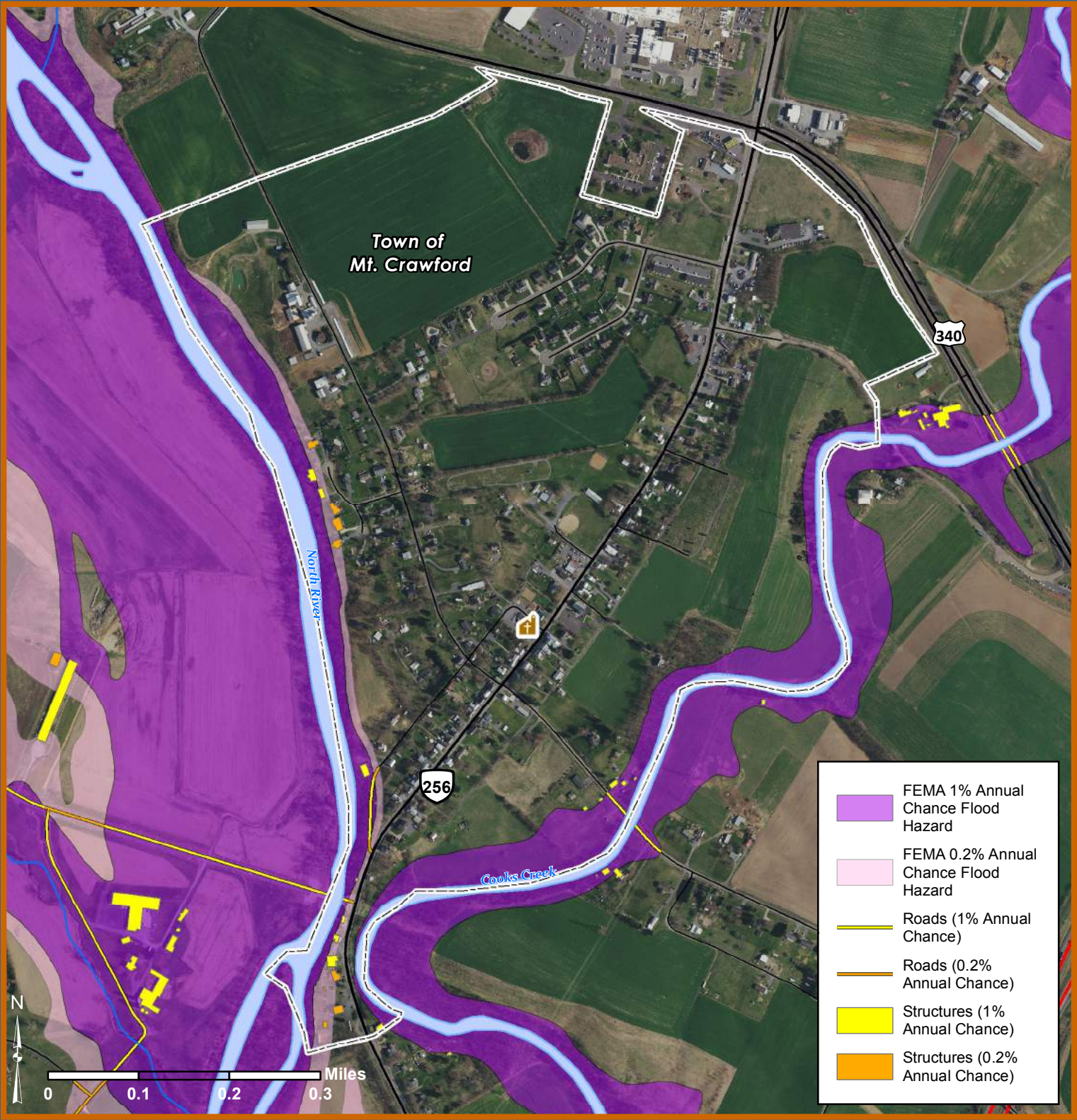
Map prepared and produced by Central Shenandoah PDC.
Map to be used for planning purposes only.
Data Source(s): CSPDC, FEMA, Commonwealth of VA, Town of Monterey
Sept. 18, 2019

Critical Facility

- CHURCH
- COURTHOUSE
- EMERGENCY RESPONSE
- GOVERNMENT
- SCHOOL
- WW WASTEWATER TREATMENT

Central Shenandoah Planning District

Critical Facilities in FEMA Floodplains - Town of Mt. Crawford



CSPDC

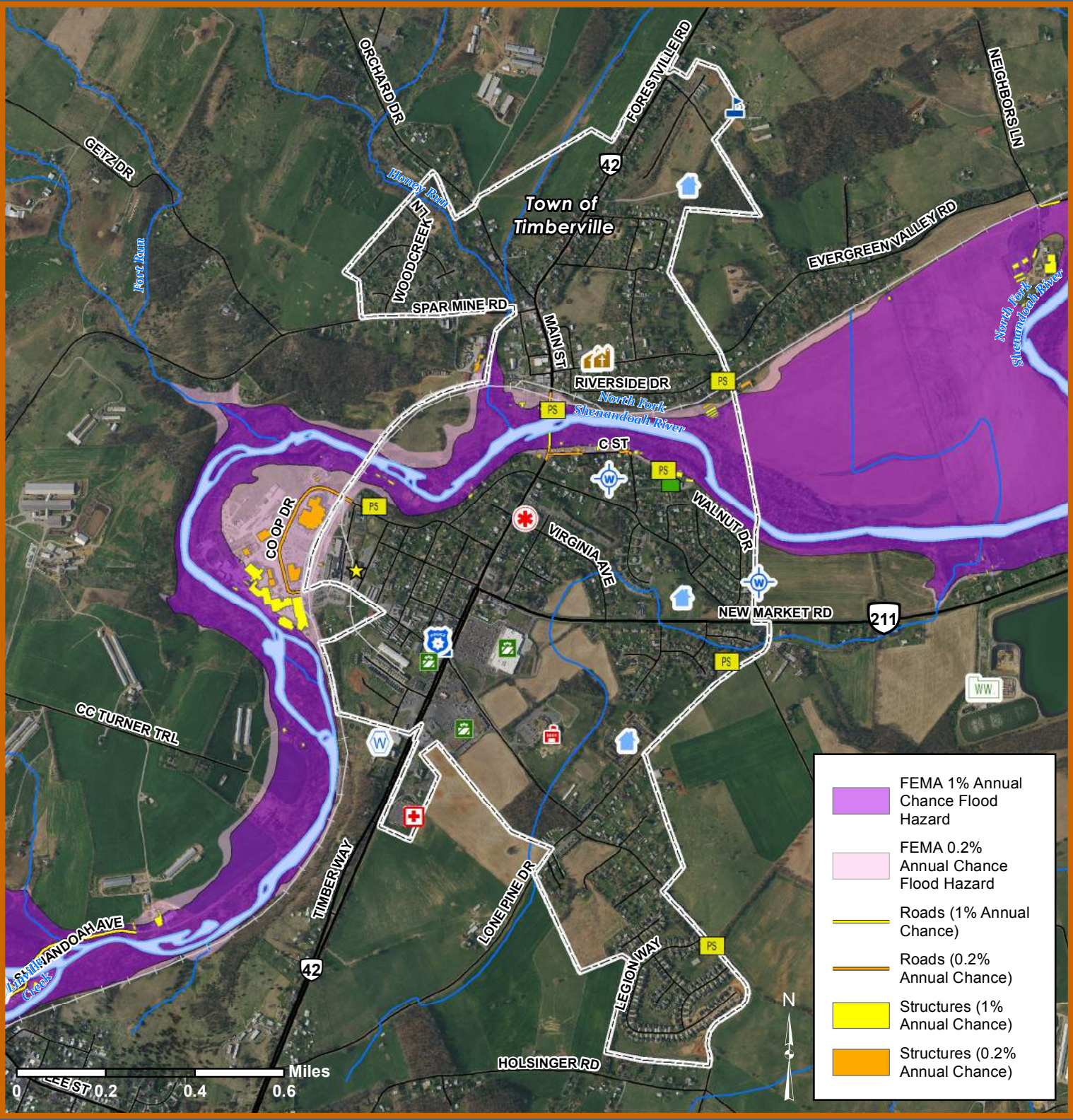
Map prepared and produced by Central Shenandoah PDC.
Map to be used for planning purposes only.
Data Source(s): CSPDC, FEMA, Commonwealth of VA, Town of Mt. Crawford
Sept. 18, 2019

Critical Facility

CHURCH

Central Shenandoah Planning District

Critical Facilities and FEMA Floodplains - Town of Timberville



CSPDC

Map prepared and produced by Central Shenandoah PDC.
Map to be used for planning purposes only.
Data Source(s): CSPDC, FEMA, Commonwealth of VA, Town of Timberville
Sept. 18, 2019

Critical Facility

- CHURCH
- COMMUNITY CENTER
- EMERGENCY RESPONSE
- GOVERNMENT
- MEDICAL FACILITY
- POLICE DEPT
- PUBLIC WORKS
- RETAIL
- SCHOOL
- SENIOR LIVING
- WASTEWATER PUMP STATION
- WASTEWATER TREATMENT
- WATER TREATMENT
- WELL

CSPDC Critical Facilities and Relative Snow Risk

Critical Facility

Relative Snow Risk

- Low Potential
- Medium Potential
- High Potential

West Virginia

Highland

Bath

Alleghany

Covington

Augusta

Rockingham

Harrisonburg

Staunton

Waynesboro

Rockbridge

Lexington

Buena Vista

Frederick

Shenandoah

Page

Madison

Greene

Nelson

Fluvanna

Amherst

Buckingham

Botetourt

Craig

Lynchburg

Appomattox

Cumberland

Charlottesville

Albemarle

Bedford

Campbell

Prince Edward

Salem

Roanoke

Franklin

Pittsylvania

N

0 8.5 17 Miles

Celebrating 50 Years CSPDC Central Shenandoah Planning District Commission

Map prepared and produced by Central Shenandoah PDC.
Map to be used for planning purposes only.
Data Source(s): CSPDC, USGS, Commonwealth of VA, VT CGIT, NOAA, VirginiaView
October 22, 2019

CSPDC Critical Facilities and Relative Ice Risk

Critical Facility

Relative Ice Risk

Low Potential

Medium Potential

West Virginia

Frederick

Shenandoah

Page

Rockingham

Harrisonburg

Madison

Highland

Augusta

Greene

Staunton

Waynesboro

Bath

Charlottesville

Albemarle

Rockbridge

Alleghany

Lexington

Buena Vista

Covington

Nelson

Fluvanna

Amherst

Buckingham

Botetourt

Craig

Lynchburg

Appomattox

Cumberland

Bedford

Salem

Campbell

Prince Edward

Roanoke

Franklin

Pittsylvania

N

0 8.5 17 Miles

Map prepared and produced by Central Shenandoah PDC.
Map to be used for planning purposes only.
Data Source(s): CSPDC, USGS, Commonwealth of VA,
VT CGIT, NOAA, VirginiaView
October 22, 2019

Appendix E - Repetitive Losses

Appendix E. Repetitive Losses in the CSPDC region

Community Name	NFIP Community Number	Number of Repetitive Loss Properties
AUGUSTA COUNTY	510013	13
BATH COUNTY	510196	2
BRIDGEWATER, TOWN OF	510134	2
BROADWAY, TOWN OF	510135	2
BUENA VISTA, CITY OF	510027	39
CRAIGSVILLE, TOWN OF	510014	1
DAYTON, TOWN OF	510136	0
ELKTON, TOWN OF	510137	1
GLASGOW, TOWN OF	515526	11
GOSHEN, TOWN OF	510217	3
GROTTOES, TOWN OF	510138	0
HARRISONBURG, CITY OF	510076	2
HIGHLAND COUNTY	510311	0
LEXINGTON, CITY OF	510089	4
MONTEREY, TOWN OF	510379	0
MT. CRAWFORD, TOWN OF	510224	0
ROCKBRIDGE COUNTY	510205	24
ROCKINGHAM COUNTY	510133	18
STAUNTON, CITY OF	510155	1
TIMBERVILLE, TOWN OF	510139	0
WAYNESBORO, CITY OF	515532	52
TOTAL FOR CSPDC REGION:		**175**

Community Name	NFIP Community Number	Number of Severe Repetitive Loss Properties
AUGUSTA COUNTY	510013	0
BATH COUNTY	510196	0
BRIDGEWATER, TOWN OF	510134	0
BROADWAY, TOWN OF	510135	0
BUENA VISTA, CITY OF	510027	0
CRAIGSVILLE, TOWN OF	510014	1
DAYTON, TOWN OF	510136	0
ELKTON, TOWN OF	510137	0
GLASGOW, TOWN OF	515526	0
GOSHEN, TOWN OF	510217	0
GROTTOES, TOWN OF	510138	0
HARRISONBURG, CITY OF	510076	0
HIGHLAND COUNTY	510311	0
LEXINGTON, CITY OF	510089	0
MONTEREY, TOWN OF	510379	0
MT. CRAWFORD, TOWN OF	510224	0
ROCKBRIDGE COUNTY	510205	1
ROCKINGHAM COUNTY	510133	0
STAUNTON, CITY OF	510155	0
TIMBERVILLE, TOWN OF	510139	0
WAYNESBORO, CITY OF	515532	4
TOTAL FOR CSPDC REGION:		**6**

Appendix F - Drought History

Month	Year	Augusta	Bath	Highland	Rockbridge	Rockingham	Lexington	Buena Vista	Waynesboro	Staunton	Harrisonburg
January	2000										
February	2000										
March	2000										
April	2000										
May	2000										
June	2000										
July	2000										
August	2000										
September	2000										
October	2000										
November	2000				D1						
December	2000		D1								
January	2001										
February	2001										
March	2001				D1						
April	2001										
May	2001	D1	D1, D2	D1		D1	D1	D1	D1	D1	D1
June	2001			D1							
July	2001			D1							
August	2001			D1							
September	2001			D1							
October	2001			D1							
November	2001	D1	D1	D1	D1	D1	D1	D1	D1	D1	D1
December	2001	D1, D2	D1, D2	D1, D2	D1, D2	D1, D2	D1, D2	D1, D2	D1, D2	D1, D2	D1
January	2002	D1, D2	D1, D2	D1, D2	D1, D2	D1, D2	D1, D2	D1, D2	D1, D2	D1, D2	D1, D2
February	2002	D1, D2	D1, D2	D1, D2	D1, D2	D1, D2	D1, D2	D1, D2	D1, D2	D1, D2	D1, D2
March	2002	D1, D2, D3	D1, D2, D3	D1, D2, D3	D1, D2, D3	D1, D2, D3	D1, D2, D3	D1, D2, D3	D1, D2, D3	D1, D2, D3	D1, D2, D3
April	2002	D1, D2, D3	D1, D2, D3	D1, D2, D3	D1, D2, D3	D1, D2, D3	D1, D2, D3	D1, D2, D3	D1, D2, D3	D1, D2, D3	D1, D2, D3
May	2002	D1, D2	D1		D1, D2	D1, D2	D1, D2	D1, D2	D1, D2	D1, D2	D1
June	2002	D1, D2	D1	D1	D1, D2	D1	D1	D1, D2	D1	D1	D1
July	2002	D1, D2	D1	D1	D1, D2	D1	D1, D2	D1, D2	D1, D2	D1	D1
August	2002	D1, D2	D1		D1, D2	D1, D2	D1, D2	D1, D2	D1, D2	D1, D2	D1
September	2002	D1, D2, D3	D1, D2, D3	D1, D2	D1, D2, D3	D1, D2, D3	D1, D2, D3	D1, D2, D3	D1, D2, D3	D1, D2, D3	D1, D2
October	2002	D1, D2, D3	D1, D2	D1, D2	D1, D2, D3	D1, D2	D1, D2, D3	D1, D2, D3	D1, D2, D3	D1, D2	D1, D2
November	2002	D1			D1		D1	D1	D1		
December	2002										
January	2003										
February	2003										
March	2003										
April	2003										
May	2003										

Month	Year	Augusta	Bath	Highland	Rockbridge	Rockingham	Lexington	Buena Vista	Waynesboro	Staunton	Harrisonburg
June	2003										
July	2003										
August	2003										
September	2003										
October	2003										
November	2003										
December	2003										
January	2004										
February	2004										
March	2004										
April	2004										
May	2004										
June	2004										
July	2004										
August	2004										
September	2004										
October	2004										
November	2004										
December	2004										
January	2005										
February	2005										
March	2005										
April	2005										
May	2005										
June	2005										
July	2005										
August	2005										
September	2005	D1							D1		
October	2005	D1			D1	D1			D1	D1	D1
November	2005										
December	2005										
January	2006										
February	2006										
March	2006				D1		D1	D1			
April	2006				D1		D1	D1			
May	2006				D1	D1	D1	D1	D1	D1	
June	2006				D1	D1	D1	D1	D1	D1	
July	2006										
August	2006	D1			D1	D1		D1	D1	D1	D1
September	2006										
October	2006										

Month	Year	Augusta	Bath	Highland	Rockbridge	Rockingham	Lexington	Buena Vista	Waynesboro	Staunton	Harrisonburg
November	2006										
December	2006										
January	2007										
February	2007										
March	2007										
April	2007										
May	2007										
June	2007										
July	2007	D1				D1			D1	D1	D1
August	2007	D1	D1		D1	D1	D1	D1	D1	D1	D1
September	2007	D1	D1		D1	D1	D1	D1	D1	D1	D1
October	2007	D1, D2			D1	D1, D2	D1	D1	D1	D1	D1
November	2007	D1			D1	D1			D1		
December	2007	D1			D1	D1			D1		
January	2008					D1					
February	2008					D1					
March	2008					D1					
April	2008				D1	D1					
May	2008				D1						
June	2008										
July	2008										
August	2008	D1			D1		D1	D1	D1		
September	2008	D1			D1		D1	D1			
October	2008			D1	D1						
November	2008		D1	D1							
December	2008	D1	D1	D1	D1	D1					
January	2009	D1	D1	D1	D1	D1					
February	2009	D1	D1	D1	D1	D1	D1	D1	D1	D1	D1
March	2009	D1	D1	D1	D1	D1	D1	D1	D1	D1	D1
April	2009		D1								
May	2009										
June	2009										
July	2009										
August	2009										
September	2009			D1		D1					
October	2009										
November	2009										
December	2009										
January	2010										
February	2010										
March	2010										

Month	Year	Augusta	Bath	Highland	Rockbridge	Rockingham	Lexington	Buena Vista	Waynesboro	Staunton	Harrisonburg
April	2010										
May	2010										
June	2010										
July	2010	D1	D1	D1	D1	D1	D1	D1	D1	D1	D1
August	2010	D1				D1, D2			D1		D1
September	2010	D1	D1	D1	D1	D1, D2			D1	D1	D1
October	2010	D1	D1	D1		D1					
November	2010	D1	D1	D1		D1					
December	2010										
January	2011	D1	D1	D1	D1	D1	D1	D1	D1	D1	D1
February	2011	D1		D1	D1	D1	D1	D1	D1	D1	D1
March	2011	D1		D1	D1	D1	D1	D1	D1	D1	D1
April	2011	D1			D1	D1			D1	D1	D1
May	2011										
June	2011										
July	2011										
August	2011										
September	2011										
October	2011										
November	2011										
December	2011										
January	2012										
February	2012										
March	2012										
April	2012										
May	2012										
June	2012										
July	2012					D1					
August	2012										
September	2012										
October	2012										
November	2012	D1			D1	D1			D1	D1	D1
December	2012	D1			D1	D1			D1	D1	D1
January	2013	D1	D1	D1	D1	D1	D1	D1	D1	D1	D1
February	2013										
March	2013										
April	2013										
May	2013										
June	2013										
July	2013										
August	2013										

Month	Year	Augusta	Bath	Highland	Rockbridge	Rockingham	Lexington	Buena Vista	Waynesboro	Staunton	Harrisonburg
September	2013										
October	2013										
November	2013										
December	2013										
January	2014										
February	2014										
March	2014										
April	2014										
May	2014										
June	2014										
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August	2015										
September	2015										
October	2015										
November	2015										
December	2015										
January	2016										
February	2016										
March	2016										
April	2016	D1		D1		D1					
May	2016	D1		D1		D1					
June	2016										
July	2016										
August	2016										
September	2016										
October	2016										
November	2016										
December	2016										
January	2017										

Month	Year	Augusta	Bath	Highland	Rockbridge	Rockingham	Lexington	Buena Vista	Waynesboro	Staunton	Harrisonburg
February	2017	D1				D1			D1		
March	2017	D1	D1	D1	D1	D1	D1	D1	D1	D1	D1
April	2017	D1	D1	D1	D1	D1	D1	D1	D1	D1	D1
May	2017	D1	D1	D1		D1			D1	D1	D1
June	2017										
July	2017										
August	2017										
September	2017										
October	2017										
November	2017										
December	2017	D1			D1	D1	D1	D1	D1	D1	D1
January	2018	D1			D1	D1	D1	D1	D1	D1	D1
February	2018	D1			D1	D1		D1	D1	D1	D1
March	2018										
April	2018										
May	2018										
June	2018										
July	2018										
August	2018										
September	2018										
October	2018										
November	2018										
December	2018										
January	2019										
February	2019										
March	2019										
April	2019										
May	2019										
June	2019										
July	2019										
August	2019										
September	2019	D1	D1		D1		D1	D1	D1		
October	2019	D1	D1, D2		D1, D2	D1	D1	D1, D2	D1		
November	2019										
December	2019										

Source: National Drought Mitigation Center (NDMC), U.S. Department of Agriculture (USDA), and the National Oceanic and Atmospheric Association (NOAA); U.S. Drought Monitor Statistics, 2000 to 2019.

Note: Data was only compiled for drought intensities of D1 Moderate Drought through D4 Exceptional Drought. Data was not included on this chart for D0 Abnormally Dry Conditions.

Appendix G – HAZUS Reports

Hazus: Flood Global Risk Report

Region Name: CSPDC

Flood Scenario: 100

Print Date: Monday, August 19, 2019

Disclaimer:
This version of Hazus utilizes 2010 Census Data.
Totals only reflect data for those census tracts/blocks included in the user's study region.

The estimates of social and economic impacts contained in this report were produced using Hazus loss estimation methodology software which is based on current scientific and engineering knowledge. There are uncertainties inherent in any loss estimation technique. Therefore, there may be significant differences between the modeled results contained in this report and the actual social and economic losses following a specific Flood. These results can be improved by using enhanced inventory data and flood hazard information.

FEMA

RiskMAP
Increasing Resilience Together

Table of Contents

General Description of the Region

Hazus is a regional multi-hazard loss estimation model that was developed by the Federal Emergency Management Agency (FEMA) and the National Institute of Building Sciences (NIBS). The primary purpose of Hazus is to provide a methodology and software application to develop multi-hazard losses at a regional scale. These loss estimates would be used primarily by local, state and regional officials to plan and stimulate efforts to reduce risks from multi-hazards and to prepare for emergency response and recovery.

- Virginia

Note:
Appendix A contains a complete listing of the counties contained in the region.

The geographical size of the region is approximately 3,438 square miles and contains 17,149 census blocks. The region contains over 111 thousand households and has a total population of 286,781 people (2010 Census Bureau data). The distribution of population by State and County for the study region is provided in Appendix B.

There are an estimated 118,565 buildings in the region with a total building replacement value (excluding contents) of 31,788 million dollars. Approximately 92.00% of the buildings (and 78.42% of the building value) are associated with residential housing.

Building Inventory

General Building Stock

Hazus estimates that there are 118,565 buildings in the region which have an aggregate total replacement value of 31,788 million dollars. Table 1 and Table 2 present the relative distribution of the value with respect to the general occupancies by Study Region and Scenario respectively. Appendix B provides a general distribution of the building value by State and County.

Table 1
Building Exposure by Occupancy Type for the Study Region

Occupancy	Exposure ($1000)	Percent of Total
Residential	24,927,457	78.4%
Commercial	4,053,304	12.8%
Industrial	1,273,474	4.0%
Agricultural	254,378	0.8%
Religion	558,559	1.8%
Government	174,125	0.5%
Education	546,526	1.7%
Total	**31,787,823**	**100%**

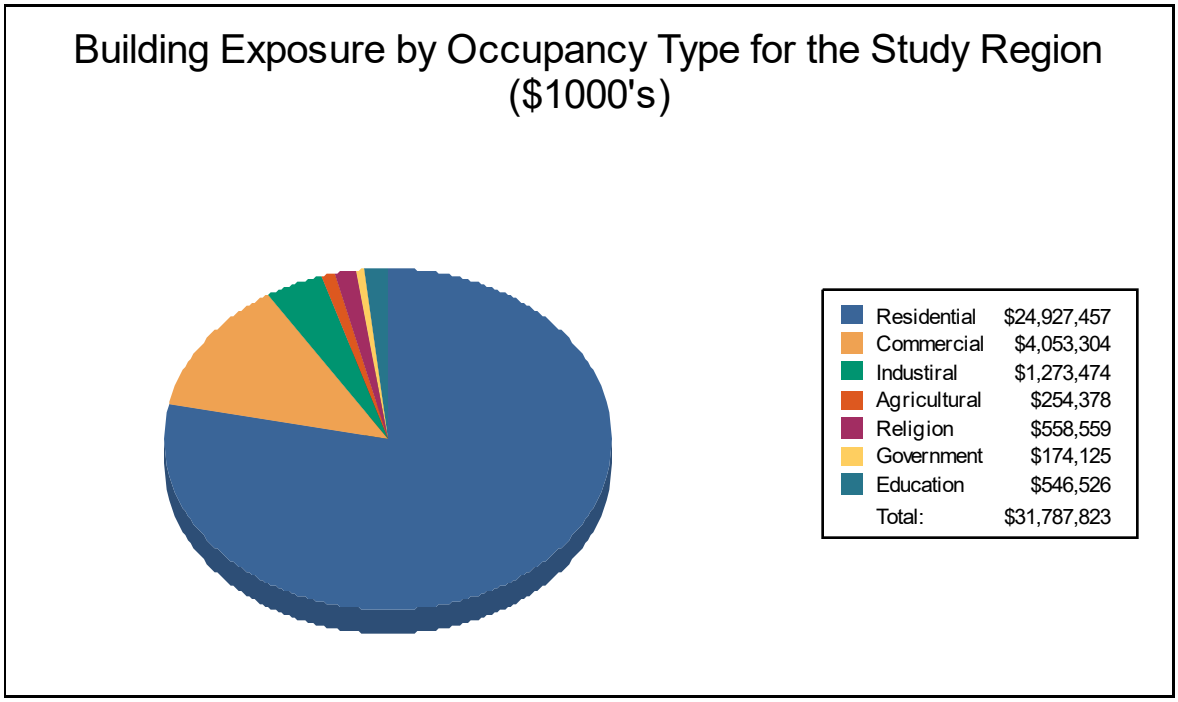
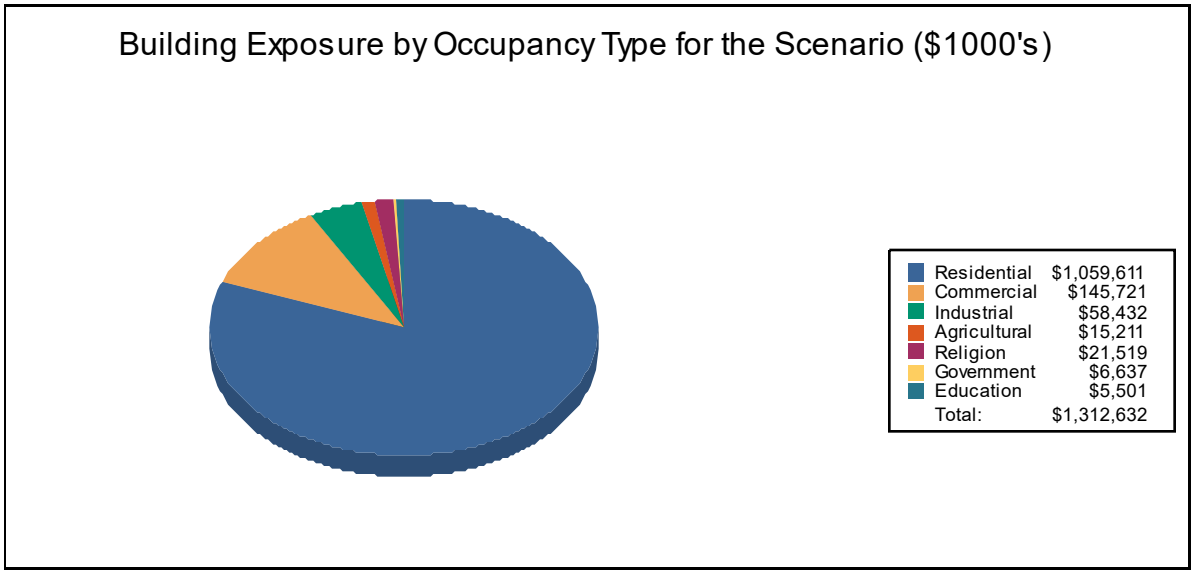


Table 2
Building Exposure by Occupancy Type for the Scenario

Occupancy	Exposure ($1000)	Percent of Total
Residential	3,810,435	75.9%
Commercial	658,005	13.1%
Industrial	329,164	6.6%
Agricultural	58,172	1.2%
Religion	86,295	1.7%
Government	28,178	0.6%
Education	50,813	1.0%
Total	**5,021,062**	**100%**



Essential Facility Inventory

For essential facilities, there are 7 hospitals in the region with a total bed capacity of 543 beds. There are 144 schools, 52 fire stations, 28 police stations and 9 emergency operation centers.

