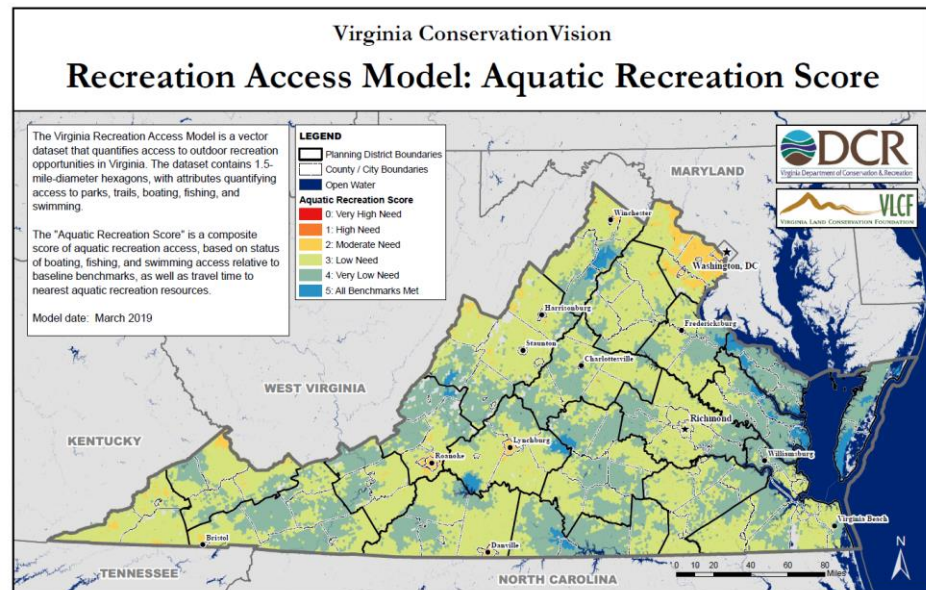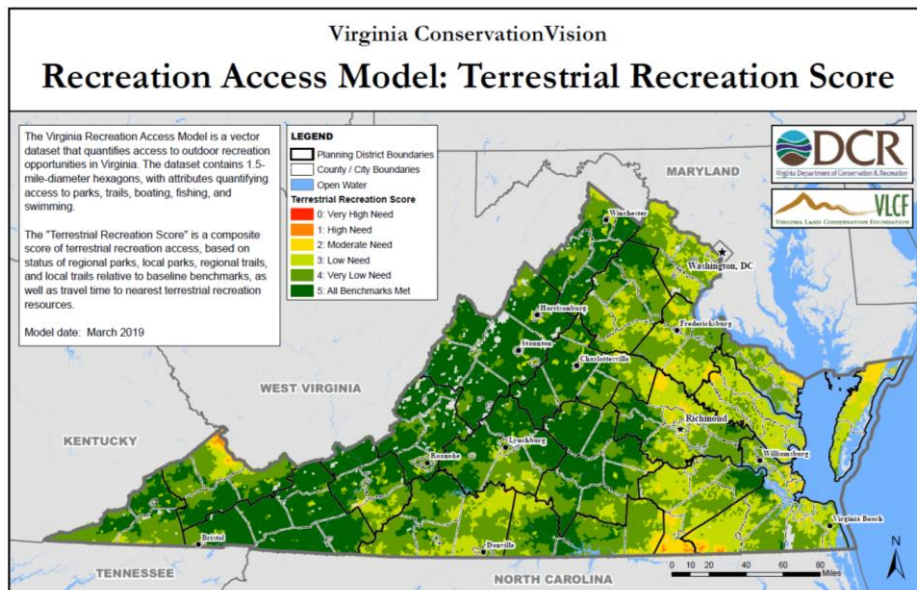**Virginia ConservationVision**
Recreation Access Model

Purpose:

To quantify access to outdoor recreation opportunities in Virginia,
and identify areas where more recreational access is needed

Model developed by Kirsten Hazler and David Bucklin
Virginia Dept. of Conservation & Recreation, Division of Natural Heritage

Virginia ConservationVision
Recreation Access Model

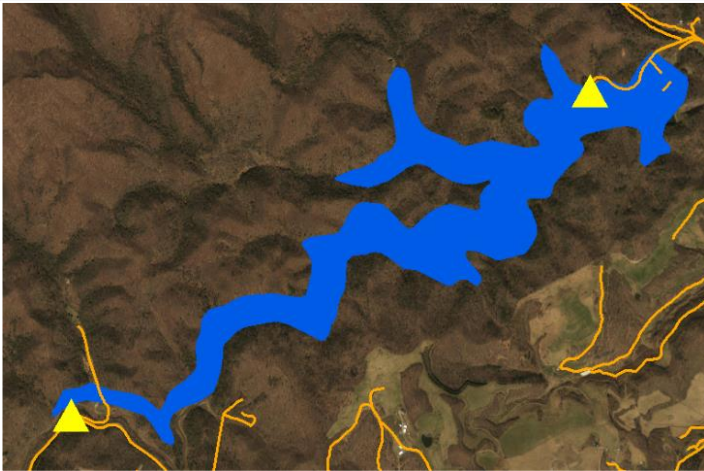# Data Sources

Input Recreation Datasets

Recreation "Features" are:

- Land or water with public recreation access

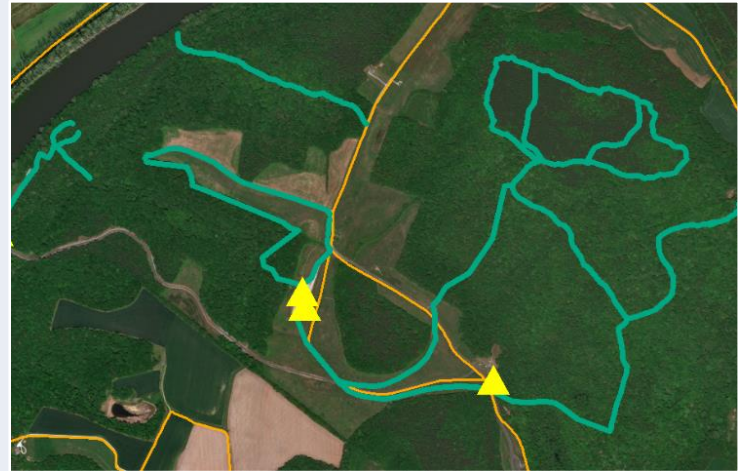- Spatially represented as **polygons** or **lines**

Recreation "Access Points" are:

- Points of entry or access to recreation features

- Spatially represented as **points**

Fishing lake with access points

Trail network with access points

orange lines = roads; green lines = trails; yellow triangles = access points

Input Recreation Datasets:
'Generated' Access Points

- Access points are used as the "starting points" for car travel analyses
- For recreation features with **no known access points**, we generated points

Parks: one point per feature

Parks

Trails: one point per feature

Trail Networks
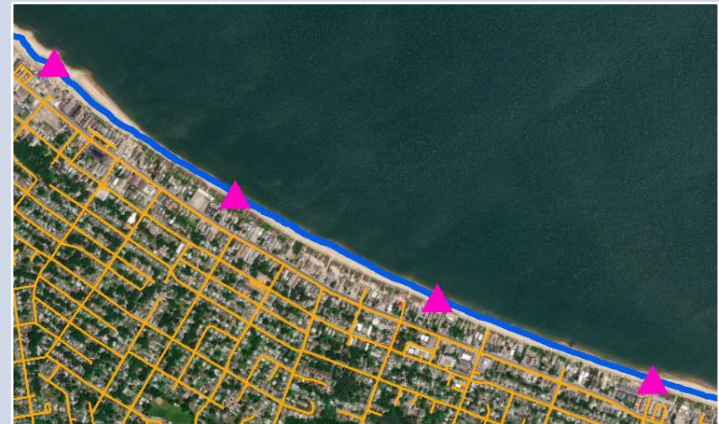

Fishing: one point per feature

Stocked trout reaches

Public fishing lakes

Swimming: one access point every ½ mile

Public beaches

Terrestrial Recreation Datasets:
Regional and Local Parks

Analysis Notes:

- **Features:**
  - "**Park**" = any contiguous block of land with recreation access*
  - Size limits:
    - Regional analysis: Minimum park size = 5 acres
    - Local analysis: No size limit
- **Access points:**
  - Used for regional analyses only
  - ***Must be associated with a park feature*** (up to a distance of ¼ mile) to be included
  - Key point attributes:
    - ID of associated park
    - Area (acres) of associated park

