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February 6, 2014

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Environment, Economic Development, and Agriculture Division
317 Capitol
St. Paul, MN 55155-1606

Senator Bill Ingebrigtsen, Ranking Minority Member, Environment, Economic Development, and Agriculture Division
143 State Office Building
St. Paul, MN 55155-1206

Senator John Marty, Chair
Environment and Energy Committee
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Senator David Brown, Ranking Minority Member, Environment and Energy Committee
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Representative Jean Wagenius, Chair
Environment, Natural Resources, and Agriculture Finance Committee
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Representative Denny McNamara, Republican Lead, Environment, Natural Resources, and Agriculture Finance Committee
359 State Office Building
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Representative David Dill, Chair
Environment and Natural Resources Policy Committee
571 State Office Building
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Representative Tom Hackbarth, Republican Lead, Environment and Natural Resources Policy Committee
309 State Office Building
St. Paul, MN 55155-1206

Dear Senators and Representatives:

Attached are the following two reports: "State Forest Nursery Program and Tree Improvement Program: Challenges, Opportunities, Roles, and Recommendations to Improve Minnesota's Future Forests" and "State Forest Nurseries Program Business Plan Update." The first report provides recommendations on opportunities to utilize the two state forest nursery facilities to ensure a long-term supply of native forest regeneration materials and address the threat posed to our forest ecosystems by climate change and invasive species. The second provides an updated budget and financial plan for the State Forest Nurseries administered by the Department of Natural Resources (DNR), Division of Forestry. This report was a requirement of Minnesota Session Laws 2013, chapter 114, article 3, section 4, subdivision 4: Forest Management.

Copies of the report have been sent to the Legislative Reference Library and will be posted on the DNR's website at www.dnr.state.mn.us/aboutdnr/reports/index.html. If you have questions or need additional information about the preparation of these reports or their contents, please contact Olin Phillips, Division of Forestry, at 651-259-5282 or olin.phillips@state.mn.us.

Sincerely,

Tom Landwehr, Commissioner
Attachments
c/ Legislative Reference Library (2 copies) , Bob Meier, Director, Policy and Government Relations, Olin Phillips, Division of Forestry

State Forest Nursery Program
Seedling Production
Seed Production
Tree Improvement Program

Challenges, Opportunities, Roles, and Recommendations

to Improve Minnesota's Future Forests

Winter 2014

Minnesota
DEPARTMENT OF NATURAL RESOURCES

Executive Summary

This report was produced to meet the requirements of Laws 2013, chapter 114, article 3, section 4, subdivision 4, which directed the commissioner of Natural Resources to develop a plan and recommendations on utilizing the state forest nurseries to 1) ensure the long-term availability of ecologically appropriate and genetically diverse native forest seed and seedlings to support state conservation projects and initiatives, 2) protect the genetic fitness and resilience of native forest ecosystems, and 3) support tree improvement research to address evolving pressures such as invasive species and climate change. It also addresses funding to improve state forest nursery and tree improvement capabilities.

The report presents an overview of the current and future challenges to the sustainability and health of Minnesota's forests from invasive species, climate change, and a declining forest land base. It describes the roles that seed, seedling, and tree improvement programs can play in responding to these challenges. It identifies both needs and opportunities for public and private forest nurseries and the Minnesota Tree Improvement Cooperative to work together to address these issues. It also identifies potential roles the State Forest Nursery Program (SFNP) and Tree Improvement Program (TIP) can play in responding to these issues.

The current operation levels within the SFNP and TIP have a stable funding source through forest tree seedling sales. As directed by the legislation, this report provides funding options to improve the infrastructure of the state forest nurseries and support the report's recommended goals. This includes identifying $3.95 million for facility needs and one-time equipment and supply costs. Annual operational program and research costs of $450,000 are also identified to support expanded cooperative efforts in tree improvement research and native forest seed production. These are listed as specific funding options the state's legislature and administration can consider to address the issues that are the basis of this report.

No major recommendations are made within the report to revise the statutory purpose and structure of the SFNP. The report, however, clarifies that the requirements for self-sufficiency within nursery operations are specific to seedling production. It identifies the critical roles and long-term investments that need to be addressed to enhance the department's seed production and tree improvement efforts.

The 2013 session laws also directed the commissioner to update the SFNP business plan submitted to the legislature on January 15, 2012. This update was produced by the Management Analysis Division of the Minnesota Management and Budget Department. It addresses the ability of the SFNP to maintain self-sufficiency during the 2015-2016 biennium and beyond. The business plan updates the financial impacts of revised market projections but does not include analysis of the proposed changes within this report.

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This document and additional information about the Minnesota State Forest Nursery Program can be found on the Internet at www.mndnr.gov/forestry/nursery.

This information is available in an alternative format upon request.

I. Introduction

The Minnesota Department of Natural Resources (MNDNR) has broad statutory authority and responsibility to support statewide conservation initiatives and reforestation efforts (see Appendix B, page 24). This report, developed in response to a legislative directive by an interdisciplinary team representing broad conservation interests (see Appendix C, page 26), presents broad recommendations and specific options for improving the State Forest Nursery Program and Tree Improvement Program.

In 2013 the MNDNR was directed to develop recommendations on utilizing the State Forest Nursery Program (SFNP) and Tree Improvement Program (TIP) to 1) ensure the long-term availability of ecologically appropriate and genetically diverse native forest seed and seedlings to support state conservation projects and initiatives, 2) protect the genetic fitness and resilience of native forest ecosystems, and 3) address evolving pressures such as invasive species and climate change. Solutions to these challenges cannot be achieved by the MNDNR SFNP working independently. It will require working partnerships with private forest nurseries, the University of Minnesota, and public, industrial, tribal, and private forest landowners.

Minnesota's forest land managers, including nonindustrial private landowners and the forest products industry, require an ample supply of native tree and shrub seedlings and seeds to reestablish forest vegetation after harvesting, wildfire, and windthrow. The SFNP was permanently established with the creation of Badoura Nursery in Akeley, Minnesota, in 1929 and the creation of General C.C. Andrews Nursery in Willow River, Minnesota, in 1939. The SFNP has actively worked with private nurseries since the 1980s to purchase and supply seeds and seedlings. The SFNP began seed-source control and seed zone establishment in 1980. In 1998, the SFNP implemented strict protocols for seed-source control, and its seed and seedling production processes and products were formally certified by the Minnesota Crop Improvement Association. These controls ensure that tree and shrub seedlings and seed produced for use in forestry and conservation initiatives are ecologically appropriate for growing conditions across the state. In addition, the MNDNR's tree improvement efforts, started in the 1950s, identify genetic variations with higher productive potential, pest resistance, and greater regeneration success than wild seed. Genetic improvement efforts are increasingly important as climate change alters precipitation and temperature regimes, which impacts species distribution and health. Shifts in climate trends have already brought about increasing threats from invasive species and native insects and diseases. This report presents options for improving the SFNP (for seedling and seed production) and improvements to the TIP that will help sustain the health of the state's forests and meet the challenges of climate change and invasive species. These three functions (seedling production, seed procurement, and tree improvement) are separate but intricately connected. Each one can be a significant contributing factor to the overall future health and productivity of Minnesota's forests.

This report offers:

- **Seedling Production—**recommendations and options to 1) continue production of native source-identified tree seedlings and shrubs for reforestation, wildlife habitat establishment, and other conservation needs and 2) upgrade production system capabilities in the state of Minnesota.

- **Seed Production—**recommendations and options to 1) expand seed production, procurement, processing, and availability of native forest species and 2) expand seed evaluation and testing capabilities for quality and diversity.

- **Tree Improvement—**recommendations to expand tree improvement research and evaluations to improve genetic diversity, quality, and fitness, including establishing new seed orchards for improved and natural populations of ecologically and commercially important tree and forest plant species.

II. Challenges Posed by Climate Change, Invasive Species, and Reforestation

Minnesota's forest managers face unprecedented challenges in their efforts to sustain the state's forests and the benefits they provide. These challenges occur in three major areas in which the SFNP and TIP play a critical role: 1) climate change and its effects on the state's forested areas, 2) response to invasive plants and pest introductions, and 3) sustaining the state's forest resources through tree planting and regeneration. The ability to expand tree planting will be needed to regain and improve the health and sustainability of Minnesota's forest ecosystems now being hindered by the impacts of invasive species and weather anomalies (drought and floods). Providing appropriate, high-quality genetic materials will be necessary to ensure that new plantings have improved abilities to withstand and survive the impacts of invasives and climate change so the state's forests can thrive in the future. As identified in the 2013 State Forest Nurseries Business Plan, the SFNP's ability to make **new** investments in seedling and seed production and expand tree improvement operations is restricted by current financial limitations. Research efforts to identify and improve the resistance, resilience, and adaptability of native forest trees and plants will play an essential role in meeting these challenges.