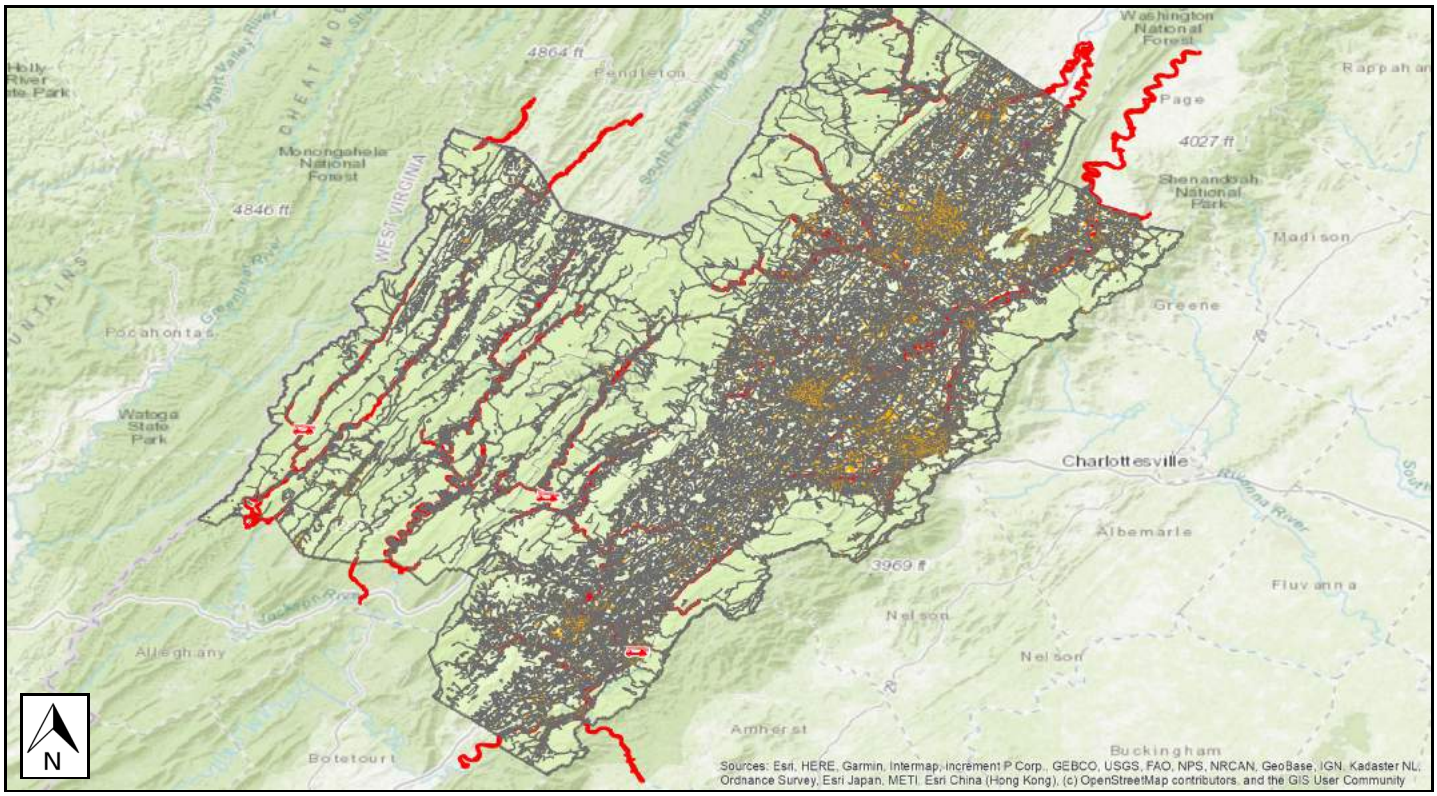
Flood Scenario Parameters

Hazus used the following set of information to define the flood parameters for the flood loss estimate provided in this report.

Study Region Name:	CSPDC
Scenario Name:	100
Return Period Analyzed:	100
Analysis Options Analyzed:	No What-Ifs

Study Region Overview Map

Illustrating scenario flood extent, as well as exposed essential facilities and total exposure



Building Damage

General Building Stock Damage

Hazus estimates that about 486 buildings will be at least moderately damaged. This is over 55% of the total number of buildings in the scenario. There are an estimated 146 buildings that will be completely destroyed. The definition of the 'damage states' is provided in the Hazus Flood Technical Manual. Table 3 below summarizes the expected damage by general occupancy for the buildings in the region. Table 4 summarizes the expected damage by general building type.

Total Economic Loss (1 dot = $300K) Overview Map

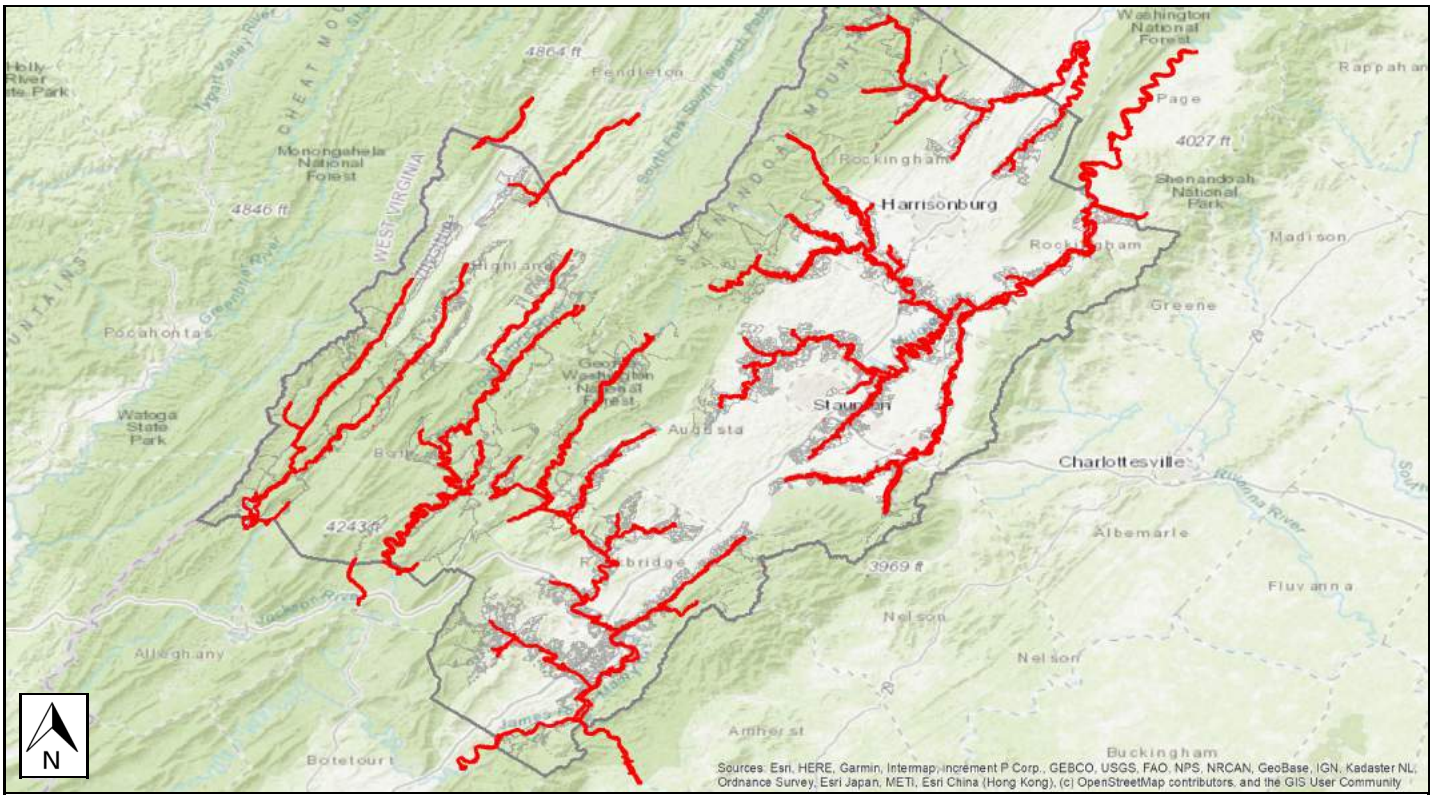


Table 3: Expected Building Damage by Occupancy

	1-10		11-20		21-30		31-40		41-50		>50	
Occupancy	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**
Agriculture	0	0	0	0	0	0	0	0	0	0	0	0
Commercial	9	26	14	40	7	20	2	6	1	3	2	6
Education	0	0	0	0	0	0	0	0	0	0	0	0
Government	0	0	1	50	0	0	1	50	0	0	0	0
Industrial	0	0	3	43	0	0	1	14	2	29	1	14
Religion	0	0	6	100	0	0	0	0	0	0	0	0
Residential	67	13	153	30	71	14	48	9	30	6	143	28
Total	**76**		**177**		**78**		**52**		**33**		**146**	

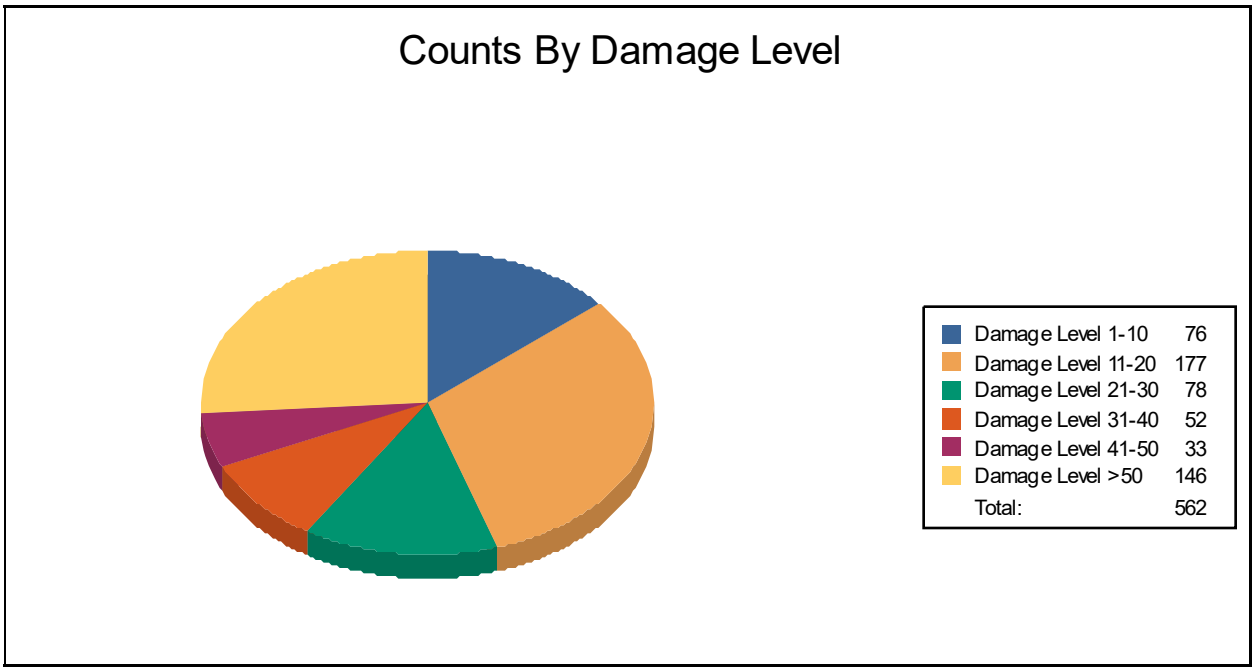


Table 4: Expected Building Damage by Building Type

Building Type	1-10		11-20		21-30		31-40		41-50		>50	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Concrete	0	0	0	0	0	0	0	0	0	0	0	0
Manuf Housing	0	0	0	0	0	0	0	0	0	0	4	100
Masonry	15	16	30	33	12	13	8	9	4	4	23	25
Steel	5	17	12	41	6	21	3	10	1	3	2	7
Wood	60	13	138	29	66	14	46	10	30	6	131	28

Essential Facility Damage

Before the flood analyzed in this scenario, the region had 543 hospital beds available for use. On the day of the scenario flood event, the model estimates that 543 hospital beds are available in the region.

Table 5: Expected Damage to Essential Facilities

		# Facilities		
Classification	Total	At Least Moderate	At Least Substantial	Loss of Use
Emergency Operation Centers	9	0	0	0
Fire Stations	52	3	0	3
Hospitals	7	0	0	0
Police Stations	28	1	0	1
Schools	144	0	0	0

If this report displays all zeros or is blank, two possibilities can explain this.

(1) None of your facilities were flooded. This can be checked by mapping the inventory data on the depth grid.

(2) The analysis was not run. This can be tested by checking the run box on the Analysis Menu and seeing if a message box asks you to replace the existing results.

Induced Flood Damage

Debris Generation

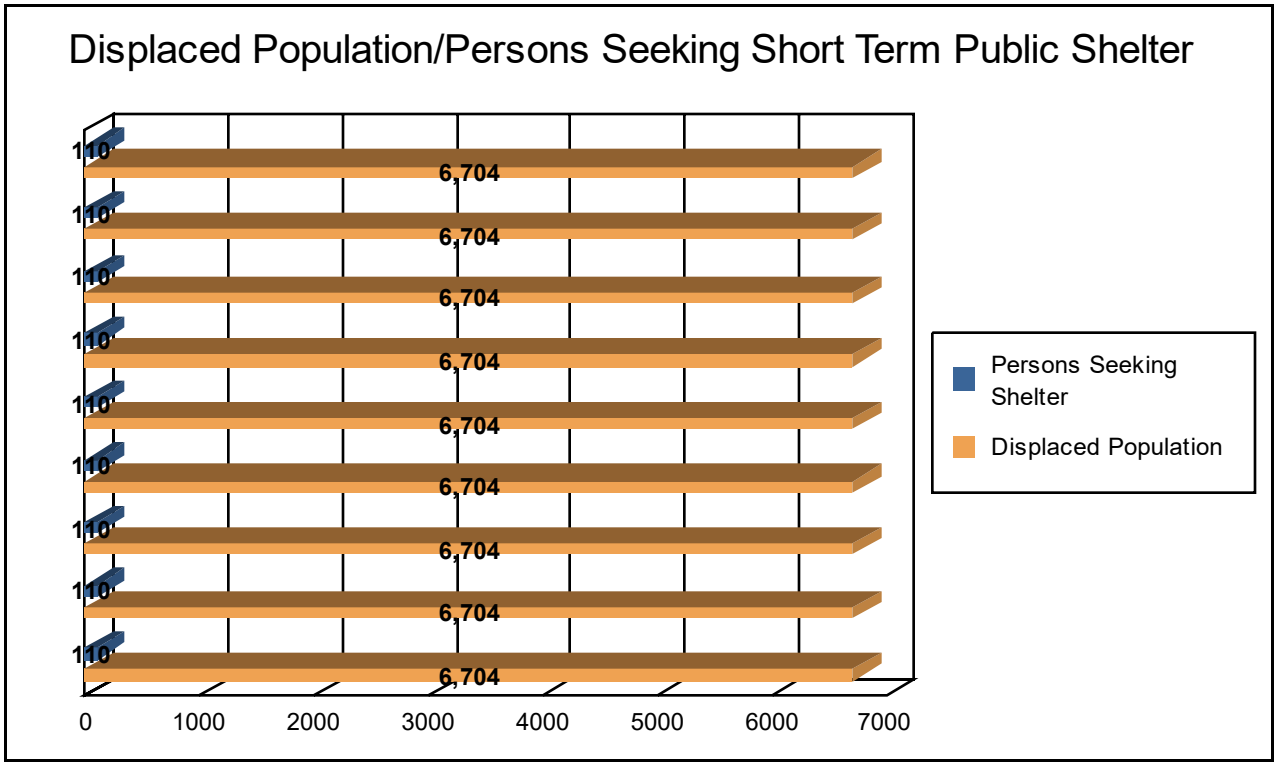
Hazus estimates the amount of debris that will be generated by the flood. The model breaks debris into three general categories: 1) Finishes (dry wall, insulation, etc.), 2) Structural (wood, brick, etc.) and 3) Foundations (concrete slab, concrete block, rebar, etc.). This distinction is made because of the different types of material handling equipment required to handle the debris.

Analysis has not been performed for this Scenario.

Social Impact

Shelter Requirements

Hazus estimates the number of households that are expected to be displaced from their homes due to the flood and the associated potential evacuation. Hazus also estimates those displaced people that will require accommodations in temporary public shelters. The model estimates 2,235 households (or 6,704 of people) will be displaced due to the flood. Displacement includes households evacuated from within or very near to the inundated area. Of these, 110 people (out of a total population of 286,781) will seek temporary shelter in public shelters.



Economic Loss

The total economic loss estimated for the flood is 1,003.58 million dollars, which represents 19.99 % of the total replacement value of the scenario buildings.

Building-Related Losses

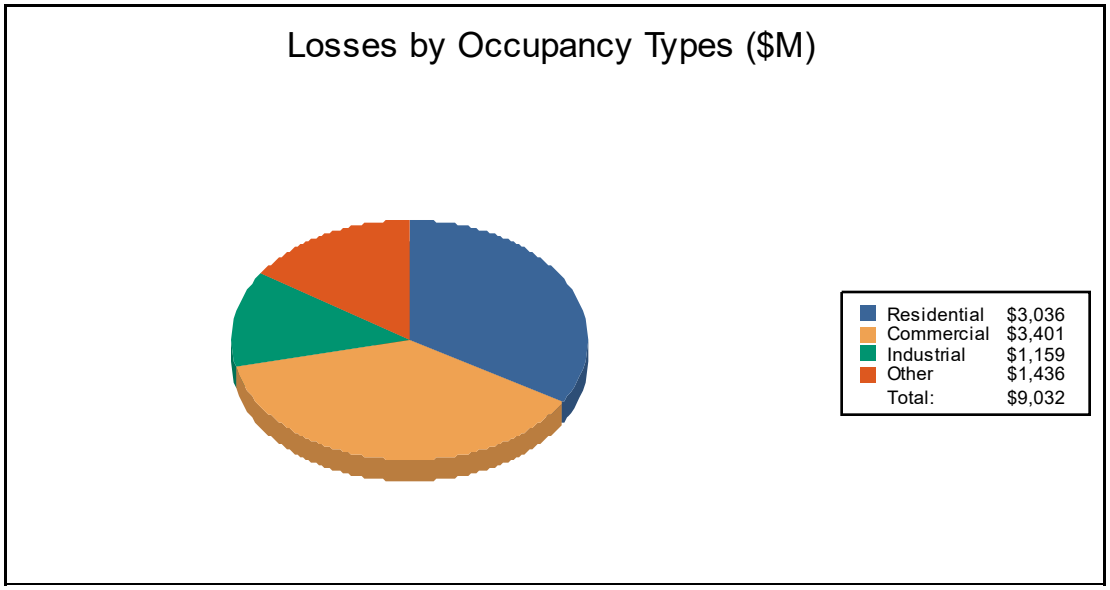
The building losses are broken into two categories: direct building losses and business interruption losses. The direct building losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability to operate a business because of the damage sustained during the flood. Business interruption losses also include the

The total building-related losses were 606.05 million dollars. 40% of the estimated losses were related to the business interruption of the region. The residential occupancies made up 33.62% of the total loss. Table 6 below provides a summary of the losses associated with the building damage.

Table 6: Building-Related Economic Loss Estimates

(Millions of dollars)

Category	Area	Residential	Commercial	Industrial	Others	Total
Building Loss						
	Building	1,653.99	396.05	295.10	67.04	2,412.19
	Content	842.51	1,023.56	670.28	328.27	2,864.62
	Inventory	0.00	36.97	136.64	4.02	177.63
	Subtotal	**2,496.50**	**1,456.59**	**1,102.02**	**399.33**	**5,454.44**
Business Interruption						
	Income	13.03	737.01	14.14	105.98	870.16
	Relocation	370.14	225.90	15.80	46.48	658.32
	Rental Income	125.67	166.58	3.96	5.74	301.95
	Wage	31.02	815.08	22.91	878.29	1,747.31
	Subtotal	**539.87**	**1,944.57**	**56.82**	**1,036.49**	**3,577.73**
ALL	**Total**	**3,036.37**	**3,401.15**	**1,158.84**	**1,435.82**	**9,032.18**



Appendix A: County Listing for the Region

Virginia

- Augusta
- Bath
- Highland
- Rockbridge
- Rockingham
- Buena Vista
- Harrisonburg
- Lexington
- Staunton
- Waynesboro

Appendix B: Regional Population and Building Value Data

		Building Value (thousands of dollars)		
	Population	Residential	Non-Residential	Total
Virginia				
Harrisonburg	48,914	3,460,375	1,630,540	5,090,915
Rockingham	76,314	6,609,137	1,260,787	7,869,924
Lexington	7,042	714,506	243,342	957,848
Highland	2,321	320,363	46,946	367,309
Staunton	23,746	2,264,098	782,529	3,046,627
Rockbridge	22,307	2,182,496	429,798	2,612,294
Augusta	73,750	6,296,301	1,337,630	7,633,931
Buena Vista	6,650	509,866	214,901	724,767
Bath	4,731	739,486	78,123	817,609
Waynesboro	21,006	1,830,829	835,770	2,666,599
Total	**286,781**	**24,927,457**	**6,860,366**	**31,787,823**
Total Study Region	**286,781**	**24,927,457**	**6,860,366**	**31,787,823**

Quick Assessment Report

August 16, 2019

Study Region : CSPDC
Scenario : 100
Return Period: 100
Analysis Option: 0

Regional Statistics

Area (Square Miles)	3,438
Number of Census Blocks	17,149
Number of Buildings	
Residential	109,076
Total	118,565
Number of People in the Region (x 1000)	287
Building Exposure ($ Millions)	
Residential	24,927
Total	31,788

Scenario Results

Shelter Requirements

Displaced Population (# Households)	2,235
Short Term Shelter (# People)	110

Economic Loss

Residential Property (Capital Stock) Losses ($ Millions)	0
Total Property (Capital Stock) Losses ($ Millions)	0
Business Interruption (Income) Losses ($ Millions)	0

Disclaimer:

Totals only reflect data for those census tracts/blocks included in the user's study region.

The estimates of social and economic impacts contained in this report were produced using Hazus loss estimation methodology software which is based on current scientific and engineering knowledge. There are uncertainties inherent in any loss estimation technique. Therefore, there may be significant differences between the modeled results contained in this report and the actual social and economic losses following a specific flood. These results can be improved by using enhanced inventory data and flood hazard information.