*Only land area is considered; surface waters are removed. Adjacent lands are dissolved into a single unit.
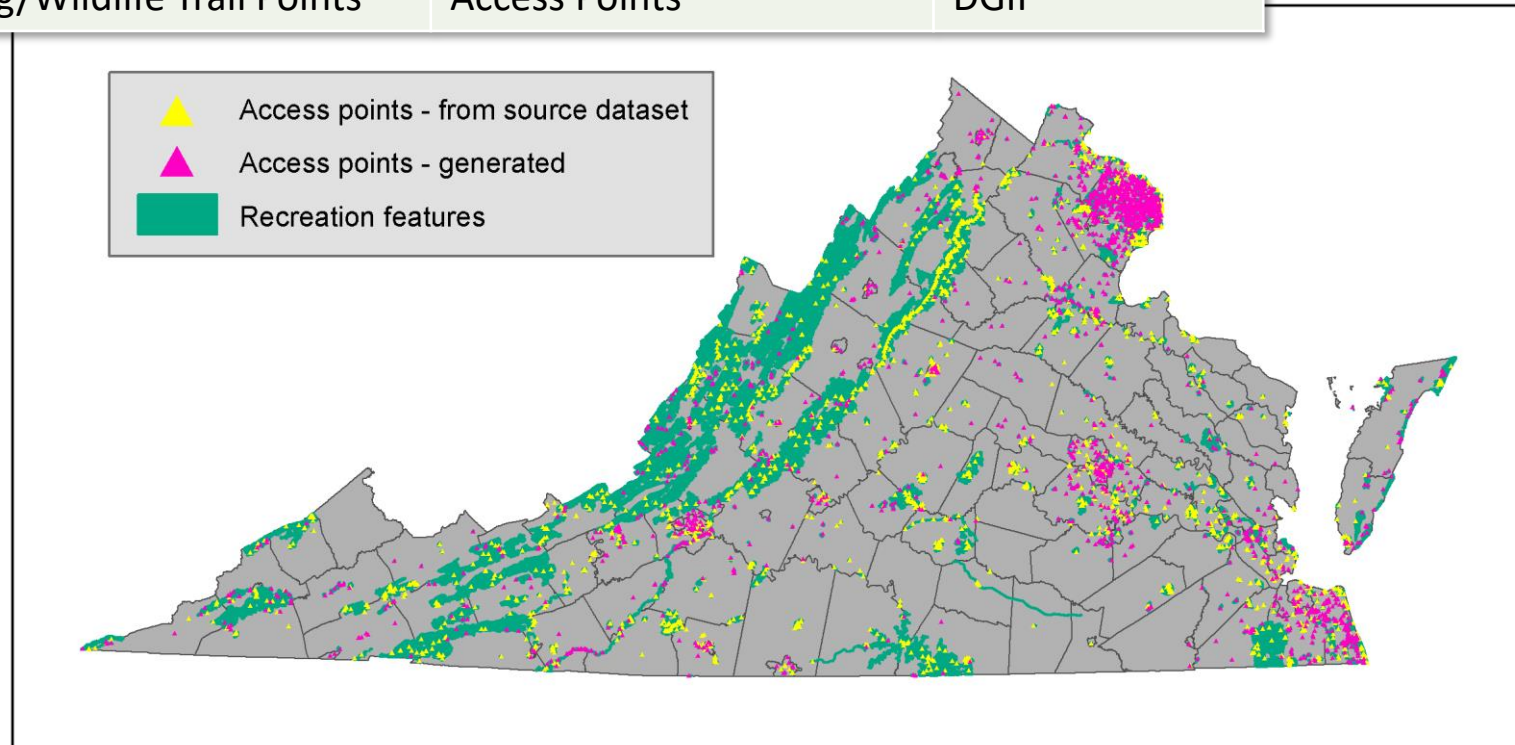
Input Recreation Datasets: Regional and Local Parks

Datasets used	Type	Source
Public Access Lands	Features	DCR-DNH/PRR
Local Parks*†	Features / Access Points	DCR-PRR
Public Access Points‡	Access Points	DCR-PRR
Virginia Trailheads‡	Access Points	DCR-PRR
WMA Points‡	Access Points	DGIF
Birding/Wildlife Trail Points‡	Access Points	DGIF

*Had to generate polygons from point records

†For local analysis only

‡For regional analysis only

Access points - from source dataset
Access points - generated
Recreation features

## Terrestrial Recreation Datasets:
Regional and Local Trails

Analysis Notes:

- **Features:**
  - "**Trail Network**" = Group of trails within ¼ mile of each other
    - On-road trails (e.g., bike lanes/routes) were excluded
  - Length limits:
    - Regional analysis: Minimum trail network length = 1 mile
    - Local analysis: No length limit
- **Access points:**
  - Used for regional analyses only
  - ***Must be associated with a trail network feature*** (up to a distance of ¼ mile) to be included
  - Key point attributes
    - ID of associated trail network
    - Length (miles) of associated trail network

Input Recreation Datasets: Regional and Local Trails

Datasets used	Type	Source
Virginia Trails	Features	DCR-PRR
Local Parks*	Access Points	DCR-PRR
Public Access Points*	Access Points	DCR-PRR
Virginia Trailheads*	Access Points	DCR-PRR
WMA Points*	Access Points	DGIF
Birding/Wildlife Trail Points*	Access Points	DGIF

*For regional analysis only

Legend:
- ▲ Access points - from source dataset
- ▲ Access points - generated
- ▮ Recreation features
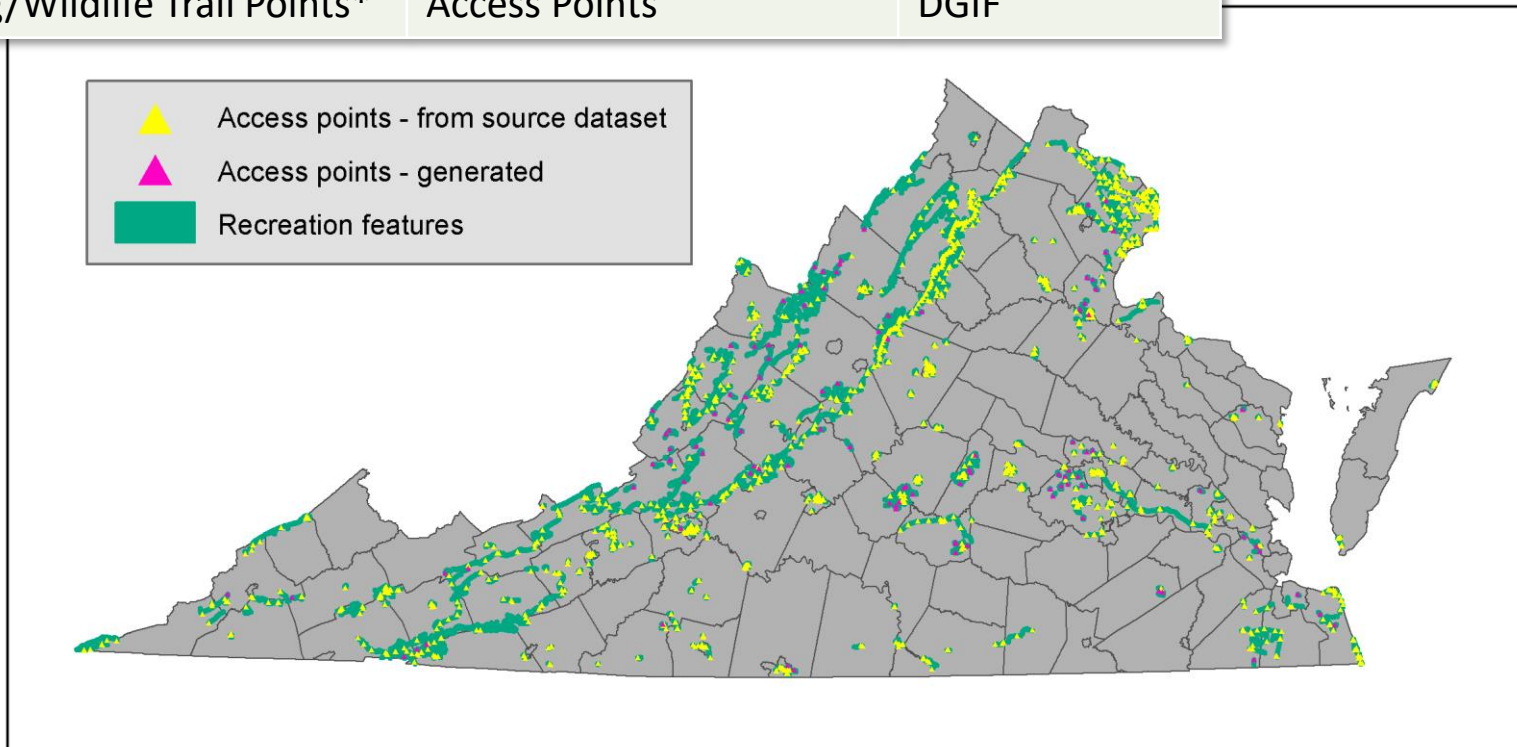
Aquatic Recreation Datasets:
Fishing, Boating and Swimming

Analysis Notes:

- **Features:**
    - Fishing: fishing Lakes, stocked trout reaches
    - Boating: none
    - Swimming: Public Beaches
- **Access points:**
    - ***Do not need to be associated with a recreation feature from a source dataset,*** *if the data specifically indicates access for the category*
    - After all access points identified for one category, they are grouped using a ¼ mile grouping distance
    - Key point attributes
        - ID of the access point group
        - Score = 1 for each access point group

Input Recreation Datasets: Fishing Access

Datasets used	Type	Source
Stocked Trout Reaches	Features	DGIF
Public Fishing Lakes	Features	DGIF
Public Access Points	Access Points	DCR-PRR
Local Park Inventory	Access Points	DCR-PRR
WMA Points	Access Points	DGIF

Fishing Access Points include:

- Known fishing access points from a source dataset

- All other known access points of any type, if within ¼ mile of a fishing recreation feature
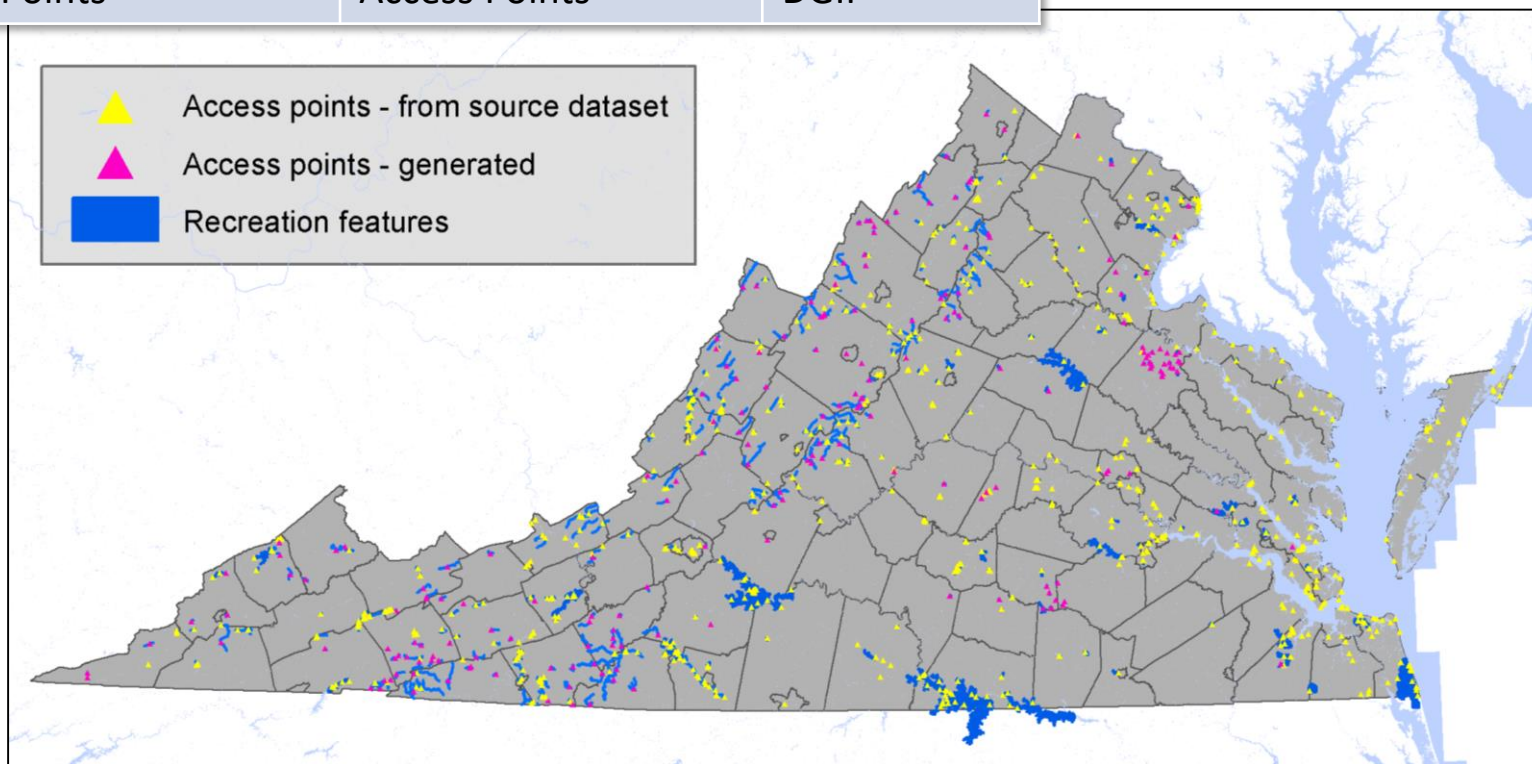
Input Recreation Datasets: Boating Access

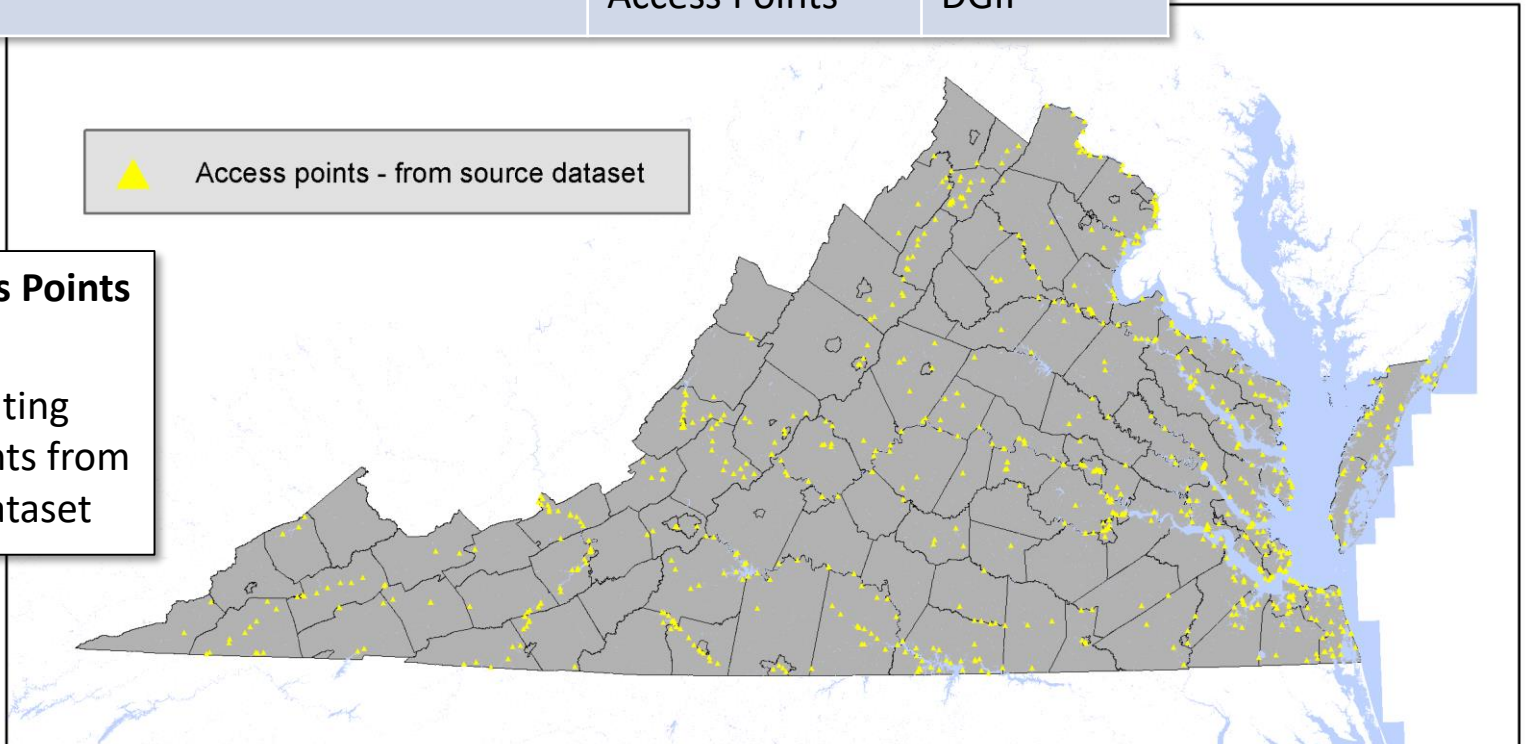| Datasets used	Type	Source
VDGIF Maintained Boating Access Locations	Access Points	DGIF
Boat access locations	Access Points	DCR-PRR
Public Access Points	Access Points	DCR-PRR
Local Park Inventory	Access Points	DCR-PRR
WMA Points	Access Points	DGIF

▲ Access points - from source dataset

Boating Access Points include:

- Known boating access points from a source dataset

Input Recreation Datasets: Swimming Access

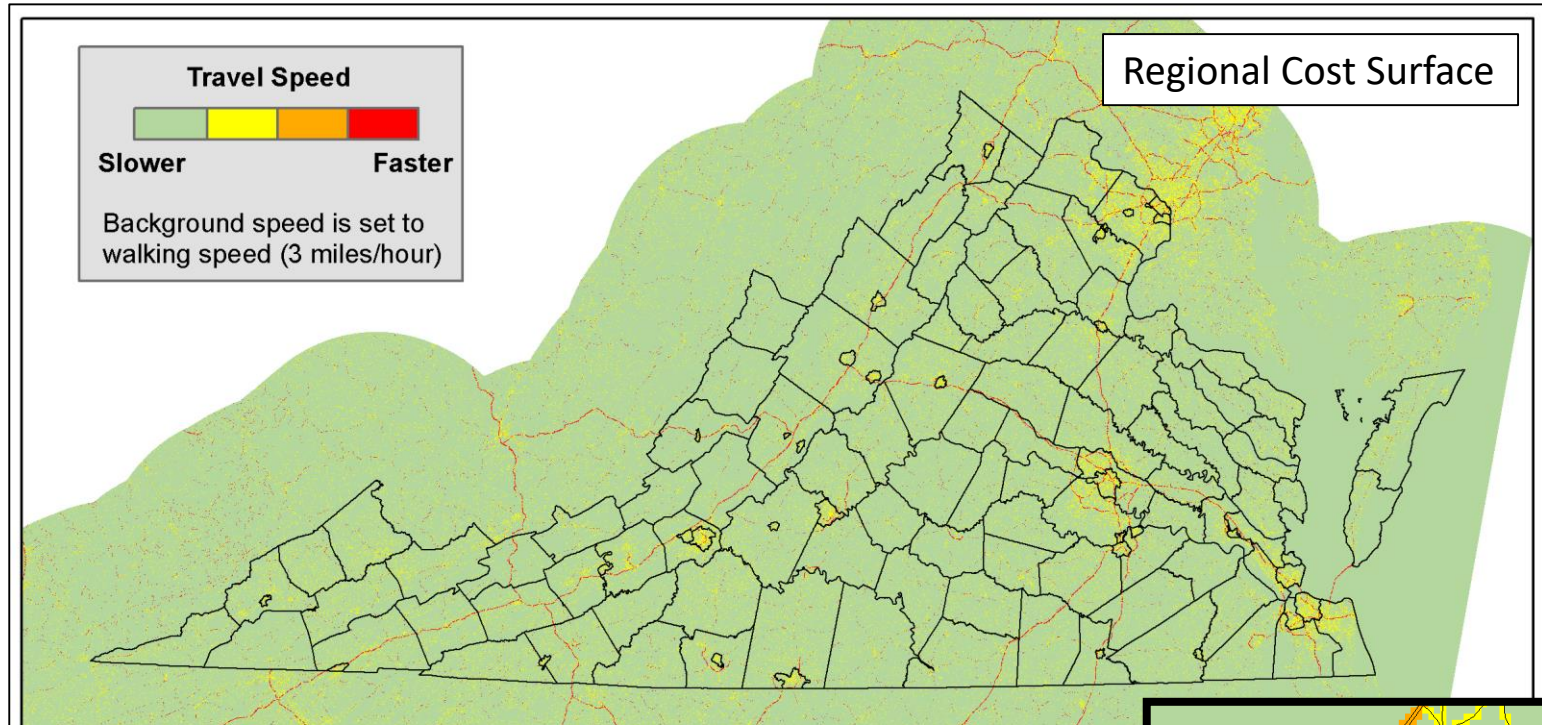| Datasets used	Type	Source
Public Beaches	Features	VIMS
Public Access Points	Access Points	DCR-PRR
Local Park Inventory	Access Points	DCR-PRR