Climate Change

Climate change will be the most significant threat to Minnesota's forests over the next century. Changes in Minnesota's climate will directly affect forests by creating more habitat for some tree species and reducing habitat for others, and indirectly, but no less significantly, by intensifying existing threats from wildfire, pests and disease, invasive species, and extreme weather events.

Climate. Changes in Minnesota's climate are already apparent (Minnesota Department of Natural Resources, 2011). Average, minimum, and maximum temperatures in all seasons have increased over the last century, with greatest increases in winter. Precipitation, particularly in summer and fall, has increased, with more of that precipitation coming in heavy events of 3 inches or more. Snowfall in the north has decreased despite an increase in winter storms.

Greater changes are on the way. All global climate models predict that temperatures will increase with increases in atmospheric greenhouse gases. In Minnesota, average annual temperatures will increase 5-9 degrees Fahrenheit by the end of the century. Temperatures will increase more in winter than in other seasons, leading to changes in snowfall, soil frost, and other winter processes. Growing seasons will be longer, but changes in precipitation patterns could negate the potential benefits of a longer season. Average annual precipitation may increase by 6-12 percent, **but** most

of that increase will come in winter and spring and soils will likely be drier later in the growing season. In addition, droughts will extend over larger areas and be more intense and an episodic precipitation regime could mean longer dry periods between events. Extreme weather events such as intense rainstorms and high winds that blow down large areas of forest will be more frequent.

Minnesota's forests. Ecological research and forest simulation models point to several likely impacts on Minnesota's forests (Handler, Duveneck, & Iverson, 2014). There will be less suitable habitat for boreal species such as aspen, paper birch, tamarack, and black spruce (Figure A, page 7) and growth rates and competitive ability in these species will decline. Species with ranges that extend to the south, such as American basswood, black cherry, northern red oak, and eastern white pine, will have more suitable habitat (Figure B, page 8) and will be favored by higher temperatures. See Table 1 on page 9 for predicted changes in the amount of suitable habitat available for trees in Minnesota at the end of the century. As individual species respond to changing temperature and precipitation regimes, the communities they form may look little like the forest communities we recognize today.

Several factors may affect the ability of Minnesota's trees and forest ecosystems to respond successfully to changes in temperature and precipitation. In species with relatively high genetic variability, genotypes capable of flourishing under the changed temperature and precipitation regimes may persist. Species with broad ecological niches will fare better than those with narrow habitat requirements. Low diversity ecosystems are less resilient to disturbance and more vulnerable to change. Forest fragmentation creates barriers to migration for some species and these species will have less opportunity to migrate in response to climate changes. Species and communities that are now limited to particular environments because of narrow habitat requirements will have less opportunity to migrate in response to climate change.

The indirect effects of climate change on Minnesota's forests will also be significant and increase the already high rate of tree mortality in Minnesota. Trees under water or nutrient stress resulting from altered precipitation regimes and nutrient cycles are more susceptible to disease and insect damage. In addition, future winter temperatures will be less of a deterrent to the northward movement of new insect pests and diseases. More frequent disturbances such as fires, blowdowns, and ice storms will also lead to increased tree mortality. Reestablishing tree cover after harvest may also become more difficult. In many locations, deer browsing now limits the success of regeneration efforts. Deer populations likely will increase under winters with less snow cover and higher temperatures. Without adequate control of deer populations, deer browsing will hamper regeneration efforts over larger portions of the state.

Figure A: Current and predicted distributions and relative abundances of four Minnesota trees that are expected to decrease under anticipated changes in climate. Blue indicates high abundance, green moderate abundance, and yellow low abundance. Maps are based on current importance values and projected importance values under a high emission scenario in the Tree Atlas model (Prasad, Iverson, & Matthews, 2007–ongoing).

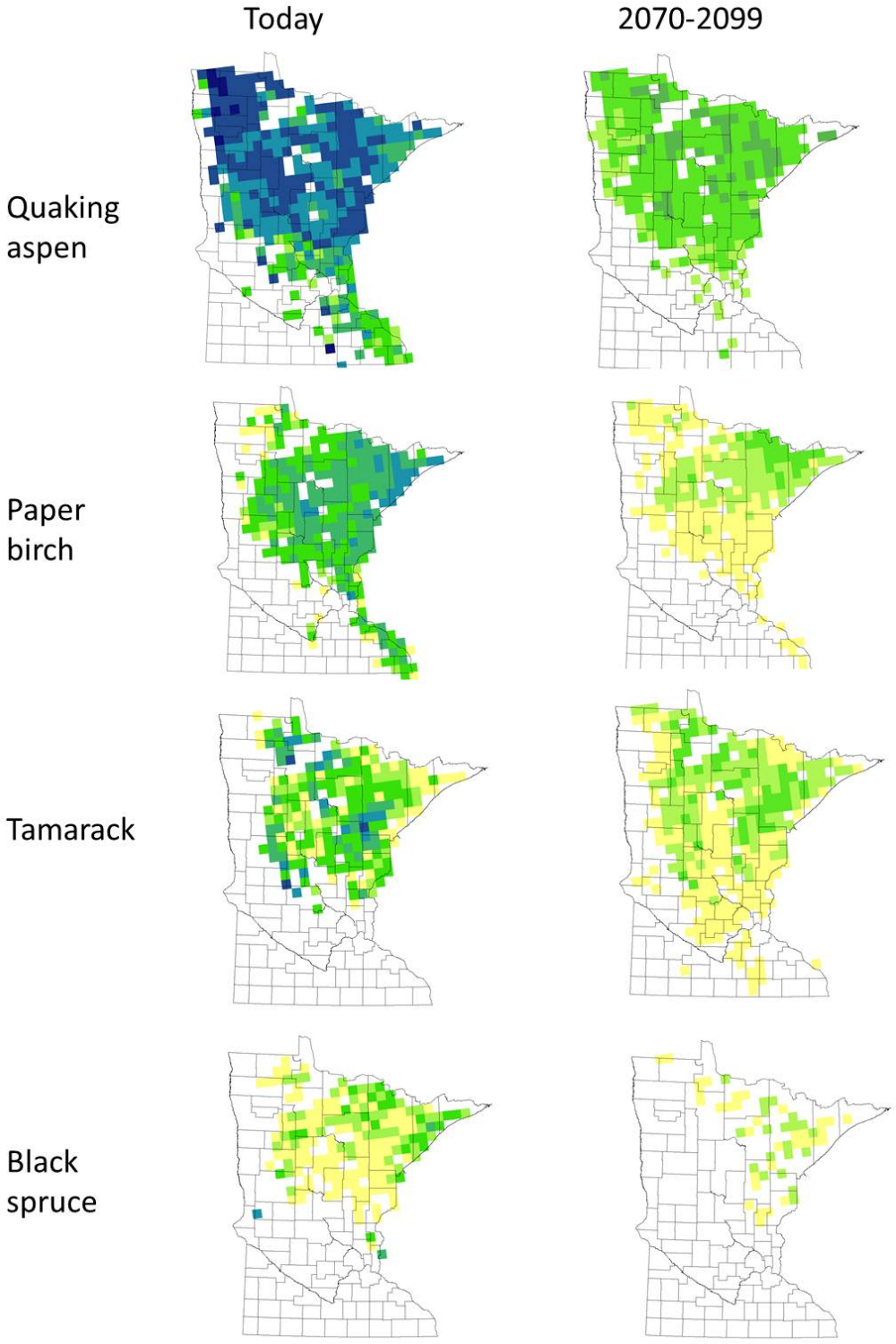

Figure B: Current and future distribution and relative abundance of three Minnesota trees that are expected to increase under anticipated changes in climate. Blue indicates high abundance, green moderate abundance, and yellow low abundance. Maps are based on current importance values and projected importance values under a high emission scenario in the Tree Atlas model (Prasad et al., 2007–ongoing).

