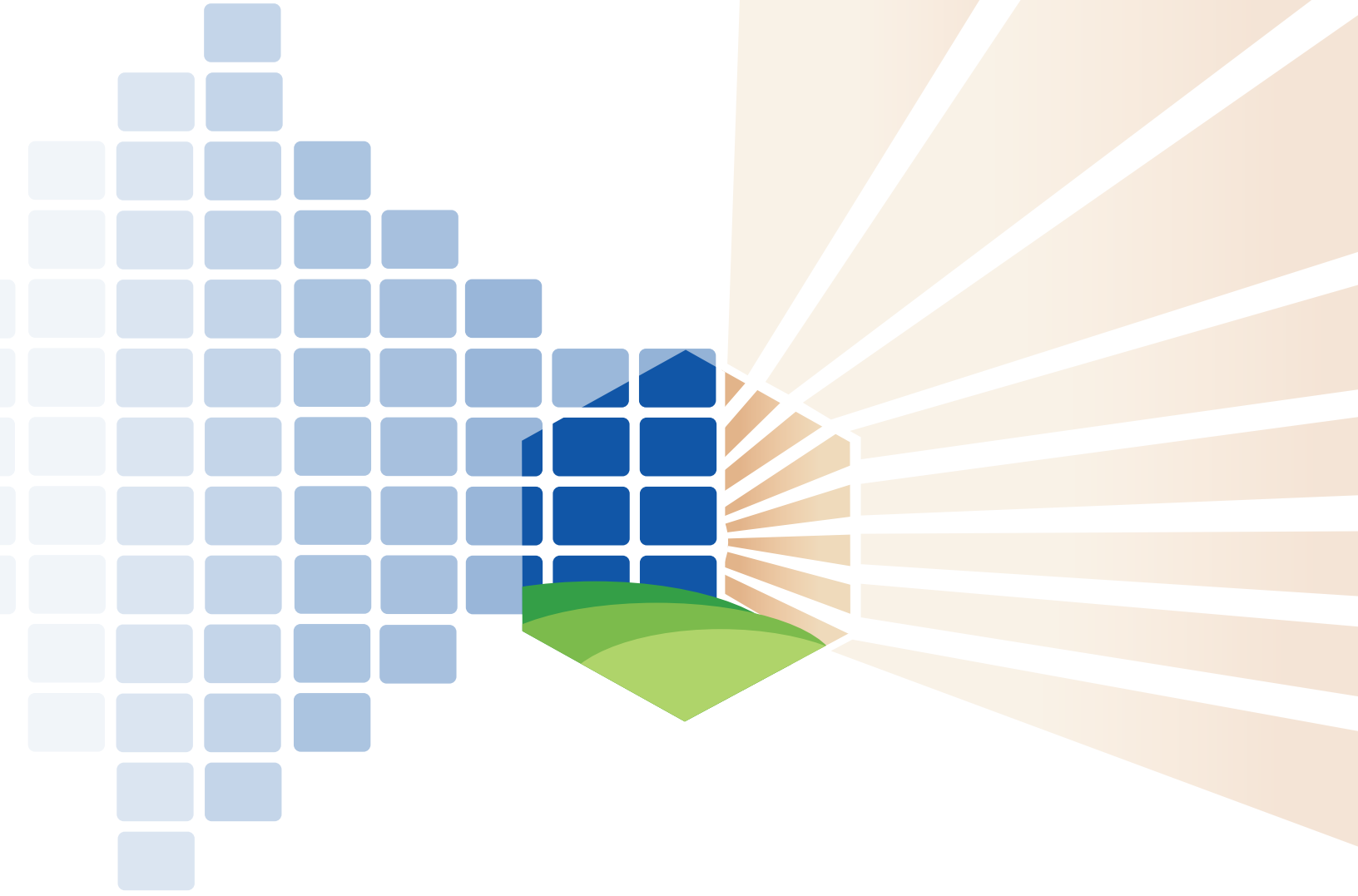
VERSION 1.0 | OCTOBER 2019

Virginia Pollinator-Smart Solar Industry



POLLINATOR–SMART

Business Plan

Virginia Department of Conservation & Recreation

Virginia Department of Environmental Quality

Building a Native Seed Industry Within Virginia

Successful native seed production requires an **entrepreneurial spirit**, **creative thinking**, **versatility**, and **a willingness** to step away from standard agricultural practices.

Table of Contents

Table of Contents Continued

List of Tables

The minimum estimated cost of developing commercially available ecoregion-specific species (Virginia ecotypes). Costs assumed 40 species per ecoregion, with three ecoregions proposed (Coastal Plain, Piedmont, and Mountains), totaling 120 species.

List of Figures

Photo credits: Ayshea Heckman, Ernst Conservation Seeds.

Executive Summary

Native seed production presents a variety of unique challenges and requires a knack for innovation.

Most traditional crops have been selected for traits that benefit seed production, such as uniform ripening, shatter resistance and lack of dormancy. Because of this breeding, they generally have a narrow genetic base. Native seed crops are grown for ecological restoration, which makes genetic diversity paramount. With unpredictable and changing host environments, they need to have a broad genetic base to become sustaining parts of a dynamic ecosystem. Unfortunately, many of the traits needed in native plants are not beneficial to seed production. This makes production of native species particularly challenging.

Successful native seed production requires an entrepreneurial spirit, creative thinking, versatility, and a willingness to step away from standard agricultural practices. While conventional crops benefit from genetic manipulation to fit production methods, native seed production requires changing agricultural methods to adapt to the challenges of producing natives.

Ultimately, the goal is a native seed industry that can be self-sustaining after the startup. To this end, the best programs have flexibility.

The native seed industry has been **growing** in sophistication over the last 30 years.