Quick Assessment Report

October 31, 2019

Study Region : Augusta
Scenario : 100
Return Period: 100
Analysis Option: 0

Regional Statistics

Area (Square Miles)	971
Number of Census Blocks	4,370
Number of Buildings	
Residential	29,645
Total	31,566
Number of People in the Region (x 1000)	74
Building Exposure ($ Millions)	
Residential	6,296
Total	7,634

Scenario Results

Shelter Requirements

Displaced Population (# Households)	702
Short Term Shelter (# People)	35

Economic Loss

Residential Property (Capital Stock) Losses ($ Millions)	68
Total Property (Capital Stock) Losses ($ Millions)	108
Business Interruption (Income) Losses ($ Millions)	56

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Quick Assessment Report

November 1, 2019

Study Region : Bath
Scenario : 100
Return Period: 100
Analysis Option: 0

Regional Statistics

Area (Square Miles)	535
Number of Census Blocks	777
Number of Buildings	
Residential	3,262
Total	3,360
Number of People in the Region (x 1000)	5
Building Exposure ($ Millions)	
Residential	739
Total	818

Scenario Results

Shelter Requirements	
Displaced Population (# Households)	91
Short Term Shelter (# People)	0
Economic Loss	
Residential Property (Capital Stock) Losses ($ Millions)	30
Total Property (Capital Stock) Losses ($ Millions)	52
Business Interruption (Income) Losses ($ Millions)	23

Disclaimer:

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Quick Assessment Report

October 29, 2019

Study Region : Bridgewater
Scenario : 100
Return Period: 100
Analysis Option: 0

Regional Statistics

Area (Square Miles)	2
Number of Census Blocks	99
Number of Buildings	
Residential	1,670
Total	1,825
Number of People in the Region (x 1000)	6
Building Exposure ($ Millions)	
Residential	473
Total	586

Scenario Results

Shelter Requirements

Displaced Population (# Households)	19
Short Term Shelter (# People)	0

Economic Loss

Residential Property (Capital Stock) Losses ($ Millions)	2
Total Property (Capital Stock) Losses ($ Millions)	2
Business Interruption (Income) Losses ($ Millions)	1

Disclaimer:

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Quick Assessment Report

October 29, 2019

Study Region : Broadway
Scenario : 100
Return Period: 100
Analysis Option: 0

Regional Statistics

Area (Square Miles)	2
Number of Census Blocks	64
Number of Buildings	
Residential	1,359
Total	1,459
Number of People in the Region (x 1000)	4
Building Exposure ($ Millions)	
Residential	311
Total	379

Scenario Results

Shelter Requirements

Displaced Population (# Households)	23
Short Term Shelter (# People)	0

Economic Loss

Residential Property (Capital Stock) Losses ($ Millions)	2
Total Property (Capital Stock) Losses ($ Millions)	6
Business Interruption (Income) Losses ($ Millions)	7

Disclaimer:

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Quick Assessment Report

November 7, 2019

Study Region : BuenaVista
Scenario : 100
Return Period: 100
Analysis Option: 0

Regional Statistics

Area (Square Miles)	7
Number of Census Blocks	551
Number of Buildings	
Residential	2,607
Total	2,897
Number of People in the Region (x 1000)	7
Building Exposure ($ Millions)	
Residential	510
Total	725

Scenario Results

Shelter Requirements	
Displaced Population (# Households)	269
Short Term Shelter (# People)	13
Economic Loss	
Residential Property (Capital Stock) Losses ($ Millions)	23
Total Property (Capital Stock) Losses ($ Millions)	46
Business Interruption (Income) Losses ($ Millions)	44

Disclaimer:

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Quick Assessment Report

October 28, 2019

Study Region : Craigsville
Scenario : 100
Return Period: 100
Analysis Option: 0

Regional Statistics

Area (Square Miles)	2
Number of Census Blocks	49
Number of Buildings	
Residential	423
Total	436
Number of People in the Region (x 1000)	1
Building Exposure ($ Millions)	
Residential	64
Total	70

Scenario Results

Shelter Requirements

Displaced Population (# Households)	34
Short Term Shelter (# People)	0

Economic Loss

Residential Property (Capital Stock) Losses ($ Millions)	3
Total Property (Capital Stock) Losses ($ Millions)	3
Business Interruption (Income) Losses ($ Millions)	1

Disclaimer:

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Quick Assessment Report

October 29, 2019

Study Region : Dayton
Scenario : 100
Return Period: 100
Analysis Option: 0

Regional Statistics

Area (Square Miles)	1
Number of Census Blocks	71
Number of Buildings	
Residential	524
Total	585
Number of People in the Region (x 1000)	2
Building Exposure ($ Millions)	
Residential	118
Total	151

Scenario Results

Shelter Requirements	
Displaced Population (# Households)	20
Short Term Shelter (# People)	1
Economic Loss	
Residential Property (Capital Stock) Losses ($ Millions)	1
Total Property (Capital Stock) Losses ($ Millions)	5
Business Interruption (Income) Losses ($ Millions)	2

Disclaimer:

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Quick Assessment Report

October 29, 2019

Study Region : Elkton
Scenario : 100
Return Period: 100
Analysis Option: 0

Regional Statistics

Area (Square Miles)	3
Number of Census Blocks	126
Number of Buildings	
Residential	1,147
Total	1,262
Number of People in the Region (x 1000)	3
Building Exposure ($ Millions)	
Residential	241
Total	295

Scenario Results

Shelter Requirements

Displaced Population (# Households)	5
Short Term Shelter (# People)	0

Economic Loss

Residential Property (Capital Stock) Losses ($ Millions)	0
Total Property (Capital Stock) Losses ($ Millions)	0
Business Interruption (Income) Losses ($ Millions)	0

Disclaimer:

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Quick Assessment Report

October 28, 2019

Study Region : Glasgow
Scenario : 100
Return Period: 100
Analysis Option: 0

Regional Statistics

Area (Square Miles)	1
Number of Census Blocks	42
Number of Buildings	
Residential	480
Total	506
Number of People in the Region (x 1000)	1
Building Exposure ($ Millions)	
Residential	81
Total	116

Scenario Results

Shelter Requirements

Displaced Population (# Households)	8
Short Term Shelter (# People)	0

Economic Loss

Residential Property (Capital Stock) Losses ($ Millions)	1
Total Property (Capital Stock) Losses ($ Millions)	9
Business Interruption (Income) Losses ($ Millions)	2

Disclaimer:

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Quick Assessment Report

October 28, 2019

Study Region : Goshen
Scenario : 100
Return Period: 100
Analysis Option: 0

Regional Statistics

Area (Square Miles)	2
Number of Census Blocks	24
Number of Buildings	
Residential	188
Total	192
Number of People in the Region (x 1000)	0
Building Exposure ($ Millions)	
Residential	28
Total	29

Scenario Results

Shelter Requirements

Displaced Population (# Households)	14
Short Term Shelter (# People)	0

Economic Loss

Residential Property (Capital Stock) Losses ($ Millions)	2
Total Property (Capital Stock) Losses ($ Millions)	2
Business Interruption (Income) Losses ($ Millions)	1

Disclaimer:

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Quick Assessment Report

October 29, 2019

Study Region : Grottoes
Scenario : 100
Return Period: 100
Analysis Option: 0

Regional Statistics

Area (Square Miles)	2
Number of Census Blocks	126
Number of Buildings	
Residential	1,027
Total	1,100
Number of People in the Region (x 1000)	3
Building Exposure ($ Millions)	
Residential	186
Total	228

Scenario Results

Shelter Requirements

Displaced Population (# Households)	35
Short Term Shelter (# People)	2

Economic Loss

Residential Property (Capital Stock) Losses ($ Millions)	1
Total Property (Capital Stock) Losses ($ Millions)	1
Business Interruption (Income) Losses ($ Millions)	1

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Quick Assessment Report

November 6, 2019

Study Region : Harrisonburg
Scenario : 100
Return Period: 100
Analysis Option: 0

Regional Statistics

Area (Square Miles)	17
Number of Census Blocks	818
Number of Buildings	
Residential	11,175
Total	12,756
Number of People in the Region (x 1000)	49
Building Exposure ($ Millions)	
Residential	3,460
Total	5,091

Scenario Results

Shelter Requirements	
Displaced Population (# Households)	476
Short Term Shelter (# People)	110
Economic Loss	
Residential Property (Capital Stock) Losses ($ Millions)	31
Total Property (Capital Stock) Losses ($ Millions)	68
Business Interruption (Income) Losses ($ Millions)	121

Disclaimer:

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Quick Assessment Report

November 5, 2019

Study Region : Highland
Scenario : 100
Return Period: 100
Analysis Option: 0

Regional Statistics

Area (Square Miles)	416
Number of Census Blocks	745
Number of Buildings	
Residential	1,814
Total	1,887
Number of People in the Region (x 1000)	2
Building Exposure ($ Millions)	
Residential	320
Total	367

Scenario Results

Shelter Requirements

Displaced Population (# Households)	51
Short Term Shelter (# People)	1

Economic Loss

Residential Property (Capital Stock) Losses ($ Millions)	12
Total Property (Capital Stock) Losses ($ Millions)	13
Business Interruption (Income) Losses ($ Millions)	2

Disclaimer:

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Quick Assessment Report

November 6, 2019

Study Region : Lexington
Scenario : 100
Return Period: 100
Analysis Option: 0

Regional Statistics

Area (Square Miles)	3
Number of Census Blocks	219
Number of Buildings	
Residential	2,030
Total	2,344
Number of People in the Region (x 1000)	7
Building Exposure ($ Millions)	
Residential	715
Total	958

Scenario Results

Shelter Requirements

Displaced Population (# Households)	25
Short Term Shelter (# People)	1

Economic Loss

Residential Property (Capital Stock) Losses ($ Millions)	2
Total Property (Capital Stock) Losses ($ Millions)	3
Business Interruption (Income) Losses ($ Millions)	2

Disclaimer:

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Quick Assessment Report

October 28, 2019

Study Region : Monterey
Scenario : 100
Return Period: 100
Analysis Option: 0

Regional Statistics

Area (Square Miles)	0
Number of Census Blocks	20
Number of Buildings	
Residential	118
Total	135
Number of People in the Region (x 1000)	0
Building Exposure ($ Millions)	
Residential	25
Total	37

Scenario Results

Shelter Requirements

Displaced Population (# Households)
Short Term Shelter (# People)

Economic Loss

Residential Property (Capital Stock) Losses ($ Millions)	0
Total Property (Capital Stock) Losses ($ Millions)	0
Business Interruption (Income) Losses ($ Millions)	0

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Quick Assessment Report

October 29, 2019

Study Region : MountCrawford
Scenario : 100
Return Period: 100
Analysis Option: 0

Regional Statistics

Area (Square Miles)	35
Number of Census Blocks	228
Number of Buildings	
Residential	1,358
Total	1,474
Number of People in the Region (x 1000)	4
Building Exposure ($ Millions)	
Residential	261
Total	306

Scenario Results

Shelter Requirements

Displaced Population (# Households)	24
Short Term Shelter (# People)	0

Economic Loss

Residential Property (Capital Stock) Losses ($ Millions)	2
Total Property (Capital Stock) Losses ($ Millions)	3
Business Interruption (Income) Losses ($ Millions)	1

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Quick Assessment Report

November 6, 2019

Study Region : Rockbridge
Scenario : 100
Return Period: 100
Analysis Option: 0

Regional Statistics

Area (Square Miles)	601
Number of Census Blocks	2,540
Number of Buildings	
Residential	10,703
Total	11,468
Number of People in the Region (x 1000)	22
Building Exposure ($ Millions)	
Residential	2,182
Total	2,612

Scenario Results

Shelter Requirements

Displaced Population (# Households)	300
Short Term Shelter (# People)	6

Economic Loss

Residential Property (Capital Stock) Losses ($ Millions)	44
Total Property (Capital Stock) Losses ($ Millions)	105
Business Interruption (Income) Losses ($ Millions)	57

Disclaimer:

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Quick Assessment Report

November 5, 2019

Study Region : Rockingham
Scenario : 100
Return Period: 100
Analysis Option: 0

Regional Statistics

Area (Square Miles)	853
Number of Census Blocks	5,531
Number of Buildings	
Residential	31,035
Total	33,500
Number of People in the Region (x 1000)	76
Building Exposure ($ Millions)	
Residential	6,609
Total	7,870

Scenario Results

Shelter Requirements

Displaced Population (# Households)	809
Short Term Shelter (# People)	25

Economic Loss

Residential Property (Capital Stock) Losses ($ Millions)	75
Total Property (Capital Stock) Losses ($ Millions)	117
Business Interruption (Income) Losses ($ Millions)	63

Disclaimer:

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Quick Assessment Report

November 6, 2019

Study Region : Staunton
Scenario : 100
Return Period: 100
Analysis Option: 0

Regional Statistics

Area (Square Miles)	20
Number of Census Blocks	711
Number of Buildings	
Residential	9,111
Total	10,118
Number of People in the Region (x 1000)	24
Building Exposure ($ Millions)	
Residential	2,264
Total	3,047

Scenario Results

Shelter Requirements	
Displaced Population (# Households)	98
Short Term Shelter (# People)	3
Economic Loss	
Residential Property (Capital Stock) Losses ($ Millions)	10
Total Property (Capital Stock) Losses ($ Millions)	75
Business Interruption (Income) Losses ($ Millions)	147

Disclaimer:

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Quick Assessment Report

October 29, 2019

Study Region : Timberville
Scenario : 100
Return Period: 100
Analysis Option: 0

Regional Statistics

Area (Square Miles)	1
Number of Census Blocks	57
Number of Buildings	
Residential	1,060
Total	1,112
Number of People in the Region (x 1000)	3
Building Exposure ($ Millions)	
Residential	219
Total	238

Scenario Results

Shelter Requirements

Displaced Population (# Households)	14
Short Term Shelter (# People)	0

Economic Loss

Residential Property (Capital Stock) Losses ($ Millions)	2
Total Property (Capital Stock) Losses ($ Millions)	2
Business Interruption (Income) Losses ($ Millions)	1

Disclaimer:

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Quick Assessment Report

November 6, 2019

Study Region : Waynesboro
Scenario : 100
Return Period: 100
Analysis Option: 0

Regional Statistics

Area (Square Miles)	15
Number of Census Blocks	887
Number of Buildings	
Residential	7,694
Total	8,669
Number of People in the Region (x 1000)	21
Building Exposure ($ Millions)	
Residential	1,831
Total	2,667

Scenario Results

Shelter Requirements	
Displaced Population (# Households)	567
Short Term Shelter (# People)	65
Economic Loss	
Residential Property (Capital Stock) Losses ($ Millions)	63
Total Property (Capital Stock) Losses ($ Millions)	280
Business Interruption (Income) Losses ($ Millions)	182

Disclaimer:

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Hazus: Hurricane Global Risk Report

Region Name: CSPDC_Hurricane

Hurricane Scenario: Probabilistic 100-year Return Period

Print Date: Wednesday, October 30, 2019

Disclaimer:
This version of Hazus utilizes 2010 Census Data.
Totals only reflect data for those census tracts/blocks included in the user's study region.

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Table of Contents

General Description of the Region

Hazus is a regional multi-hazard loss estimation model that was developed by the Federal Emergency Management Agency and the National Institute of Building Sciences. The primary purpose of Hazus is to provide a methodology and software application to develop multi-hazard losses at a regional scale. These loss estimates would be used primarily by local, state and regional officials to plan and stimulate efforts to reduce risks from multi-hazards and to prepare for emergency response and recovery.

The hurricane loss estimates provided in this report are based on a region that includes 10 county(ies) from the following state(s):

- Virginia

Note:
Appendix A contains a complete listing of the counties contained in the region.

The geographical size of the region is 3,437.64 square miles and contains 62 census tracts. There are over 110 thousand households in the region and a total population of 286,781 people (2010 Census Bureau data). The distribution of population by State and County is provided in Appendix B.

There are an estimated 118 thousand buildings in the region with a total building replacement value (excluding contents) of 31,788 million dollars (2014 dollars). Approximately 92% of the buildings (and 78% of the building value) are associated with residential housing.

Building Inventory

General Building Stock

Hazus estimates that there are 118,565 buildings in the region which have an aggregate total replacement value of 31,788 million (2014 dollars). Table 1 presents the relative distribution of the value with respect to the general occupancies. Appendix B provides a general distribution of the building value by State and County.

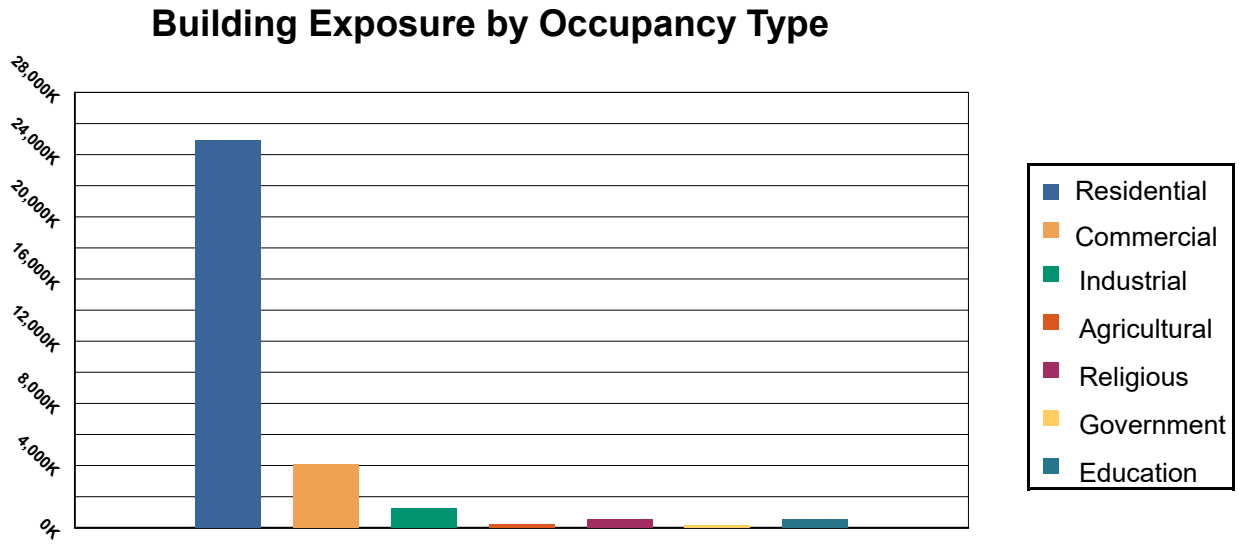


Table 1: Building Exposure by Occupancy Type

Occupancy	Exposure ($1000)	Percent of Tot
Residential	24,927,457	78.42 %
Commercial	4,053,304	12.75%
Industrial	1,273,474	4.01%
Agricultural	254,378	0.80%
Religious	558,559	1.76%
Government	174,125	0.55%
Education	546,526	1.72%
Total	**31,787,823**	**100.00%**

Essential Facility Inventory

For essential facilities, there are 7 hospitals in the region with a total bed capacity of 543 beds. There are 144 schools, 52 fire stations, 28 police stations and 9 emergency operation facilities.

Hurricane Scenario

Hazus used the following set of information to define the hurricane parameters for the hurricane loss estimate provided in this report.

Scenario Name:	Probabilistic
Type:	Probabilistic

Building Damage

General Building Stock Damage

Hazus estimates that about 1 buildings will be at least moderately damaged. This is over 0% of the total number of buildings in the region. There are an estimated 0 buildings that will be completely destroyed. The definition of the 'damage states' is provided in the Hazus Hurricane technical manual. Table 2 below summarizes the expected damage by general occupancy for the buildings in the region. Table 3 summarizes the expected damage by general building type.

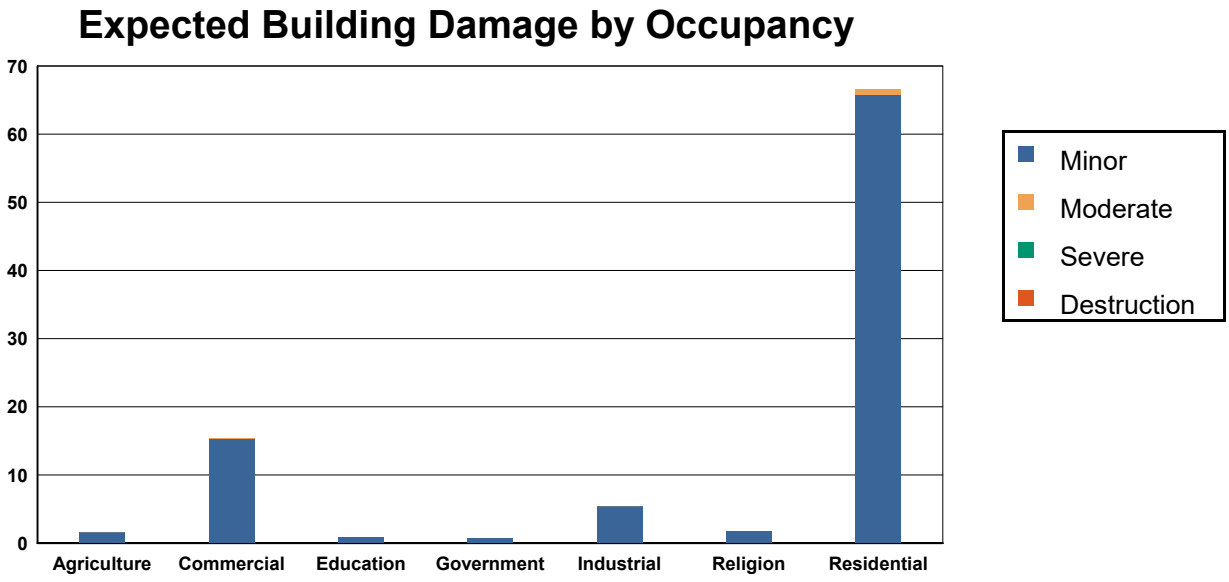


Table 2: Expected Building Damage by Occupancy : 100 - year Event

	None		Minor		Moderate		Severe		Destruction	
Occupancy	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**
Agriculture	786.47	99.81	1.53	0.19	0.00	0.00	0.00	0.00	0.00	0.00
Commercial	5,665.63	99.73	15.34	0.27	0.02	0.00	0.00	0.00	0.00	0.00
Education	276.14	99.69	0.86	0.31	0.00	0.00	0.00	0.00	0.00	0.00
Government	220.27	99.67	0.73	0.33	0.00	0.00	0.00	0.00	0.00	0.00
Industrial	1,704.59	99.68	5.41	0.32	0.01	0.00	0.00	0.00	0.00	0.00
Religion	810.26	99.79	1.74	0.21	0.00	0.00	0.00	0.00	0.00	0.00
Residential	109,009.36	99.94	65.82	0.06	0.83	0.00	0.00	0.00	0.00	0.00
Total	**118,472.71**		**91.43**		**0.85**		**0.00**		**0.00**	

Table 3: Expected Building Damage by Building Type : 100 - year Event

Building Type	None		Minor		Moderate		Severe		Destruction	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Concrete	1,146	99.58	5	0.42	0	0.00	0	0.00	0	0.00
Masonry	27,676	99.82	50	0.18	1	0.00	0	0.00	0	0.00
MH	9,682	100.00	0	0.00	0	0.00	0	0.00	0	0.00
Steel	4,316	99.67	14	0.33	0	0.00	0	0.00	0	0.00
Wood	75,626	99.98	14	0.02	0	0.00	0	0.00	0	0.00

Essential Facility Damage

Before the hurricane, the region had no hospital beds available for use. On the day of the hurricane, the model estimates that 543 hospital beds (0%) are available for use by patients already in the hospital and those injured by the hurricane. After one week, none of the beds will be in service. By 30 days, none will be operational.

Thematic Map of Essential Facilities with greater than 50% moderate

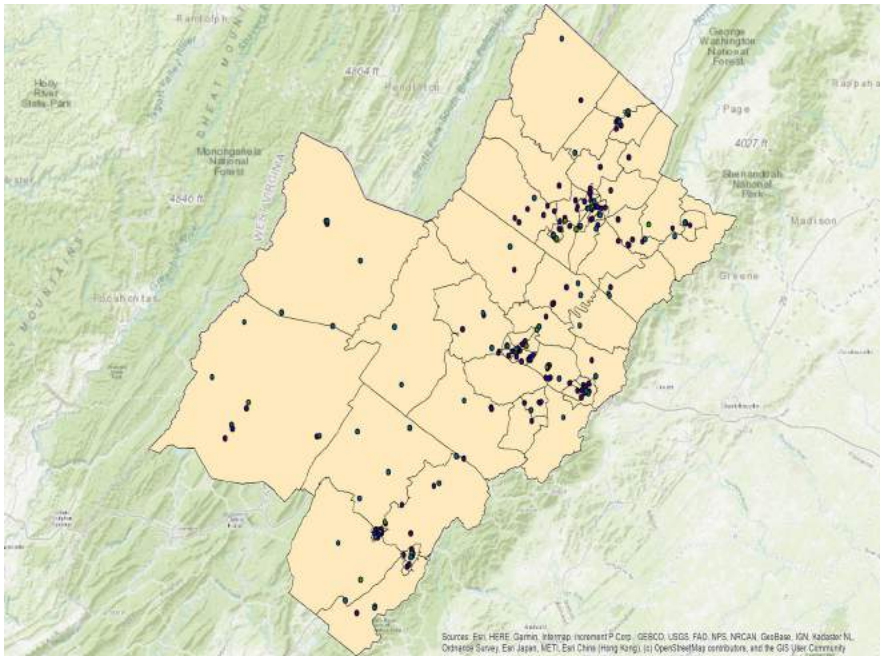
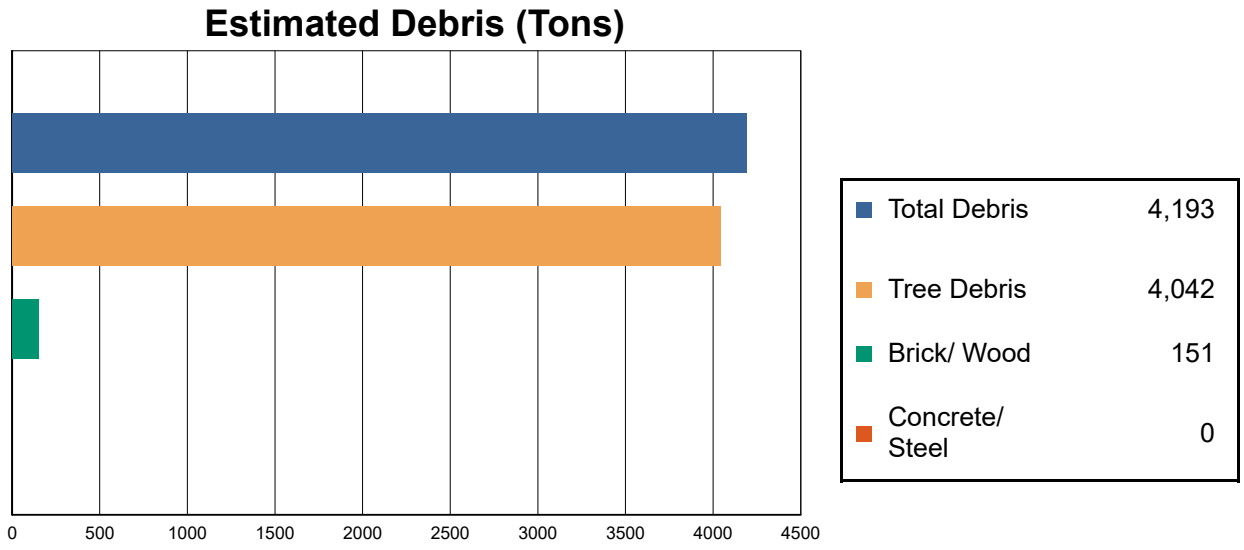


Table 4: Expected Damage to Essential Facilities

		# Facilities		
Classification	Total	Probability of at Least Moderate Damage > 50%	Probability of Complete Damage > 50%	Expected Loss of Use < 1 day
EOCs	9	0	0	9
Fire Stations	52	0	0	52
Hospitals	7	0	0	7
Police Stations	28	0	0	28
Schools	144	0	0	144

Induced Hurricane Damage

Debris Generation

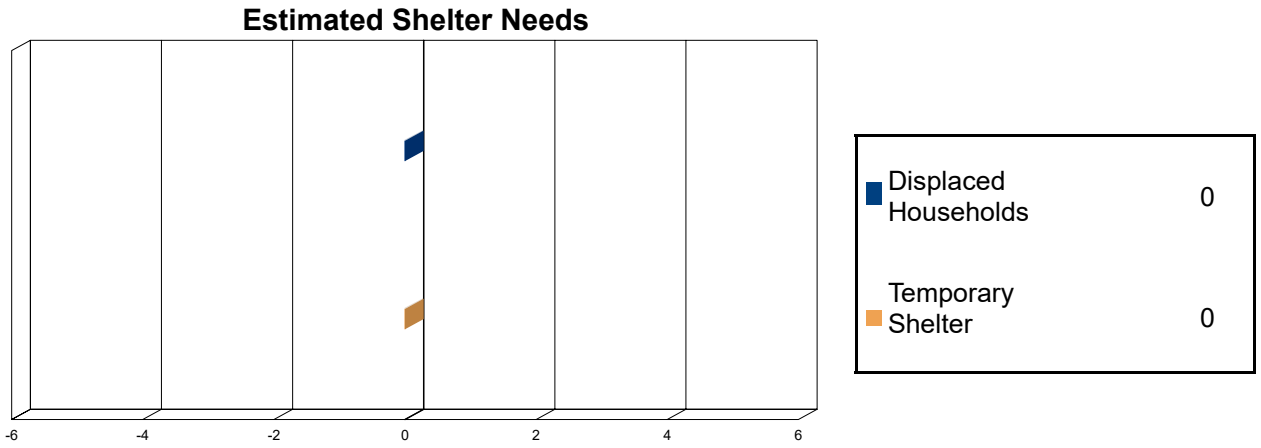


Hazus estimates the amount of debris that will be generated by the hurricane. The model breaks the debris into four general categories: a) Brick/Wood, b) Reinforced Concrete/Steel, c) Eligible Tree Debris, and d) Other Tree Debris. This distinction is made because of the different types of material handling equipment required to handle the debris.