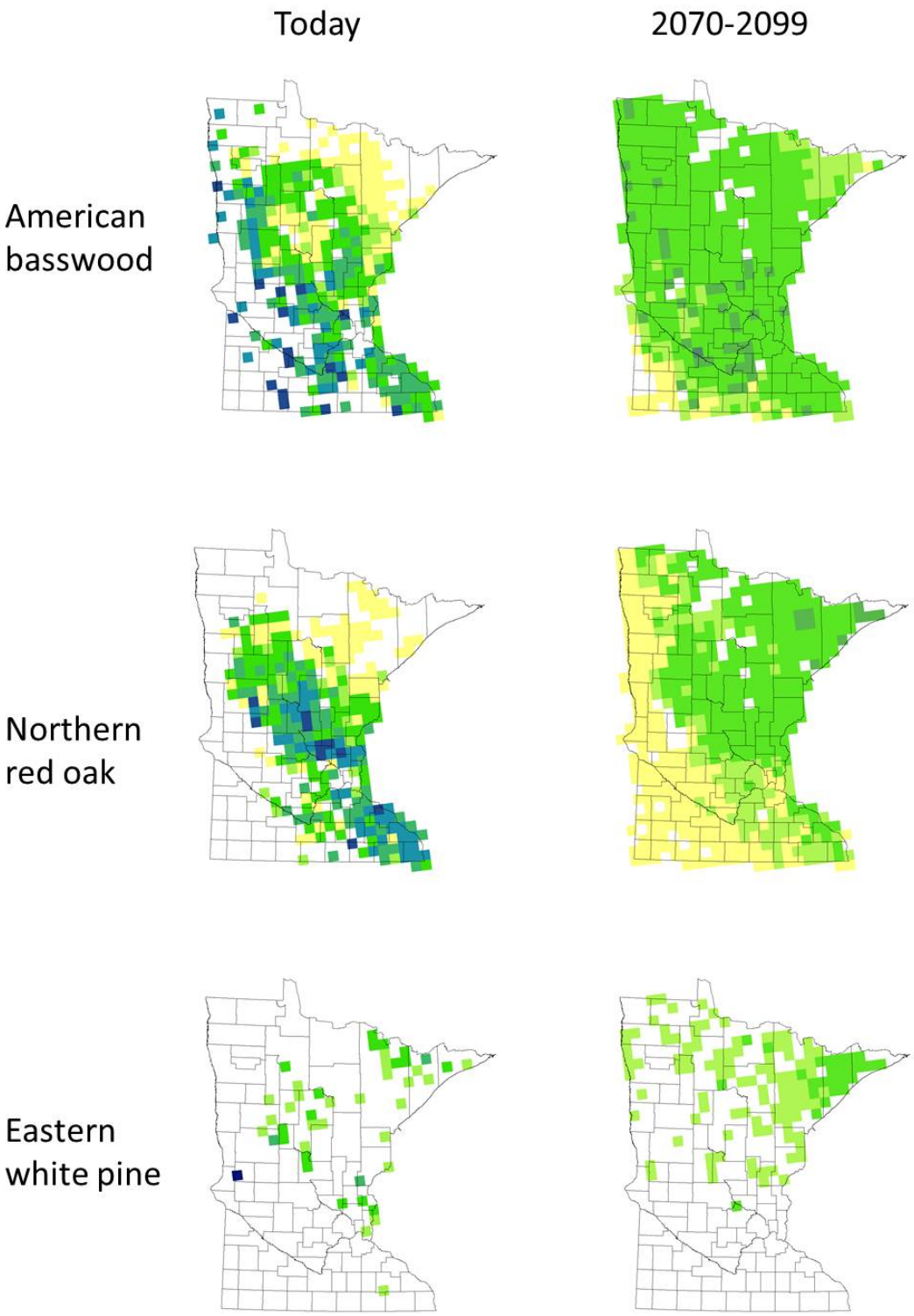

Table 1: Potential changes in suitable habitat for 74 tree species in northern Minnesota from the Tree Atlas model under a high greenhouse gas emission scenario. Change categories are based on a comparison between end of the century (2070–2099) and current values for habitat suitability based on Forest Inventory and Analysis data. A potential change of "new habitat" indicates species not currently in northern Minnesota that would find suitable habitat in the future.

Common Name	**Potential Change**
Balsam fir	Large decrease
Balsam poplar	Large decrease
Black spruce	Large decrease
Butternut	Large decrease
Mountain maple	Large decrease
Northern white cedar	Large decrease
Paper birch	Large decrease
Bigtooth aspen	Decrease
Black ash	Decrease
Jack pine	Decrease
Quaking aspen	Decrease
Tamarack	Decrease
White spruce	Decrease
Yellow birch	Decrease
Choke cherry	No change
Northern red oak	No change
Pin cherry	No change
Striped maple	No change
American basswood	Increase
Bur oak	Increase
Eastern hophornbeam	Increase
Eastern white pine	Increase
Green ash	Increase
Red maple	Increase
Red pine	Increase
River birch	Increase
Rock elm	Increase
Sugar maple	Increase
Wild plum	Increase
American elm	Large increase
American hornbeam	Large increase
Bitternut hickory	Large increase
Black cherry	Large increase
Black oak	Large increase
Black walnut	Large increase
Black willow	Large increase
Boxelder	Large increase
Eastern cottonwood	Large increase

Common Name	Potential Change
Eastern red cedar	Large increase
Hackberry	Large increase
Northern pin oak	Large increase
Peachleaf willow	Large increase
Silver maple	Large increase
Slippery elm	Large increase
Swamp white oak	Large increase
White ash	Large increase
White oak	Large increase
American beech	New habitat
Black hickory	New habitat
Black locust	New habitat
Blackgum	New habitat
Blackjack oak	New habitat
Chestnut oak	New habitat
Chinkapin oak	New habitat
Eastern hemlock	New habitat
Eastern redbud	New habitat
Flowering dogwood	New habitat
Honeylocust	New habitat
Mockernut hickory	New habitat
Northern catalpa	New habitat
Ohio buckeye	New habitat
Osage-orange	New habitat
Pignut hickory	New habitat
Pin oak	New habitat
Post oak	New habitat
Red mulberry	New habitat
Sassafras	New habitat
Scarlet oak	New habitat
Shagbark hickory	New habitat
Shingle oak	New habitat
Sugarberry	New habitat
Sweet birch	New habitat
Sweetgum	New habitat
Yellow poplar	New habitat

The Impacts of Invasive and Adaptive Native Pests

Forest managers will need to increase tree planting efforts to compensate for mortality from a combination of plant and animal pests. Invasive insects such as emerald ash borer and gypsy moth, already established in Minnesota, will impact a wide-range of tree and plant species in forest ecosystems.

Gypsy moth populations established in Cook and Lake counties are expected to build to outbreak levels and spread south and west into high-value oak resources. Factors affecting tree mortality after gypsy moth defoliation include: 1) severity, frequency, and distribution of gypsy moth defoliation events; 2) site and stand factors such as soil type and stand composition; 3) environmental conditions such as results from drought or frost events; and 4) tree vigor and crown condition (Davidson, Gottschalk, & Johnson, 1999). As forest tent caterpillars (which prefer many of the same host species as gypsy moths) have shown, defoliation events in Minnesota can affect up to 7 million acres at a time. The 2004–2005 gypsy moth outbreak in central Pennsylvania cost the state hundreds of thousands of dollars in lost revenue on over 300,000 acres as a result of oak mortality (Eggen, 2013).

Invasive plant species such as buckthorn compete with native species and hinder the successful reestablishment of native forest vegetation. Woody invasive plants are already a serious threat to the sustainability of Minnesota's oak forests. In areas infested with buckthorn or other woody invasive species, producing adequate oak regeneration requires a multi-year treatment regime including underplanting prior to harvest. Without such measures, woody invasive species crowd out oak sprouts before they can reach maturity. As buckthorn continues to spread northward and gypsy moth populations expand from the north, oak forests across the state are at risk of serious degradation.

Modern commerce, through global air travel and shipping, has created new transport opportunities for pests that have evolved on other continents. Some examples:

Emerald ash borer. The emerald ash borer (EAB) arrived in the United States on solid wood-packing material sent from the Far East. Minnesota has nearly a billion ash trees (the largest number in the United States) susceptible to attack. In other states affected with EAB, 99 percent of all ash species have died as a result of infestation; almost all trees greater than 1 inch in diameter. As the remaining ash seedlings increase in size, they too are invaded and killed (Herms, Gandhi, & Smith, 2011). Research has started looking at the surviving 1 percent of ash trees to begin to identify potential genetic material for future ash tree improvement (Knight, Herms, & Plumb, 2013). However, that work has so far been confined to Michigan and Ohio. In Minnesota, a large proportion of the stands dominated by ash have few, if any other tree species available to help maintain a forest canopy or the stand's hydrology if the ash component is lost. Substantial work is needed to identify stands where management is possible. Considerable work is also needed to develop plant material suitable for planting under Minnesota conditions.