When the industry was young, markets were smaller and prices were higher. As the industry has matured, the entry level infrastructure has increased along with quality standards. In order for the industry to grow, seeding costs had to become more competitive with non-native species used on similar projects. One of the most important steps for success is the availability of consistent markets.

Within the Commonwealth of Virginia, an annual market of 2,000–3,000 acres of native pollinator habitat plantings is the minimum needed to sustain a viable native seed industry able to deliver product at a reasonable cost. Due to the level of specialized equipment and infrastructure costs needed to deliver multiple plant species for high quality native habitat, the most viable model is the development of a grower network that can produce a few species and build out the minimum infrastructure needed to deliver a rough conditioned product to a facility capable of conditioning the seed to a marketable state.

Species to focus on are those that require a similar equipment investment to keep overhead down. This will allow growers to become familiar with the challenges of producing native seed before investing in more extensive infrastructure.

1. Industry Structure

Within the Commonwealth of Virginia, there is no native seed industry (with the exception of some native plant nurseries) that collects native seed mainly from the wild for its own plant production. In the eastern U.S., there are currently two native seed companies that provide species native to the Commonwealth. The number of Virginia ecotype species is currently limited to seven. The development of a grower network is needed that would be able to work with the existing industry in the region.

A significant amount of infrastructure is also needed, which has a high upfront cost that includes the software required to maintain accurate inventories and makes delivering seed to the end user efficient while complying with the regulations placed on the seed industry. Warehousing the seed requires climate-controlled storage.

Seed conditioning is the process of taking seed harvested from the field and removing the impurities to turn it into a marketable product. This involves several different pieces of equipment to condition the various species. There are multiple stages of conditioning. Every grower or group of growers will have to have some seed conditioning equipment. Harvested seed contains impurities that need to be removed. This procedure is referred to as rough conditioning. Once rough conditioning is complete, a majority of the unwanted materials should be removed. This will make shipping the seed to another location for fine conditioning to a marketable product more economical. As growers develop, they can begin accumulating more conditioning equipment, which will allow them to get the seed closer to a marketable product and increase its value.

Seed conditioning is the process of taking seed harvested from the field and removing the impurities to turn it into a marketable product.

2. Native Seed Growers Business Development Committee

With a host of issues that make growing native seed challenging, a network of experts will be necessary. An essential component of this program will be to convene a **Virginia Native Seed Growers' Business Advisory Committee** made up of experienced growers and other partners from the region, such as universities, NGOs and government agencies that have expertise with plants, pollinators and other wildlife. This advisory committee would have the primary task of implementing the business plan, and it could be subdivided into specific committees to address various tasks and program elements. Recommended subcommittees and responsibilities include:

MARKET DEVELOPMENT GROUP

Responsible for evaluating the current market and determining the focus of the species based on market and environmental needs, as well as seeking out new potential markets (e.g., Virginia Department of Transportation (VDOT)).

ECOTYPE DEVELOPMENT GROUP

In combination with the Market Development Group, responsible for determining the priority species needed to launch the industry in the Commonwealth. It will be solely in charge of the wild collections, procuring genetic material needed to develop foundation seed for the industry, developing relationships with greenhouse growers, determining the best facilities for executing each stage of the ecotype development program, finding personnel needed to track down and make seed collections, provide best management practices to growers, and determine the focus of the species based on market and environmental needs.

GROWER DEVELOPMENT/ CONSULTING GROUP

Responsible for identifying and working with growers to maximize their efficiency. Along with input from the Market Development Group, this subcommittee will determine which crops will be prioritized from an acreage standpoint on each farm. Because this industry is young, it will be important to produce crops where the highest chance for success exists, both for the crops and the growers. This group will also be responsible for ensuring that, as the industry matures and more genetics become available, one species is not over-produced while another is ignored. As the industry matures, growers may try other species. Other challenges will include finding and educating new growers and determining the best crops for each grower. This group will also provide financial guidance to the growers by helping them understand the cost involved in seed production. They will also insure that each grower is properly mentored making the tools and information needed for success available.

GRANTS AND FINANCIAL GROUP

Responsible for identifying funding sources to assist in industry development. As an example, the largest single cost for the producer of many pollinator species is transplants. This will be a good area in which to utilize grants or other funds to offset the initial production costs.

Some individuals may serve in more than one group.

3. Producers

The first step in developing a native seed industry is to locate available growers in the region to produce the crops. When evaluating a farm or individual to become a grower, financial stability is paramount. Production of native plants is a multi-year investment requiring the financial support of lenders, grants, or investors to weather the time between when the seed is planted to when it is marketed. Depending on the species, some plants will produce seed the year they are planted while others will require two or more growing seasons to produce a crop. Most species have a known development time, so this can be accounted for in financial planning.

Every crop has different costs unique to it. Industry experience also tells us that the potential for crop failure is relatively high. It is unlikely that a crop insurance program will be available that would cover native seed production, so the grower and backers will have to be able to absorb any crop losses. An important and related question that will need to be answered is: Are there multiple growers in a given area that would be willing share the cost of infrastructure and equipment?

3.1 LAND MANAGEMENT AND GROWER SUITABILITY

A crop's lifespan varies by species, from an annual to a very long-lived perennial. With long-lived species, it is critical that the producer has control of the land, either by owning the ground or by having a strong long-term lease. Strong control is also important to ensure that the historical weed management program is appropriate for the native crop. Factors include what weeds were controlled and how they were controlled. There needs to be an awareness of the history of chemical use on the fields in which natives are planted. Some chemicals have a longer residual effect on direct-seeded natives than many other crops. It is necessary to investigate the carry-over period of the herbicides used for their effect on small-seeded crops.

Rotation options are important. The more diverse the available crops are for rotation, the better prepared a grower will be to deal with such issues as weeds and nematodes.