The model estimates that a total of 4,193 tons of debris will be generated. Of the total amount, 3,065 tons (73%) is Other Tree Debris. Of the remaining 1,128 tons, Brick/Wood comprises 13% of the total, Reinforced Concrete/Steel comprises of 0% of the total, with the remainder being Eligible Tree Debris. If the building debris tonnage is converted to an estimated number of truckloads, it will require 6 truckloads (@25 tons/truck) to remove the building debris generated by the hurricane. The number of Eligible Tree Debris truckloads will depend on how the 977 tons of Eligible Tree Debris are collected and processed. The volume of tree debris generally ranges from about 4 cubic yards per ton for chipped or compacted tree debris to about 10 cubic yards per ton for bulkier, uncompacted debris.

Social Impact

Shelter Requirement



Hazus estimates the number of households that are expected to be displaced from their homes due to the hurricane and the number of displaced people that will require accommodations in temporary public shelters. The model estimates 0 households to be displaced due to the hurricane. Of these, 0 people (out of a total population of 286,781) will seek temporary shelter in public shelters.

Economic Loss

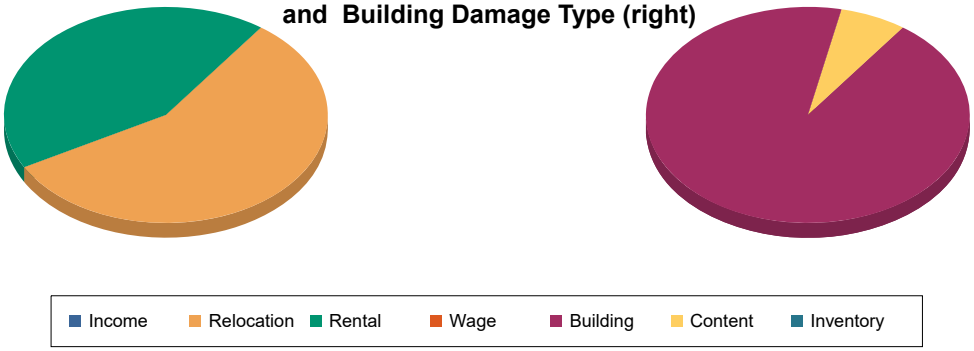
The total economic loss estimated for the hurricane is 5.1 million dollars, which represents 0.02 % of the total replacement value of the region's buildings.

Building-Related Losses

The building related losses are broken into two categories: direct property damage losses and business interruption losses. The direct property damage losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability to operate a business because of the damage sustained during the hurricane. Business interruption losses also include the temporary living expenses for those people displaced from their homes because of the hurricane.

The total property damage losses were 5 million dollars. 0% of the estimated losses were related to the business interruption of the region. By far, the largest loss was sustained by the residential occupancies which made up over 98% of the total loss. Table 5 below provides a summary of the losses associated with the building damage.

Loss by Business Interruption Type (left) and Building Damage Type (right)



Loss Type by General Occupancy

Table 5: Building-Related Economic Loss Estimates

(Thousands of dollars)

Category	Area	Residential	Commercial	Industrial	Others	Total
Property Damage						
	Building	4,622.01	56.56	23.83	27.76	4,730.16
	Content	334.04	0.00	0.00	0.00	334.04
	Inventory	0.00	0.00	0.00	0.00	0.00
	Subtotal	**4,956.05**	**56.56**	**23.83**	**27.76**	**5,064.20**
Business Interruption Loss						
	Income	0.00	0.00	0.00	0.00	0.00
	Relocation	2.81	0.10	0.00	0.00	2.91
	Rental	2.21	0.00	0.00	0.00	2.21
	Wage	0.00	0.00	0.00	0.00	0.00
	Subtotal	**5.02**	**0.10**	**0.00**	**0.00**	**5.12**

Total

Total	**4,961.07**	**56.66**	**23.83**	**27.76**	**5,069.32**

Appendix A: County Listing for the Region

Virginia
- Augusta
- Bath
- Highland
- Rockbridge
- Rockingham
- Buena Vista
- Harrisonburg
- Lexington
- Staunton
- Waynesboro

Appendix B: Regional Population and Building Value Data

		Building Value (thousands of dollars)		
	Population	Residential	Non-Residential	Total
Virginia				
Augusta	73,750	6,296,301	1,337,630	7,633,931
Bath	4,731	739,486	78,123	817,609
Buena Vista	6,650	509,866	214,901	724,767
Harrisonburg	48,914	3,460,375	1,630,540	5,090,915
Highland	2,321	320,363	46,946	367,309
Lexington	7,042	714,506	243,342	957,848
Rockbridge	22,307	2,182,496	429,798	2,612,294
Rockingham	76,314	6,609,137	1,260,787	7,869,924
Staunton	23,746	2,264,098	782,529	3,046,627
Waynesboro	21,006	1,830,829	835,770	2,666,599
Total	**286,781**	**24,927,457**	**6,860,366**	**31,787,823**
Study Region Total	**286,781**	**24,927,457**	**6,860,366**	**31,787,823**

Quick Assessment Report

October 30, 2019

Study Region : CSPDC_Hurricane

Scenario : Probabilistic

Regional Statistics

Area (Square Miles)	3,438
Number of Census Tracts	62
Number of People in the Region	286,781

General Building Stock

Occupancy	*Building Count*	*Dollar Exposure ($ K)*
Residential	109,076	24,927,457
Commercial	5,681	4,053,304
Other	3,808	2,807,062
Total	118,565	31,787,823

Scenario Results

Number of Residential Buildings Damaged

Return Period	*Minor*	*Moderate*	*Severe*	*Destruction*	*Total*
10	0	0	0	0	0
20	0	0	0	0	0
50	20	0	0	0	20
100	66	1	0	0	67
200	158	3	0	0	161
500	880	35	0	0	915
1000	2,228	110	1	1	2,339

Number of Buildings Damaged

Return Period	*Minor*	*Moderate*	*Severe*	*Destruction*	*Total*
10	0	0	0	0	0
20	0	0	0	0	0
50	31	0	0	0	31
100	91	1	0	0	92
200	194	4	0	0	198
500	961	38	1	0	1,000
1000	2,374	121	2	1	2,498

Shelter Requirements

Return Period	*Displaced Households (#Households)*	*Short Term Shelter (#People)*
10	0	0
20	0	0
50	0	0
100	0	0
200	0	0
500	0	0
1000	0	0

Economic Loss (x 1000)

	Property Damage (Capital Stock) Losses		*Business Interruption*
ReturnPeriod	***Residential***	***Total***	***(Income) Losses***
10	0	0	0
20	0	0	0
50	214	214	0
100	4,956	5,064	5
200	15,705	16,347	32
500	44,891	46,220	1,022
1000	76,205	78,679	4,886
Annualized	359	379	20

Quick Assessment Report

October 31, 2019

Study Region : Augusta

Scenario : Probabilistic

Regional Statistics

Area (Square Miles)	971
Number of Census Tracts	13
Number of People in the Region	73,750

General Building Stock

Occupancy	*Building Count*	*Dollar Exposure ($ K)*
Residential	29,645	6,296,301
Commercial	1,029	744,145
Other	892	593,485
Total	31,566	7,633,931

Scenario Results

Number of Residential Buildings Damaged

Return Period	*Minor*	*Moderate*	*Severe*	*Destruction*	*Total*
10	0	0	0	0	0
20	0	0	0	0	0
50	2	0	0	0	2
100	8	0	0	0	8
200	38	0	0	0	39
500	266	7	0	0	273
1000	683	25	0	1	709

Number of Buildings Damaged

Return Period	*Minor*	*Moderate*	*Severe*	*Destruction*	*Total*
10	0	0	0	0	0
20	0	0	0	0	0
50	5	0	0	0	5
100	13	0	0	0	13
200	46	0	0	0	47
500	286	7	0	0	293
1000	719	28	0	1	748

Shelter Requirements

Return Period	*Displaced Households (#Households)*	*Short Term Shelter (#People)*
10	0	0
20	0	0
50	0	0
100	0	0
200	0	0
500	0	0
1000	0	0

Economic Loss (x 1000)

	Property Damage (Capital Stock) Losses		*Business Interruption*
ReturnPeriod	***Residential***	***Total***	***(Income) Losses***
10	0	0	0
20	0	0	0
50	8	8	0
100	1,448	1,472	0
200	4,685	4,814	11
500	13,402	13,674	374
1000	22,154	22,729	1,237
Annualized	111	116	6

Quick Assessment Report

November 1, 2019

Study Region : Bath

Scenario : Probabilistic

Regional Statistics

Area (Square Miles)	535
Number of Census Tracts	1
Number of People in the Region	4,731

General Building Stock

Occupancy	*Building Count*	*Dollar Exposure ($ K)*
Residential	3,262	739,486
Commercial	49	43,825
Other	49	34,298
Total	3,360	817,609

Scenario Results

Number of Residential Buildings Damaged

Return Period	*Minor*	*Moderate*	*Severe*	*Destruction*	*Total*
10	0	0	0	0	0
20	0	0	0	0	0
50	0	0	0	0	0
100	0	0	0	0	0
200	1	0	0	0	1
500	8	0	0	0	8
1000	26	0	0	0	26

Number of Buildings Damaged

Return Period	*Minor*	*Moderate*	*Severe*	*Destruction*	*Total*
10	0	0	0	0	0
20	0	0	0	0	0
50	0	0	0	0	0
100	1	0	0	0	1
200	1	0	0	0	1
500	9	0	0	0	9
1000	26	1	0	0	27

Shelter Requirements

Return Period	*Displaced Households (#Households)*	*Short Term Shelter (#People)*
10	0	0
20	0	0
50	0	0
100	0	0
200	0	0
500	0	0
1000	0	0

Economic Loss (x 1000)

	Property Damage (Capital Stock) Losses		*Business Interruption*
ReturnPeriod	***Residential***	***Total***	***(Income) Losses***
10	0	0	0
20	0	0	0
50	0	0	0
100	20	20	0
200	241	249	0
500	721	729	2
1000	1,376	1,392	17
Annualized	7	7	0

Disclaimer:

Totals only reflect data for those census tracts/blocks included in the user's study region.

The estimates of social and economic impacts contained in this report were produced using HAZUS loss estimation methodology software which is based on current scientific and engineering knowledge. There are uncertainties inherent in any loss estimation technique. Therefore, there may be significant differences between the modeled results contained in this report and the actual social and economic losses following a specific Hurricane. These results can be improved by using enhanced inventory data.

Quick Assessment Report

November 7, 2019

Study Region : BuenaVista

Scenario : Probabilistic

Regional Statistics

Area (Square Miles)	7
Number of Census Tracts	1
Number of People in the Region	6,650

General Building Stock

Occupancy	*Building Count*	*Dollar Exposure ($ K)*
Residential	2,607	509,866
Commercial	163	60,555
Other	127	154,346
Total	2,897	724,767

Scenario Results

Number of Residential Buildings Damaged

Return Period	*Minor*	*Moderate*	*Severe*	*Destruction*	*Total*
10	0	0	0	0	0
20	0	0	0	0	0
50	1	0	0	0	1
100	1	0	0	0	1
200	4	0	0	0	4
500	24	1	0	0	24
1000	82	4	0	0	86

Number of Buildings Damaged

Return Period	*Minor*	*Moderate*	*Severe*	*Destruction*	*Total*
10	0	0	0	0	0
20	0	0	0	0	0
50	1	0	0	0	1
100	2	0	0	0	2
200	5	0	0	0	5
500	26	1	0	0	27
1000	89	4	0	0	93

Shelter Requirements

Return Period	*Displaced Households (#Households)*	*Short Term Shelter (#People)*
10	0	0
20	0	0
50	0	0
100	0	0
200	0	0
500	0	0
1000	0	0

Economic Loss (x 1000)

	Property Damage (Capital Stock) Losses		*Business Interruption*
ReturnPeriod	***Residential***	***Total***	***(Income) Losses***
10	0	0	0
20	0	0	0
50	1	1	0
100	87	87	0
200	336	357	2
500	909	948	7
1000	1,849	2,004	145
Annualized	9	10	1

Disclaimer:

Totals only reflect data for those census tracts/blocks included in the user's study region.

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Quick Assessment Report

November 6, 2019

Study Region : Harrisonburg

Scenario : Probabilistic

Regional Statistics

Area (Square Miles)	17
Number of Census Tracts	11
Number of People in the Region	48,914

General Building Stock

Occupancy	*Building Count*	*Dollar Exposure ($ K)*
Residential	11,175	3,460,375
Commercial	1,128	1,093,970
Other	453	536,570
Total	12,756	5,090,915

Scenario Results

Number of Residential Buildings Damaged

Return Period	*Minor*	*Moderate*	*Severe*	*Destruction*	*Total*
10	0	0	0	0	0
20	0	0	0	0	0
50	0	0	0	0	0
100	9	0	0	0	9
200	18	1	0	0	19
500	86	6	0	0	92
1000	206	16	0	0	222

Number of Buildings Damaged

Return Period	*Minor*	*Moderate*	*Severe*	*Destruction*	*Total*
10	0	0	0	0	0
20	0	0	0	0	0
50	0	0	0	0	0
100	13	0	0	0	13
200	24	1	0	0	25
500	99	6	0	0	105
1000	227	17	0	0	245

Shelter Requirements

Return Period	*Displaced Households (#Households)*	*Short Term Shelter (#People)*
10	0	0
20	0	0
50	0	0
100	0	0
200	0	0
500	0	0
1000	0	0

Economic Loss (x 1000)

	Property Damage (Capital Stock) Losses		*Business Interruption*
ReturnPeriod	***Residential***	***Total***	***(Income) Losses***
10	0	0	0
20	0	0	0
50	0	0	0
100	314	315	0
200	1,313	1,473	2
500	4,369	4,685	95
1000	7,750	8,208	717
Annualized	35	39	3

Disclaimer:

Totals only reflect data for those census tracts/blocks included in the user's study region.

The estimates of social and economic impacts contained in this report were produced using HAZUS loss estimation methodology software which is based on current scientific and engineering knowledge. There are uncertainties inherent in any loss estimation technique. Therefore, there may be significant differences between the modeled results contained in this report and the actual social and economic losses following a specific Hurricane. These results can be improved by using enhanced inventory data.

Quick Assessment Report

November 5, 2019

Study Region : Highland

Scenario : Probabilistic

Regional Statistics

Area (Square Miles)	416
Number of Census Tracts	1
Number of People in the Region	2,321

General Building Stock

Occupancy	*Building Count*	*Dollar Exposure ($ K)*
Residential	1,814	320,363
Commercial	37	21,392
Other	36	25,554
Total	1,887	367,309

Scenario Results

Number of Residential Buildings Damaged

Return Period	*Minor*	*Moderate*	*Severe*	*Destruction*	*Total*
10	0	0	0	0	0
20	0	0	0	0	0
50	0	0	0	0	0
100	0	0	0	0	0
200	0	0	0	0	0
500	4	0	0	0	4
1000	13	0	0	0	14

Number of Buildings Damaged

Return Period	*Minor*	*Moderate*	*Severe*	*Destruction*	*Total*
10	0	0	0	0	0
20	0	0	0	0	0
50	0	0	0	0	0
100	0	0	0	0	0
200	1	0	0	0	1
500	4	0	0	0	4
1000	14	0	0	0	14

Shelter Requirements

Return Period	*Displaced Households (#Households)*	*Short Term Shelter (#People)*
10	0	0
20	0	0
50	0	0
100	0	0
200	0	0
500	0	0
1000	0	0

Economic Loss (x 1000)

	Property Damage (Capital Stock) Losses		*Business Interruption*
ReturnPeriod	***Residential***	***Total***	***(Income) Losses***
10	0	0	0
20	0	0	0
50	0	0	0
100	8	8	0
200	103	107	0
500	322	327	1
1000	626	634	5
Annualized	3	3	0

Quick Assessment Report

November 6, 2019

Study Region : Lexington

Scenario : Probabilistic

Regional Statistics

Area (Square Miles)	3
Number of Census Tracts	1
Number of People in the Region	7,042

General Building Stock

Occupancy	*Building Count*	*Dollar Exposure ($ K)*
Residential	2,030	714,506
Commercial	204	144,783
Other	110	98,559
Total	2,344	957,848

Scenario Results

Number of Residential Buildings Damaged

Return Period	*Minor*	*Moderate*	*Severe*	*Destruction*	*Total*
10	0	0	0	0	0
20	0	0	0	0	0
50	1	0	0	0	1
100	2	0	0	0	2
200	4	0	0	0	4
500	18	1	0	0	19
1000	58	4	0	0	62

Number of Buildings Damaged

Return Period	*Minor*	*Moderate*	*Severe*	*Destruction*	*Total*
10	0	0	0	0	0
20	0	0	0	0	0
50	2	0	0	0	2
100	2	0	0	0	2
200	5	0	0	0	5
500	20	1	0	0	21
1000	64	5	0	0	69

Shelter Requirements

Return Period	*Displaced Households (#Households)*	*Short Term Shelter (#People)*
10	0	0
20	0	0
50	0	0
100	0	0
200	0	0
500	0	0
1000	0	0

Economic Loss (x 1000)

	Property Damage (Capital Stock) Losses		*Business Interruption*
ReturnPeriod	***Residential***	***Total***	***(Income) Losses***
10	0	0	0
20	0	0	0
50	1	1	0
100	141	141	0
200	344	368	0
500	999	1,047	12
1000	2,082	2,181	167
Annualized	10	11	1

Quick Assessment Report

November 6, 2019

Study Region : Rockbridge

Scenario : Probabilistic

Regional Statistics

Area (Square Miles)	601
Number of Census Tracts	4
Number of People in the Region	22,307

General Building Stock

Occupancy	*Building Count*	*Dollar Exposure ($ K)*
Residential	10,703	2,182,496
Commercial	424	233,051
Other	341	196,747
Total	11,468	2,612,294

Scenario Results

Number of Residential Buildings Damaged

Return Period	*Minor*	*Moderate*	*Severe*	*Destruction*	*Total*
10	0	0	0	0	0
20	0	0	0	0	0
50	1	0	0	0	1
100	2	0	0	0	2
200	12	0	0	0	12
500	78	2	0	0	80
1000	273	11	0	0	285

Number of Buildings Damaged

Return Period	*Minor*	*Moderate*	*Severe*	*Destruction*	*Total*
10	0	0	0	0	0
20	0	0	0	0	0
50	3	0	0	0	3
100	3	0	0	0	3
200	15	0	0	0	16
500	84	2	0	0	86
1000	289	13	0	0	302

Shelter Requirements

Return Period	*Displaced Households (#Households)*	*Short Term Shelter (#People)*
10	0	0
20	0	0
50	0	0
100	0	0
200	0	0
500	0	0
1000	0	0

Economic Loss (x 1000)

	Property Damage (Capital Stock) Losses		***Business Interruption***
ReturnPeriod	***Residential***	***Total***	***(Income) Losses***
10	0	0	0
20	0	0	0
50	11	11	0
100	475	495	0
200	1,524	1,565	4
500	4,541	4,624	120
1000	8,781	9,027	524
Annualized	41	43	2

Disclaimer:

Totals only reflect data for those census tracts/blocks included in the user's study region.

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Quick Assessment Report

November 5, 2019

Study Region : Rockingham

Scenario : Probabilistic

Regional Statistics

Area (Square Miles)	853
Number of Census Tracts	19
Number of People in the Region	76,314

General Building Stock

Occupancy	*Building Count*	*Dollar Exposure ($ K)*
Residential	31,035	6,609,137
Commercial	1,310	607,664
Other	1,155	653,123
Total	33,500	7,869,924

Scenario Results

Number of Residential Buildings Damaged

Return Period	*Minor*	*Moderate*	*Severe*	*Destruction*	*Total*
10	0	0	0	0	0
20	0	0	0	0	0
50	2	0	0	0	2
100	9	0	0	0	9
200	41	1	0	0	41
500	245	7	0	0	252
1000	769	40	0	2	811

Number of Buildings Damaged

Return Period	*Minor*	*Moderate*	*Severe*	*Destruction*	*Total*
10	0	0	0	0	0
20	0	0	0	0	0
50	5	0	0	0	5
100	13	0	0	0	13
200	51	1	0	0	52
500	267	8	0	0	275
1000	817	45	1	2	864

Shelter Requirements

Return Period	*Displaced Households (#Households)*	*Short Term Shelter (#People)*
10	0	0
20	0	0
50	0	0
100	0	0
200	0	0
500	0	0
1000	0	0

Economic Loss (x 1000)

	Property Damage (Capital Stock) Losses		***Business Interruption***
ReturnPeriod	***Residential***	***Total***	***(Income) Losses***
10	0	0	0
20	0	0	0
50	3	3	0
100	1,071	1,105	1
200	4,339	4,442	18
500	12,259	12,534	436
1000	22,278	22,979	1,191
Annualized	104	109	6

Quick Assessment Report

November 6, 2019

Study Region : Staunton

Scenario : Probabilistic

Regional Statistics

Area (Square Miles)	20
Number of Census Tracts	6
Number of People in the Region	23,746

General Building Stock

Occupancy	*Building Count*	*Dollar Exposure ($ K)*
Residential	9,111	2,264,098
Commercial	670	521,766
Other	337	260,763
Total	10,118	3,046,627

Scenario Results

Number of Residential Buildings Damaged

Return Period	*Minor*	*Moderate*	*Severe*	*Destruction*	*Total*
10	0	0	0	0	0
20	0	0	0	0	0
50	2	0	0	0	2
100	5	0	0	0	5
200	12	0	0	0	12
500	68	4	0	0	71
1000	174	11	0	0	185

Number of Buildings Damaged

Return Period	*Minor*	*Moderate*	*Severe*	*Destruction*	*Total*
10	0	0	0	0	0
20	0	0	0	0	0
50	3	0	0	0	3
100	8	0	0	0	8
200	15	0	0	0	16
500	75	4	0	0	79
1000	189	11	0	0	200

Shelter Requirements

Return Period	*Displaced Households (#Households)*	*Short Term Shelter (#People)*
10	0	0
20	0	0
50	0	0
100	0	0
200	0	0
500	0	0
1000	0	0

Economic Loss (x 1000)

	Property Damage (Capital Stock) Losses		***Business Interruption***
ReturnPeriod	***Residential***	***Total***	***(Income) Losses***
10	0	0	0
20	0	0	0
50	1	1	0
100	403	403	0
200	1,163	1,241	1
500	3,893	4,035	34
1000	6,679	6,894	471
Annualized	31	33	2

Disclaimer:

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Quick Assessment Report

November 6, 2019

Study Region : Waynesboro

Scenario : Probabilistic

Regional Statistics

Area (Square Miles)	15
Number of Census Tracts	5
Number of People in the Region	21,006

General Building Stock

Occupancy	*Building Count*	*Dollar Exposure ($ K)*
Residential	7,694	1,830,829
Commercial	667	582,153
Other	308	253,617
Total	8,669	2,666,599

Scenario Results

Number of Residential Buildings Damaged

Return Period	*Minor*	*Moderate*	*Severe*	*Destruction*	*Total*
10	0	0	0	0	0
20	0	0	0	0	0
50	3	0	0	0	3
100	4	0	0	0	4
200	14	0	0	0	15
500	74	3	0	0	78
1000	179	10	0	0	189

Number of Buildings Damaged

Return Period	*Minor*	*Moderate*	*Severe*	*Destruction*	*Total*
10	0	0	0	0	0
20	0	0	0	0	0
50	5	0	0	0	5
100	6	0	0	0	6
200	18	0	0	0	19
500	83	4	0	0	87
1000	194	11	0	0	206

Shelter Requirements

Return Period	*Displaced Households (#Households)*	*Short Term Shelter (#People)*
10	0	0
20	0	0
50	0	0
100	0	0
200	0	0
500	0	0
1000	0	0

Economic Loss (x 1000)

	Property Damage (Capital Stock) Losses		***Business Interruption***
ReturnPeriod	***Residential***	***Total***	***(Income) Losses***
10	0	0	0
20	0	0	0
50	2	2	0
100	410	410	0
200	1,407	1,491	7
500	3,911	4,054	48
1000	6,380	6,681	428
Annualized	30	33	2

Disclaimer:

Totals only reflect data for those census tracts/blocks included in the user's study region.

The estimates of social and economic impacts contained in this report were produced using HAZUS loss estimation methodology software which is based on current scientific and engineering knowledge. There are uncertainties inherent in any loss estimation technique. Therefore, there may be significant differences between the modeled results contained in this report and the actual social and economic losses following a specific Hurricane. These results can be improved by using enhanced inventory data.

Hazus: Earthquake Global Risk Report

Region Name	CSPDC_EQ
Earthquake Scenario:	100yr Probablistic Earthquake - Mag 5
Print Date:	August 19, 2019

Disclaimer:
This version of Hazus utilizes 2010 Census Data.
Totals only reflect data for those census tracts/blocks included in the user's study region.

The estimates of social and economic impacts contained in this report were produced using Hazus loss estimation methodology software which is based on current scientific and engineering knowledge. There are uncertainties inherent in any loss estimation technique. Therefore, there may be significant differences between the modeled results contained in this report and the actual social and economic losses following a specific earthquake. These results can be improved by using enhanced inventory, geotechnical, and observed ground motion data.

Table of Contents

General Description of the Region

Hazus-MH is a regional earthquake loss estimation model that was developed by the Federal Emergency Management Agency (FEMA) and the National Institute of Building Sciences. The primary purpose of Hazus is to provide a methodology and software application to develop multi-hazard losses at a regional scale. These loss estimates would be used primarily by local, state and regional officials to plan and stimulate efforts to reduce risks from multi-hazards and to prepare for emergency response and recovery.

The earthquake loss estimates provided in this report was based on a region that includes 10 county(ies) from the following state(s):

Virginia

Note:
Appendix A contains a complete listing of the counties contained in the region.

The geographical size of the region is 3,436.75 square miles and contains 62 census tracts. There are over 110 thousand households in the region which has a total population of 286,781 people (2010 Census Bureau data). The distribution of population by Total Region and County is provided in Appendix B.

There are an estimated 118 thousand buildings in the region with a total building replacement value (excluding contents) of 31,787 (millions of dollars). Approximately 92.00 % of the buildings (and 78.00% of the building value) are associated with residential housing.

The replacement value of the transportation and utility lifeline systems is estimated to be 6,448 and 3,038 (millions of dollars) , respectively.

Building and Lifeline Inventory

Building Inventory

Hazus estimates that there are 118 thousand buildings in the region which have an aggregate total replacement value of 31,787 (millions of dollars) . Appendix B provides a general distribution of the building value by Total Region and County.