Swimming Access Points include:

- Known swimming access points from a source dataset

- Generated every ½ mile along a recreation feature (beachfront)
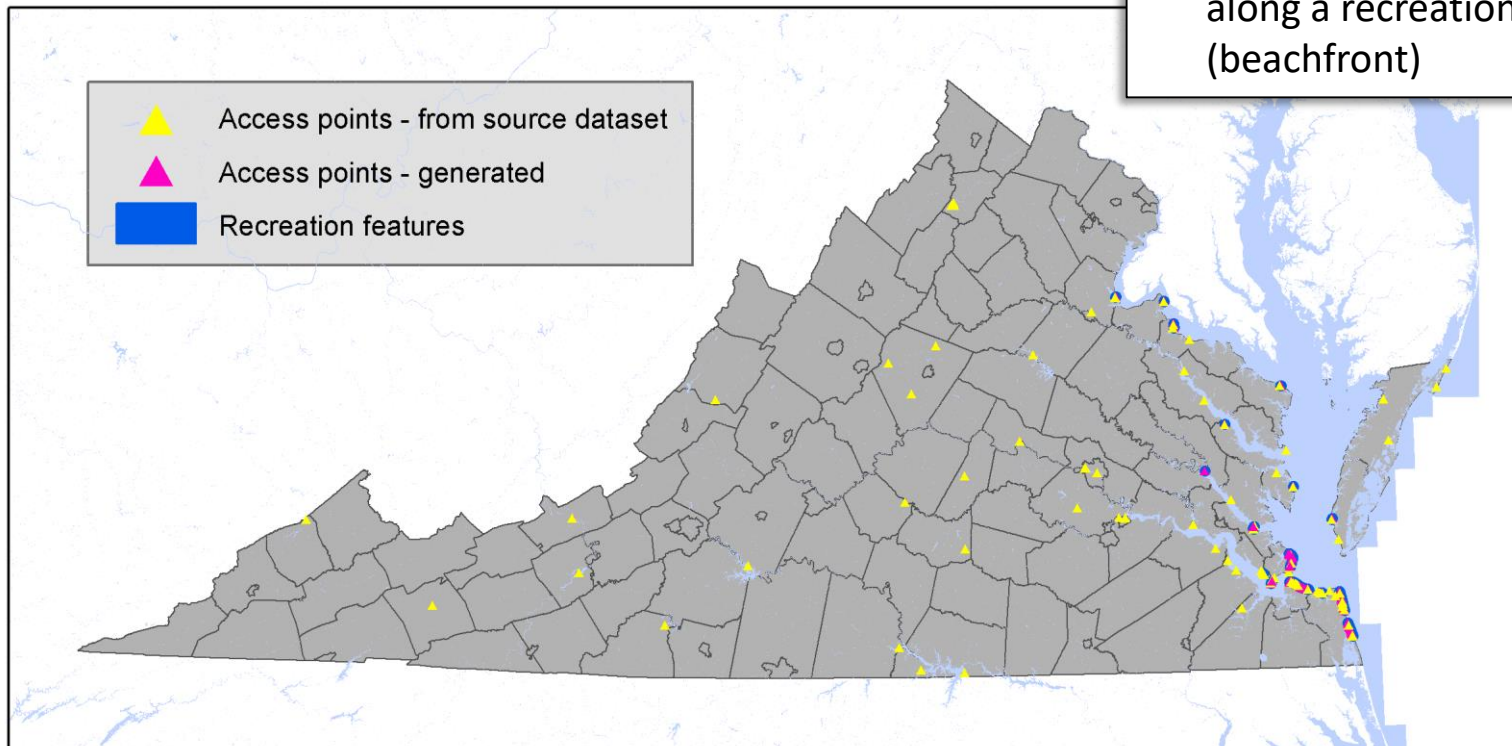
Input Recreation Datasets: Access Point Summary

| Recreation Category	Access Point Grouping	Access Point Group Recreation Value	Number of Access Points	Number of Access Point Groups
Parks	Grouped by associated park	Value = area (acres) of associated park	4,275 (1,657 generated)	2,294
Trails	Grouped by associated trail network	Value = length (miles) of associated trail network	1,956 (105 generated)	368
Fishing	Grouped by distance (¼ mile)	Value = 1 for each group	1,273 (205 generated)	848
Boating	Grouped by distance (¼ mile)	Value = 1 for each group	1,123 (none generated)	717
Swimming	Grouped by distance (¼ mile)	Value = 1 for each group	184 (87 generated)	131

Supplementary Data: Cost Surfaces

Regional Cost Surface

Travel Speed

Slower — Faster

Background speed is set to walking speed (3 miles/hour)

- Cost surfaces used in the Recreation Access Model for:

  - **Travel Time** analyses

  - **Service Area** delineation

- A "cost surface" raster defines the cost (e.g., minutes) to travel across each cell

  - Regional analyses used **driving speed** cost surfaces

  - Local analyses used a **walking speed** cost surface

Close-up of example area, showing original roads

Supplementary Data: Population
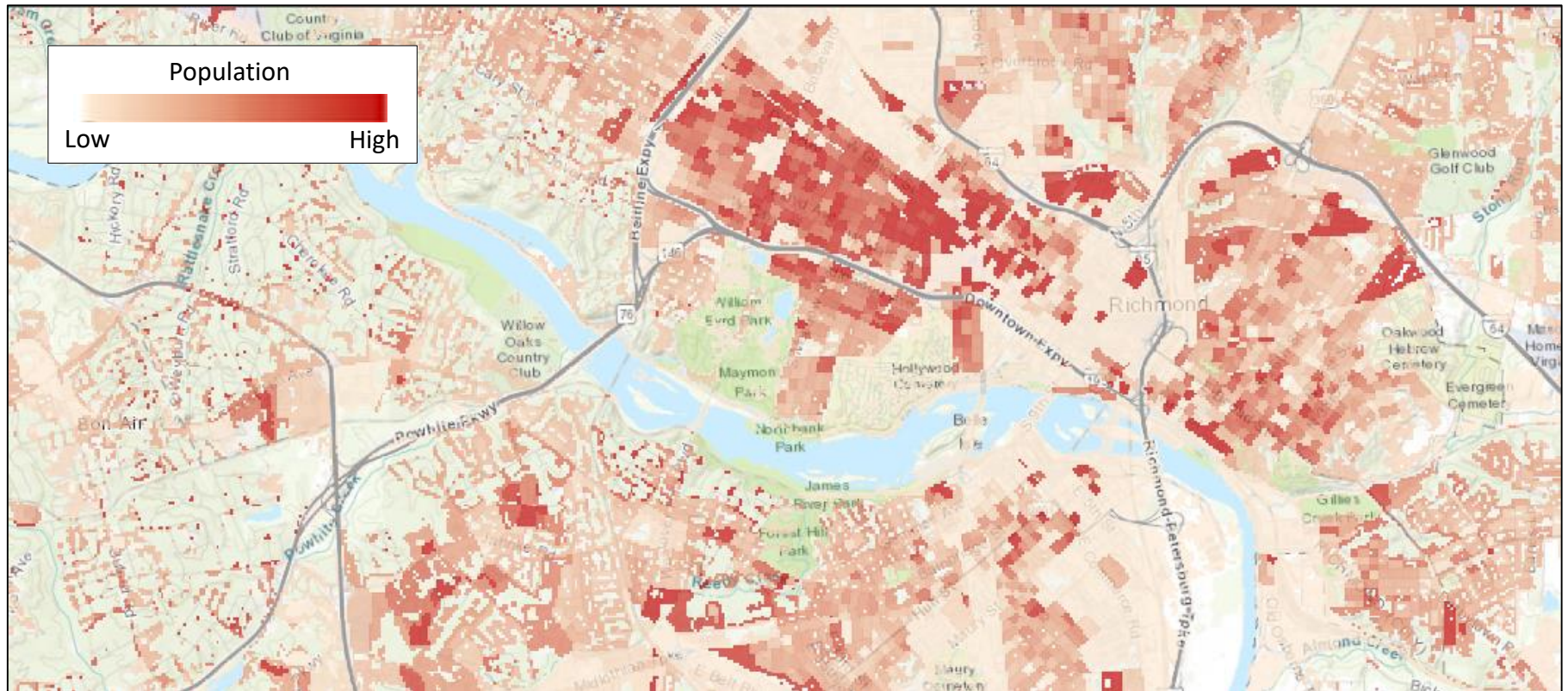
- Population within census blocks was distributed proportionally among pixels based on imperviousness

  - Census block population estimates from U.S. Census Bureau

  - Imperviousness estimates from National Land Cover Database

- Used to estimate population within recreation service areas and focal neighborhoods

# Recreation Access Model

Methods and Outputs

Overview of Modeling Approach

Recreation Access Categories:

- Terrestrial (regional and local access)
  - Parks*
  - Trails
- Aquatic (regional access only)
  - Boating
  - Fishing
  - Swimming[†]

* The term "park" is used loosely to refer to any contiguous block of land with recreation access.