Asian long-horned beetle. Unlike EAB, which sticks to species of ash, the Asian long-horned beetle (ALB) can attack and successfully kill all species of maple, basswood, poplar, and willow. While ALB has not yet become established in Minnesota, it can spread via firewood and solid

waste-packing material in much the same way as EAB. Considering the large infestation in Ohio, it's likely that ALB will hit Minnesota at some point in the future. The United States has not yet experienced outbreak levels of ALB, so the full extent of the damage they can do is unknown. With the combination of gypsy moth, EAB, invasive plants, and ALB, Minnesota's northern hardwoods face a difficult future. This substantiates that developing and planting suitable tree species will be critical to future forest sustainability in the state.

Even native insects are increasingly more destructive to Minnesota forests. Some examples:

Eastern larch beetle. Tamarack has lost greater acreages in its natural range due to eastern larch beetle than any other tree in the last 200 years. Originally covering 6 million acres, tamarack occupies just over 1 million acres today (Minnesota Department of Natural Resources, 2013). Eastern larch beetle has killed approximately 18 percent of the state's mature tamarack resource over the past decade. This insect kills the trees by breeding in the water-conducting tissues, effectively girdling them. Current research in the forest insect laboratory at the University of Minnesota is beginning to reveal how a changing climate is affecting beetle reproduction. Earlier springs and warmer summers and falls have expanded the seasonal reproductive window and enhanced developmental rates for the eastern larch beetle, leading to many more insects on the landscape than in previous years.

Mountain pine beetle. Like eastern larch beetle, the mountain pine beetle kills trees by breeding in their water-conducting tissues. Native to the western United states, mountain pine beetle is typically kept in check by winter temperatures below -40 degrees Celsius (= -40 degrees Fahrenheit) that kill the larvae during the winter. In recent years, climate warming trends in the western United States have relaxed the northern boundaries of this insect (Carroll, Taylor, & Régniere, 2004). It has spread over the geographic and climate barrier of the western Rocky Mountains and is now reproducing in jack pine forests of western Canada (Safranyik, Carroll, Régniere, 2010; Cullingham, Cooke, & Dang, 2011; de la Giroday, Carroll, & Aukema, 2012). Jack pine stretches through the boreal forest of Canada to the Great Lakes region where it mingles with white, red, and Scots pines. Mountain pine beetle reproduces on almost all types of mature pines, making it a critical emerging forest health threat that endangers Minnesota's pines.

These two examples illustrate the necessity to maintain a thriving nursery program in the face of current and emerging forest insect threats. Both of these aggressive, tree-killing bark beetle species are native insects that have altered their historic behavior in response to a changing climate. Given the increasing rate of introductions of forest pests (Brockerhoff, Liebhold, & Jactel, 2006), the state needs to be prepared for mitigation strategies in the face of future introductions (e.g., Asian gypsy moth and European spruce bark beetle).

The combination of newly introduced invasive species, increasingly pernicious native pests, and a warmer climate will significantly alter forest ecosystems. A diversity of trees for forest plantings will be needed to avert wholesale losses of plant communities and species that could be threatened with extirpation. Efforts to improve the genetic variation and fitness of native tree species will also play a key role in responding to these challenges.

Reforestation
State laws require that MNDNR sustain forest resources on state-administered forest land and support sustainable forestry on all forest landownerships. In practice this means that forest cover must be reestablished on every acre of state-administered forest land that is harvested. MNDNR accomplishes this through a combination of natural regeneration via stump sprouting and seed tree retention, direct seeding, and planting seedlings. As the housing market and other sectors of the economy recover from the 2008 recession, demand for forest resources and harvest levels will return to normal. In addition, new wood fiber markets (i.e., potential expansions in the use of wood fiber for bio-energy production and bio-chemical industries) will increase the volume of timber harvested and the number of species harvested. Regenerating harvested sites will continue to be the primary use of seed and seedlings on public and private lands.

Significant additional demand for seed and seedlings, however, will be associated with climate change. Responding to climate change-driven increases in the frequency and intensity of wildfires and blowdowns will require seed and seedlings. Replacing species that are subject to climate change-driven increased mortality from water or nutrient stress, pests, and diseases with species or varieties better suited to new growing conditions will require additional seed and seedlings.

Acting on Minnesota Climate Change Advisory Group (MCCAG) recommendations to expand ecosystem carbon sinks and reduce the state's greenhouse gas emissions could require substantially more seed and seedlings. MCCAG recommendations focused in part on establishing new forests on up to 1 million acres, ensuring that forests on public lands are fully stocked, and emphasizing carbon management using carbon-friendly management methods. An economic analysis of afforestation opportunities requested by the legislature (Turner, Becker, & Taff, 2010) found that establishing forests on 1 million acres of private lands currently in other uses would be cost prohibitive, but that about 34,000 acres could be forested if relatively small public payments are added to income to landowners from carbon markets and timber sales. Non-economic incentives for tree planting to mitigate climate change were not evaluated in the study, but could contribute significantly to an increased demand for seed and seedlings.

III. Responding to the Challenges

The challenges facing Minnesota's forest ecosystems will require cooperation between the state's public and private nurseries and significant additional efforts by the SFNP and TIP. Together they must:

- Maintain the capacity to produce a significant portion of the seeds and seedlings needed for reforestation in Minnesota.
- Assure that the seedlings and seed they make available are ecologically appropriate and genetically diverse.
- Expand the number of species offered by Minnesota nurseries to include species whose future range due to climate change is likely to include Minnesota.

Assuring the ecological appropriateness and genetic diversity of the seeds and seedlings used in Minnesota will require them to:

- Acquire seeds from outside the current seed zones and of species that have received little attention to date, including nonwoody forest plants and rare, threatened, and endangered plants.
- Maintain detailed provenance records for seeds and other regeneration stock and control the distribution of seeds and seedlings to appropriate locations.
- Evaluate the potential of seeds from new sources to perform well in Minnesota ecosystems.
- Select for genotypes and varieties that resist insects and diseases and can tolerate a wider range of soil moisture conditions.

The range of products available should enable forest managers to regenerate and restore forest vegetation efficiently and effectively. Forest managers should be able to select from:

- A variety of seedling types, including bareroot and containerized seedlings, transplant and caliper-size variations, root-pruned seedlings, and painted seedlings (seedlings actually painted to make them more visible in the ground after planting).
- Seed and seedlings treated to encourage germination and discourage deer browsing.
- Packages of trees, shrubs, and forbs assembled to be appropriate for specific locations and conditions.

IV. Improvements Needed to Meet Minnesota's Challenges

The challenges facing Minnesota's forest ecosystems can be met only if improvements to the state's existing seedling production, seed production, and tree improvement facilities are made and efforts to improve the genetic fitness and resiliency of seed and seedlings are expanded. The following improvements will only be met through the efforts of both public and private nurseries:

Improve Seedling Production, Diversity, Capacity, and Distribution

- Increase production of diverse seed sources and the variety of tree and forest plant species offered. Examples include:
    a) Diversity of stock (bareroot seedlings, containerized seedlings, and transplants and caliper-size variations).
    b) Specialty products (e.g., mixed seedling species packaged for ecologically diverse plantings, treated species to respond to deer depredation, and root-pruned and painted seedlings).
    c) Diversity of seed sources (native, source-identified tree seed and seedlings available from collections throughout Minnesota).
    d) Genetically improved seed and seedlings.
    e) Diversity of species (conifers, hardwoods, shrubs, herbs, and forbs).

- Expand the development and production of improved seedlings.

Increase Genetic Fitness and Resiliency

The sustainability of Minnesota's future forests will hinge on the genetic resilience of forested ecosystems. The genetic quality of the tree seedlings that are planted can improve or detract from ecosystem fitness. Local seed sources that possess sufficient genetic diversity are considered the lower risk option for planting projects, but appropriate locality may need to be redefined in light of climate change. To achieve genetic fitness and resiliency for the state's future forests, the following tree improvement functions must be implemented:

- **Evaluation and testing**
  a) Improve genetic evaluation and material testing in Minnesota to determine and propagate the most desirable species that best respond to climate changes. To achieve this, Minnesota needs to accelerate efforts to collect or acquire improved seed. Minnesota also needs to evaluate the potential for novel genotypes or species to grow and thrive in forests affected by invasive pests and climate change.
  b) Expand seed procurement beyond historical seed collection zones to increase capacity to evaluate and utilize the most adaptable seed available and identify suitable locations of wild seed.
  c) Identify and expand native wild seed collection areas throughout Minnesota; explore expanding seed procurement of nonwoody forest plants to establish foundation stock for seed production and expand availability of regeneration materials for sustaining diverse forest plant communities.
  d) Investigate seed collection and propagation of rare, threatened, or reduced-range species of forest trees, shrubs, and plants to support natural migration and breeding populations in the wild.
  e) Investigate alternative methods and processes to improve the genetic diversity of seed available.