In terms of building construction types found in the region, wood frame construction makes up 64% of the building inventory. The remaining percentage is distributed between the other general building types.

Critical Facility Inventory

Hazus breaks critical facilities into two (2) groups: essential facilities and high potential loss facilities (HPL). Essential facilities include hospitals, medical clinics, schools, fire stations, police stations and emergency operations facilities. High potential loss facilities include dams, levees, military installations, nuclear power plants and hazardous material sites.

For essential facilities, there are 7 hospitals in the region with a total bed capacity of 543 beds. There are 144 schools, 52 fire stations, 28 police stations and 9 emergency operation facilities. With respect to high potential loss facilities (HPL), there are no dams identified within the inventory. The inventory also includes 120 hazardous material sites, no military installations and no nuclear power plants.

Transportation and Utility Lifeline Inventory

Within Hazus, the lifeline inventory is divided between transportation and utility lifeline systems. There are seven (7) transportation systems that include highways, railways, light rail, bus, ports, ferry and airports. There are six (6) utility systems that include potable water, wastewater, natural gas, crude & refined oil, electric power and communications. The lifeline inventory data are provided in Tables 1 and 2.

The total value of the lifeline inventory is over 9,486.00 (millions of dollars). This inventory includes over 741.92 miles of highways, 778 bridges, 42,400.49 miles of pipes.

Table 1: Transportation System Lifeline Inventory

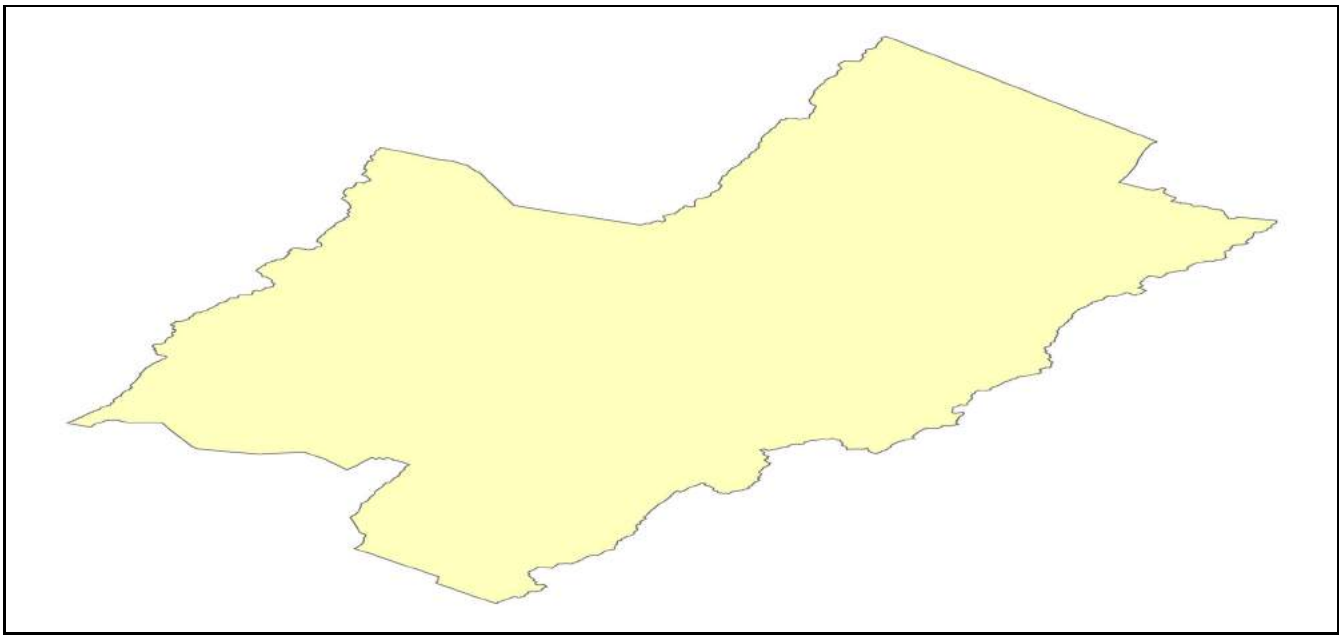
System	Component	# Locations/ # Segments	Replacement value (millions of dollars)
Highway	Bridges	778	460.7884
	Segments	297	5423.5850
	Tunnels	0	0.0000
		Subtotal	**5884.3734**
Railways	Bridges	3	0.1171
	Facilities	2	5.3260
	Segments	222	412.3045
	Tunnels	0	0.0000
		Subtotal	**417.7476**
Light Rail	Bridges	0	0.0000
	Facilities	0	0.0000
	Segments	0	0.0000
	Tunnels	0	0.0000
		Subtotal	**0.0000**
Bus	Facilities	1	1.0137
		Subtotal	**1.0137**
Ferry	Facilities	0	0.0000
		Subtotal	**0.0000**
Port	Facilities	0	0.0000
		Subtotal	**0.0000**
Airport	Facilities	3	31.9530
	Runways	3	113.8920
		Subtotal	**145.8450**
		Total	**6,449.00**

Table 2: Utility System Lifeline Inventory

System	Component	# Locations / Segments	Replacement value (millions of dollars)
Potable Water	Distribution Lines	NA	682.3788
	Facilities	12	371.6280
	Pipelines	0	0.0000
		Subtotal	**1054.0068**
Waste Water	Distribution Lines	NA	409.4273
	Facilities	16	991.0080
	Pipelines	0	0.0000
		Subtotal	**1400.4353**
Natural Gas	Distribution Lines	NA	272.9515
	Facilities	1	1.0137
	Pipelines	0	0.0000
		Subtotal	**273.9652**
Oil Systems	Facilities	0	0.0000
	Pipelines	0	0.0000
		Subtotal	**0.0000**
Electrical Power	Facilities	3	306.9000
		Subtotal	**306.9000**
Communication	Facilities	29	2.6970
		Subtotal	**2.6970**
		Total	**3,038.00**

Earthquake Scenario

Hazus uses the following set of information to define the earthquake parameters used for the earthquake loss estimate provided in this report.



Scenario Name	100yr Probablistic Earthquake - Mag 5
Type of Earthquake	Probabilistic
Fault Name	NA
Historical Epicenter ID #	NA
Probabilistic Return Period	100.00
Longitude of Epicenter	NA
Latitude of Epicenter	NA
Earthquake Magnitude	5.00
Depth (km)	NA
Rupture Length (Km)	NA
Rupture Orientation (degrees)	NA
Attenuation Function	NA

Direct Earthquake Damage

Building Damage

Hazus estimates that about 0 buildings will be at least moderately damaged. This is over 0.00 % of the buildings in the region. There are an estimated 0 buildings that will be damaged beyond repair. The definition of the 'damage states' is provided in Volume 1: Chapter 5 of the Hazus technical manual. Table 3 below summarizes the expected damage by general occupancy for the buildings in the region. Table 4 below summarizes the expected damage by general building type.

Damage Categories by General Occupancy Type

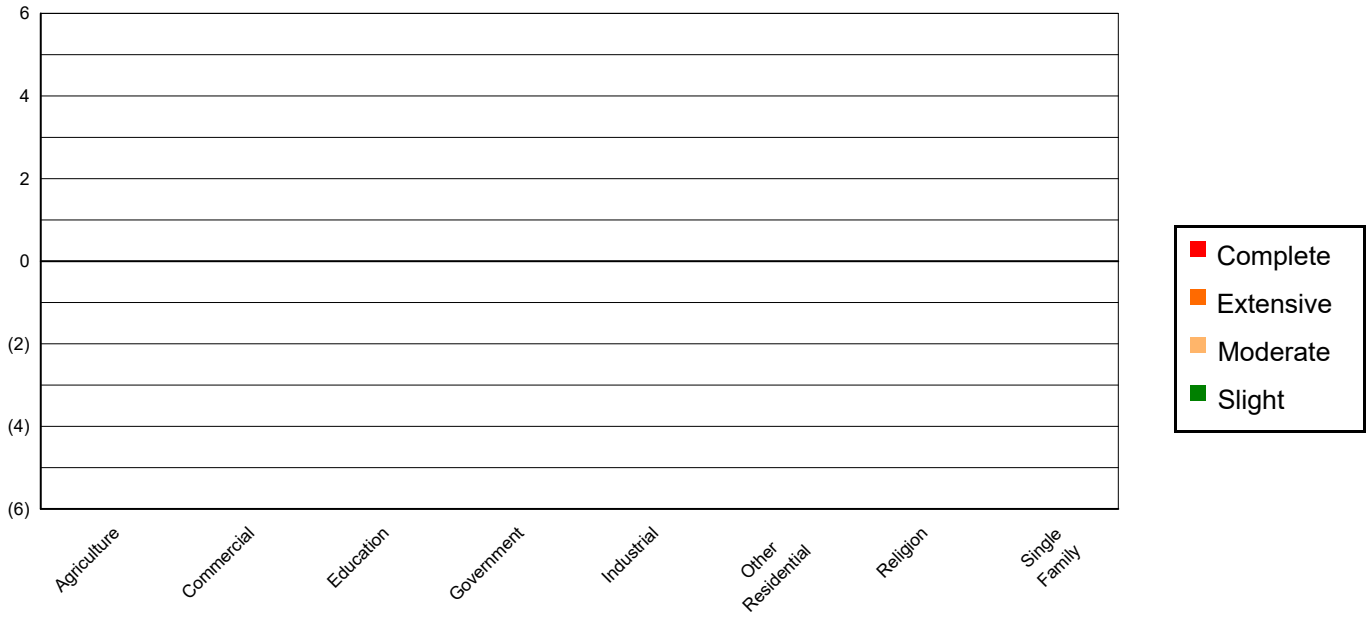


Table 3: Expected Building Damage by Occupancy

	None		Slight		Moderate		Extensive		Complete	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Agriculture	788.00	0.66	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Commercial	5681.00	4.79	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Education	277.00	0.23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Government	221.00	0.19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Industrial	1710.00	1.44	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Other Residential	14316.00	12.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Religion	812.00	0.68	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Single Family	94760.00	79.92	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	**118,565**		**0**		**0**		**0**		**0**	

Table 4: Expected Building Damage by Building Type (All Design Levels)

	None		Slight		Moderate		Extensive		Complete	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Wood	75641.90	63.80	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Steel	4344.47	3.66	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Concrete	822.76	0.69	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Precast	324.04	0.27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
RM	1151.37	0.97	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
URM	26595.46	22.43	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MH	9685.00	8.17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	**118,565**		**0**		**0**		**0**		**0**	

*Note:
RM Reinforced Masonry
URM Unreinforced Masonry
MH Manufactured Housing

Essential Facility Damage

Before the earthquake, the region had 543 hospital beds available for use. On the day of the earthquake, the model estimates that only 540 hospital beds (100.00%) are available for use by patients already in the hospital and those injured by the earthquake. After one week, 100.00% of the beds will be back in service. By 30 days, 100.00% will be operational.

Table 5: Expected Damage to Essential Facilities

Classification	Total	# Facilities		
		At Least Moderate Damage > 50%	Complete Damage > 50%	With Functionality > 50% on day 1
Hospitals	7	0	0	7
Schools	144	0	0	144
EOCs	9	0	0	9
PoliceStations	28	0	0	28
FireStations	52	0	0	52

Transportation Lifeline Damage

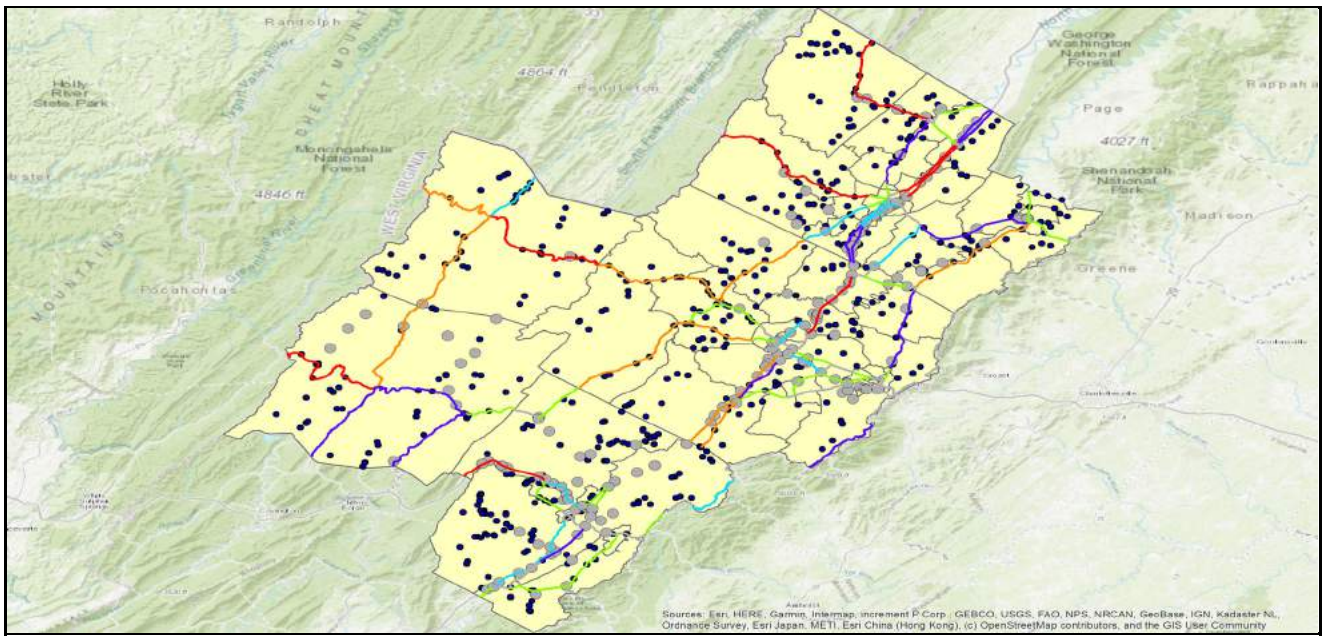


Table 6: Expected Damage to the Transportation Systems

System	Component		Number of Locations			
		Locations/ Segments	With at Least Mod. Damage	With Complete Damage	With Functionality > 50 %	
					After Day 1	After Day 7
Highway	Segments	297	0	0	297	297
	Bridges	778	0	0	778	778
	Tunnels	0	0	0	0	0
Railways	Segments	222	0	0	222	222
	Bridges	3	0	0	3	3
	Tunnels	0	0	0	0	0
	Facilities	2	0	0	2	2
Light Rail	Segments	0	0	0	0	0
	Bridges	0	0	0	0	0
	Tunnels	0	0	0	0	0
	Facilities	0	0	0	0	0
Bus	Facilities	1	0	0	1	1
Ferry	Facilities	0	0	0	0	0
Port	Facilities	0	0	0	0	0
Airport	Facilities	3	0	0	3	3
	Runways	3	0	0	3	3

Table 6 provides damage estimates for the transportation system.

Note: Roadway segments, railroad tracks and light rail tracks are assumed to be damaged by ground failure only. If ground failure maps are not provided, damage estimates to these components will not be computed.

Tables 7-9 provide information on the damage to the utility lifeline systems. Table 7 provides damage to the utility system facilities. Table 8 provides estimates on the number of leaks and breaks by the pipelines of the utility systems. For electric power and potable water, Hazus performs a simplified system performance analysis. Table 9 provides a summary of the system performance information.

Table 7 : Expected Utility System Facility Damage

System	# of Locations				
	Total #	With at Least Moderate Damage	With Complete Damage	with Functionality > 50 %	
				After Day 1	After Day 7
Potable Water	12	0	0	12	12
Waste Water	16	0	0	16	16
Natural Gas	1	0	0	1	1
Oil Systems	0	0	0	0	0
Electrical Power	3	0	0	3	3
Communication	29	0	0	29	29

Table 8 : Expected Utility System Pipeline Damage (Site Specific)

System	Total Pipelines Length (miles)	Number of Leaks	Number of Breaks
Potable Water	21,201	2	0
Waste Water	12,720	1	0
Natural Gas	8,480	0	0
Oil	0	0	0

Table 9: Expected Potable Water and Electric Power System Performance

	Total # of Households	Number of Households without Service				
		At Day 1	At Day 3	At Day 7	At Day 30	At Day 90
Potable Water	110,702	0	0	0	0	0
Electric Power		0	0	0	0	0

Induced Earthquake Damage

Fire Following Earthquake

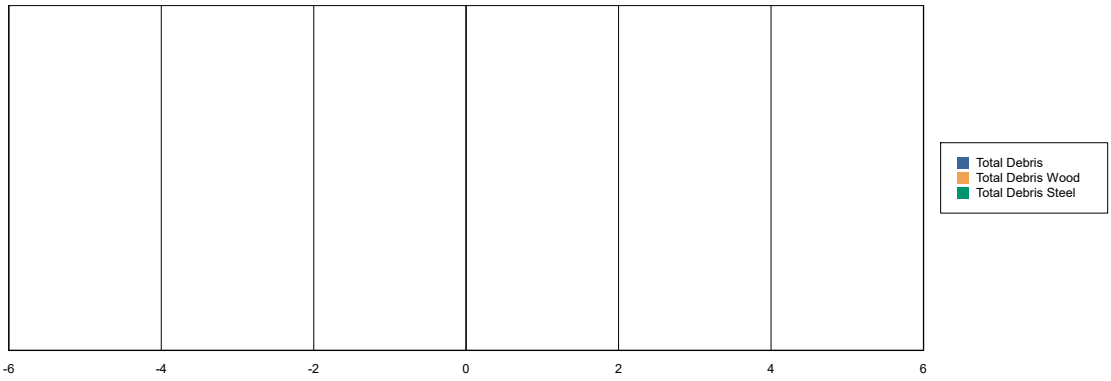
Fires often occur after an earthquake. Because of the number of fires and the lack of water to fight the fires, they can often burn out of control. Hazus uses a Monte Carlo simulation model to estimate the number of ignitions and the amount of burnt area. For this scenario, the model estimates that there will be 0 ignitions that will burn about 0.00 sq. mi 0.00 % of the region's total area.) The model also estimates that the fires will displace about 0 people and burn about 0 (millions of dollars) of building value.

Debris Generation

Hazus estimates the amount of debris that will be generated by the earthquake. The model breaks the debris into two general categories: a) Brick/Wood and b) Reinforced Concrete/Steel. This distinction is made because of the different types of material handling equipment required to handle the debris.

The model estimates that a total of 0 tons of debris will be generated. Of the total amount, Brick/Wood comprises % of the total, with the remainder being Reinforced Concrete/Steel. If the debris tonnage is converted to an estimated number of truckloads, it will require 0 truckloads (@25 tons/truck) to remove the debris generated by the earthquake.

Earthquake Debris (millions of tons)



Brick/ Wood	Reinforced Concrete/Steel	Total Debris	Truck Load
		0.00	0 (@25 tons/truck)

Social Impact

Shelter Requirement

Hazus estimates the number of households that are expected to be displaced from their homes due to the earthquake and the number of displaced people that will require accommodations in temporary public shelters. The model estimates 0 households to be displaced due to the earthquake. Of these, 0 people (out of a total population of 286,781) will seek temporary shelter in public shelters.

Displaced Households/ Persons Seeking Short Term Public Shelter

Displaced households as a result of the earthquake	Persons seeking temporary public shelter
0	0

Casualties

Hazus estimates the number of people that will be injured and killed by the earthquake. The casualties are broken down into four (4) severity levels that describe the extent of the injuries. The levels are described as follows;

- Severity Level 1: Injuries will require medical attention but hospitalization is not needed.
- Severity Level 2: Injuries will require hospitalization but are not considered life-threatening
- Severity Level 3: Injuries will require hospitalization and can become life threatening if not promptly treated.
- Severity Level 4: Victims are killed by the earthquake.

The casualty estimates are provided for three (3) times of day: 2:00 AM, 2:00 PM and 5:00 PM. These times represent the periods of the day that different sectors of the community are at their peak occupancy loads. The 2:00 AM estimate considers that the residential occupancy load is maximum, the 2:00 PM estimate considers that the educational, commercial and industrial sector loads are maximum and 5:00 PM represents peak commute time.

Table 10 provides a summary of the casualties estimated for this earthquake

Table 10: Casualty Estimates

		Level 1	Level 2	Level 3	Level 4
2 AM	Commercial	0.00	0.00	0.00	0.00
	Commuting	0.00	0.00	0.00	0.00
	Educational	0.00	0.00	0.00	0.00
	Hotels	0.00	0.00	0.00	0.00
	Industrial	0.00	0.00	0.00	0.00
	Other-Residential	0.00	0.00	0.00	0.00
	Single Family	0.00	0.00	0.00	0.00
	Total	**0**	**0**	**0**	**0**
2 PM	Commercial	0.00	0.00	0.00	0.00
	Commuting	0.00	0.00	0.00	0.00
	Educational	0.00	0.00	0.00	0.00
	Hotels	0.00	0.00	0.00	0.00
	Industrial	0.00	0.00	0.00	0.00
	Other-Residential	0.00	0.00	0.00	0.00
	Single Family	0.00	0.00	0.00	0.00
	Total	**0**	**0**	**0**	**0**
5 PM	Commercial	0.00	0.00	0.00	0.00
	Commuting	0.00	0.00	0.00	0.00
	Educational	0.00	0.00	0.00	0.00
	Hotels	0.00	0.00	0.00	0.00
	Industrial	0.00	0.00	0.00	0.00
	Other-Residential	0.00	0.00	0.00	0.00
	Single Family	0.00	0.00	0.00	0.00
	Total	**0**	**0**	**0**	**0**

Economic Loss

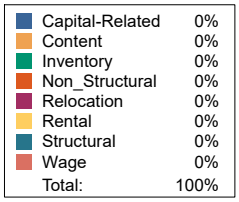
The total economic loss estimated for the earthquake is 0.02 (millions of dollars), which includes building and lifeline related losses based on the region's available inventory. The following three sections provide more detailed information about these losses.

Building-Related Losses

The building losses are broken into two categories: direct building losses and business interruption losses. The direct building losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability to operate a business because of the damage sustained during the earthquake. Business interruption losses also include the temporary living expenses for those people displaced from their homes because of the earthquake.

The total building-related losses were 0.00 (millions of dollars); 0 % of the estimated losses were related to the business interruption of the region. By far, the largest loss was sustained by the residential occupancies which made up over 0 % of the total loss. Table 11 below provides a summary of the losses associated with the building damage.

Earthquake Losses by Loss Type ($ millions)



Earthquake Losses by Occupancy Type ($ millions)

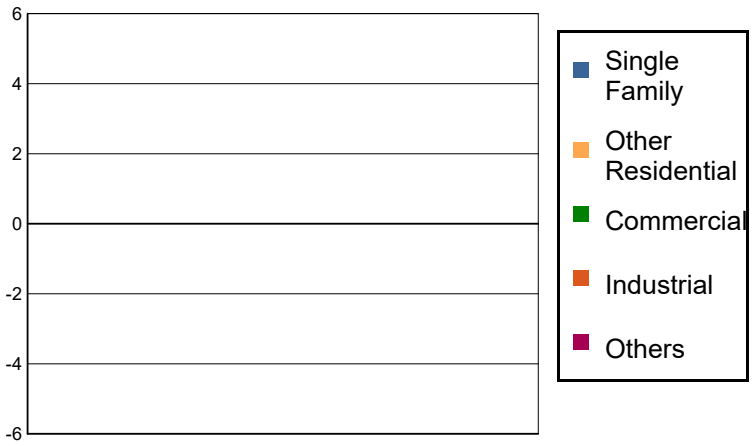


Table 11: Building-Related Economic Loss Estimates

(Millions of dollars)

Category	Area	Single Family	Other Residential	Commercial	Industrial	Others	Total
Income Losses							
	Wage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	Capital-Related	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	Rental	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	Relocation	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	Subtotal	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**
Capital Stock Losses							
	Structural	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	Non_Structural	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	Content	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	Inventory	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	Subtotal	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**
	Total	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

Transportation and Utility Lifeline Losses

For the transportation and utility lifeline systems, Hazus computes the direct repair cost for each component only. There are no losses computed by Hazus for business interruption due to lifeline outages. Tables 12 & 13 provide a detailed breakdown in the expected lifeline losses.

Table 12: Transportation System Economic Losses
(Millions of dollars)

System	Component	Inventory Value	Economic Loss	Loss Ratio (%)
Highway	Segments	5423.5850	0.0000	0.00
	Bridges	460.7884	0.0000	0.00
	Tunnels	0.0000	0.0000	0.00
	Subtotal	**5884.3734**	**0.0000**	
Railways	Segments	412.3045	0.0000	0.00
	Bridges	0.1171	0.0000	0.00
	Tunnels	0.0000	0.0000	0.00
	Facilities	5.3260	0.0007	0.01
	Subtotal	**417.7476**	**0.0007**	
Light Rail	Segments	0.0000	0.0000	0.00
	Bridges	0.0000	0.0000	0.00
	Tunnels	0.0000	0.0000	0.00
	Facilities	0.0000	0.0000	0.00
	Subtotal	**0.0000**	**0.0000**	
Bus	Facilities	1.0137	0.0001	0.01
	Subtotal	**1.0137**	**0.0001**	
Ferry	Facilities	0.0000	0.0000	0.00
	Subtotal	**0.0000**	**0.0000**	
Port	Facilities	0.0000	0.0000	0.00
	Subtotal	**0.0000**	**0.0000**	
Airport	Facilities	31.9530	0.0038	0.01
	Runways	113.8920	0.0000	0.00
	Subtotal	**145.8450**	**0.0038**	
	Total	**6,448.98**	**0.00**	

Table 13: Utility System Economic Losses

(Millions of dollars)

System	Component	Inventory Value	Economic Loss	Loss Ratio (%)
Potable Water	Pipelines	0.0000	0.0000	0.00
	Facilities	371.6280	0.0005	0.00
	Distribution Line	682.3788	0.0087	0.00
	Subtotal	**1054.0068**	**0.0092**	
Waste Water	Pipelines	0.0000	0.0000	0.00
	Facilities	991.0080	0.0006	0.00
	Distribution Line	409.4273	0.0044	0.00
	Subtotal	**1400.4353**	**0.0050**	
Natural Gas	Pipelines	0.0000	0.0000	0.00
	Facilities	1.0137	0.0000	0.00
	Distribution Line	272.9515	0.0015	0.00
	Subtotal	**273.9652**	**0.0015**	
Oil Systems	Pipelines	0.0000	0.0000	0.00
	Facilities	0.0000	0.0000	0.00
	Subtotal	**0.0000**	**0.0000**	
Electrical Power	Facilities	306.9000	0.0000	0.00
	Subtotal	**306.9000**	**0.0000**	
Communication	Facilities	2.6970	0.0000	0.00
	Subtotal	**2.6970**	**0.0000**	
	Total	**3,038.00**	**0.02**	

Appendix A: County Listing for the Region

Augusta,VA

Bath,VA

Highland,VA

Rockbridge,VA

Rockingham,VA

Buena Vista,VA

Harrisonburg,VA

Lexington,VA

Staunton,VA

Waynesboro,VA

Appendix B: Regional Population and Building Value Data

State	County Name	Population	Building Value (millions of dollars)		
			Residential	Non-Residential	Total
Virginia					
	Augusta	73,750	6,296	1,337	7,633
	Bath	4,731	739	78	817
	Highland	2,321	320	46	367
	Rockbridge	22,307	2,182	429	2,612
	Rockingham	76,314	6,609	1,260	7,869
	Buena Vista	6,650	509	214	724
	Harrisonburg	48,914	3,460	1,630	5,090
	Lexington	7,042	714	243	957
	Staunton	23,746	2,264	782	3,046
	Waynesboro	21,006	1,830	835	2,666
Total Region		**286,781**	**24,923**	**6,854**	**31,781**

Appendix H-

2020 Central Shenandoah Regional Wildfire Protection Plan

APPENDIX H: Central Shenandoah Regional Wildfire Protection Plan

Concurrent to the Central Shenandoah Hazard Mitigation Plan (CSHMP) , Central Shenandoah Planning District Commission staff is completing the Central Shenandoah Regional Wildfire Protection Plan (CSRWPP). The CSRWPP will be a companion document to the CSHMP.