[†] "Swimming" refers to non-pool, beach or bank swimming.

Recreation Access Score

- Travel time to nearest recreation access
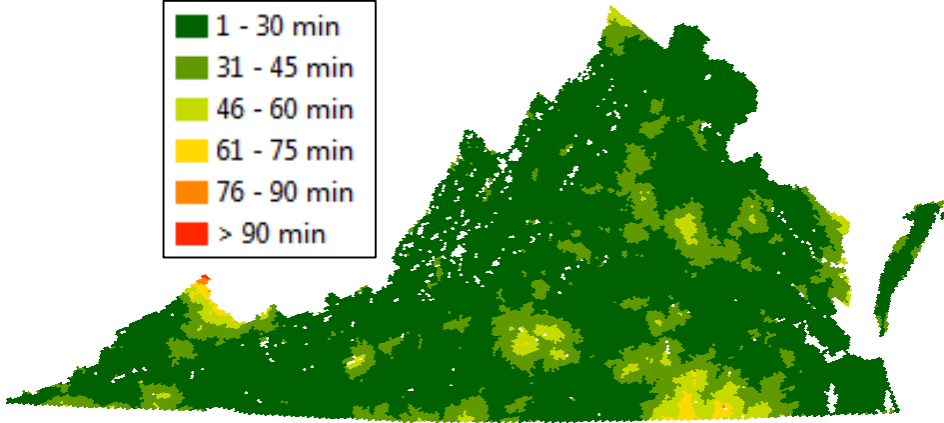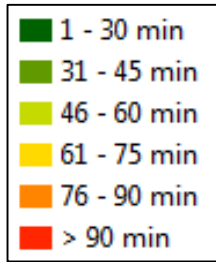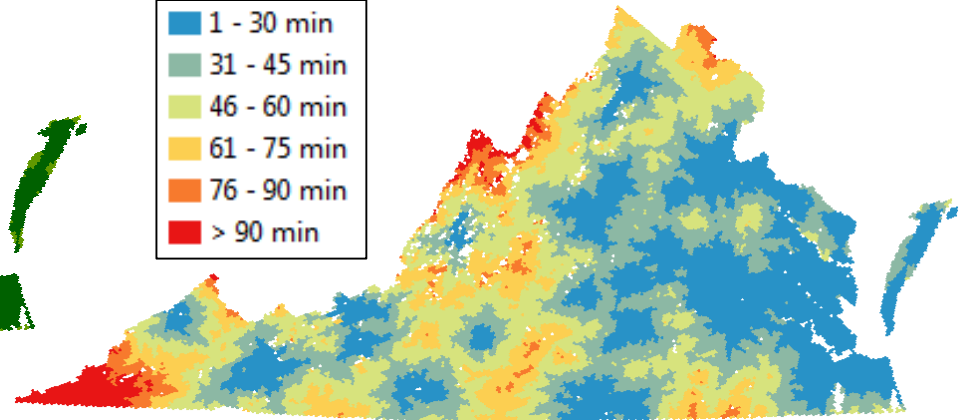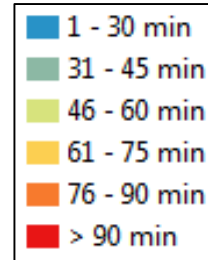- Quantity of access, relative to benchmark
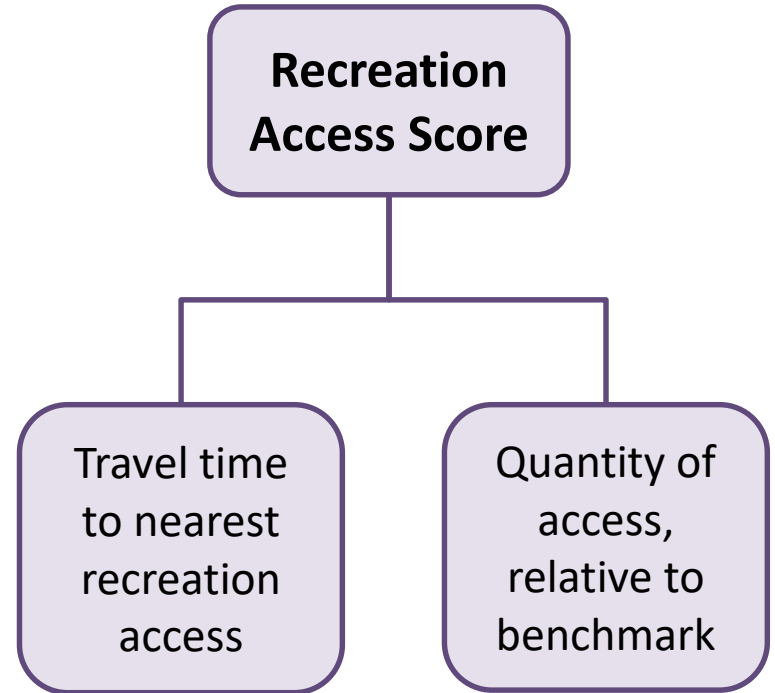
NOTE:

Raster data analyses (30-m resolution) were summarized to hexagons (1.5-mile diameter) for final output
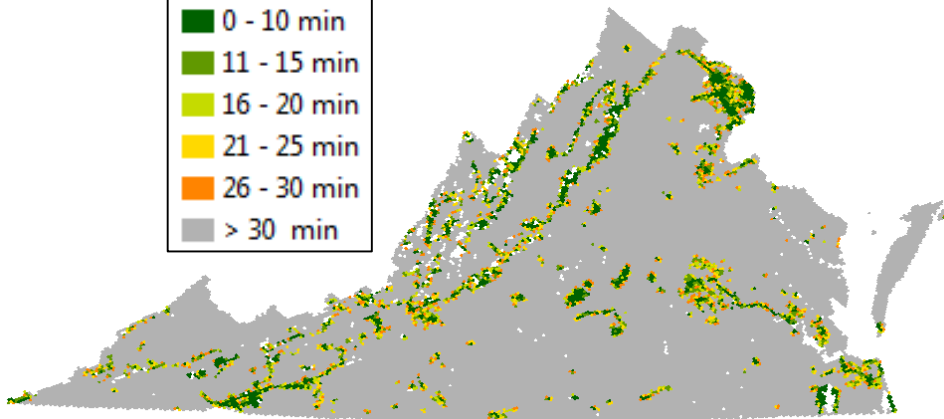
Travel Time Scoring

Avg. Drive Time to Nearest 1000+ Acre Park

■	1 - 30 min
■	31 - 45 min
■	46 - 60 min
■	61 - 75 min
■	76 - 90 min
■	> 90 min

Avg. Drive Time to Nearest Swimming

■	1 - 30 min
■	31 - 45 min
■	46 - 60 min
■	61 - 75 min
■	76 - 90 min
■	> 90 min

Avg. Walk Time to Nearest Trail

■	0 - 10 min
■	11 - 15 min
■	16 - 20 min
■	21 - 25 min
■	26 - 30 min
■	> 30 min
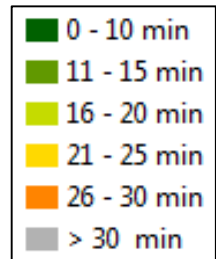
Score	Drive Time	Walk Time
0	> 90 min	> 30 min
1	76 – 90 min	26 – 30 min
2	61 – 75 min	21 – 25 min
3	46 – 60 min	16 – 20 min
4	31 – 45 min	11 – 15 min
5	Up to 30 min	Up to 10 min

Recreation Need Assessment

To assess recreation need, we calculate:

- The quantity of recreation access
  - Acres of parks
  - Miles of trails
  - Number of boating, fishing, or swimming access points
- The **number of people** served by those recreation resources
- The recreation **quantity per person**
- A **score** based on deviation from a standard **benchmark**

Example benchmarks from the Virginia Outdoors Plan

Figure 7.4 Park Area Standards

type	acres/1,000 People	urban/suburban service area
Neighborhood park	3	2 Miles
Playground	no minimum	2 Miles
Community park	3	1 Mile
District park	4	5-7 Miles
Regional park	based on local guidelines	25 Miles
State park	10	1 Hour

Source: 2007 Virginia Outdoors Plan Appendix C, page 671

Recreation quantities per person are calculated using:

- **Focal neighborhoods** for local analyses
- **Service areas** for regional analyses