- **Research**
  a) Improve techniques to propagate trees through grafting and/or cuttings to facilitate efforts to conserve unique or valuable genotypes.
  b) Investigate the stability of seed-transfer distances within Minnesota and adjacent states to develop rigorous standards to guide movement of forest seed.
  c) Identify replacement genotypes and species to plant in forests threatened by invasive species and climate change.
  d) Explore the influence of the environment on gene translation (which affects gene expression) through studies of adaptation via epigenetic mechanisms (i.e., heritable changes in gene expression due to nongenetic factors).

- **Material breeding improvements**
  Public (e.g., MNDNR, University of Minnesota) and private sectors (e.g., forest industry, commercial nurseries, Minnesota Nursery and Landscape Association) must collaborate with the Minnesota Tree Improvement Cooperative to:
  a) Breed trees with improved resistance to pests (both insects and diseases) and improved tolerance to a future with a warmer and likely drier climate.
  b) Develop seed orchards that provide a stable source of seed with quantifiable improvements in resiliency to grow and thrive in future conditions.

c) Develop seed collection areas that can serve as off-site conservation areas and a seed source for reforestation in targeted areas.

V. Roles of the State Forest Nursery and Tree Improvement Programs

The MNDNR has the statutory charge and authority to lead the effort of addressing the challenges facing Minnesota's forest ecosystems. The state over the SFNP's 85-year history has established broad experience and significant facilities associated with seed collection, seedling propagation and growth, materials distribution, and tree improvement operations. These investments include two major public land bases developed for these efforts. This section outlines how these facilities could contribute to meeting the challenges facing Minnesota's future forests.

Options for the Badoura State Forest Nursery Facility

- **Seedlings**
  a) Continue to produce 6 million seedlings of the total statewide annual demand (currently this is approximately 15 million) for bareroot seedlings.
  b) Serve as a broker of seedlings produced by private nurseries. Badoura Nursery currently brokers seedlings from private nurseries to meet the needs of its customers. Developing closer ties to private nurseries would be mutually beneficial and facilitate conservation efforts.
  c) Increase the number of forest species for which seedlings are produced, focusing on additional native tree, nontree woody, and herbaceous species; additional nontimber species; and additional tree species whose future range due to climate change is likely to include Minnesota.

- **Seeds**
  a) Increase the volume of seeds procured each year and increase seed handling and storage capabilities accordingly.
  b) Increase the number of species for which seed is collected from the wild, including species that are rare, threatened, or endangered.
  c) Establish orchards of naturally diverse native and non-native forest species expressly for producing seeds on state forest lands in several climatic regions of the state.
  d) Expand current wild seed collection zones to include more climatic variation including areas outside of the state.
  e) Develop a means of evaluating the performance of seeds and the seedlings they produce based on the location and climatic conditions from which they were collected and their resistance to pests and diseases.

Conversion of the General Andrews Nursery to a Tree Improvement Facility

General Andrews Nursery (GAN) has been the center of operations for the MNDNR's TIP since the program's inception in the 1950s. Historically, improved seed orchards were established in dispersed locations across the state. Since seedling production operations have been consolidated into the Badoura Nursery long-term, refocusing the use of the GAN facility as a site for future

orchards was initiated in 2012 under existing limited funding. Consolidating new orchard investments at GAN will reduce costs and improve management efficiency. It is proposed that any future expansions in tree improvement research and orchard development take advantage of GAN for cost efficiency.

VI. Facility, Program, and Funding Options

The SFNP as detailed in the 2013 State Nurseries Business Plan has the ability to maintain its current seed, seedling, and tree improvement operations without new funding. This includes the ability to annually produce and distribute bareroot seedlings, collect and process native seed to meet nursery and state forest seeding needs, and maintain limited cooperative tree improvement activities. The long-term consolidation of seedling and seed production at Badoura Nursery will require facility investments and equipment upgrades to maintain a viable infrastructure over the next 20 years. These investments are both identified below and in the 2013 State Nurseries Business Plan. If necessary, these investments will be funded over time by increasing seedling prices.

Diversifying the species or intraspecies genetics available with SFNP products will require expanded tree improvement research and studies, as well as expanded facility capabilities to support these operations. They will be long-term investments to meet the challenges facing Minnesota's future forests with limited financial returns. Expanded operations would require the investments identified below in greenhouse, laboratory, and seed processing capabilities. As directed by the 2013 legislative charge, funding options to improve state forest nursery and tree improvement capabilities are identified. (See Appendix A on page 23 for a summary table of all funding options.)

Seedling Production

- **SFNP seedling production facility consolidation—**The following seedling production facility and equipment improvements have been identified in the business plan and this report to address long-term SFNP consolidation at the Badoura Forest Nursery:
  a) Improve facility to consolidate both seed and seedling operations. Improvements include:
     i. Expanding the grading and packing building to provide adequate working space to grade and count the nearly doubled seedling packaging and distribution needs.
     ii. Constructing a steel building with a cement floor, all typical utilities, and a CoRayVac® overhead heating system for the counting and grading area.
     iii. Increasing cold storage capacity for seedlings and seed. This expanded freezer and refrigeration space is needed to facilitate expanded fall lifting and storage of seedlings for new spring seedling processing and distribution demands and to support operational efficiency and enhanced survival of regeneration materials. Recommended construction specifications include adequate height to accommodate forklifts and storage space for seedlings.

b) Acquire state-of-the-art seeding equipment such as a Whitfield hardwood seeder and Love/Oyjord® conifer and small seed seeder. Equipment of this type is necessary to accommodate the control bed density seeding requirements for the range of materials envisioned to be grown by the nursery complex. Appropriate bed densities for hardwood and nonwoody plants will improve regeneration, seedling survival, and seedling quality.

c) Establish all-weather roads and surface transition areas among the seed and seedling processing, packing, and distribution facilities complex. Improvements would allow safe movement of forklifts and other equipment between buildings and provide an all-weather surface to support meeting shipping demands and seed processing in the fall.

d) Investigate alternative methods of co-generation and energy conservation for the nursery complex facilities to control and reduce energy demands over the long-term.

- **Funding estimates for options for Badoura Nursery seedling production improvements**
  a) $1,500,000 for Badoura facility expansion and upgrades (includes a packaging building and freezer building).

  b) One-time equipment purchases of $150,000 (includes the purchase of a Whitfield hardwood seeder and Love/Oyjord® conifer and small seed seeder).

Seed Production

The SFNP's current seed production program is sufficient to meet existing demands. Implementing program actions to diversify seed sources or expand seed availability are constrained by the commitment of the SFNP to self-sufficiency. This fiscal limitation is addressed in the 2014 business plan. Enabling the SFNP to support options for expanding seed production for broad forest ecosystem goals would require financial investments beyond those available from income associated with current or anticipated seedling sales.

Expanded seed production, evaluation, and collection (including zone identification and management), should be viewed as a long-term investment for the public good. The value of expanded seed production as well as improved seed quality will only be realized in the future quality and health of regenerated forests. To address Minnesota's reforestation challenges, both improvements to the current seed production facilities and program expansions are identified with an estimate of their costs.

- **Seed production options identified for the Badoura Seed Operations Facility**
  a) Improve and expand the capability to provide the highest quality seed for Minnesota conservation initiatives through development of a state-of-the-art Forest Seed Production Complex. Facility improvements within the complex include:
     i. Upgrading and expanding the native seed processing and cold storage capabilities at Badoura. Expanded physical facilities for seed extraction and cleaning operations include: 1) a separate expanded cold storage facility for

improved shelf life of stored seed and expansions in seed volumes and diversity, 2) a kiln room designed to operate at safer extraction temperatures than the current oven, and 3) an expanded seed processing and storage space.

ii. Adding a greenhouse facility to conduct seed performance evaluations and provide a source of foundation stock for nonwoody species.

b) Acquire specialized equipment to expand the capability to process the volume and diversity of seed needed to support future conservation needs. Equipment investments include:

i. Westrup brush machine for cleaning deciduous and nonwoody seed
ii. Vibratory cone shaker (extracts conifer seed)
iii. Amalco plot thresher (harvests nonwoody seeds)
iv. Belt thresher (harvests nonwoody seeds)
v. Westrup indent cylinder seed cleaner
vi. Conifer seed extraction straight wall system

- **Program improvements that would complement improved seed production efforts**
  a) Identify and establish seed collection areas and seed orchards for major forest species on public lands within seed collection zones to facilitate efficient seed collection and quality.

  b) Conduct an exploratory assessment on the availability and sources of native nonwoody seed and identify needs for currently unavailable seed sources that should be prioritized for foundation stock development.