The purpose of this Wildfire Protection Plan is to help the local jurisdictions in the Central Shenandoah Region begin the steps to address forest planning at local level by refining and clarifying their priorities for the protection of life, property, and critical infrastructure in the Wildland Urban Interface (WUI). The CSRWPP is a planning process that involves collaboration between government agencies and other stakeholders involved with the wildland areas in the Region. The Plan examines the vulnerabilities communities in the region have to wildfire and includes strategies for prioritizing fuel reduction and structural ignitability.

The Central Shenandoah Regional Wildfire Plan will be a complimentary and valuable resource for communities interested in wildfire mitigation.

Appendix I –
National Flood Insurance Program (NFIP) Surveys

NATIONAL FLOOD INSURANCE PROGRAM (NFIP) SURVEY

MUNICIPALITY: AUGUSTA COUNTY

1. FLOODPLAIN IDENTIFICATION AND MAPPING

Requirement	*Recommended Action*	*Yes/No*	*Comments*
a. Does the municipality maintain accessible copies of an effective Flood Insurance Rate Map (FIRM)/Digital Flood Insurance Rate Map (DFIRM)? Does the municipality maintain accessible copies of the most recent Flood Insurance Study (FIS)?	Place these documents in the local libraries or make available publicly.	Yes	Paper copies are available at the Community Development Office. Digital is incorporated into the online GIS available to the public
b. Has the municipality adopted the most current DFIRM/FIRM and FIS?	State the date of adoption, if approved.	Yes	Latest revision adopted 8/3/2015
c. Does the municipality support request for map updates?	If yes, state how.	Yes	Augusta County has worked with FEMA through the Cooperating Technical Partners (CTP) program to provide improved mapping along select waterways
d. Does the municipality share with Federal Emergency Management Agency (FEMA) any new technical or scientific data that could result in map revisions within 6 months of creation or identification of new data?	If yes, specify how.	Yes	Any project that would impact other properties is required to obtain a Letter of Map Revision (LOMR) from FEMA
e. Does the municipality provide assistance with local floodplain determinations?	If yes, specify how.	Yes	County will make determinations upon request
f. Does the municipality maintain a record of approved Letters of Map Change?	If yes, specify the responsible office.	Yes	County maintains all LOMC in paper and digital format

2. FLOODPLAIN MANAGEMENT			
Requirement	***Recommended Action***	***Yes/No***	***Comments***
a. Has the municipality adopted a compliant floodplain management ordinance that, at a minimum, regulates the following:	If yes, answer questions (1) through (4) below.		Yes
(1) Does the municipality issue permits for all proposed development in the Special Flood Hazard Areas (SFHAs)?	If yes, specify the office responsible.	Yes	Office of Community Development
(2) Does the municipality obtain, review, and utilize any Base Flood Elevation (BFE) and floodway data, and/or require BFE data for subdivision proposals and other development proposals larger than 50 lots or 5 acres?	If yes, specify the office responsible.	Yes	Office of Community Development
(3) Does the municipality identify measures to keep all new and substantially improved construction reasonably safe from flooding to or above the BFE, including anchoring, using flood-resistant materials, and designing or locating utilities and service facilities to prevent water damage?	If yes, specify the office responsible.	Yes	Office of Community Development
(4) Does the municipality document and maintain records of elevation data that document lowest floor elevation for new or substantially improved structures?	If yes, specify the office responsible.	Yes	Office of Community Development
b. If a compliant floodplain ordinance was adopted, does the municipality enforce the ordinance by monitoring compliance and taking remedial action to correct violations?	If yes, specify how.	Yes	Zoning inspection and upon receipt of complaints

2. FLOODPLAIN MANAGEMENT			
Requirement	***Recommended Action***	***Yes/No***	***Comments***
c. Has the municipality considered adopting activities that extend beyond the minimum requirements? Examples include: • Participation in the Community Rating System • Prohibition of production or storage of chemicals in SFHA • Prohibition of certain types of structures, such as hospitals, nursing homes, and jails in SFHA • Prohibition of certain types of residential housing (manufactured homes) in SFHA • Floodplain ordinances that prohibit any new residential or nonresidential structures in SFHA	If yes, specify activities.	Yes	County prohibits creation of new lots in the floodplain, requires 1 ft of freeboard, and restricts development in the pool area of flood control dams

3. FLOOD INSURANCE			
Requirement	***Recommended Action***	***Yes/No***	***Comments***
a. Does the municipality educate community members about the availability and value of flood insurance?	If yes, specify how.	Yes	Education provided by CSPDC through Shen Valley Project Impact
b. Does the municipality inform community property owners about changes to the DFIRM/FIRM that would impact their insurance rates?	If yes, specify how.	Yes	Part of the approval process of adopting revised maps
c. Does the municipality provide general assistance to community members regarding insurance issues?	If yes, specify how.	No	Augusta County directs residents and property owners to their insurance provider

NATIONAL FLOOD INSURANCE PROGRAM (NFIP) SURVEY

MUNICIPALITY: BATH COUNTY

1. FLOODPLAIN IDENTIFICATION AND MAPPING

Requirement	*Recommended Action*	*Yes/No*	*Comments*
a. Does the municipality maintain accessible copies of an effective Flood Insurance Rate Map (FIRM)/Digital Flood Insurance Rate Map (DFIRM)? Does the municipality maintain accessible copies of the most recent Flood Insurance Study (FIS)?	Place these documents in the local libraries or make available publicly.	yes	
b. Has the municipality adopted the most current DFIRM/FIRM and FIS?	State the date of adoption, if approved.	Yes 8/29/2011	
c. Does the municipality support request for map updates?	If yes, state how.	n/a	
d. Does the municipality share with Federal Emergency Management Agency (FEMA) any new technical or scientific data that could result in map revisions within 6 months of creation or identification of new data?	If yes, specify how.	n/a	
e. Does the municipality provide assistance with local floodplain determinations?	If yes, specify how.	Yes	Documentation and guidance on obtaining assumed elevations
f. Does the municipality maintain a record of approved Letters of Map Change?	If yes, specify the responsible office.	Yes	Building, Planning & Zoning

2. FLOODPLAIN MANAGEMENT			
Requirement	***Recommended Action***	***Yes/No***	***Comments***
a. Has the municipality adopted a compliant floodplain management ordinance that, at a minimum, regulates the following:	If yes, answer questions (1) through (4) below.	Yes	
(1) Does the municipality issue permits for all proposed development in the Special Flood Hazard Areas (SFHAs)?	If yes, specify the office responsible.	Yes	Building, Planning & Zoning
(2) Does the municipality obtain, review, and utilize any Base Flood Elevation (BFE) and floodway data, and/or require BFE data for subdivision proposals and other development proposals larger than 50 lots or 5 acres?	If yes, specify the office responsible.	Yes	Building, Planning & Zoning
(3) Does the municipality identify measures to keep all new and substantially improved construction reasonably safe from flooding to or above the BFE, including anchoring, using flood-resistant materials, and designing or locating utilities and service facilities to prevent water damage?	If yes, specify the office responsible.	Yes	Building, Planning & Zoning
(4) Does the municipality document and maintain records of elevation data that document lowest floor elevation for new or substantially improved structures?	If yes, specify the office responsible.	Yes	Building, Planning & Zoning
b. If a compliant floodplain ordinance was adopted, does the municipality enforce the ordinance by monitoring compliance and taking remedial action to correct violations?	If yes, specify how.	Yes	Corrected to be brought into compliance

2. FLOODPLAIN MANAGEMENT			
Requirement	***Recommended Action***	***Yes/No***	***Comments***
c. Has the municipality considered adopting activities that extend beyond the minimum requirements? Examples include: • Participation in the Community Rating System • Prohibition of production or storage of chemicals in SFHA • Prohibition of certain types of structures, such as hospitals, nursing homes, and jails in SFHA • Prohibition of certain types of residential housing (manufactured homes) in SFHA • Floodplain ordinances that prohibit any new residential or nonresidential structures in SFHA	If yes, specify activities.	n/a	

3. FLOOD INSURANCE			
Requirement	***Recommended Action***	***Yes/No***	***Comments***
a. Does the municipality educate community members about the availability and value of flood insurance?	If yes, specify how.	Yes	Supply phone number for them to call
b. Does the municipality inform community property owners about changes to the DFIRM/FIRM that would impact their insurance rates?	If yes, specify how.	Yes	Public hearings when applicable
c. Does the municipality provide general assistance to community members regarding insurance issues?	If yes, specify how.	Yes	Provide information as available

NATIONAL FLOOD INSURANCE PROGRAM (NFIP) SURVEY

MUNICIPALITY: ROCKBRIDGE COUNTY

1. FLOODPLAIN IDENTIFICATION AND MAPPING

Requirement	*Recommended Action*	*Yes/No*	*Comments*
a. Does the municipality maintain accessible copies of an effective Flood Insurance Rate Map (FIRM)/Digital Flood Insurance Rate Map (DFIRM)? Does the municipality maintain accessible copies of the most recent Flood Insurance Study (FIS)?	Place these documents in the local libraries or make available publicly.	yes	In the Office of Community Development and a GIS layer available on our web site
b. Has the municipality adopted the most current DFIRM/FIRM and FIS?	State the date of adoption, if approved.	yes	April 6, 2000
c. Does the municipality support request for map updates?	If yes, state how.	yes	Provide information for Land surveyors
d. Does the municipality share with Federal Emergency Management Agency (FEMA) any new technical or scientific data that could result in map revisions within 6 months of creation or identification of new data?	If yes, specify how.	yes	If we had such data
e. Does the municipality provide assistance with local floodplain determinations?	If yes, specify how.	yes	Floodplain Determination Letters
f. Does the municipality maintain a record of approved Letters of Map Change?	If yes, specify the responsible office.	yes	Office of Community Development

2. FLOODPLAIN MANAGEMENT			
Requirement	***Recommended Action***	***Yes/No***	***Comments***
a. Has the municipality adopted a compliant floodplain management ordinance that, at a minimum, regulates the following:	If yes, answer questions (1) through (4) below.	yes	
(1) Does the municipality issue permits for all proposed development in the Special Flood Hazard Areas (SFHAs)?	If yes, specify the office responsible.	yes	Office of Community Development Building Department
(2) Does the municipality obtain, review, and utilize any Base Flood Elevation (BFE) and floodway data, and/or require BFE data for subdivision proposals and other development proposals larger than 50 lots or 5 acres?	If yes, specify the office responsible.	yes	Office of Community Development
(3) Does the municipality identify measures to keep all new and substantially improved construction reasonably safe from flooding to or above the BFE, including anchoring, using flood-resistant materials, and designing or locating utilities and service facilities to prevent water damage?	If yes, specify the office responsible.	yes	
(4) Does the municipality document and maintain records of elevation data that document lowest floor elevation for new or substantially improved structures?	If yes, specify the office responsible.	yes	Building Department
b. If a compliant floodplain ordinance was adopted, does the municipality enforce the ordinance by monitoring compliance and taking remedial action to correct violations?	If yes, specify how.	yes	Office of Community Development Building Department

2. FLOODPLAIN MANAGEMENT			
Requirement	***Recommended Action***	***Yes/No***	***Comments***
c. Has the municipality considered adopting activities that extend beyond the minimum requirements? Examples include: • Participation in the Community Rating System • Prohibition of production or storage of chemicals in SFHA • Prohibition of certain types of structures, such as hospitals, nursing homes, and jails in SFHA • Prohibition of certain types of residential housing (manufactured homes) in SFHA • Floodplain ordinances that prohibit any new residential or nonresidential structures in SFHA	If yes, specify activities.	no	

3. FLOOD INSURANCE			
Requirement	***Recommended Action***	***Yes/No***	***Comments***
a. Does the municipality educate community members about the availability and value of flood insurance?	If yes, specify how.	yes	Provide information -
b. Does the municipality inform community property owners about changes to the DFIRM/FIRM that would impact their insurance rates?	If yes, specify how.	no	
c. Does the municipality provide general assistance to community members regarding insurance issues?	If yes, specify how.	yes	Provide maps to landowners and insurance companies

NATIONAL FLOOD INSURANCE PROGRAM (NFIP) SURVEY

MUNICIPALITY: ROCKINGHAM COUNTY

1. FLOODPLAIN IDENTIFICATION AND MAPPING

Requirement	*Recommended Action*	*Yes/No*	*Comments*
a. Does the municipality maintain accessible copies of an effective Flood Insurance Rate Map (FIRM)/Digital Flood Insurance Rate Map (DFIRM)? Does the municipality maintain accessible copies of the most recent Flood Insurance Study (FIS)?	Place these documents in the local libraries or make available publicly.	Yes	
b. Has the municipality adopted the most current DFIRM/FIRM and FIS?	State the date of adoption, if approved.	Yes	August 18, 2014
c. Does the municipality support request for map updates?	If yes, state how.	No	I don't understand this question. If this means does the County undertake mapping projects, then no.
d. Does the municipality share with Federal Emergency Management Agency (FEMA) any new technical or scientific data that could result in map revisions within 6 months of creation or identification of new data?	If yes, specify how.	Yes	Will be doing this process going forward based on recent conversation with DCR Floodplain Staff.
e. Does the municipality provide assistance with local floodplain determinations?	If yes, specify how.	Yes	Provide limited assistance in Approximate A zones, but generally require P.E. involvement.
f. Does the municipality maintain a record of approved Letters of Map Change?	If yes, specify the responsible office.	Yes	Community Development

2. FLOODPLAIN MANAGEMENT			
Requirement	***Recommended Action***	***Yes/No***	***Comments***
a. Has the municipality adopted a compliant floodplain management ordinance that, at a minimum, regulates the following:	If yes, answer questions (1) through (4) below.	Yes	
(1) Does the municipality issue permits for all proposed development in the Special Flood Hazard Areas (SFHAs)?	If yes, specify the office responsible.	Yes	Community Development
(2) Does the municipality obtain, review, and utilize any Base Flood Elevation (BFE) and floodway data, and/or require BFE data for subdivision proposals and other development proposals larger than 50 lots or 5 acres?	If yes, specify the office responsible.	Yes	Community Development
(3) Does the municipality identify measures to keep all new and substantially improved construction reasonably safe from flooding to or above the BFE, including anchoring, using flood-resistant materials, and designing or locating utilities and service facilities to prevent water damage?	If yes, specify the office responsible.	Yes	Community Development
(4) Does the municipality document and maintain records of elevation data that document lowest floor elevation for new or substantially improved structures?	If yes, specify the office responsible.	Yes	This process (collecting the 2nd Elevation Certificate) could be improved on our part.
b. If a compliant floodplain ordinance was adopted, does the municipality enforce the ordinance by monitoring compliance and taking remedial action to correct violations?	If yes, specify how.	Yes	Enforcement through building inspection processes if still under construction. If the violations are pre-existing, letters are sent detailing requirements for compliance.

2. FLOODPLAIN MANAGEMENT			
Requirement	***Recommended Action***	***Yes/No***	***Comments***
c. Has the municipality considered adopting activities that extend beyond the minimum requirements? Examples include: • Participation in the Community Rating System • Prohibition of production or storage of chemicals in SFHA • Prohibition of certain types of structures, such as hospitals, nursing homes, and jails in SFHA • Prohibition of certain types of residential housing (manufactured homes) in SFHA • Floodplain ordinances that prohibit any new residential or nonresidential structures in SFHA	If yes, specify activities.	Yes	Attempted to prohibit manufactured homes from being constructed in the floodplain, but were challenged by the Virginia Manufactured and Modular Housing Association and did not codify the prohibition. Have considered joining CRS, but do not currently have adequate staffing capacity to manage program requirements.

3. FLOOD INSURANCE			
Requirement	***Recommended Action***	***Yes/No***	***Comments***
a. Does the municipality educate community members about the availability and value of flood insurance?	If yes, specify how.	Yes	Only by request – no proactive outreach.
b. Does the municipality inform community property owners about changes to the DFIRM/FIRM that would impact their insurance rates?	If yes, specify how.	Yes	Per FEMA letter notification requirements.
c. Does the municipality provide general assistance to community members regarding insurance issues?	If yes, specify how.	Yes	Available to answer questions via phone, email, or in person.

NATIONAL FLOOD INSURANCE PROGRAM (NFIP) SURVEY

MUNICIPALITY: CITY OF BUENA VISTA

1. FLOODPLAIN IDENTIFICATION AND MAPPING

Requirement	*Recommended Action*	*Yes/No*	*Comments*
a. Does the municipality maintain accessible copies of an effective Flood Insurance Rate Map (FIRM)/Digital Flood Insurance Rate Map (DFIRM)? Does the municipality maintain accessible copies of the most recent Flood Insurance Study (FIS)?	Place these documents in the local libraries or make available publicly.	Yes	
b. Has the municipality adopted the most current DFIRM/FIRM and FIS?	State the date of adoption, if approved.	Not Known	City always references most recent DFIRM/FIRM
c. Does the municipality support request for map updates?	If yes, state how.	Yes	City provides contact information and letters of support if needed.
d. Does the municipality share with Federal Emergency Management Agency (FEMA) any new technical or scientific data that could result in map revisions within 6 months of creation or identification of new data?	If yes, specify how.	No	City is unaware of process for this, or of what data would qualify.
e. Does the municipality provide assistance with local floodplain determinations?	If yes, specify how.	Yes	City uses GIS maps to provide general flood hazard zone location, and directs to surveying firms for confirmation.
f. Does the municipality maintain a record of approved Letters of Map Change?	If yes, specify the responsible office.	Yes	Community & Economic Development

2. FLOODPLAIN MANAGEMENT			
Requirement	***Recommended Action***	***Yes/No***	***Comments***
a. Has the municipality adopted a compliant floodplain management ordinance that, at a minimum, regulates the following:	If yes, answer questions (1) through (4) below.	Yes	
(1) Does the municipality issue permits for all proposed development in the Special Flood Hazard Areas (SFHAs)?	If yes, specify the office responsible.	Yes	Community & Economic Development
(2) Does the municipality obtain, review, and utilize any Base Flood Elevation (BFE) and floodway data, and/or require BFE data for subdivision proposals and other development proposals larger than 50 lots or 5 acres?	If yes, specify the office responsible.	Yes	Community & Economic Development
(3) Does the municipality identify measures to keep all new and substantially improved construction reasonably safe from flooding to or above the BFE, including anchoring, using flood-resistant materials, and designing or locating utilities and service facilities to prevent water damage?	If yes, specify the office responsible.	Yes	Community & Economic Development
(4) Does the municipality document and maintain records of elevation data that document lowest floor elevation for new or substantially improved structures?	If yes, specify the office responsible.	Yes	Community & Economic Development
b. If a compliant floodplain ordinance was adopted, does the municipality enforce the ordinance by monitoring compliance and taking remedial action to correct violations?	If yes, specify how.	Yes	Building Official/Property Maintenance Official enforces through same process as other code violations

2. FLOODPLAIN MANAGEMENT			
Requirement	***Recommended Action***	***Yes/No***	***Comments***
c. Has the municipality considered adopting activities that extend beyond the minimum requirements? Examples include: • Participation in the Community Rating System • Prohibition of production or storage of chemicals in SFHA • Prohibition of certain types of structures, such as hospitals, nursing homes, and jails in SFHA • Prohibition of certain types of residential housing (manufactured homes) in SFHA • Floodplain ordinances that prohibit any new residential or nonresidential structures in SFHA	If yes, specify activities.	Yes	City evaluated CRS in 2015 but determined not cost-effective at the time. Other measures listed have not been considered.

3. FLOOD INSURANCE			
Requirement	***Recommended Action***	***Yes/No***	***Comments***
a. Does the municipality educate community members about the availability and value of flood insurance?	If yes, specify how.	No	Education/promotion plan in development to launch in 2020
b. Does the municipality inform community property owners about changes to the DFIRM/FIRM that would impact their insurance rates?	If yes, specify how.	No	Education/promotion plan in development to launch in 2020
c. Does the municipality provide general assistance to community members regarding insurance issues?	If yes, specify how.	No	Education/promotion plan in development to launch in 2020

NATIONAL FLOOD INSURANCE PROGRAM (NFIP) SURVEY

MUNICIPALITY: CITY OF HARRISONBURG

1. FLOODPLAIN IDENTIFICATION AND MAPPING

Requirement	*Recommended Action*	*Yes/No*	*Comments*
a. Does the municipality maintain accessible copies of an effective Flood Insurance Rate Map (FIRM)/Digital Flood Insurance Rate Map (DFIRM)? Does the municipality maintain accessible copies of the most recent Flood Insurance Study (FIS)?	Place these documents in the local libraries or make available publicly.	Yes	
b. Has the municipality adopted the most current DFIRM/FIRM and FIS?	State the date of adoption, if approved.	2008	
c. Does the municipality support request for map updates?	If yes, state how.	Yes	Send out adjacent property owner notifications before, during, and after sign off on FEMA applications
d. Does the municipality share with Federal Emergency Management Agency (FEMA) any new technical or scientific data that could result in map revisions within 6 months of creation or identification of new data?	If yes, specify how.	No	
e. Does the municipality provide assistance with local floodplain determinations?	If yes, specify how.	Yes	Local Floodplan Administrator makes the determination.
f. Does the municipality maintain a record of approved Letters of Map Change?	If yes, specify the responsible office.	Yes	Depart of Community Development

2. FLOODPLAIN MANAGEMENT			
Requirement	***Recommended Action***	***Yes/No***	***Comments***
a. Has the municipality adopted a compliant floodplain management ordinance that, at a minimum, regulates the following:	If yes, answer questions (1) through (4) below.	Yes	
(1) Does the municipality issue permits for all proposed development in the Special Flood Hazard Areas (SFHAs)?	If yes, specify the office responsible.	Yes	Community Development
(2) Does the municipality obtain, review, and utilize any Base Flood Elevation (BFE) and floodway data, and/or require BFE data for subdivision proposals and other development proposals larger than 50 lots or 5 acres?	If yes, specify the office responsible.	Yes	Community Development
(3) Does the municipality identify measures to keep all new and substantially improved construction reasonably safe from flooding to or above the BFE, including anchoring, using flood-resistant materials, and designing or locating utilities and service facilities to prevent water damage?	If yes, specify the office responsible.	Yes	Community Development
(4) Does the municipality document and maintain records of elevation data that document lowest floor elevation for new or substantially improved structures?	If yes, specify the office responsible.	Yes	Community Development
b. If a compliant floodplain ordinance was adopted, does the municipality enforce the ordinance by monitoring compliance and taking remedial action to correct violations?	If yes, specify how.	Yes	It's enforced through the Zoning Ordinance and has a progressive action process starting with written notification and ending through the court system.

2. FLOODPLAIN MANAGEMENT			
Requirement	***Recommended Action***	***Yes/No***	***Comments***
c. Has the municipality considered adopting activities that extend beyond the minimum requirements? Examples include: • Participation in the Community Rating System • Prohibition of production or storage of chemicals in SFHA • Prohibition of certain types of structures, such as hospitals, nursing homes, and jails in SFHA • Prohibition of certain types of residential housing (manufactured homes) in SFHA • Floodplain ordinances that prohibit any new residential or nonresidential structures in SFHA	If yes, specify activities.	No	

3. FLOOD INSURANCE			
Requirement	***Recommended Action***	***Yes/No***	***Comments***
a. Does the municipality educate community members about the availability and value of flood insurance?	If yes, specify how.	No	Unless they specifically ask
b. Does the municipality inform community property owners about changes to the DFIRM/FIRM that would impact their insurance rates?	If yes, specify how.	Yes	Notify adjacent properties of changes
c. Does the municipality provide general assistance to community members regarding insurance issues?	If yes, specify how.	Yes	During permitting processes and when asked.