Local Status Relative to Benchmarks:
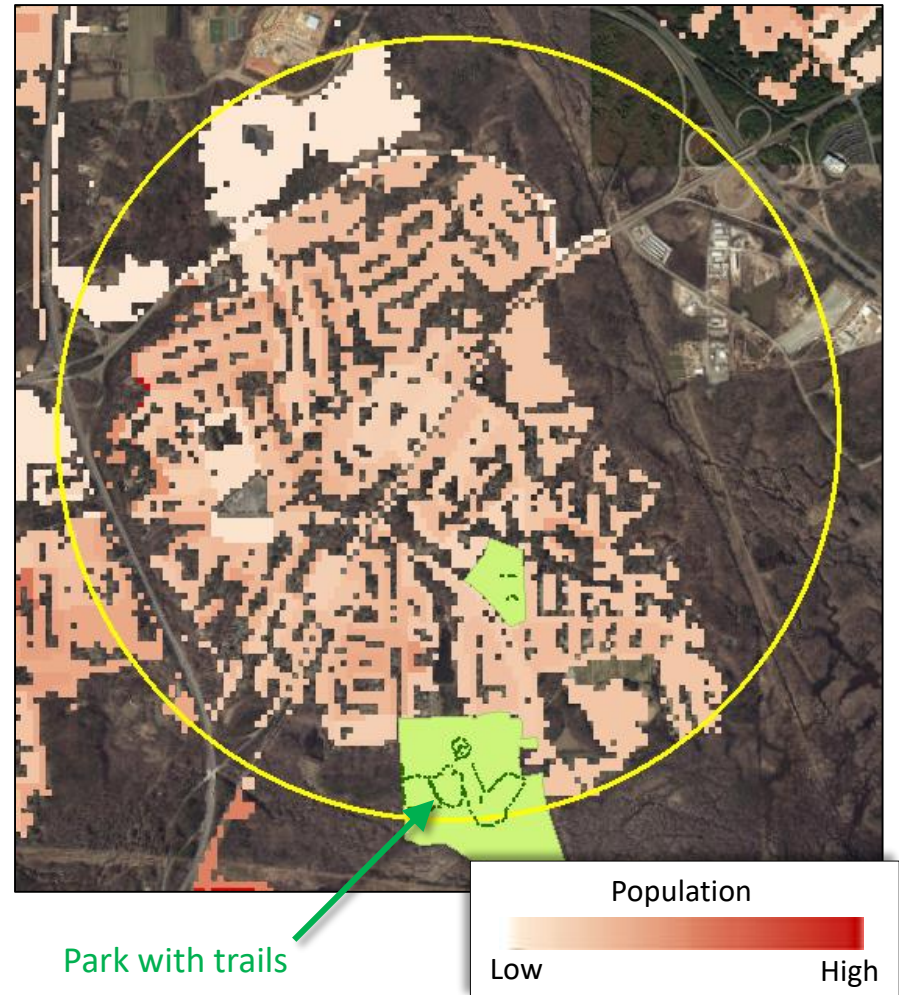# Use of Focal Neighborhoods

The **focal neighborhood** for a point on the ground is the area **within a specified radius** of the point (which is arbitrary).

Example:

1.5-mile focal neighborhood (yellow) around an arbitrary point

For **each** pixel, within a circular neighborhood, we quantify:

- Population

- Acres of parks

- Miles of trails

Park with trails

Population

Low — High

Regional Status Relative to Benchmarks:
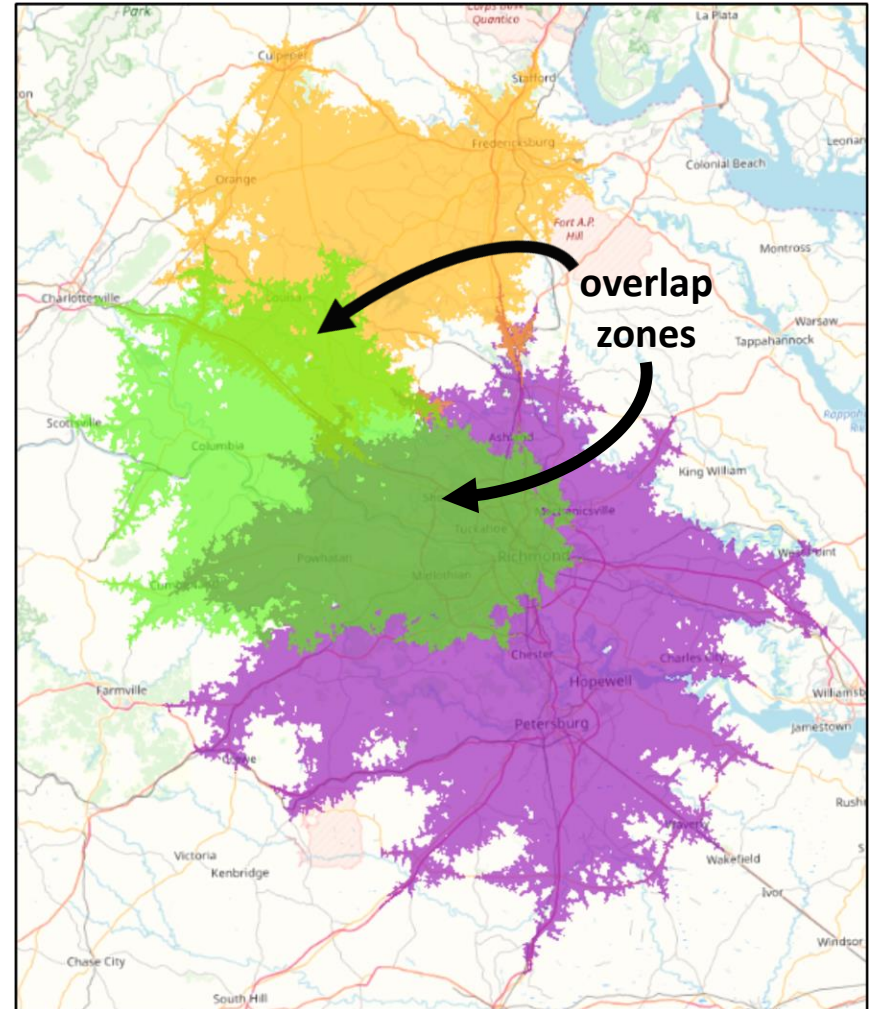## Use of Service Areas

The **service area** for a park, trail system, or water access point is the area that can be reached from that facility **within a specified travel time** (which is arbitrary).

Example:

Service areas delineated for three state parks:

- Pocahontas (purple)

- Powhatan (green)

- Lake Anna (orange)

Note that some people live in an area served by 2 or 3 parks (overlap zones).
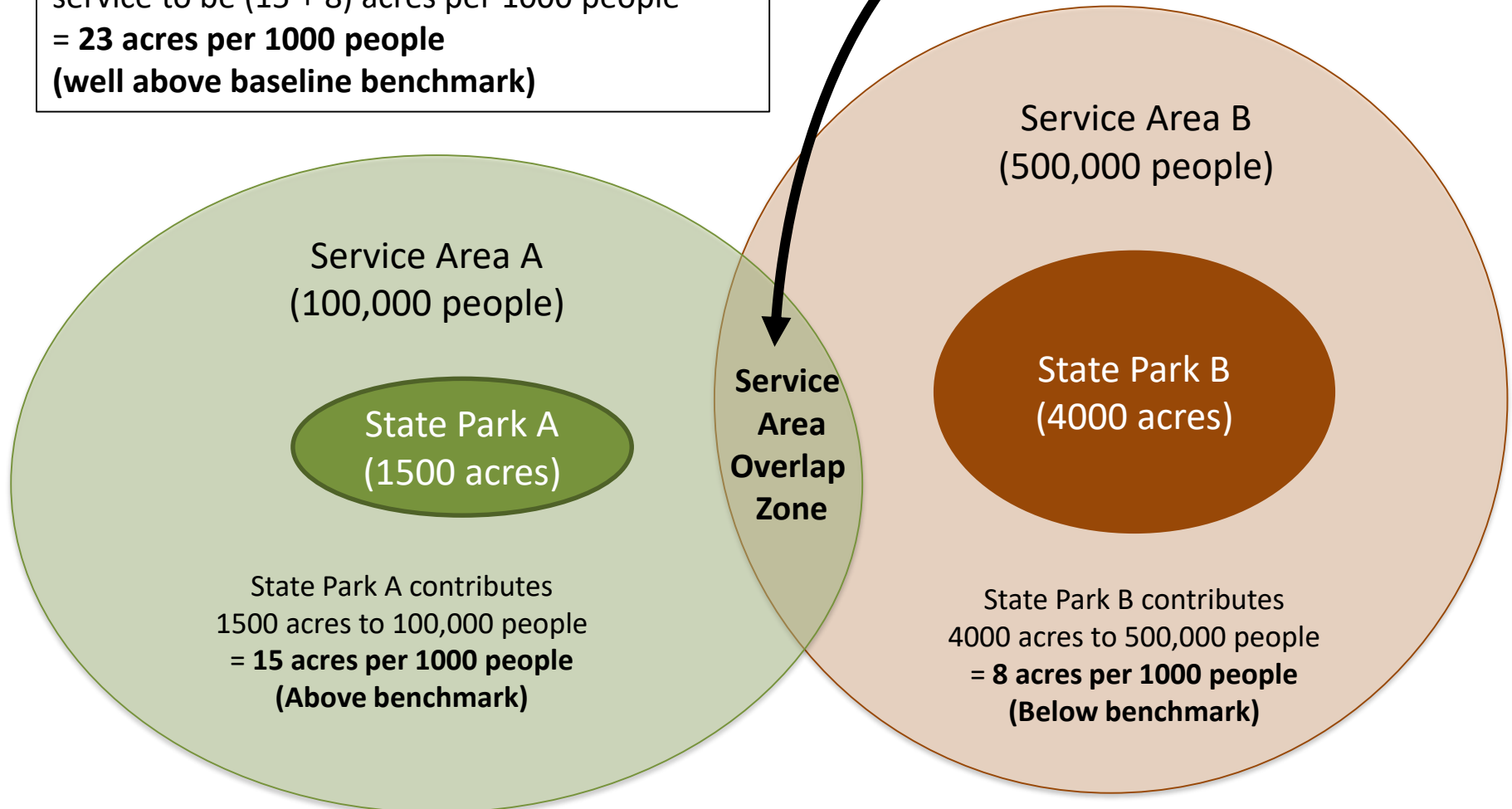
Simplified Example of Service Areas