- **Funding estimates for options to establish a Native Seed Production Facility at Badoura Nursery**
  a) $1,500,000 for the facility improvements and major equipment purchases.

  b) $200,000 annually to plan, manage, and implement an expanded seed production program after the facility is in place.

Tree Improvement Program

The purpose of applied forest tree improvement is to steadily and continuously improve the genetic quality of seeds, stem cuttings, and other regenerated stock for use in reforestation programs. The tree improvement program combines basic orchard management with other specialized skills such as grafting, progeny testing, and tree breeding. These types of analysis and research are conducted cooperatively with the University of Minnesota's Minnesota Tree Improvement Cooperative (MTIC) administered through the University's Department of Forest Resources in St. Paul. Improved seed and seedlings, when supporting commercial use of forest resources, can provide a financial return on investments. This return is generally only available after several years of development and testing. The differential value associated with improved seed or seedlings is generally of a short-term nature until expanded availability reduces the potential for income. Generally, financial returns are used to offset operating costs and support continuous improvement goals.

The General Andrews Nursery site is being converted into the base operation for current tree improvement work by the MNDNR. The centralized location and existing infrastructure make this a logical and cost-effective focus for expanded investments in tree improvement operations. Providing the capabilities to support implementation of statewide tree improvement strategies to address invasive species and climate change would require investments in a combination of retrofits to existing facilities for a laboratory and construction of a new greenhouse facility.

- **Options for expanding tree improvement operations at General Andrews Nursery**
  a) Existing nursery beds and fields:
     i. Convert to grafted orchards and seed orchards for a variety of tree species and seed zones.
     ii. Establish test sites to evaluate or improve seedling adaptability, resilience, pest resistance, fiber production, and quality.
     iii. Upgrade existing irrigation system to improve energy and water conservation.

  b) Propagation areas:
     i. Expand available greenhouse space and work area and include improved climate control capability, irrigation and misting systems, and energy efficiency.
     ii. Construct a working laboratory space for seed and pollen testing, grafting, and evaluating pest resistance within new selections.

- **Funding estimates for options for tree improvement expansions**
  a) $100,000 annually in increased base support for tree improvement research and development to the MTIC in the University of Minnesota's Department of Forest Resources.

  b) $800,000 for General Andrews Nursery to support the expansion of statewide tree improvement through facility improvements and acquisition of laboratory, field, and irrigation equipment.

  c) $150,000 annually to support the establishment and operation of grafted orchards and seed production areas. This budget includes program coordinator, seasonal research technician, and seasonal laborer positions.

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VIII. Appendix

A. Summary of Funding Needed to Implement Identified Options

One-time Facility and Equipment

$1,500,000	Badoura Nursery—expansion and upgrades of current facility for improving seedling production
$1,500,000	Badoura Nursery—establishment of **new** Native Seed Production Facility
$ 150,000	Badoura Nursery—one-time equipment purchases for current seedling facility
$ 800,000	General Andrews Nursery—Facility improvements and laboratory, field, and irrigation equipment to support tree improvement
$3,950,000	**Total**

Annual Funding

$200,000	For planning, managing and implementing an expanded seed production program when the Native Seed Production Facility is in place
$150,000	For establishing and operating grafted orchards and seed production areas
$100,000	For the Minnesota Tree Improvement Cooperative to do more research
$450,000	**Total**

B. Legislative Direction

***Minnesota Statutes,* section 89.01, subdivision 1. Best methods.** The commissioner shall ascertain and observe the best methods of reforesting cutover and denuded lands, foresting waste lands, minimizing loss or damage of forest resources by fire, forest pests, or shade tree pests, administering forests on forestry principles, encouraging private owners to preserve and grow trees or timber for commercial or other purposes, and conserving the forests around the headwaters of streams and on the watersheds of the state;

***Minnesota Statutes,* section 89.002, subdivision 1. Forest resource management policy.** The commissioner shall manage the forest resources of state forest lands under the authority of the commissioner according to the principles of multiple use and sustained yield. The forest resource management policy shall not supersede any existing duty or authority of the commissioner in managing forest lands, but the duties and authorities, as far as practicable, shall be exercised consistently with this policy. The forest resource management policy is not intended to exclude extractive uses of forest lands under the authority of the commissioner pursuant to state law.

Subdivision 2. Reforestation policy. (a) The commissioner shall maintain all forest lands under authority of the commissioner in appropriate forest cover with species of trees, degree of stocking, rate of growth and stand conditions designed to secure optimum public benefits according to multiple use, sustained yield principles and consistent with applicable forest management plans.

(b) Each year the commissioner shall strive to assure that (1) reforestation occurs annually on an acreage at least equal to the acreage harvested that year on all forest lands under the authority of the commissioner; (2) additional reforestation is accomplished on areas previously harvested but not adequately reforested so that the backlog of reforestation work can be eliminated; and (3) poorly stocked forest land, or forest land damaged by natural causes, shall be returned to a state of productivity.

***Minnesota Statutes, s*ection 89.35, subdivision 1. Definitions.** The definitions in this subdivision apply to sections 89.35 to 89.39.

(a) "Tree" means any species of tree, woody perennial, shrub, or vine approved by the commissioner for the purposes authorized in sections 89.35 to 89.39, except cultivated varieties that are capable of producing fruit for human consumption.

(b) "Planting stock" or "tree planting stock" means trees native to this state and includes native tree hybrids that have been improved for conservation purposes.

Subdivision 2. Purpose of planting. The purposes for which trees may be produced, procured, distributed, and planted under sections 89.35 to 89.39 shall include auxiliary forests, woodlots, windbreaks, shelterbelts, erosion control, soil conservation, water conservation, provision of permanent food and cover for wild life, environmental education, and afforestation and reforestation on public or private lands of any kind, but shall not include the raising of fruit for human consumption or planting for purely ornamental purposes. It is hereby declared that all such authorized purposes are in furtherance of the public health, safety, and welfare.

***Minnesota Statutes,* section 216H.02, subdivision 1. Greenhouse gas emissions-reduction goal.** It is the goal of the state to reduce statewide greenhouse gas emissions across all sectors producing those emissions to a level at least 15 percent below 2005 levels by 2015,

to a level at least 30 percent below 2005 levels by 2025, and to a level at least 80 percent below 2005 levels by 2050 …

***Minnesota Statutes,* section 84.0895, subdivision 5. Management.** (a) Notwithstanding any other law, the commissioner may undertake management programs, issue orders, and adopt rules necessary to bring a resident species of wild animal or plant that has been designated as threatened or endangered to a point at which it is no longer threatened or endangered.

(b) Subject to the provisions of subdivision 6, management programs for endangered or threatened species include research, census, law enforcement, habitat acquisition, habitat maintenance, propagation, live trapping, transplantation, and regulated taking.

Recent Legislative Direction

This report provides recommendations on implementing the current legislative direction while also considering all past legislative authorities:

Laws 2013, chapter 114, article 3, section 4, subdivision 4. Forest Management. $50,000 the first year is for development of a plan and recommendations, in consultation with the University of Minnesota, Department of Forest Resources, on utilizing the state forest nurseries to: ensure the long-term availability of ecologically appropriate and genetically diverse native forest seed and seedlings to support state conservation projects and initiatives; protect the genetic fitness and resilience of native forest ecosystems; and support tree improvement research to address evolving pressures such as invasive species and climate change. By December 31, 2013, the commissioner shall submit a report with the plan and recommendations to the chairs and ranking minority members of the senate and house of representatives committees and divisions with jurisdiction over natural resources. The report shall address funding to improve state forest nursery and tree improvement capabilities. The report shall also provide updated recommendations from those contained in the budget and financial plan required under Laws 2011, First Special Session chapter 2, article 4, section 30.

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DATE: February 6, 2014

LEGISLATIVE REPORT – Cost of Preparation

NAME OF LEGISLATIVE REPORT – _Minnesota Department of Natural Resources, Division of Forestry—State Forest Nursery & Tree Improvement Program: 2014 Legislative Report

Based on: _Legislatively Mandated Report

Minnesota Statute Reference: Minnesota Session Laws of 2013, Regular Session; chapter 114 Environment, Natural Resources, and Agriculture Finance and Policy Bill, section 4, subdivision 4. "Forest Management."