The soil types will have an impact on which species will grow well on the site. Ideally, it is best to grow in soils similar to the soils found in the natural habitats of the target species. Wetland species can be grown on upland sites but need soil that has a good water-holding capacity. When transplanting, it is essential to have an irrigation source. Individuals should have experience growing multiple crops and, for many of the species, experience working with transplants. Another key step is the availability of a labor force with good agricultural skills. The weaker the labor skills, the more important the producer's management skills become.

Along with financial stability is the growers' willingness to add infrastructure to their operation, such as buildings and equipment that may not benefit them with other crops. In addition, how willing are they to work with advisers? At the outset of this program, it is expected that many growers will want to participate, but some of them may not be a good fit for the reasons outlined above. In the early development of the industry, the focus will need to be on the growers who show the most promise. As the industry matures, an opportunity may become available for less capable applicants.

3.2 CROPS AND TECHNIQUES

When planning a new crop, the first decisions to be made should be the best field in which to grow the crop and the growing technique to use. Two such techniques are direct seeding and transplanting.

TRANSPLANTS

It is preferable to transplant if you lack the seed to direct seed the acreage. Many native species have multiple forms of seed dormancy that prevent uniform germination. When transplanting, seeds can be put through processes to break dormancy when grown out in a greenhouse, but these processes are difficult to replicate when direct seeding. Another benefit of transplanting is weed control. The use of pre-emergent herbicides prevents weeds from growing after transplant. Care still needs to be taken as some pre-emergent herbicides can damage freshly planted transplants. A significant benefit to transplanting is the ability to have a seed crop in the first growing season. This is very time sensitive and does not work on all crops. The biggest downside to transplants is cost. With planting rates of 11,000 plants per acre and a cost of $0.30 per plant, plus the labor to plant them, first year costs of $4,000 per acre should be expected.

DIRECT SEEDING

Establishing fields with seed is much more economical. One challenge when growing from seed is weed control. Direct seeding requires a good herbicide program for that species. Few chemicals are available, but it is possible to control many of the weed problems with selective herbicides. Seed dormancy is another challenge that needs to be addressed. Because the seeds of native species are adapted to wild conditions, the seed will not always germinate when planted. The most common method for overcoming this is planting in the fall to allow the natural process of breaking dormancy to occur.

4. Ecotype Development

The first critical step in the development of a regional ecotype seed supply is the collection and subsequent propagation of genetic materials needed to fulfill goals. The following are some of the key components of this process:

4.1 PRIORITY SPECIES

Determine priority species within each ecoregion that best fulfill the site requirements according to the Scorecard for the panel zone, open area, and screening zone, and are adapted to the varying hydrology and site characteristics that may be found on a solar facility within that ecoregion. This step should take advantage of the botanical knowledge that is available for the Commonwealth. A group of plant experts will be needed to begin the process of identifying the locations where the seed collections of the priority species can be made. These plant experts may be utilized to collect seed along with other trained collectors who have the basic skills for identifying wild sites and understand the developmental stage at which seeds should or should not be collected. A seed collection form and manual will need to be developed to log seed collecting activities and ensure that seed is harvested from the site at the proper time. A hands-on training program will be required before collectors are sent out.

4.2 SEED CONDITIONING AND STORAGE

Once seed has been collected and cataloged, the seed and plant material should be conditioned, with every reasonable effort made to maintain as much viable seed as possible before it is placed in a climate-controlled facility for long-term storage. A good climate-controlled storage facility is one in which the sum of the relative humidity (percentage) and temperature (Fahrenheit) is less than or equal to 100. A common ratio is 50° F and 50% humidity. Some benefit can be gained with a lower combined number, but the cost may out way the benefit. The relative humidity should not exceed 50%. Once the seed is in storage, a determination must be made as to the dormancy breaking procedures for that species. The procedures should be initiated in time for the seed to be placed in greenhouses for plug production at an early enough date to be transplanted in the field within a reasonable time frame. The first generation from the wild will be the foundation seed used to plant the expansion plots.

4.3 SEED INCREASE

It is recommended that Virginia follow a protocol similar to the Iowa Department of Transportation's Iowa Ecotype Project. As in the Iowa example, the collection should be made from at least 10 different populations – ideally 20 or more – from each ecoregion. A target of 50 plants per population should be sought for a total of at least 500 plants. This step requires the use of transplants. When a larger number of plants can be produced from each population, it is possible to scale production up faster. Each of these populations will be planted out in a single nursery block. The transplants will be randomized in the nursery to maximize the crossing of the various collections. The nursery block should be maintained for as long as is reasonable to serve as the base seed for any new plantings. Seed collected from these seed nursery blocks will be used to plant the foundation seed increase field. Transplants may be used if the volume of seed is not enough for direct seeding or for better weed control. Seed produced from the increased field will be planted in a certified production field. Depending on the nature of the plant and the amount of available seed, the determination should be made to expand the production field by direct seeding vs. transplants. It is much easier to control weeds with transplants due to the ability to use pre-emergent herbicides, while the biggest advantage to direct seeding is the major implementation cost savings and ease of planting larger acreages.

For this program to be successful, the following networks will be needed:

1. **Collection Group** – made up of a professional botanist and a well-trained group of collectors.
2. **Nursery Group** (preferably a university) – grows out the collected seed in a greenhouse, plants and maintains the seed nursery and harvests the seed so it can be sent to the foundation seed grower.
3. **Foundation Seed Increase Group** – takes the seed from the nursery and grows it out for the certified seed producer.
4. **Certified Seed Producer** – produces the seed for market. With enough capacity, the Certified Seed Producer may be able to produce the foundation seed.

4.4 TIMING AND YIELD

Different species develop at different times. Annuals and fast-growing perennials will produce seed within the first year. Most perennial plants will become productive in the second growing season, while other species may take multiple years to begin producing seed.

Because the goal of this effort is to maintain genetic diversity to the greatest extent practical, it is difficult to determine what seed yield expectations will be from each crop. This may result in a variation of the production cost per pound of different ecotypes.