NATIONAL FLOOD INSURANCE PROGRAM (NFIP) SURVEY

MUNICIPALITY: CITY OF LEXINGTON

1. FLOODPLAIN IDENTIFICATION AND MAPPING

Requirement	*Recommended Action*	*Yes/No*	*Comments*
a. Does the municipality maintain accessible copies of an effective Flood Insurance Rate Map (FIRM)/Digital Flood Insurance Rate Map (DFIRM)? Does the municipality maintain accessible copies of the most recent Flood Insurance Study (FIS)?	Place these documents in the local libraries or make available publicly.	Yes	
b. Has the municipality adopted the most current DFIRM/FIRM and FIS?	State the date of adoption, if approved.	Yes	April 6, 2000
c. Does the municipality support request for map updates?	If yes, state how.	?	Have not had a map update request during my tenure (3.5 years)
d. Does the municipality share with Federal Emergency Management Agency (FEMA) any new technical or scientific data that could result in map revisions within 6 months of creation or identification of new data?	If yes, specify how.	?	If we were creating any new technical or scientific data, we would surely share with FEMA
e. Does the municipality provide assistance with local floodplain determinations?	If yes, specify how.	Yes	By request of the floodplain manager
f. Does the municipality maintain a record of approved Letters of Map Change?	If yes, specify the responsible office.	No	FEMA has those

2. FLOODPLAIN MANAGEMENT			
Requirement	***Recommended Action***	***Yes/No***	***Comments***
a. Has the municipality adopted a compliant floodplain management ordinance that, at a minimum, regulates the following:	If yes, answer questions (1) through (4) below.	Yes	
(1) Does the municipality issue permits for all proposed development in the Special Flood Hazard Areas (SFHAs)?	If yes, specify the office responsible.	Yes	Planning and Development
(2) Does the municipality obtain, review, and utilize any Base Flood Elevation (BFE) and floodway data, and/or require BFE data for subdivision proposals and other development proposals larger than 50 lots or 5 acres?	If yes, specify the office responsible.	Yes	Planning and Development office reviews BFE and floodway data, but there is not enough land in Lexington available for 50 lot subdivisions
(3) Does the municipality identify measures to keep all new and substantially improved construction reasonably safe from flooding to or above the BFE, including anchoring, using flood-resistant materials, and designing or locating utilities and service facilities to prevent water damage?	If yes, specify the office responsible.	Yes	Planning and Development
(4) Does the municipality document and maintain records of elevation data that document lowest floor elevation for new or substantially improved structures?	If yes, specify the office responsible.	Yes	Planning and Development
b. If a compliant floodplain ordinance was adopted, does the municipality enforce the ordinance by monitoring compliance and taking remedial action to correct violations?	If yes, specify how.	Yes	Compliance is achieved through building permit review process and have not needed to take corrective action in the last 3.5 years

2. FLOODPLAIN MANAGEMENT			
Requirement	***Recommended Action***	***Yes/No***	***Comments***
c. Has the municipality considered adopting activities that extend beyond the minimum requirements? Examples include: • Participation in the Community Rating System • Prohibition of production or storage of chemicals in SFHA • Prohibition of certain types of structures, such as hospitals, nursing homes, and jails in SFHA • Prohibition of certain types of residential housing (manufactured homes) in SFHA • Floodplain ordinances that prohibit any new residential or nonresidential structures in SFHA	If yes, specify activities.	No	

3. FLOOD INSURANCE			
Requirement	***Recommended Action***	***Yes/No***	***Comments***
a. Does the municipality educate community members about the availability and value of flood insurance?	If yes, specify how.	No	
b. Does the municipality inform community property owners about changes to the DFIRM/FIRM that would impact their insurance rates?	If yes, specify how.	No	No changes to the DFIRM/FIRM have occurred in the last 3.5 years
c. Does the municipality provide general assistance to community members regarding insurance issues?	If yes, specify how.	No	

NATIONAL FLOOD INSURANCE PROGRAM (NFIP) SURVEY

MUNICIPALITY: CITY OF STAUNTON

1. FLOODPLAIN IDENTIFICATION AND MAPPING

Requirement	*Recommended Action*	*Yes/No*	*Comments*
a. Does the municipality maintain accessible copies of an effective Flood Insurance Rate Map (FIRM)/Digital Flood Insurance Rate Map (DFIRM)? Does the municipality maintain accessible copies of the most recent Flood Insurance Study (FIS)?	Place these documents in the local libraries or make available publicly.	Yes	On the GIS
b. Has the municipality adopted the most current DFIRM/FIRM and FIS?	State the date of adoption, if approved.	Yes	1/6/2010
c. Does the municipality support request for map updates?	If yes, state how.	Yes	
d. Does the municipality share with Federal Emergency Management Agency (FEMA) any new technical or scientific data that could result in map revisions within 6 months of creation or identification of new data?	If yes, specify how.	Yes	
e. Does the municipality provide assistance with local floodplain determinations?	If yes, specify how.	Yes	We answer requests
f. Does the municipality maintain a record of approved Letters of Map Change?	If yes, specify the responsible office.	Yes	Building Services Division

2. FLOODPLAIN MANAGEMENT			
Requirement	***Recommended Action***	***Yes/No***	***Comments***
a. Has the municipality adopted a compliant floodplain management ordinance that, at a minimum, regulates the following:	If yes, answer questions (1) through (4) below.		
(1) Does the municipality issue permits for all proposed development in the Special Flood Hazard Areas (SFHAs)?	If yes, specify the office responsible.	Yes	Building Services Division
(2) Does the municipality obtain, review, and utilize any Base Flood Elevation (BFE) and floodway data, and/or require BFE data for subdivision proposals and other development proposals larger than 50 lots or 5 acres?	If yes, specify the office responsible.	Yes	Building Services Division
(3) Does the municipality identify measures to keep all new and substantially improved construction reasonably safe from flooding to or above the BFE, including anchoring, using flood-resistant materials, and designing or locating utilities and service facilities to prevent water damage?	If yes, specify the office responsible.	Yes	Building Services Division
(4) Does the municipality document and maintain records of elevation data that document lowest floor elevation for new or substantially improved structures?	If yes, specify the office responsible.	Yes	Building Services Division
b. If a compliant floodplain ordinance was adopted, does the municipality enforce the ordinance by monitoring compliance and taking remedial action to correct violations?	If yes, specify how.	Yes	Notices sent for violations

2. FLOODPLAIN MANAGEMENT			
Requirement	***Recommended Action***	***Yes/No***	***Comments***
c. Has the municipality considered adopting activities that extend beyond the minimum requirements? Examples include: • Participation in the Community Rating System • Prohibition of production or storage of chemicals in SFHA • Prohibition of certain types of structures, such as hospitals, nursing homes, and jails in SFHA • Prohibition of certain types of residential housing (manufactured homes) in SFHA • Floodplain ordinances that prohibit any new residential or nonresidential structures in SFHA	If yes, specify activities.	Yes	Currently application in process for CRS

3. FLOOD INSURANCE			
Requirement	***Recommended Action***	***Yes/No***	***Comments***
a. Does the municipality educate community members about the availability and value of flood insurance?	If yes, specify how.	Yes	Educational programs with the CSPDC.
b. Does the municipality inform community property owners about changes to the DFIRM/FIRM that would impact their insurance rates?	If yes, specify how.	Yes	Public hearing and or Notice
c. Does the municipality provide general assistance to community members regarding insurance issues?	If yes, specify how.	Yes	Meet with and make recommendations.

NATIONAL FLOOD INSURANCE PROGRAM (NFIP) SURVEY

MUNICIPALITY: WAYNESBORO

1. FLOODPLAIN IDENTIFICATION AND MAPPING

Requirement	*Recommended Action*	*Yes/No*	*Comments*
a. Does the municipality maintain accessible copies of an effective Flood Insurance Rate Map (FIRM)/Digital Flood Insurance Rate Map (DFIRM)? Does the municipality maintain accessible copies of the most recent Flood Insurance Study (FIS)?	Place these documents in the local libraries or make available publicly.	yes	
b. Has the municipality adopted the most current DFIRM/FIRM and FIS?	State the date of adoption, if approved.	yes	06/2012
c. Does the municipality support request for map updates?	If yes, state how.	no	
d. Does the municipality share with Federal Emergency Management Agency (FEMA) any new technical or scientific data that could result in map revisions within 6 months of creation or identification of new data?	If yes, specify how.	yes	
e. Does the municipality provide assistance with local floodplain determinations?	If yes, specify how.	yes	
f. Does the municipality maintain a record of approved Letters of Map Change?	If yes, specify the responsible office.	yes	zoning

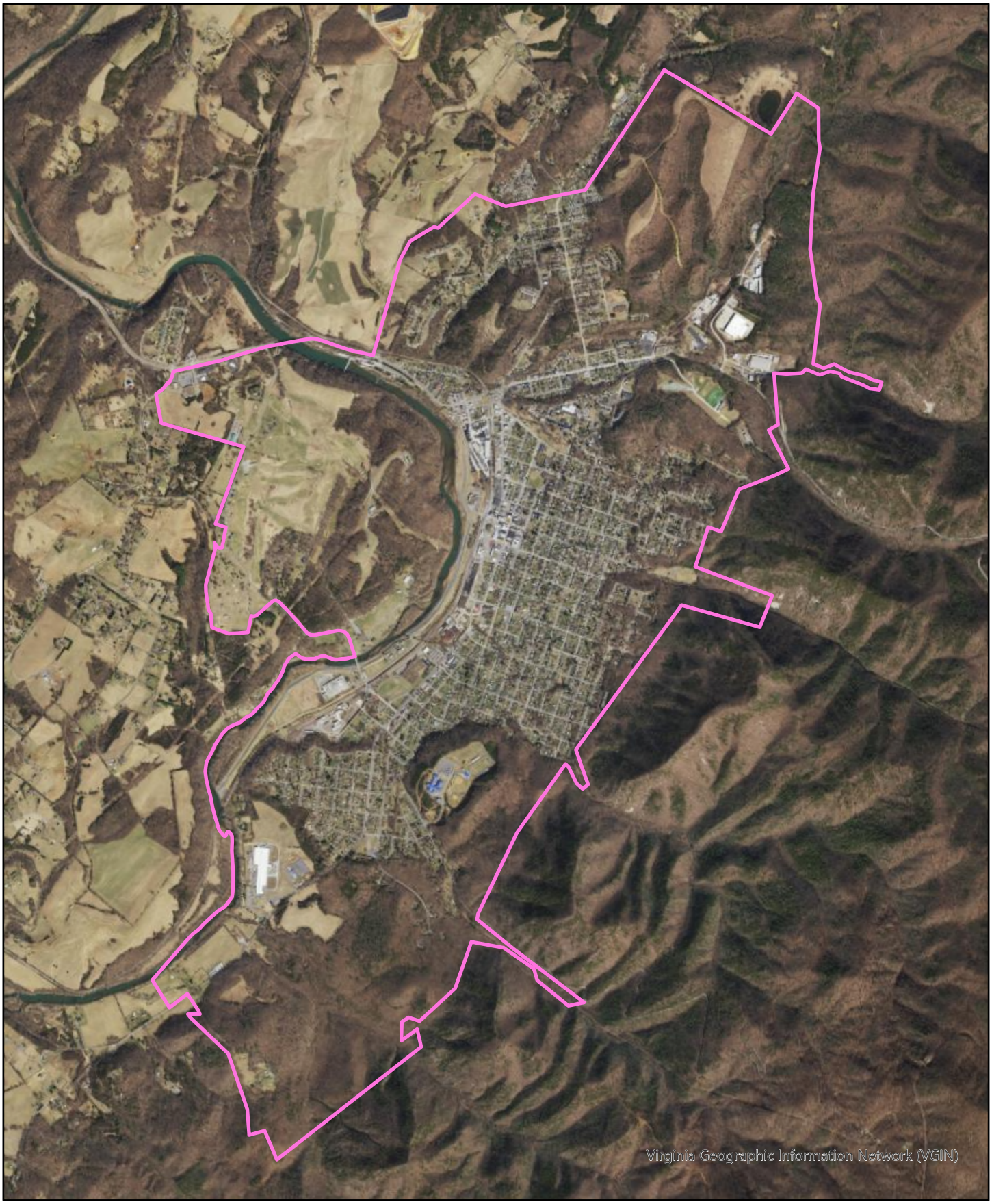
2. FLOODPLAIN MANAGEMENT			
Requirement	***Recommended Action***	***Yes/No***	***Comments***
a. Has the municipality adopted a compliant floodplain management ordinance that, at a minimum, regulates the following:	If yes, answer questions (1) through (4) below.	yes	
(1) Does the municipality issue permits for all proposed development in the Special Flood Hazard Areas (SFHAs)?	If yes, specify the office responsible.	yes	
(2) Does the municipality obtain, review, and utilize any Base Flood Elevation (BFE) and floodway data, and/or require BFE data for subdivision proposals and other development proposals larger than 50 lots or 5 acres?	If yes, specify the office responsible.	yes	
(3) Does the municipality identify measures to keep all new and substantially improved construction reasonably safe from flooding to or above the BFE, including anchoring, using flood-resistant materials, and designing or locating utilities and service facilities to prevent water damage?	If yes, specify the office responsible.	yes	
(4) Does the municipality document and maintain records of elevation data that document lowest floor elevation for new or substantially improved structures?	If yes, specify the office responsible.	yes	
b. If a compliant floodplain ordinance was adopted, does the municipality enforce the ordinance by monitoring compliance and taking remedial action to correct violations?	If yes, specify how.	yes	

2. FLOODPLAIN MANAGEMENT			
Requirement	***Recommended Action***	***Yes/No***	***Comments***
c. Has the municipality considered adopting activities that extend beyond the minimum requirements? Examples include: • Participation in the Community Rating System • Prohibition of production or storage of chemicals in SFHA • Prohibition of certain types of structures, such as hospitals, nursing homes, and jails in SFHA • Prohibition of certain types of residential housing (manufactured homes) in SFHA • Floodplain ordinances that prohibit any new residential or nonresidential structures in SFHA	If yes, specify activities.	yes	No crs, cup per regulations from fema

3. FLOOD INSURANCE			
Requirement	***Recommended Action***	***Yes/No***	***Comments***
a. Does the municipality educate community members about the availability and value of flood insurance?	If yes, specify how.	yes	
b. Does the municipality inform community property owners about changes to the DFIRM/FIRM that would impact their insurance rates?	If yes, specify how.	no	
c. Does the municipality provide general assistance to community members regarding insurance issues?	If yes, specify how.	yes	

Appendix J - Locality Resolutions

The Plan will go before each of the 21 jurisdictions for adoption after approval of the Plan is received from VDEM and FEMA. The final copy of the Plan will include the Locality Resolutions.



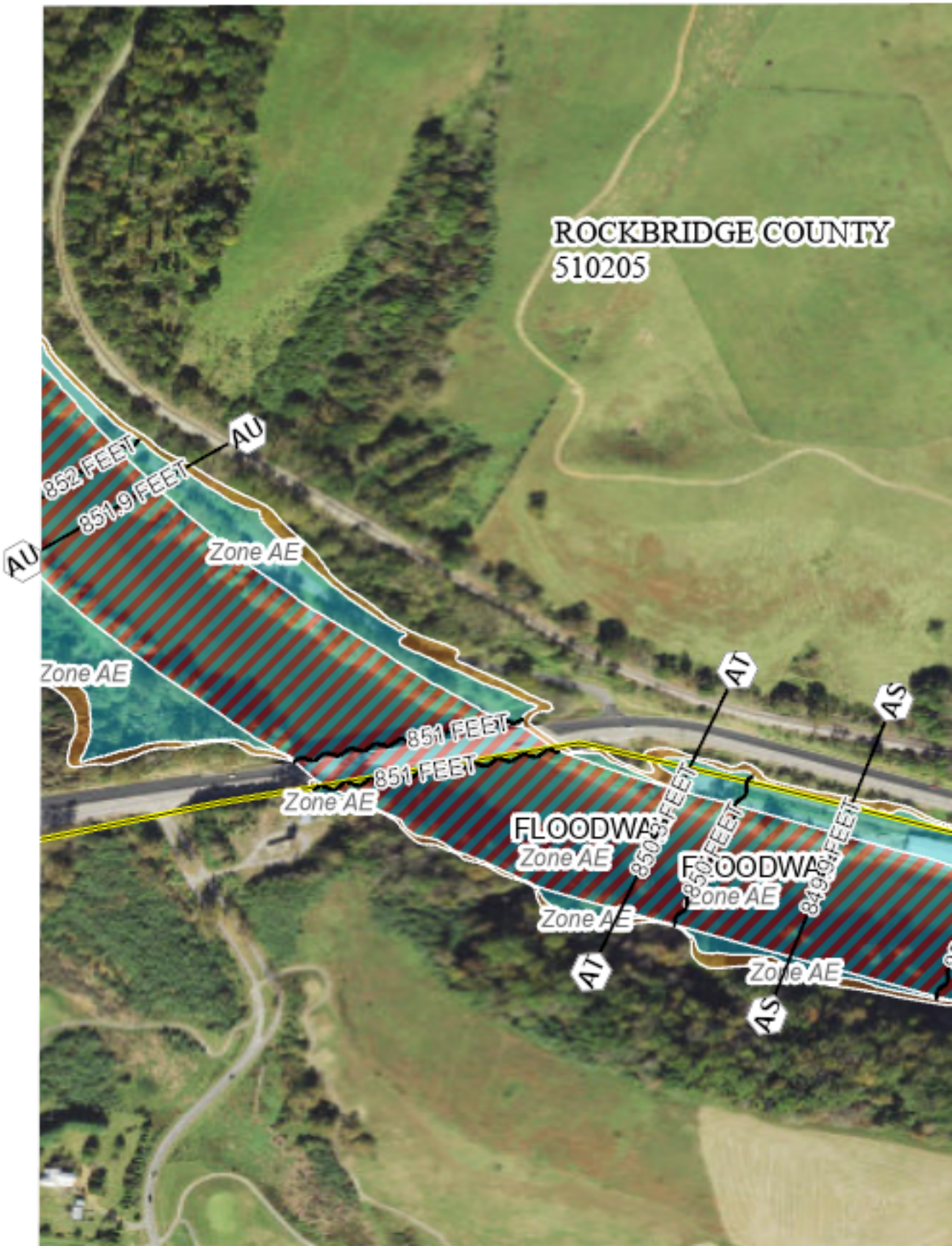
N

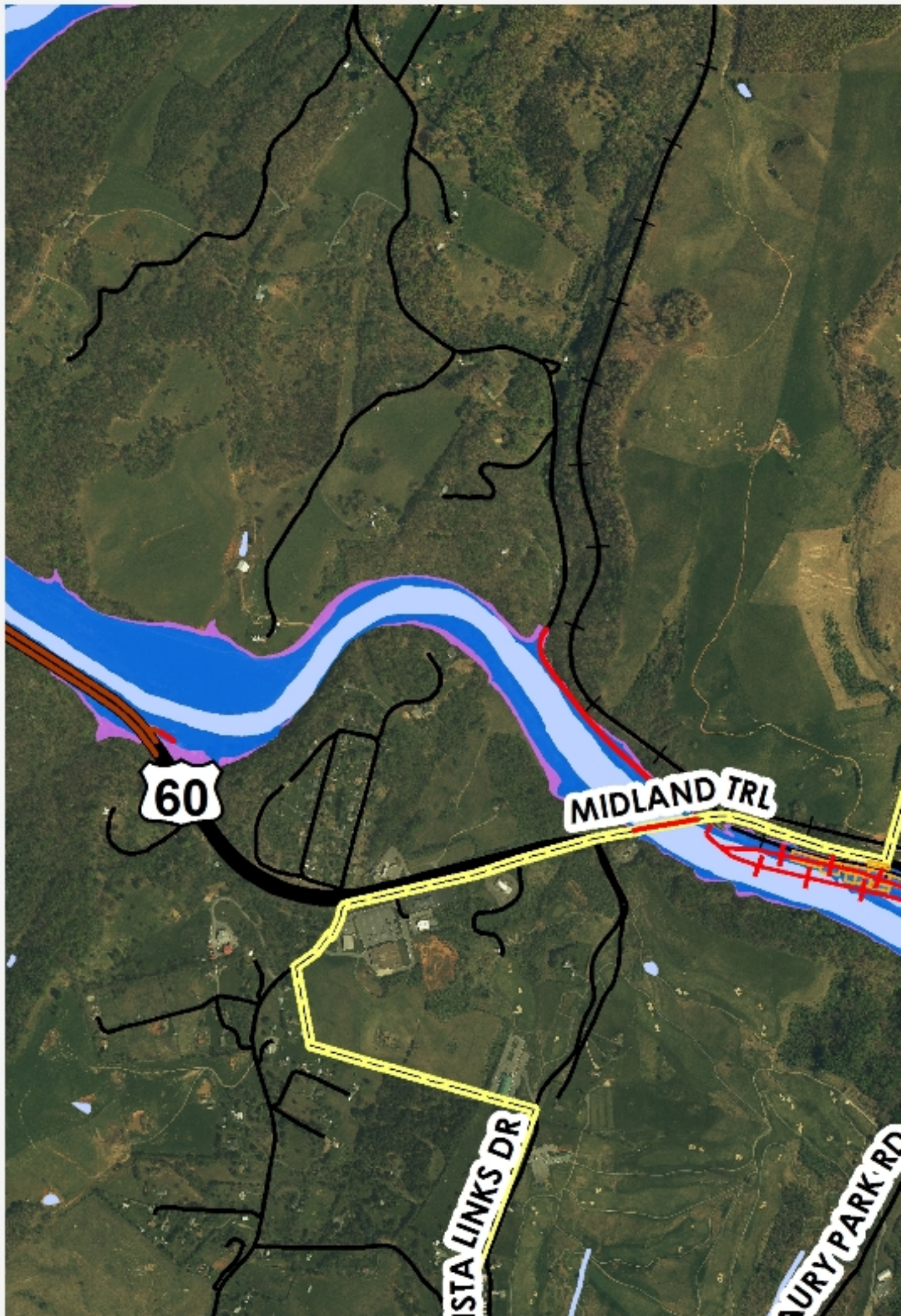
0 0.150.3 0.6 0.9 1.2
Miles

City of Buena Vista
Moderate Vulnerability (0.0-1.0)

9/12/2023

79°22'28.22"W 37°45'9.15"N

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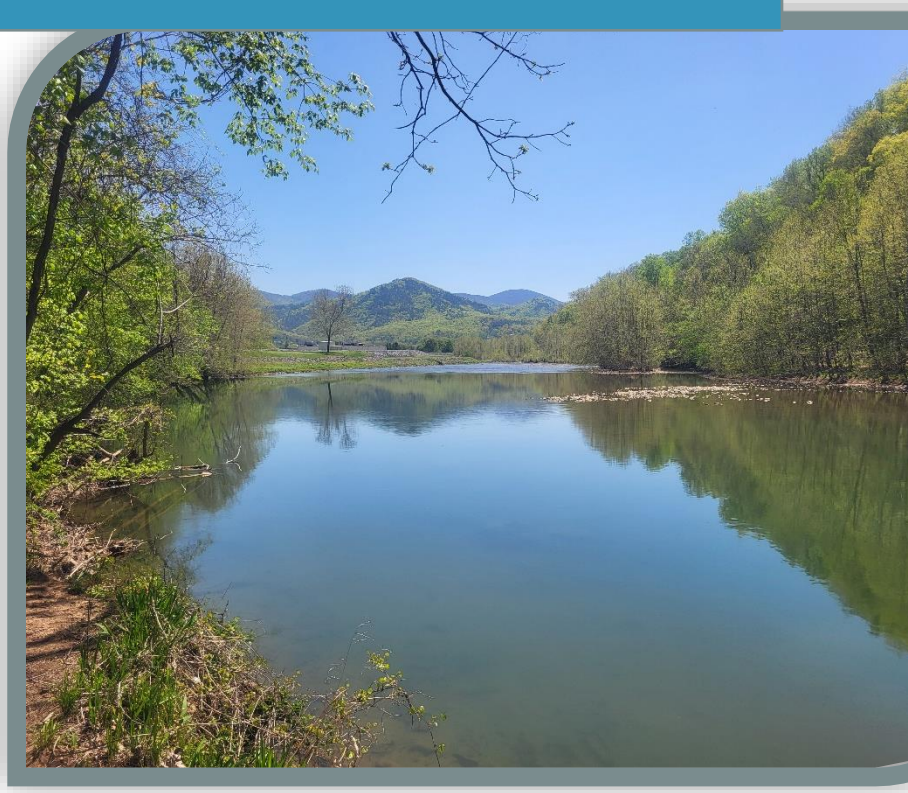
MIDLAND TRL
STA LINKS DR
URY PARK RD

Buena Vista Community Flood Preparedness Fund Round 4 Grant Application Resilience Plan



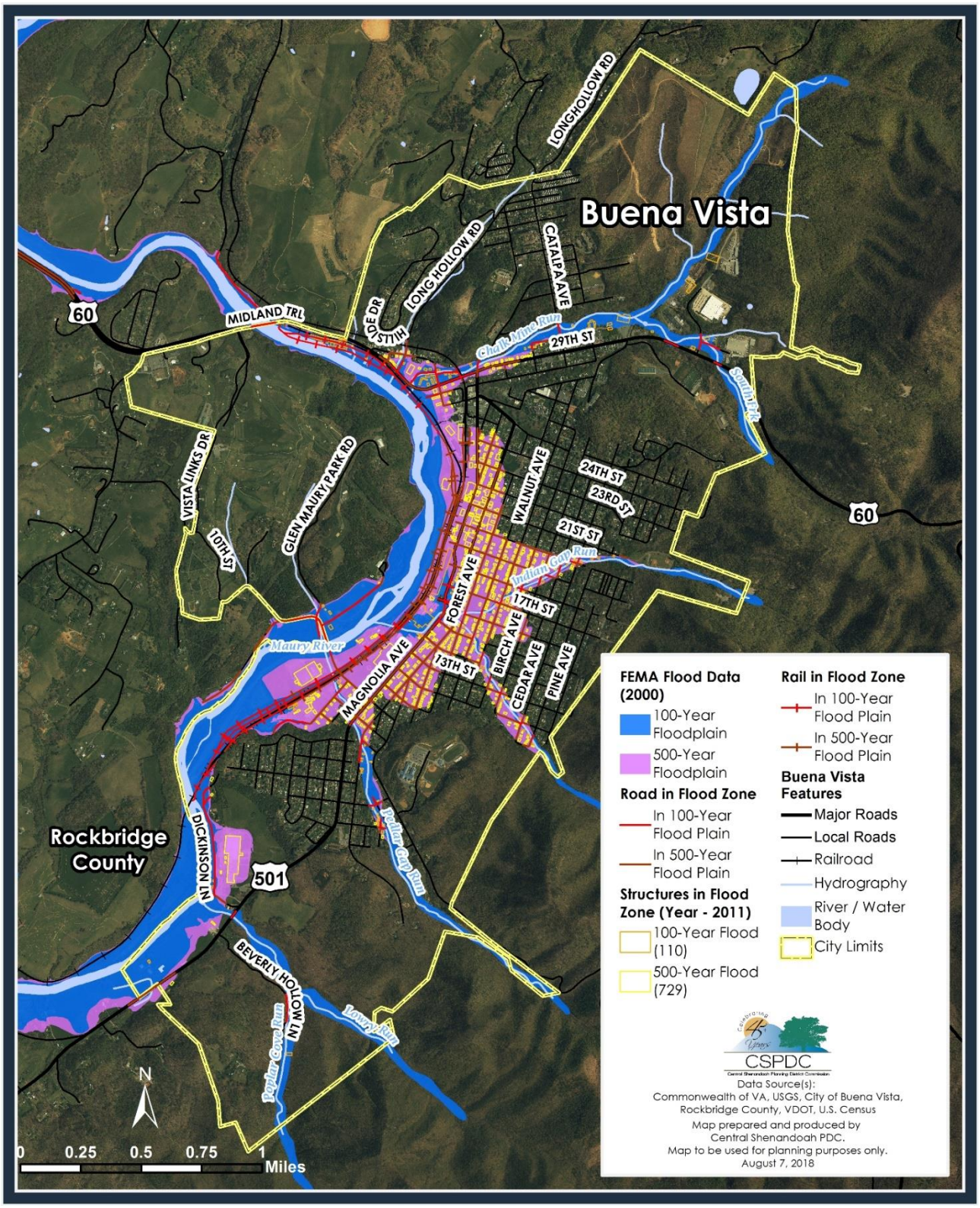
Department of Community Development
City of Buena Vista
11/10/2023

Contents

Introduction

The City of Buena Vista (population 6,600) is located in the Shenandoah Valley on the Maury River. The river and water have been central to the City's history. At first the river was the route of the Kanawha Canal, which led to the Chesapeake & Ohio Railroad, and the power source at the Buena Vista Paper Company. In 1969, the river was the source of catastrophic flooding that shaped the psyche of multiple generations and dealt a major blow to the local economy. Today, the river has new significance as a source of recreation and beauty, but the threat of flooding remains. This grant application is for the creation of a Resilience Plan focused on flood hazards in the City of Buena Vista.

Map – Buena Vista Flood Zones and Structures



Scope of Work Narrative

Previous Plans

Because of the long history of flooding in the City of Buena Vista, there have been multiple plans and studies that address hazards and mitigation. Published relevant plans/studies include:

- *Central Shenandoah Hazard Mitigation Plan* (2020)
- *Viewpoints* Comprehensive Plan for the City of Buena Vista (2012)
- *Central Shenandoah Valley Regional Flood Mitigation Plan* (2002)
- *Buena Vista Watershed Final Plan – Environmental Impact Statement* (1999)

Additionally, there are engineering studies for the James Olin Flood Protection Project (the flood levee) and for specific projects identified in the *Buena Vista Watershed Final Plan*.