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Description of Cost	Further explanation if necessary	Amount
Staff Time	660 hours @ $50.00/hr	$33,000
Travel Expenses	Meals and Mileage	$4, 480
Duplication Cost (includes paper)	2500 copies @ $0.05	$125
	TOTAL TO PREPARE REPORT (*Note: Right click on amount cell and choose update to complete*)	$37,605

Management
Analysis
& Development

Minnesota Department of Natural Resources—Division of Forestry

State Forest Nurseries Program

Business Plan Update Fiscal Years 2013-2016

December 2013

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Division of Forestry

State Forest Nurseries Program

Business Plan Update – Fiscal Years 2013-2016

December 2013

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Executive Summary

The Legislature in 2013 directed the DNR Commissioner to update the Nurseries Program business plan from 2012 in conjunction with the "development of a plan and recommendations, in consultation with the University of Minnesota, Department of Forest Resources, on utilizing the state forest nurseries to: ensure the long-term availability of ecologically appropriate and genetically diverse native forest seed and seedlings to support state conservation projects and initiatives, protect the genetic fitness and resilience of native forest ecosystems; and support tree improvement research to address evolving pressures such as invasive species and climate change." (Laws 2013, art. 3, ch. 114, sec. 4, subd. 4). The business plan and update were developed by the Management Analysis Division, Minnesota Management & Budget with information provided by the Nurseries Program staff and DNR management.

This document updates the 2012 state nurseries business plan, with a focus on strengthening the Badoura Nursery as the sole state forest nursery after the cessation of seedling production at the Gen. Andrews Nursery. The report:

- reviews developments at both nurseries,
- updates financial and operating statistics through FY2016, and
- describes a scenario for development and expansion of Badoura to continue as a financially self-sufficient operation positioned to maintain for the longer-term the necessary capabilities to produce conservation grade source-identified bareroot seedlings in large volumes for public and private forestry purposes. The state nursery program does not produce containerized seedlings.

The transition to a single state forest nursery has been completed, with a few minor actions to be completed in this fiscal year. No more seedlings are being planted and harvested at Gen. Andrews Nursery, which now accommodates several other Division of Forestry and department activities. Gen. Andrews Nursery has been the site for tree improvement activities and would be the site for expanded tree improvement activities and seed orchard development, contingent on the availability of funds.

Badoura's identified long-term needs in this scenario include expansion to support two essential seedling production functions – grading and packaging space to accommodate workers, supplies, and workflow (expansion of the current packing shed); and cooler/storage space in a new building to accommodate the combination of hardwood and conifer production now combined at Badoura. Hardwoods formerly grown, harvested, processed and stored over the winter at Andrews will now (to the extent of demand) be accommodated at the Badoura Nursery. Hardwoods require several times the cooler/storage space in comparison to an equal number of conifer seedlings.

Badoura is projected to produce between 4.7 and 5.5 million seedlings each year through FY2016. Financial self-sufficiency is attained at approximately 5 million. The current production capacity at Badoura is estimated at 6 million seedlings annually in the current configuration of staffing and buildings. The two nurseries operated at well over 10 million seedlings for several years, but reduced demand and self-sufficient operations moved the production goals down to 8

million then 6 million seedlings annually. The current expected longer-term level of stable production would be 6 million, subject to changes in demand from cost share programs and other events, trends and initiatives. Badoura might be stretched to 8 million seedlings annual production with infrastructure and staffing changes. This magnitude of production would require a major increase in mostly-seasonal labor and ability to manage increased processing demands.

The estimated long-term facilities investment to upgrade Badoura for its role as the single state forest seedling nursery would be approximately $1.5 million including expanded packaging building, new cooler/storage building, some additional office space and road paving.

Introduction

In 2013, the Legislature directed the commissioner of natural resources to develop a plan and recommendations on utilizing long-term availability of ecologically appropriate and genetically diverse native forest seed and seedlings to support state conservation projects and initiatives, protect the genetic fitness and resilience of native forest ecosystems, and support tree improvement research to address evolving pressures such as invasive species and climate change.

The report would (1) address funding to improve state forest nursery and tree improvement capabilities, and (2) provide updated recommendations from those contained in the budget and financial plan required under Minnesota law.[1] *This Business Plan Update addresses the second of the two numbered items.*

2012 Business Plan

The State Forest Nurseries Program Business Plan and Report to the Legislature (January 15, 2012)[2] included a description of the program with budget and financial history and plan through FY2015. A central theme of the plan was the transition from two state forest nurseries to one for the large-scale planting, cultivation and harvesting of forest tree seedlings.[3]

Today, the Badoura State Forest Nursery in Akeley, MN (Badoura) is the sole remaining large-scale seedling production and distribution operation within the DNR. The General C.C. Andrews State Forest Nursery in Willow River, MN (Andrews) has been repurposed, principally for various Division of Forestry operations. Both locations are currently involved with forest tree seed processing, and Andrews has become the center for tree improvement activities, in support of long-term sustainability of Minnesota's forest resources.

2013 Business Plan Update

The updated plan concentrates on strengthening the one-location DNR seedling production nursery program model[4] to meet future needs of the DNR and the state's public and private forests. The scope of discussion is the State Forest Nurseries Program and excludes the proposed

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[1] Laws of Minnesota 2013, article 3, chapter 114, section 4, subdivision 4.

[2] For the full 2012 business plan and report, go to: http://files.dnr.state.mn.us/aboutdnr/reports/legislative/StateForestNurseryProgramBusinessPlan-Jan2012.pdf

[3] Additionally, the plan addressed the implications of a recently enacted statutory limitation on the uses of new plantings at Badoura: "Beginning July 1, 2011, the commissioner of natural resources shall limit all new plantings at the Badoura Nursery to the planting of stock for research or use on public lands or private conservation lands with permanent protection. Excess plant material may be sold or traded to private wholesale nurseries." (Laws of Minnesota 2011, First Special Session, chapter 2, article 4, section 30.) For this business plan update, it is noteworthy that the 2013 legislature *repealed* this provision. (Laws of Minnesota 2013, chapter 114, article 4, section 108.)

[4] That is, the business plan update assumes that no event or combination of events and circumstances will revive the need for a multi-location state forest seedling production capability within the time frame of this plan. If it would become necessary to recommission Andrews for any reason, the effort would take two to three years to harvest the first crop of seedlings. For the first two to three years, the financial picture would be costs-only, without revenues.

state-managed Tree Improvement Program. More specifically, the goals of the updated nursery program plan are to:

(1) continue operations as a self-sustaining program,

(2) provide physical infrastructure for the single-site consolidated seedling production at Badoura,

(3) expand readiness to meet potential increased demand for *seedling* production and distribution capabilities at Badoura,

(4) continue forest *seed* production and processing capabilities within the nurseries program for public and private conservation program needs, and

(5) coordinate and support actions with the *tree improvement program* as funding and capabilities allow.

Nursery Operations Update

Program changes presented in the 2012 plan were based in part on a provision in 2011 laws that limited certain private sales. That provision was repealed by the 2013 legislature.[5] Discussion of the Andrews site presented a number of options for repurposing the nursery that would no longer be used for large-scale seedling production. Actions taken after the business plan's completion have strongly supported the one-nursery design for seedling production at Badoura and alternative uses for Andrews that include small but viable tree improvement and seed production activities with plans for added capabilities.

Badoura Nursery transition to single-site operation

Badoura Nursery is now the single large-scale DNR seedling production facility. No new planting has occurred at Andrews for several years and the final harvest of in-ground seedlings planted in earlier years was completed in fall 2012.

Most seedling production nurseries program staff and equipment have been transferred from Andrews to Badoura. Nurseries program staffing at Andrews is currently zero. Additional staff will be hired at Badoura in the current fiscal year. Although not finalized, the new staffing would include an assistant office manager (0.9 FTE), two equipment operators (0.8 FTE each) and an assistant supervisor (1.0 FTE).

The financial breakeven point for single-site Badoura operations was calculated by the program onsite supervisor to be 4.6 to 4.7 million seedlings sold annually.[6]

The annual supply of seedlings *available for sale* at Badoura shows a declining trend from FY2012 to FY2015, and then is projected to increase for FY2016 as the hardwood seedlings that previously were produced at Gen. Andrews Nursery become available for sale at Badoura Nursery.