Different species develop at different times.

4.5 CERTIFICATION

The Association of Official Seed Certifying Agencies (AOSCA) has developed a certification program to certify the genetic origin of seed from wild collections that has not gone through any genetic selections. Virginia Crop Improvement Association, Inc., Virginia's seed-certifying agency, is familiar with this program. This organization is capable of aiding in the development of a source-identified crop certification program. The source-identified class is unevaluated germplasm identified only as to species and location of the wild-growing parents. This program is referred to as "Yellow Tag ", referring to the color of the tag used to identify the seed lots as Source-Identified Class.

From: AOSCA Native Plant Connection Brochure

1. **Wildland Collection** - Wildland collected seed can be used for direct sales to end users, for establishment of field/ nursery production, or for entry into plant germplasm development programs. Certification procedures include:
   a. Pre-Collection Application filed before harvest
   b. Proper permitting and/or permission for collecting on public and private lands
   c. Site Identification Log filled out during and after harvest
   d. Verification of the collection site and identification and evaluation of plant and seed samples before, during, and/or post harvest
   e. Tagging of the seed lot after compliance with applicable requirements and standards; seed purity and viability analysis may be required

f. Germplasm accessions acquired within established protocols of recognized public or private agencies are normally eligible (with appropriate data on file in lieu of the above procedures) to enter the certification process as planting stock.

2. Field/Nursery Production Stock seed or plants for establishing certified field/nursery production must be of an eligible generation and have appropriate labeling. Certification procedures include:

a. Application for Certification

b. Verification of origin and generation of planting stock

c. Seedling inspection

d. Field inspection before harvest to check compliance with species requirements for isolation and genetic purity (control of prohibited and other specified weeds or other species may be required)

e. Tagging of the seed lot after compliance with applicable requirements and standards; seed purity and viability analysis may be required.

5. Seed Distribution

As with any successful industry, a good distribution and quality control system should be in place to provide the solar industry's native seed needs.

5.1 TRACKING AND TAGGING

When providing seed to contractors, the ability to get seed to the jobsite in a timely manner is critical. The ability to supply complex mixes requires a well-managed inventory, which consists of sophisticated software that can track seed inventories, maintain seed test records, and generate seed tags for mixes and straight seed.

Many native seeding projects are installed using mixes. Some specifications for seeding require that the seed is sent to the site with each species in its own bag. With many seeding projects needing 20 or more species, straight seed creates a significant increase in the labor needed to seed and for the order to be processed in the warehouse. From a productivity standpoint, it is preferable to have the seed supplied as a mix. Creating a legal tag for the seed mix is a bit more challenging, but software exists that automates this process.

5.2 SEED TESTING

A primary step in quality control is seed testing. All seed sold requires a current seed test for each seed lot. Seed tests on native species are valid for 9 months. At the end of that period, it is a violation to sell that lot of seed unless an updated test has been obtained. Native seed testing is more difficult than that of other crops as not all seed labs have the infrastructure and experience to effectively test native seeds. Therefore, it is important to recognize the labs that have a history of producing good tests, and work to ensure that the Virginia lab has the resources needed to regulate the industry. Many of the native pollinator species fall into a special category. Because they have been commercially available for a short time and have few lots tested relative to other species in the trade, no official testing rules have been developed. If no rules exist for testing, species can be legally sold without a germination test. All reputable seed companies test native species, and evidence that the seed complies with weed standards for the marketed region is required.

The seed test is reflected on the seed tag that must be attached to every bag of seed. A seed tag will list purity, germination percentage, weed content and other crop(s). Native seeds are sold on a pure live seed (PLS) basis. PLS refers to the amount of live, viable seed in a lot of bulk seed. In other words, it indicates the amount of seed in the lot that is capable of developing into seedlings. Most native seeds are sold on a PLS basis. This means that the seed test will set the value for each lot of seed. Therefore, consistent results from seed testing are critical.

Another important issue related to seed testing is that the weed content in each lot will determine if it is legal to sell. Basically, there are two weed seed categories – noxious and prohibited. Noxious weeds have a legal limit as to the amount of weed seed in a seed lot. If a prohibited seed is found in a seed lot, it is illegal to sell. Accurate inventory tracking is vital to ensure that the end users get what they order.

A well-organized mixing facility is critical along with the development of protocols for seed handling to prevent cross-contamination of different seed lots.

All the above will ensure that the contractor receives a high-quality product in a reasonable amount of time.

6. Seed Production, Infrastructure and Equipment

When evaluating a farm for its ability to grow native crops, the minimum infrastructure required is land, planting equipment, weed control, harvesting equipment, drying system, storage, and rough conditioning equipment. Multiple options exist for each. For a farm starting in native seed production, it makes sense to focus on species that require similar infrastructure. The other requirements may be shared with other producers, assuming that the timing of the crops and distance do not create conflicts. From an economic standpoint, when starting out, adapting a farm's existing infrastructure to the cropping system is always best when possible.

6.1 LAND CONSIDERATIONS AND INFRASTRUCTURE

The first component to be looked at is the land. What crops are best suited to the soils on the property? How close is it to existing infrastructure? What are the irrigation options? Finding native plants that grow well on any soil type is not difficult. All farmable soil types have multiple plants that can be produced on them, but some plants need soils that are more challenging to locate in some areas. This is one reason to have the Grower Development/Consulting Group make the determination of what growers are chosen to produce what species. Each species will require various amounts of land to deliver the production capacity needed to meet the demand for that species. Also, the more intensive the cropping system, the smaller the acreage needed to produce the seed at an economically viable cost. For example, a species that needs to be transplanted and hand harvested can be easily grown on a quarter acre and still be competitive with a larger producer. Whereas, a crop such as little bluestem that is easily grown from seed, has excellent herbicide options, and is easy to combine may need to be produced at 20 or more acres to be competitive.