The comprehensive plan, hazard mitigation plan, and flood mitigation plan are high-level or general in nature and their data and recommendations require further analysis or specificity. In most cases the recommendations were not project-specific. The *Buena Vista Watershed Final Plan* is relatively comprehensive, although it does not analyze the function of the flood levee system in detail because the levee had just been completed. However, the *Watershed Final Plan* is nearly 25 years old, and parts of it have been constructed and parts have not.

The proposed resilience plan will pull together analysis and recommendations from disparate documents as well as a fresh engineering perspective on the issues with a greater focus on nature-based solutions.

Risk of Flooding and Need for Resilience Plan

The *Central Shenandoah Hazard Mitigation Plan* estimated potential damages from a 100-year flood scenario in Buena Vista. Such a flood would displace 269 people, cause $46 million in property losses, and cause $44 million of business income interruption losses. 27.9% of the City's structures are at risk due to flooding.

Additionally, according to the Virginia Flood Risk Information System (VFRIS), two of the four census tracts in Buena Vista have High Social Vulnerability, and one has Moderate Social Vulnerability. The City is a Low-Income Geographic Area, with a median household income of $42,156 (2022) and 21.4% of the population in poverty.

An updated plan and watershed engineering study will accomplish the following and more:

- Identify policy and programmatic changes City government can make to improve flood hazard resilience
- Identify gaps in flood hazard mitigation project planning
- Analyze the impact of projects constructed (and not constructed) over the last 20 years on hydrology

- Offer project recommendations that are informed by advancing industry best practices, especially nature-based solutions. The 1999 Watershed Plan's recommendations were almost do not adequately consider nature-based solutions.
- Project impact of climate change on the City, and factor this into policy and project recommendations

Flood damages hurt the whole community, not just the residents or business owners whose property is damaged or lost. Buena Vista has experienced this kind of loss before, and is committed to proactive steps to protect the whole community. The resilience plan will include guidance on project prioritization, which will include formal or informal benefit/costs analysis as well as beneficiary socioeconomic factors.

Project Goals

1. Develop a Resilience Plan that meets DCR criteria:
    a. It is project-based with projects focused on flood control and resilience.
    b. It incorporates nature-based infrastructure to the maximum extent possible.
    c. It includes considerations of all parts of a locality regardless of socioeconomics or race, and addresses flood resilience needs of underserved populations within the community.
    d. It identifies and includes all flooding occurring in all areas of the community, not just within the SFHAs, and provides the number and location of repetitive loss and severe repetitive loss properties.
    e. It provides recommendations on property acquisition and/or relocation, including equitable relocation strategies for all affected and where land is acquired.
    f. It includes a strategy for debris management.
    g. It includes administrative procedures for substantial development/substantial improvement of structures within the SFHA.
    h. It includes coordination with other local and inter-jurisdictional projects, plans, and activities and has a clearly articulated timeline or phasing for plan implementation.
    i. It is based on the best available science, and incorporates climate change, sea level rise, and storm surge (where appropriate), and current flood maps.
2. Conduct a new watershed engineering report modeled on the 1999 watershed study.
    a. Obtain detailed topography of the City and other land as needed to map floodplain and waterways
    b. Perform fresh hydrologic/hydraulic modeling on the watershed, using current best practices and incorporating channel modifications and projects included in the 1999 plan
    c. Include analysis of function of flood levee system
    d. Provide revised or new project recommendations, which will be incorporated in the larger resilience plan

Work Plan

Key partners for this project will include the following:

- Department of Conservation & Recreation *to review and approve completed resilience plan*
- Central Shenandoah Planning District Commission *to review/assist/provide…*
- Natural Resource Conservation Service (NRCS, author of the 1999 *Buena Vista Watershed Plan*)…
- Selected engineering consultant.

The timeline and sequence of tasks is shown below. After procurement, which will be handled by the City and the Central Shenandoah Planning District Commission, the remaining tasks will be performed by the selected consultant.

Task	Duration
Procurement of consultant	2 months
Data Gathering: • Key stakeholder outreach • Review of existing plans and studies • Mapping	4 months
Engineering • Hydrologic/hydraulic analysis of the overall watershed and target areas within the City • Review and development of project opportunities that improve flood resilience in Buena Vista	4 months
Resilience plan development and recommendations	1 month
City and stakeholder feedback	1 month

At the time of application, the City has not procured a consultant for this project. However, several consultants who have assisted with DCR-approved resilience plans or are in the process of assisting with DCR-funded resilience plans are part of the Central Shenandoah Planning District Commission's on-call consultant program. The City intends to use the CSPDC's on-call consultant program to expedite procurement of a suitable consultant.

There will be two deliverables. The first will be a standalone Resilience Plan, which will be subsequently adopted as part of the City's comprehensive plan. The second will be an engineering report on the watershed, recapitulating the 1999 scope.

Evaluation and Implementation

The Resilience Plan will identify the greatest flooding risks in the City, allowing prioritization of projects and future evaluation of risks. Additionally, the plan will examine existing hazard monitoring capabilities and whether improvements can be made.

Once confident of project recommendations, the City can aggressively pursue funding for implementation. Implementation funding sources may include the following:

- Community Flood Protection Fund (CFPF) study or project grants
- National Fish and Wildlife Federation (NFWF) Small Watershed Grants or other programs
- Virginia Stormwater Local Assistance Fund (SLAF)
- Community Development Block Grant (CDBG)

The Plan may also have programmatic recommendations related to staff capacity building, outreach, policy updates, etc. These can be executed with City general funds or pursuing non-construction grants.

Budget

The City will procure an experienced consultant to perform the engineering analysis and develop the Resilience Plan. The majority of the budget is consultant fees ($78,800). The remaining $1,200 is in-kind match of City staff time. The amount represents 40 hours of staff time at $30.00 per hour. City staff will use this time to perform the following:

- Grant management and administration
- GIS data layer creation, manipulation, and formatting for consultant use
- Stakeholder/public engagement

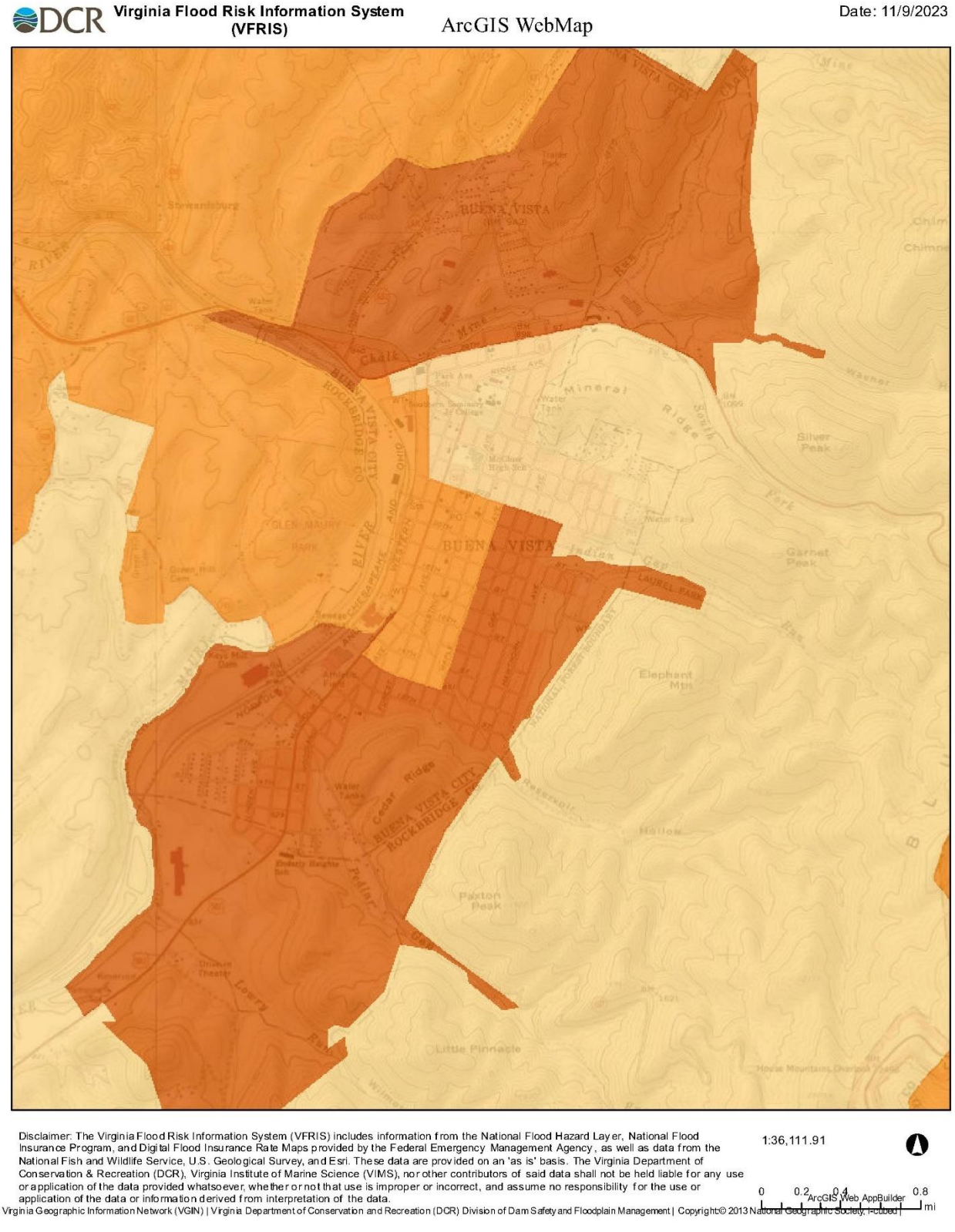
Although a consultant has not yet been procured, a consultant fee was estimated using comparable scope and fee proposals from recent CFPF applications and speaking with an engineer.

Buena Vista Flood Hazard Resilience Plan
Community Flood Preparedness Fund & Resilient Virginia Revolving Loan Fund
Detailed Budget Narrative
Period of Performance: April 2024 through May 2025
Submitted 11/10/2023

Grand Total State Funding Request	**$72,000.00**
Grand Total Local Share of Project	**$8,000.00**
Federal Funding (if applicable)	**$0.00**
Project Grand Total	**$80,000.00**
Locality Cost Match	**10.00%**

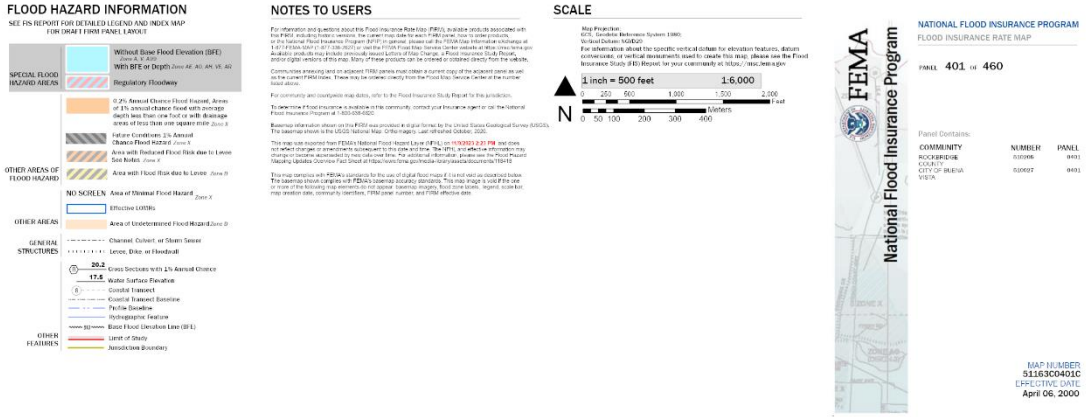
Cost Type	Personnel	Contracts	**Total**
Federal Share	$0.00	$0.00	**$0.00**
Local Share	$1,200.00	$6,800.00	**$8,000.00**
State Share	$0.00	$72,000.00	**$72,000.00**
Pre-Award/Startup	$0.00	$0.00	**$0.00**
Maintenance	$0.00	$0.00	**$0.00**
Total	**$1,200.00**	**$78,800.00**	**$80,000.00**

Map – Buena Vista Social Vulnerability



Map – FIRM


79°22'28.22"W 37°45'9.15"N
ROCKBRIDGE COUNTY
510029
AREA OF MINIMAL FLOOD HAZARD
Zone X
CITY OF BUENA VISTA
510027
FLOODWAY
Zone AE
0.2 PCT ANNUAL CHANCE FLOOD HAZARD
Zone X
79°20'34.80"W 37°47'3.47"N


FLOOD HAZARD INFORMATION
SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP
FOR DRAFT FIRM PANEL LAYOUT
SPECIAL FLOOD HAZARD AREAS
Without Base Flood Elevation (BFE)
With BFE or Depth
Regulatory Floodway
OTHER AREAS OF FLOOD HAZARD
0.2% Annual Chance Flood Hazard
Future Conditions 1% Annual Chance Flood Hazard
Area with Reduced Flood Risk due to Levee
Area with Flood Risk due to Levee
NO SCREEN
Area of Minimal Flood Hazard
OTHER AREAS
Effective LOMRs
Area of Undetermined Flood Hazard
GENERAL STRUCTURES
Channel, Culvert, or Storm Sewer
Levee, Dike, or Floodwall
20.2
17.5
Cross Sections with 1% Annual Chance
Water Surface Elevation
Coastal Transect
Coastal Transect Baseline
Profile Baseline
Hydrographic Feature
Base Flood Elevation Line (BFE)
OTHER FEATURES
Limit of Study
Jurisdiction Boundary
NOTES TO USERS
SCALE
1 inch = 500 feet
1:6,000
N
Meters
FEMA
National Flood Insurance Program
NATIONAL FLOOD INSURANCE PROGRAM
FLOOD INSURANCE RATE MAP
PANEL 401 OF 460
COMMUNITY
NUMBER
PANEL
ROCKBRIDGE COUNTY
CITY OF BUENA VISTA
MAP NUMBER
51163C0401C
EFFECTIVE DATE
April 06, 2000

Supporting Documents

1) *Buena Vista Watershed Final Plan – Environmental Impact Statement* (1999)

    a. https://cityofbuenavista-my.sharepoint.com/:b:/g/personal/troberts_bvcity_org/EZAeHQDyKgRGsmOyxOq6sD4BuUCeFTpAI1NXbPsqwFReoQ?e=7fTkUM

2) *Central Shenandoah Valley Regional Flood Mitigation Plan* (2002)

    a. https://cityofbuenavista-my.sharepoint.com/:b:/g/personal/troberts_bvcity_org/EXNoR5OBgRNGlqKGf5zzWhUBDVc2sYSS1fiRhDzSxMwd2g?e=X5S1bt

3) *Viewpoints* Comprehensive Plan for the City of Buena Vista (2012)

    a. https://www.buenavistava.org/wp-content/uploads/2020/12/2012-Viewpoints-Buena-Vista-Comprehensive-Plan.pdf

4) *Central Shenandoah Hazard Mitigation Plan* (2020)

    a. https://cityofbuenavista-my.sharepoint.com/:b:/g/personal/troberts_bvcity_org/EddOoXruY6RMtOVNooNiRhABDH1KHtAOOYHTVBE8TiCimw?e=8Ryrmv

5) *Buena Vista Land Development Regulations – Flood Hazard District*

    a. https://library.municode.com/va/buena_vista/codes/code_of_ordinances?nodeId=PTIIILADERE_ART6USDI_S612.00FLHADI

Appendices

Appendix A: Application Form for Grant and Loan Requests for All Categories

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Virginia Department of Conservation and Recreation
Virginia Community Flood Preparedness Fund Grant Program

Name of Local Government: City of Buena Vista

Category Being Applied for (check one):

☒ **Capacity Building/Planning**

☐ **Project**

☐ **Study**

NFIP/DCR Community Identification Number (CID)

Name of Authorized Official and Title: Thomas Roberts, Director of Community Development

Signature of Authorized Official: 

Mailing Address (1): 2039 Sycamore Ave

Mailing Address (2):

City: **State:** **Zip:** Buena Vista VA 24416

Telephone Number: (540) 261-8607 **Cell Phone Number:** (540) 319-8004

Email Address: troberts@bvcity.org

Contact and Title (If different from authorized official): SAME

Is the proposal in this application intended to benefit a low-income geographic area as defined in the Part 1 Definitions? Yes ☒ No ____

Categories (select applicable activities that will be included in the project and used for scoring criterion):

Capacity Building and Planning Grants

☐ Floodplain Staff Capacity.

☒ **Resilience Plan Development**

☐ Revisions to existing resilience plans and modifications to existing comprehensive and hazard mitigation plans.

☒ **Resource assessments, planning, strategies, and development.**

Policy management and/or development.

Stakeholder engagement and strategies.

☐ Other:

Study Grants (Check All that Apply)

N/A

Project Grants and Loans (Check All that Apply – Hybrid Solutions will include items from both the "Nature-Based" and "Other" categories)

N/A

Location of Project or Activity (Include Maps): City of Buena Vista

NFIP Community Identification Number (CID#) : 510027

Is Project Located in an NFIP Participating Community? ☒ Yes

Is Project Located in a Special Flood Hazard Area? ☒ Yes, a portion of the City is a SFHA

Flood Zone(s) (If Applicable): X500, A, AE

Flood Insurance Rate Map Number(s) (If Applicable): 51163C0385C, 51163C0290C, 51163C0401C, 51163C0405C

Total Cost of Project: $80,000

Total Amount Requested $72,000

Amount Requested as Grant $72,000

Amount Requested as Project Loan (not including short-term loans for up-front costs) NONE

Amount Requested as Short-Term loan for Up-Front Costs (not to exceed 20% of amount requested as Grant) NONE

For projects, planning, capacity building, and studies in low-income geographic areas: Are you requesting that match be waived? ☒ No

Additional Information for Loan Requests

N/A

Appendix C: Checklist All Categories

(Benefit-cost analysis must be included if the proposed Project is over $2 million.)

Virginia Department of Conservation and Recreation
Community Flood Preparedness Fund Grant Program

☒ Detailed map of the project area(s) (Projects/Studies)

☒ FIRMette of the project area(s) (Projects/Studies)

☒ Historic flood damage data and/or images (Projects/Studies)

☒ A link to or a copy of the current floodplain ordinance

☐ Non-Fund financed maintenance and management plan for project extending a minimum of 10 years from project close

☒ A link to or a copy of the current comprehensive plan

☒ Social vulnerability index score(s) for the project area from VFRIS SVI Layer

☐ If applicant is not a town, city, or county, letters of support from affected localities

☐ Letter of support from impacted stakeholders

☒ Budget Narrative

☐ Supporting Documentation, including the Benefit-Cost Analysis tool/narrative (for projects over $2 million)

☒ Authorization to request funding from the Fund from governing body or chief executive of the local government

☐ Signed pledge agreement from each contributing organization

☒ Detailed budget and narrative for all costs

City of Buena Vista

Office of the City Manager
2039 Sycamore Avenue, Buena Vista, Virginia
(540)261-8601

Virginia Department of Conservation and Recreation
Attn: Virginia Community Flood Preparedness Fund
Division of Dam Safety and Floodplain Management
600 East Main Street, 24th Floor
Richmond, VA 23219

To Whom it May Concern:

On behalf of the City of Buena Vista, it is my pleasure to submit a Community Flood Preparedness Fund (CFPF) Planning and Capacity Building application to develop a Buena Vista Flood Hazard Resiliency Plan. Although the City has experienced multiple flood events, and has constructed multiple flood protection and hazard mitigation structures, the City lacks a comprehensive and forward-looking plan. The plan is essential to identifying action steps, both programmatic and project-based, for the City to undertake in the coming years.

Despite the need for this plan, the City lacks the resources to execute a plan of this quality on its own. The City appreciates the opportunity to apply for this funding.

As City Manager I authorize the application for $72,000 of CFPF grant funds. Additionally, I authorize the use of $6,800 from the Planning Department – Professional Services FY2024 budget for use as matching funds.

Sincerely,

Jason Tyree

Budget

The City will procure an experienced consultant to perform the engineering analysis and develop the Resilience Plan. The majority of the budget is consultant fees ($78,800). The remaining $1,200 is in-kind match of City staff time. The amount represents 40 hours of staff time at $30.00 per hour. City staff will use this time to perform the following:

- Grant management and administration
- GIS data layer creation, manipulation, and formatting for consultant use
- Stakeholder/public engagement

Although a consultant has not yet been procured, a consultant fee was estimated using comparable scope and fee proposals from recent CFPF applications and speaking with an engineer.

Buena Vista Flood Hazard Resilience Plan
Community Flood Preparedness Fund & Resilient Virginia Revolving Loan Fund
Detailed Budget Narrative
Period of Performance: April 2024 through May 2025
Submitted 11/10/2023

Grand Total State Funding Request	**$72,000.00**
Grand Total Local Share of Project	**$8,000.00**
Federal Funding (if applicable)	**$0.00**
Project Grand Total	**$80,000.00**
Locality Cost Match	**10.00%**

Cost Type	Personnel	Contracts	**Total**
Federal Share	$0.00	$0.00	**$0.00**
Local Share	$1,200.00	$6,800.00	**$8,000.00**
State Share	$0.00	$72,000.00	**$72,000.00**
Pre-Award/Startup	$0.00	$0.00	**$0.00**
Maintenance	$0.00	$0.00	**$0.00**
Total	**$1,200.00**	**$78,800.00**	**$80,000.00**

Scope of Work Narrative

Previous Plans

Because of the long history of flooding in the City of Buena Vista, there have been multiple plans and studies that address hazards and mitigation. Published relevant plans/studies include:

- *Central Shenandoah Hazard Mitigation Plan* (2020)
- *Viewpoints* Comprehensive Plan for the City of Buena Vista (2012)
- *Central Shenandoah Valley Regional Flood Mitigation Plan* (2002)
- *Buena Vista Watershed Final Plan – Environmental Impact Statement* (1999)

Additionally, there are engineering studies for the James Olin Flood Protection Project (the flood levee) and for specific projects identified in the *Buena Vista Watershed Final Plan*.

The comprehensive plan, hazard mitigation plan, and flood mitigation plan are high-level or general in nature and their data and recommendations require further analysis or specificity. In most cases the recommendations were not project-specific. The *Buena Vista Watershed Final Plan* is relatively comprehensive, although it does not analyze the function of the flood levee system in detail because the levee had just been completed. However, the *Watershed Final Plan* is nearly 25 years old, and parts of it have been constructed and parts have not.

The proposed resilience plan will pull together analysis and recommendations from disparate documents as well as a fresh engineering perspective on the issues with a greater focus on nature-based solutions.

Risk of Flooding and Need for Resilience Plan

The *Central Shenandoah Hazard Mitigation Plan* estimated potential damages from a 100-year flood scenario in Buena Vista. Such a flood would displace 269 people, cause $46 million in property losses, and cause $44 million of business income interruption losses. 27.9% of the City's structures are at risk due to flooding.

Additionally, according to the Virginia Flood Risk Information System (VFRIS), two of the four census tracts in Buena Vista have High Social Vulnerability, and one has Moderate Social Vulnerability. The City is a Low-Income Geographic Area, with a median household income of $42,156 (2022) and 21.4% of the population in poverty.

An updated plan and watershed engineering study will accomplish the following and more:

- Identify policy and programmatic changes City government can make to improve flood hazard resilience
- Identify gaps in flood hazard mitigation project planning
- Analyze the impact of projects constructed (and not constructed) over the last 20 years on hydrology

- Offer project recommendations that are informed by advancing industry best practices, especially nature-based solutions. The 1999 Watershed Plan's recommendations were almost do not adequately consider nature-based solutions.
- Project impact of climate change on the City, and factor this into policy and project recommendations

Flood damages hurt the whole community, not just the residents or business owners whose property is damaged or lost. Buena Vista has experienced this kind of loss before, and is committed to proactive steps to protect the whole community. The resilience plan will include guidance on project prioritization, which will include formal or informal benefit/costs analysis as well as beneficiary socioeconomic factors.

Project Goals

1. Develop a Resilience Plan that meets DCR criteria:
    a. It is project-based with projects focused on flood control and resilience.
    b. It incorporates nature-based infrastructure to the maximum extent possible.
    c. It includes considerations of all parts of a locality regardless of socioeconomics or race, and addresses flood resilience needs of underserved populations within the community.
    d. It identifies and includes all flooding occurring in all areas of the community, not just within the SFHAs, and provides the number and location of repetitive loss and severe repetitive loss properties.
    e. It provides recommendations on property acquisition and/or relocation, including equitable relocation strategies for all affected and where land is acquired.
    f. It includes a strategy for debris management.
    g. It includes administrative procedures for substantial development/substantial improvement of structures within the SFHA.
    h. It includes coordination with other local and inter-jurisdictional projects, plans, and activities and has a clearly articulated timeline or phasing for plan implementation.
    i. It is based on the best available science, and incorporates climate change, sea level rise, and storm surge (where appropriate), and current flood maps.
2. Conduct a new watershed engineering report modeled on the 1999 watershed study.
    a. Obtain detailed topography of the City and other land as needed to map floodplain and waterways
    b. Perform fresh hydrologic/hydraulic modeling on the watershed, using current best practices and incorporating channel modifications and projects included in the 1999 plan
    c. Include analysis of function of flood levee system
    d. Provide revised or new project recommendations, which will be incorporated in the larger resilience plan

Work Plan

Key partners for this project will include the following:

- Department of Conservation & Recreation *to review and approve completed resilience plan*
- Central Shenandoah Planning District Commission *to review/assist/provide…*
- Natural Resource Conservation Service (NRCS, author of the 1999 *Buena Vista Watershed Plan*)…
- Selected engineering consultant.

The timeline and sequence of tasks is shown below. After procurement, which will be handled by the City and the Central Shenandoah Planning District Commission, the remaining tasks will be performed by the selected consultant.

Task	Duration
Procurement of consultant	2 months
Data Gathering: • Key stakeholder outreach • Review of existing plans and studies • Mapping	4 months
Engineering • Hydrologic/hydraulic analysis of the overall watershed and target areas within the City • Review and development of project opportunities that improve flood resilience in Buena Vista	4 months
Resilience plan development and recommendations	1 month
City and stakeholder feedback	1 month

At the time of application, the City has not procured a consultant for this project. However, several consultants who have assisted with DCR-approved resilience plans or are in the process of assisting with DCR-funded resilience plans are part of the Central Shenandoah Planning District Commission's on-call consultant program. The City intends to use the CSPDC's on-call consultant program to expedite procurement of a suitable consultant.

There will be two deliverables. The first will be a standalone Resilience Plan, which will be subsequently adopted as part of the City's comprehensive plan. The second will be an engineering report on the watershed, recapitulating the 1999 scope.

Evaluation and Implementation

The Resilience Plan will identify the greatest flooding risks in the City, allowing prioritization of projects and future evaluation of risks. Additionally, the plan will examine existing hazard monitoring capabilities and whether improvements can be made.

Once confident of project recommendations, the City can aggressively pursue funding for implementation. Implementation funding sources may include the following:

- Community Flood Protection Fund (CFPF) study or project grants
- National Fish and Wildlife Federation (NFWF) Small Watershed Grants or other programs
- Virginia Stormwater Local Assistance Fund (SLAF)
- Community Development Block Grant (CDBG)

The Plan may also have programmatic recommendations related to staff capacity building, outreach, policy updates, etc. These can be executed with City general funds or pursuing non-construction grants.