Two parks with overlapping service areas

In the overlap zone, we calculate the level of service to be (15 + 8) acres per 1000 people
= **23 acres per 1000 people**
(well above baseline benchmark)

People in the "overlap zone" are served by both parks

Service Area B
(500,000 people)

Service Area A
(100,000 people)

State Park A
(1500 acres)

Service Area Overlap Zone

State Park B
(4000 acres)

State Park A contributes
1500 acres to 100,000 people
= **15 acres per 1000 people**
(Above benchmark)

State Park B contributes
4000 acres to 500,000 people
= **8 acres per 1000 people**
(Below benchmark)

Delineation of Service Areas

The delineation of service areas is critical for regional analyses

- For **boating, fishing, and swimming** access points: **fixed 30-minute travel time** used to delineate all service areas

- For regional **parks and trails**: **variable travel times** used to delineate service areas based on park size or trail system length (logarithmic functions)

Park Size vs. Service Area Travel Time

Travel Time (minutes) used to generate Service Area

Pocahontas, 7919 acres
Belle Isle, 892 acres
Wilderness Road, 327 acres
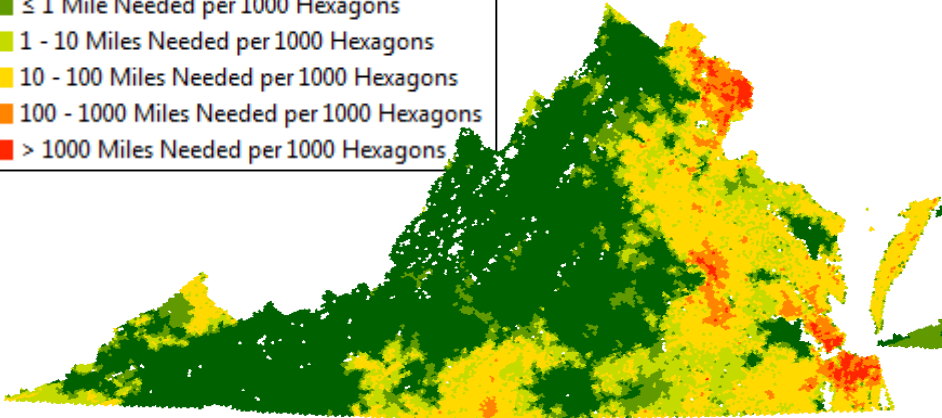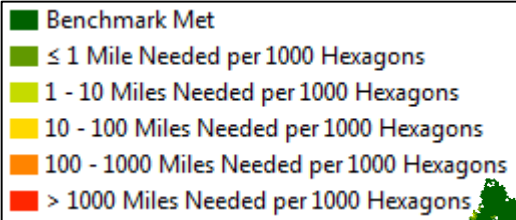Shot Tower, 10 acres

Park Size (acres)
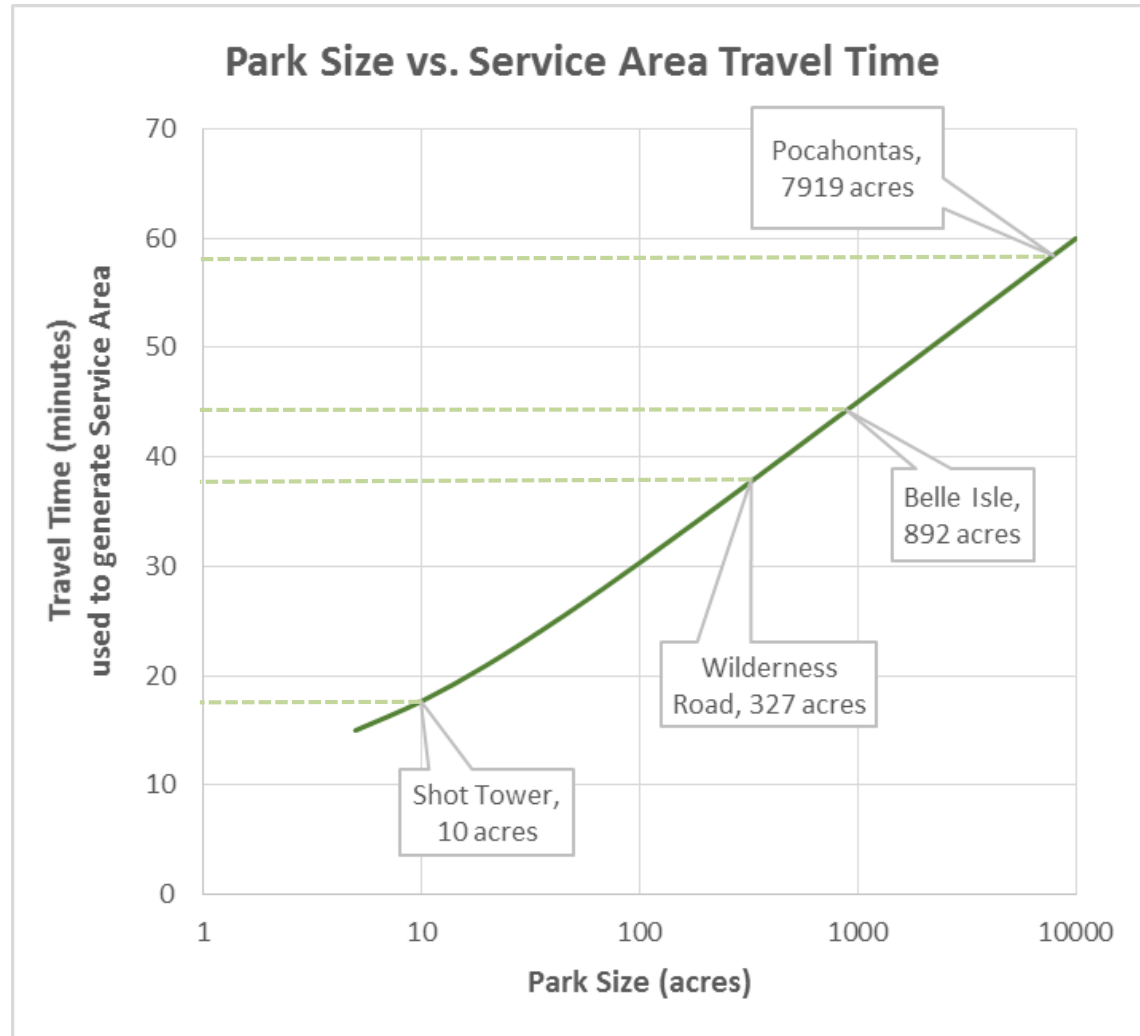
Benchmarks for Adequacy of Recreation Access