In the first few years of production, most of the crops will need to be transplanted, making irrigatable ground a necessity. Land with a limited water supply may need to utilize a trickle irrigation system. There are trickle tapes designed to deliver water directly to the transplant row and use a fraction of the amount required with a sprinkler-type system.

The land will need to be prepared for native seed production. There are many factors affecting tillage equipment that will be used. In various regions of the Commonwealth, some tillage methods have become more popular than others. The reasons vary from cultural to very sophisticated, research-based choices. What is required for transplant ground is a system by which the soil is broken up to a point where the transplanter can place the plant in and pack it to ensure that the soil is in contact with the plug and at the proper depth. With some soils and transplanter types, this may require a rototiller. Planting seed allows for more flexibility when it comes to tillage. It is critical that seed be placed in a firm seedbed. This requires a soil that is not overworked. Overworked soils inhibit good seed-to-soil contact. No-till planting is a good option if the proper crop rotation has been followed.

6.2 EQUIPMENT

There are many types of transplanters that can be used effectively to produce natives. The row widths that are transplanted need to be determined. If a standard exists in the area, then that is the best one to use. This will reduce the amount of customized equipment that will be needed. Other types of equipment include tractors, sprayers, cultivators, and hood sprayers.

When enough seed is available for direct seeding, other options, such as broadcast seeding and drill seeding, may be used. Native seed can be challenging

to put through a standard grain drill or broadcaster and requires a special drill equipped with a fluffy seed box. The broadcaster may require that the seed be blended with a product to help it flow and have some type of agitation. This type of drill may be available to rent from a soil conservation district.

6.3 HARVESTING AND DRYING

Harvesting and drying seed requires the most creativity. With some species, hand harvesting may be the most efficient method available. Other methods include direct harvesting the plant with a forage chopper or a direct cutter that conveys the plant into a wagon without cutting it up. Combines can be very effective on some crops. It is recommended that the native producer or group of producers own a combine. Contamination between crops can be an issue; therefore, a good cleanout between crops is critical. As most native crops coming from the field don't flow like grain crops, different conveying systems are needed. A paddle elevator is very effective in moving the plant material when it comes off the field. In some cases, when the whole plant is harvested and not chopped up, a pitchfork may be the best method. A silage blower is extremely effective in conveying a crop with a high ratio of plant material to seed. All native crops require drying to prevent the seed from overheating and destroying germination. Options available include wagons or pallet boxes with false floors or structures with areas dedicated for drying. For larger scale production, a grain bin with a drying floor is an excellent option. On a small scale, a thin layer on a plastic sheet or raised area with a breathable fabric is an option in an area with good airflow.

Harvesting and drying seed requires the most creativity.

Most crops can be dried with ambient air forced through a fan, but some need additional heat. When adding heat, it is important to keep the temperature of the air below 110° F. Otherwise, the potential exists for the seed to be damaged. There are many options for drying units. It is critical to have a false floor and fan that can provide enough force to blow air through the crop. When drying seed, it is very important to check the seed twice daily to make sure that air is flowing uniformly through the material. When the crop is first placed in the drying unit, the product should be stirred to allow air to flow properly. Stirring should continue until the air can be felt blowing uniformly through the crop for two or more days. Because airflow is so important, there is a maximum depth to which seed can be placed in the drying unit. This depth depends on the crop. There is also a minimum depth. The crop needs to be deep enough to prevent blowout in areas that open to the drying floor. This prevents air from properly moving through the crop.

Once the crop has dried enough to start the conditioning process, it is removed from the drying facility and put through rough conditioning. There are several rough conditioning options, each of which works on a particular group of crops. For the majority of crops, an air-screen conditioner will be required. The rough conditioning equipment could be shared by a group of growers as long as the distance from the drying equipment to a rough conditioning facility is close enough to keep the transport costs down. Once rough conditioning is completed, the cost to transport the seed to a facility able to condition the seed to market ready condition is relatively low compared to its value. The seed will then be sent to one of the regional native seed companies for final processing and marketing.

7. Best Practices and Knowledge Base

With the current time frame between today and when the first generation of Virginia ecotype seed is available to be planted, there will be an opportunity to have the growers prepare the production fields. Soils need to be tested for nutrient levels to determine if they need to be adjusted. Most likely, the soils will have excess nutrients for native seed production which increases weed competition. If this is the case, a rotation designed to lower the nutrient levels will be recommended. A history of chemical applications from the last three growing seasons will also be required to ensure that chemical carry-over issues do not exist, as well as an inventory of existing field weeds to determine what crops can be planted that will tolerate the chemicals needed to control the weed issues.

With chemical availability lacking to the native seed industry, there will be a need for research and special use permits, which will necessitate the involvement of universities and other government agencies. A big challenge will be to understand that, while a plant may look like it is thriving after an herbicide application, the end result can easily be that the plant may not make viable seed.

When grown for seed, native plants are placed in a monoculture habitat rather than their natural polyculture habitat. In a polyculture habitat, plant health issues are magnified which require the use of fungicides and, in some cases, insecticides. In both cases, an understanding of the application impact on the pollinator population needs to be realized to ensure minimal impact. This makes developing relationships with university experts in entomology and plant science a high priority.

As native seed production advances, such methods as cover crops, zone tilling, and other conservation practices can be reviewed.

With all of the information required to successfully produce native seeds, utilization of a dynamic record-keeping system is critical. Information regarding crop production activities will be required to evaluate successes and failures. Such information will be utilized to make continuing improvements on production methods.