Quantity of recreation access is compared to benchmarks to determine need

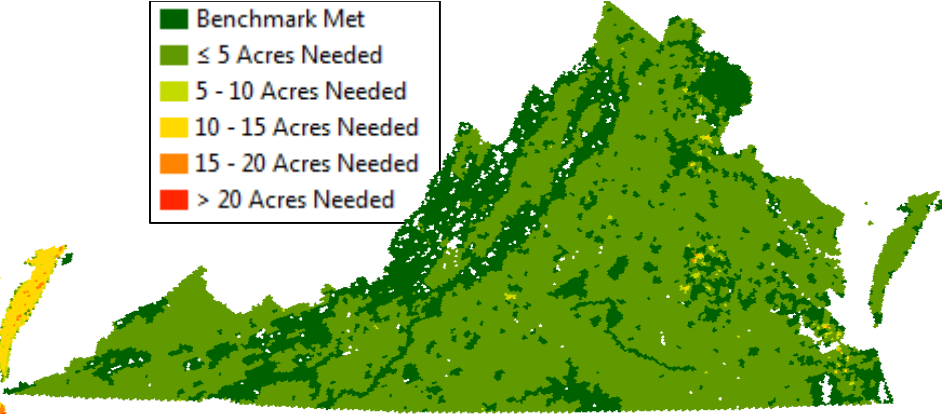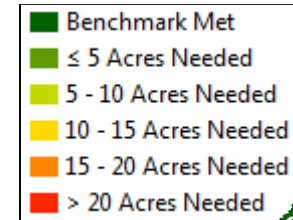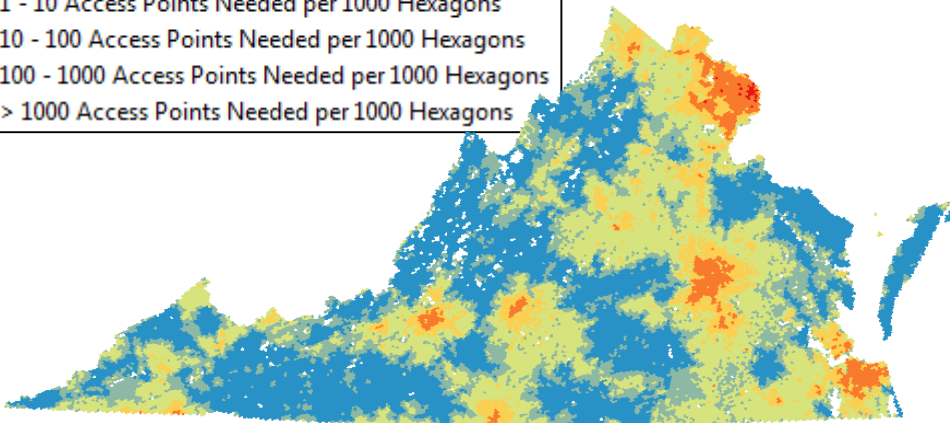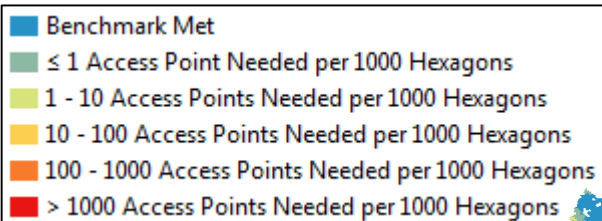| Analysis Category	Baseline Benchmark	Type of Analysis
Regional Parks	10 acres per 1000 people	Regional: variable service areas
Local Parks	3 acres per 1000 people	Local: 1.5-mile radius focal neighborhoods
Regional Trails	3 miles per 7500 people	Regional: variable service areas
Local Trails	1 mile per 7500 people	Local: 1.5-mile radius focal neighborhoods
Boating	1 boat launch per 10,000 people	Regional: fixed service areas
Fishing	1 fishing access point per 10,000 people	Regional: fixed service areas
Swimming	1 swimming access point per 10,000 people	Regional: fixed service areas

Benchmark Status Scoring

Benchmark Status of Regional Trails

- Benchmark Met
- ≤ 1 Mile Needed per 1000 Hexagons
- 1 - 10 Miles Needed per 1000 Hexagons
- 10 - 100 Miles Needed per 1000 Hexagons
- 100 - 1000 Miles Needed per 1000 Hexagons
- > 1000 Miles Needed per 1000 Hexagons

Benchmark Status of Local Parks

- Benchmark Met
- ≤ 5 Acres Needed
- 5 - 10 Acres Needed
- 10 - 15 Acres Needed
- 15 - 20 Acres Needed
- > 20 Acres Needed

Benchmark Status of Fishing

- Benchmark Met
- ≤ 1 Access Point Needed per 1000 Hexagons
- 1 - 10 Access Points Needed per 1000 Hexagons
- 10 - 100 Access Points Needed per 1000 Hexagons
- 100 - 1000 Access Points Needed per 1000 Hexagons
- > 1000 Access Points Needed per 1000 Hexagons

Score	Regional Status: Acres/Miles/Access Points Needed per 1000 Hexagons	Local Status: Acres or Miles Needed
0	> 1000	> 20 acres or 4 miles
1	100 - 1000	15 – 20 acres or 3 – 4 miles
2	10 - 100	10 – 15 acres or 2 – 3 miles
3	1 – 10	5 – 10 acres or 1 – 2 miles
4	≤ 1	≤ 5 acres or 1 mile
5	Benchmark Met	Benchmark Met

Composite Recreation Scores

Aquatic Recreation Score
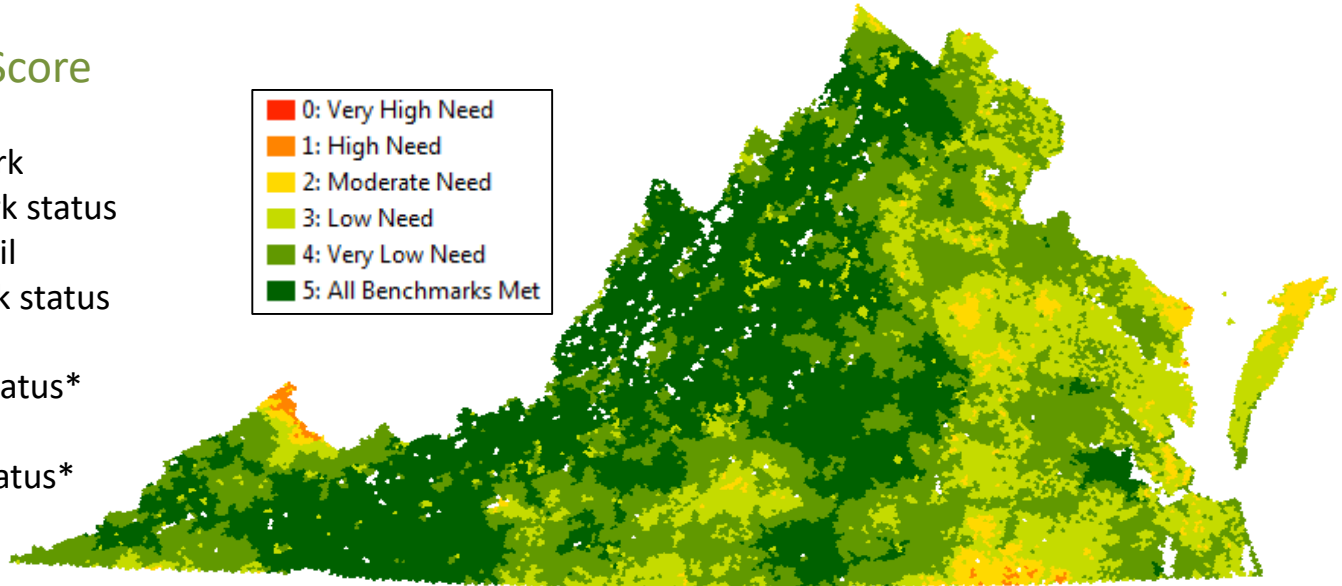
Average of scores from:

- Drive time to boating
- Boating benchmark status
- Drive time to fishing
- Fishing benchmark status
- Drive time to swimming
- Swimming benchmark status

Legend:
- 0: Very High Need
- 1: High Need
- 2: Moderate Need
- 3: Low Need
- 4: Very Low Need
- 5: All Benchmarks Met
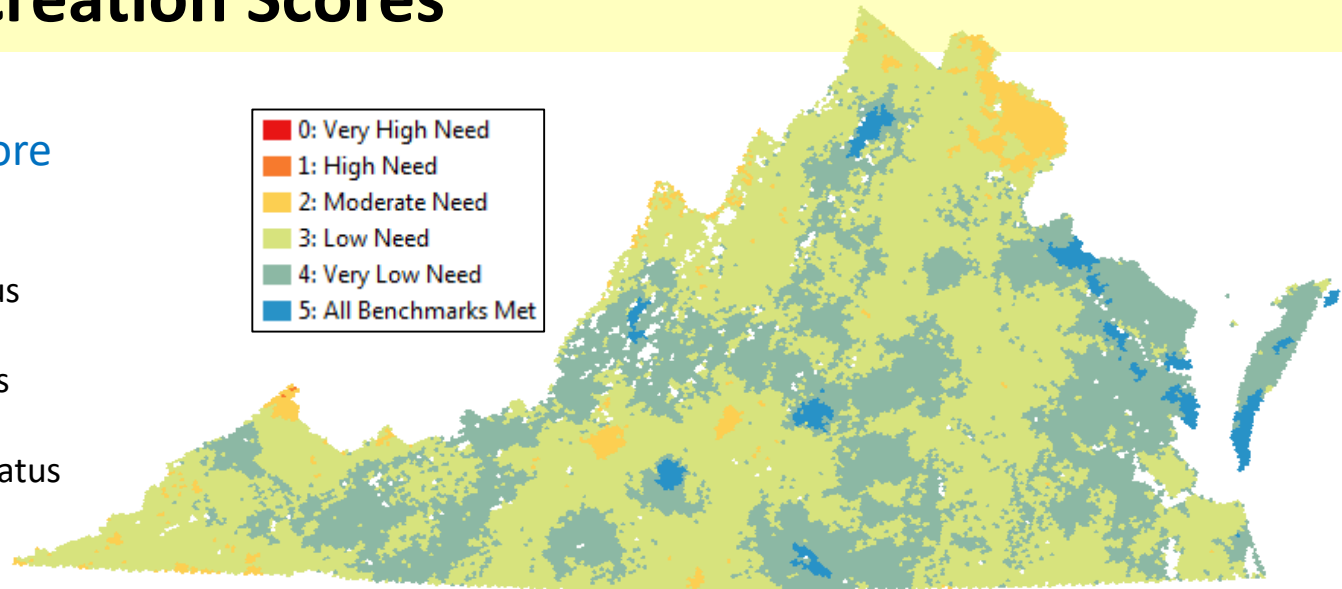
Terrestrial Recreation Score

Average of scores from:

- Drive time to regional park
- Regional parks benchmark status
- Drive time to regional trail
- Regional trails benchmark status
- Walk time to local park*
- Local parks benchmark status*
- Walk time to local trail*
- Local trails benchmark status*

Legend:
- 0: Very High Need
- 1: High Need
- 2: Moderate Need
- 3: Low Need
- 4: Very Low Need
- 5: All Benchmarks Met

* Local components only included where population in hexagon is at least 500

Virginia Recreation Access Model: Web Map