Following are areas to be tracked:

- Planting dates and methods
- Fertilizer and chemical applications, dates and methods
- Crop observations
- Harvest dates and methods
- Yields
- Operators

8. Economics

When developing the ecoregion-specific collections, the first thing to look at is cost. Currently, this is a difficult number to pin down because the species and collection locations are as of yet unknown. Based on the costs of the Iowa Ecotype Project experience, each collection would cost about $100. If we take that number and expand it to 10 collections per species per ecotype, each species from an ecoregion would cost approximately $1,000. In order to have enough species from each ecoregion to cover the various solar farm site requirements, roughly 40 species from each ecoregion would be needed. With three ecoregions, that would be around 120. Therefore, seed collection costs to initiate this industry would be approximately $120,000.

Each collection will have to be grown out in a greenhouse. Considering the low volume of plugs that will be grown out, each plug will cost approximately $.75 each. With the level of hand labor required, the harvest cost from this grow out will be approximately $1.80 per plant to produce seed from the first generation from the wild. The goal for this planting is a minimum of 500 plants with a minimum grow-out cost for 120 species of $153,000. Maintaining the blocks long term will cost $.50 per plant for each additional year. Therefore, the cost to maintain the blocks will be approximately $30,000 per year. Some species will take up to four years to produce seed.

Foundation seed planting will be less expensive. Expecting that enough seed will be produced from the first generation, this should exceed one acre. Depending on the crop, it may be large enough to be at production level. At this point, whether to use transplants or direct seeding would need to be decided. The cost of direct seeding is much less.

An estimate needs to be made regarding the productive life of the planting in order to establish production costs. Assuming that no harvestable seed is produced the year the crop is planted, expenses incurred that season need to be applied to the cost of the following years. If a crop only produces for one year, the cost of both years has to be applied to that harvest. If multiple years can be expected, the cost can be spread out over additional years. Most native seed fields produce for four seasons; therefore, that is the number assumed in the cost.

Another very important cost is land because of the time that the field must be available to the producer and the need to have full control. The cost of land used is $500 per acre, assuming that the grower is paying off a $5,000 per acre property. Land cost will vary by location; therefore, each grower will have land cost adjustments. A 20% overhead should be added to cover infrastructure, such as irrigation. The cost for transplants is $.30 per plant, at 11,000 plants per acre. Establishment year cost for a transplanted field is $5,800 per acre. By applying the establishment cost to production years, production costs would be $3,200 per acre. For seed, the establishment year cost is $1,200 per acre and $1,400 per acre for production. The greatest challenge to successful direct seeding is the ability to have an herbicide program that works well with the crop.

Table 1. The minimum estimated cost of developing commercially available ecoregion-specific species (Virginia ecotypes). Costs assumed 40 species per ecoregion, with three ecoregions proposed (Coastal Plain, Piedmont, and Mountains), totaling 120 species.

Task	Single Species	Estimated Cost
Seed Collection		
Wild Collections	$1,000	$120,000
First Generation Grow-Out	$1,275	$153,000
Maintaining Blocks Long-Term	$250/year	$30,000/year
Foundation Planting		
Option A: Transplanting - First Year	--	$5,800/acre
Production Years from Transplanting*	--	$3,200/acre/year
Option B: Seed – First Year	--	$1,200/acre
Production Years from Seed*	--	$1,400/acre/year

**Assuming 4 productive years*

The grower may need to have some of the following equipment; otherwise, it will have to be added to the project cost. Some of the items can be shared with other nearby growers:

- A **transplanter** (Figure 1) and tillage equipment to prepare the ground. A good used four-row unit should be available for $10,000 which would be capable of planting 30 or more acres in a season. Not all transplanters work well with natives.
- A **native seed drill** (Figure 2) will be needed to plant native seeds. With planting depth being so important a drill will need that has good depth control and the ability to distribute native seeds uniformly. Many native species have seeds that do not flow well. A native seed drill can be purchased for around $25,000. Smaller drills are easy to transport and could be shared by many growers.

Figure 1. Mechanical Transplanter in Field

Figure 2. Truax Native Seed Drill

- A **hood sprayer** (Figure 3) will be needed for crops planted in rows, and some are available that would work for 30”-40” row spacing. Not all native plants respond well to cultivation and a hood sprayer will do an excellent job of controlling weeds between rows. Units under $12,000 are available.
- A **forage chopper** is used to harvest many of the plants. Some plants will have to be chopped before seed conditioning can begin. The chopper can be used to harvest directly from the field or as a stationary unit. Units under $30,000 are available and specialized heads may be needed.
- Many species must be harvested as a whole plant and reduced so they will flow through a conditioning system. A **combine** (Figure 4) will be useful for some crops for both direct harvest and as a stationary unit. Smaller units may be available for less than $15,000. Models with an easy cleanout are best.
- Once a crop is harvested, a **dryer** (Figures 5 and 6) is necessary. A 5-ring, 21’ bin with a drying floor will cost approximately $10,000. Depending on the crop, a bin this size will hold from four to ten acres of product. A layer of breathable fabric can be placed between crops in a single bin provided the crops can be separated in the conditioning process, thus avoiding purity issues. Harvest timing and rough conditioning capacity will dictate whether the bin can be reused for a second round of harvesting.

Figure 3. Hood Sprayer during field maintenance

Figure 4. Gleaner Combine for Plant Harvesting

Figure 5. Exterior of Seed Drying Bins

Figure 6. Interior of Seed Drying Bin

» Rough seed conditioning requires equipment to detach and separate the seed from the other plant material. Many options are available for this process. For a facility capable of doing larger volumes, a **debearder** (Figure 7) and **air-screen conditioner** (Figure 8) will be needed. This unit will require a structure over it, a 3-phase electrical system able to provide power for 30 hp and a concrete floor. The debearder cost is $15,000 and an air screen equipped with a belt feeder will cost $35,000. There will be an additional cost of $10,000 for the conveyor system. The building size would have to be approximately 2,000 sq. ft. (a pole barn with a 5" cement floor would work). A total estimated cost would be approximately $75,000. The rough conditioning facility will need to be replicated on multiple farms depending on the number of producers existing in an area and the distance between producer regions. This is the infrastructure necessary to get seed to fine conditioning, storage, and marketing.

Figure 7. Portable Seed Debearder

Figure 8. Air-Screen Seed Conditioner

In addition to startup cost a major cost consideration is the probability of crop failure. It is not uncommon to have a field produce a good crop on year and then have a complete failure the next year. In some cases, the seed yield may be good, but the germination rate is poor this can be due to environmental issues or because of mismanagement of the seed when it comes from the field. It is a common practice to overproduce species that have a record of irregular production or a high probability of failure. When producing more than one seasons worth of sales the availability of climate-controlled storage becomes even more important.

Note: the costs do not reflect the additional costs of maintaining a seed company. Because they already exist, no additional expense is needed to create them.

9. Successful Models

Many states have developed an ecoregion-based seed industry. A common factor with each of the states that have a successful ecotype program is that a well-established native seed industry already existed. Another is that the market was developed for public property whereby it was easy to put the start-up premium into the bidding process. States, such as Minnesota, developed their program by relating to the seed industry that they would require ecotype seeds for state projects. As the industry was starting to make ecotype seeds available, they were paid a premium price for seed from the proper ecoregions.

The Iowa program stands out as one of the best examples for developing its own ecotype seed supply. The Iowa Ecotype Project was set up in 1990 with a goal of making Iowa ecotype seed available for projects at a price competitive with other native seeds with a wider distribution. It is part of the Integrated Roadside Vegetation Management Program that uses native species as a foundation to provide a cost-effective and ecologically balanced means of weed management. They divided the state into three zones and developed ecotype-based collections to start a source-identified seed industry. The long-term goal was to restore 600,000 acres of Iowa roadsides to source-identified seed. Source-identified seed is a standard set by the Association of Official Seed Certifying Agencies (AOSCA) for certifying the genetic origin of native seed that is collected but has no genetic selections made on it. As of 2011, 800 acres representing 116 species of Iowa source-identified seed was certified. Of these, 53 came out of the Iowa Ecotype Project. So far, this project has supplied seed for 50,000 acres of Iowa roadside.

These native planting goals made the Iowa Department of Transportation (IDOT) the perfect market catalyst for the Iowa Ecotype program. In addition, grants made through The Living Roadway Trust Fund have made up to $600,000 a year available for vegetation inventories, specialized seeding equipment, and native grass and wildflower seed. With this market, native seed producers were willing to develop their production.

In comparison, the Green Belt Native Plant Center has done a good job in developing genetics for a project in the New York City area; however, because of an inadequate market and restrictions placed on where the genetics can be marketed, they have had difficulty finding growers to work with them.

10. Marketing Strategy and Sales Management

10.1 MARKETING STRATEGY

The marketing strategy serves to engage and solicit support and compliance from potential partners in the program; potential specifiers of the seed products; affected industries, groups, and organizations; and, the public at-large.

Potential partners might include seed producers, contractors/installers, and academia. Potential specifiers might include the VA DEQ, environmental consultants, designers, landscape architects, and others tasked with determining what seed mixes are to be used on projects. Affected parties might include solar developers, public/private landowners, and public utilities.

Key to the success of the program will be the development of strategic partnerships and collaboration between stakeholders. The expertise and spheres of influence offered by these entities will augment the collective reach of the messaging points above. Examples of these organizations include Pollinator Partnership, Xerces Society for Invertebrate Research, Fresh Energy, Wildlife Habitat Council, Chesapeake Bay Foundation, Virginia Native Plant Society, and other groups whose support is critical and whose insights, expertise, and network will prove valuable to the long-term success of the program.

A SWOT analysis (strengths, weaknesses, opportunities and threats) is a traditional first step in helping inform the next steps in the plan. The process represents an organized brainstorming session among the stakeholders, resulting in a list of the top factors in each category. Strengths and weaknesses are those factors that are internal to the program, that the program generally can control, and that can be modified if needed. Opportunities and threats are external to the program and may or may not be able to be controlled. Opportunities should be capitalized upon and threats should be protected against to the extent possible.

Utilizing the results of the SWOT analysis, talking points and key messaging should be developed for inclusion in all outreach and marketing activities moving forward. These talking points should be shared with partner groups to ensure a singular "voice" when promoting the program at trade shows, conferences, and in everyday interaction with the public and potential stakeholders.

A speakers' bureau might also be considered. A speakers' bureau is a collection of individuals particularly well prepared to speak on behalf of a topic or initiative such as this. This would consist of a few select individuals from the development team that are employed by or represent different stakeholder groups in the program. They are well-versed on the program and can speak officially on behalf of the program to community groups, municipalities, stakeholder groups, etc. upon request. The speakers' bureau is a voluntary group with the commitment and flexibility to make themselves generally available for such speaking engagements when requested.

An organized media relations effort will be aimed at engaging news outlets, trade media, and freelance journalists and informing them about the program and its importance.

Identification of story leads, key contacts for comment, and talking points will be part of this phase of the plan. Press releases and media advisories, written and distributed by a single source, will help ensure a level of transparency to the media, encourage favorable press attention, and

make certain that program messaging is delivered in a clear and singular voice. Similarly, freelance journalists in the environmental and sustainability circles can be key allies for favorable coverage in a broad range of print, broadcast, and digital outlets.

A website will be developed, either as a stand-alone site or under the umbrella of VA DEQ or the appropriate agency, to be determined. The site should feature the philosophy behind the program and provide updates on its development, key accomplishments, and milestones throughout the process. This owned promotional vehicle presents the opportunity to include all relevant content, blog posts from key stakeholders, and links to social media profiles that will be developed as well under the marketing plan.

Traditional collateral marketing materials will be developed including informational fliers and brochures, trade show banners, and other public exhibition materials that can be distributed by many different means.

Email lists of potential partners, stakeholders, influencers, and the public at-large will be collected from partner groups and via solicitation in marketing materials, social media, and other forms of outreach. These lists can ultimately be curated via list opt-in on the program website. Regular, targeted email communication can then be developed and maintained with specific messaging for specific audiences.

The aim of the marketing plan is to leverage the most diverse array of communication and promotion opportunities with the least amount of paid exposure. Earned media, owned media, and grass roots group and interpersonal communication efforts as outlined herein will be pivotal in fostering a positive, informed, and receptive public.

10.2 SALES MANAGEMENT

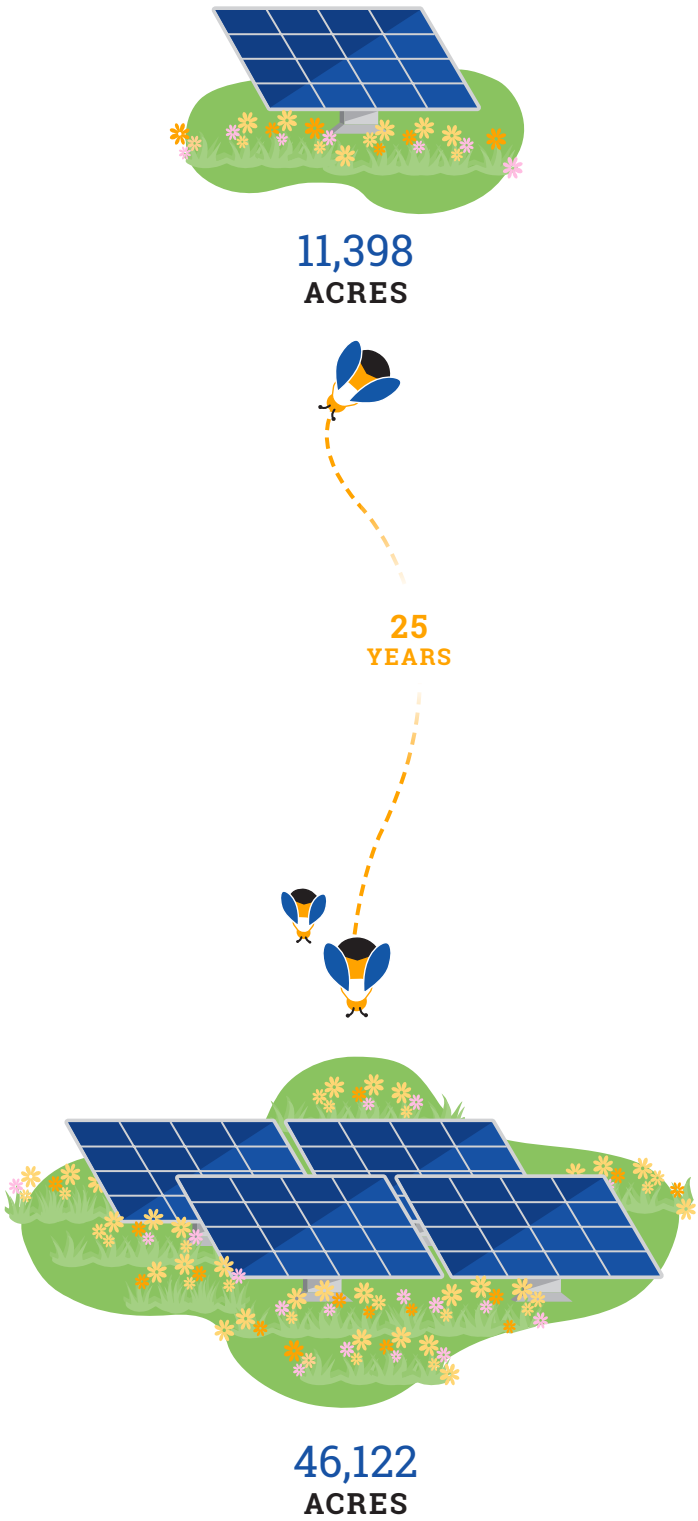
Trained sales staff with extensive expertise in the various nuances of successful native seed establishment are a must for the sales component to be a positive experience for those in purchasing roles. These frontline sales representatives must be able to advise customers on the best seed solutions based on site location, conditions, and objectives, and able to help troubleshoot problems and recommend further resources if necessary.

In order to satisfy the anticipated demand for seed mixes, sales should be centralized as much as possible and fulfilled from facilities with adequate climate-controlled warehouse space. These would ideally be established native seed companies with the systems in place to efficiently handle the receipt of product from the grower network; a proven seed cleaning and conditioning apparatus in place; established inventory management and pricing systems; and sales fulfillment and logistics capabilities to ensure timely and accurate delivery of product to the contractor.

11. Pollinator-Smart Market Summary

Currently there are 11,398 acres of land in existing solar sites, including those that have permits but are not yet constructed. Over the next 25 years, 46,122 acres of land for solar sites are projected by DEQ. The solar industry has not shown a broad acceptance for raising the height of the panels to accommodate the use of native plants in the Panel Zone. This will limit the potential market for natives. Assuming that 10% of the area of the solar facilities is planted to natives, this market will be too small to sustain a native plant industry by itself. This makes the Market Development Group one of the most important elements for this plan's success. There are many potential markets that, when combined with solar, can create a market that will sustain a native seed industry in the Commonwealth. The Iowa model has shown, for example, that a native seed industry can be sustained with a DOT market.

Currently there are 11,398 acres of land in existing solar sites, including those that have permits but are not yet constructed. Over the next 25 years, 46,122 acres of land for solar sites are projected by DEQ.




DCR
Virginia Department of Conservation & Recreation


DEQ
Virginia Department of
Environmental Quality