With expected demand—in the timeframe of this plan, covering FY2013-FY2016—Badoura seedling *sales* are expected to be in the range of 4.7 to 5.5 million per year.

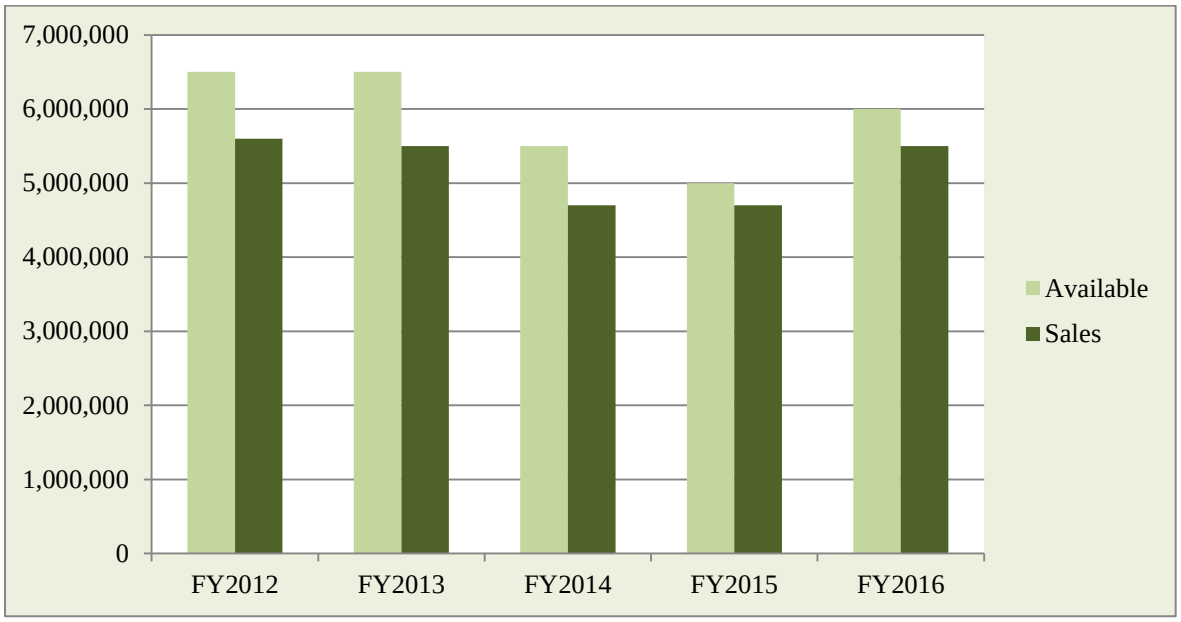
			Estimated		
	FY2012*	FY2013*	FY2014	FY2015	FY2016
Available for sale	6,500,000	6,500,000	5,500,000	5,000,000	6,000,000
Sales	5,700,000	5,600,000	4,700,000	4,700,000	5,500,000

*FY2012 and FY2013 include sales at both Badoura and Gen. Andrews Nurseries. Andrews Nursery production was approximately 1 million in each year.

[5] See footnote 3 above for text.

[6] When the 2012 business plan was prepared, an assumption was made that 6 million seedling sales would needed for the program to achieve financial self-sufficiency. However, current estimates of future revenues and expenditures through FY2016 forecast that financial breakeven can be achieved at a level of 4.7 million sales. The completed consolidation of resources and staff at Badoura has reduced costs to better align with expected revenues. See the financial and operating statistics for FY2012 to FY2016 on the following pages.

Table 1: Seedling production (1) Available for Sale and (2) Sold (FY2012-13) or expected to be sold (FY2014-16).



Badoura has current capacity to *grow* up to 6 million seedlings per year. Additional physical infrastructure and staffing beyond its historical baseline would be needed for the Badoura seedling *production* capability (lifting, grading, packaging for sale, and cooler storage) to accommodate additional workload from the Gen. Andrews Nursery closing and increased demand. Components of additional physical infrastructure to increase the capacity of Badoura are enumerated and discussed later in the report.

The changeover to all-Badoura for plantings affected the nursery program's ability to meet current demand. Andrews produced most of the hardwoods and Badoura produced conifers principally for state lands. Past practice to plant very limited hardwoods at Badoura has been changed with the Andrews closure and repeal of the 2011 provision of laws; however, there will be a continuing shortage of state nursery hardwoods (estimated at 50 percent of demand this year) for sale to private parties through 2015. Conifer plantings and demand at Badoura are at full strength. Overall, several new strategies have been implemented and are being planned for the all-Badoura plantings and production.[7]

Seedling prices were raised twice in the past few years, most recently in FY2013. The more recent price increase was implemented a year sooner than had been scheduled in the 2012 business plan. There will be no price increase in the current fiscal year for spring sales.

[7] For example, changes are required because hardwood seedlings are not as well adapted for growth at Badoura, and the seedlings require two to three times the cooler/storage space per thousand compared to conifer seedlings.

Gen. Andrews Nursery repurposing

The contraction of seedling production at Andrews had begun as early as FY2008–09, and for FY2012 there were no new plantings. By fall of 2012, all Gen. Andrews stock for sale had been liquidated. Discussions within the Division of Forestry included planting alternative crops to support the facility as part of the nurseries program, but the ideas were not implemented.

The 2012 business plan recommended options for repurposing Andrews. Several of those alternative uses have been implemented. Currently, the Division of Forestry, not the Nurseries Program, has primary responsibility for use of Gen. Andrews space and its costs.

The nursery program in FY2014 is paying for two groundskeepers (together 0.5 FTE) and minor field maintenance. Otherwise, Gen. Andrews costs are paid by DNR Forestry and other parts of the department utilizing the remaining buildings. The Forestry Division fire program occupies the shop building. The office building houses seven people from various divisions, and each division pays a portion of costs. A few items of nursery equipment still at Andrews will be brought to Badoura in the near future. In summary, operations at Andrews now consist of tree improvement, forestry activities, DNR enforcement or wildlife, and the federal excess property program.

In the future, the nurseries program at Badoura might use the cooler at Andrews for seedling storage and pay for the electrical costs. However, the transportation between Badoura and Andrews would reduce efficiency and increase costs.

The Division of Forestry is making recommendations to expand and upgrade Andrews as a tree improvement facility if additional funding becomes available. Among the needed functions would be establishment of additional seed orchards—trees planted and maintained for the sole purpose of harvesting seeds.

In the fall of 2012, two fields of white spruce, one field of jack pine, and one field for prairie crabapple were planted as seed orchards. These will be “seed source” orchards for use in the nursery program and for others. Now, 4 of 60 available fields at Andrews are in service as orchards, either in production or wild orchards. Andrews could be further upgraded for tree improvement capabilities. The Division of Forestry intends that the 60 fields at Andrews will not be turned over to uncontrolled growth. All 60 fields will be put into cover crops and kept free of weeds. As a result, if there is a need for additional orchards or seed beds, the fields would be usable in the short term. As each field turns into an orchard, grass will be planted. In 2015, the program expects to add three additional fields under existing funding.

The State Forest Nursery and Tree Improvement Report prepared in response to the 2013 legislation identifies options to expand tree improvement operations. An important consideration is that seed orchards don’t make money, but seed production is necessary to improve seedlings and ultimately forests.

Operational Directions and Infrastructure Development

The transition to a single-site DNR seedling production location at Badoura has been essentially completed. Andrews has been repurposed and may be the location for an expanded tree improvement program and larger, more diverse seed orchards. The direction of Badoura development is toward a developed single-site seedling production facility, with capacity to efficiently meet short-term demand and adapt to longer-term trends and cyclical changes.

Goals and current limitations

Overall, current demand for identified-source conservation grade bareroot seedlings in large quantities is down but stable, mostly as a result of depressed timber and housing markets. Additionally, the current lack of federal cost-share program funds for private tree plantings hurts demand for seedlings.

The current *production* capacity at Badoura is estimated at 6 million seedlings annually in the current configuration of staffing and buildings.[8] The two nurseries operated at well over 10 million seedlings for several years, but reduced demand and self-sufficient operations moved the production goals down to 8 million then 6 million seedlings annually. Badoura might be stretched to 8 million seedlings annual production with infrastructure investments and staffing changes. This magnitude of production would also require a major increase in mostly-seasonal labor and other significant changes to usual practices.[9] It should also be noted that capacity can effectively be increased by purchases and exchanges from other states and private nurseries, although under current limited demand this is done on a comparatively small scale. Outside entities are not always able to meet specific needs.

Scenarios and contingencies

Various scenarios of demand indicate the need for an anticipatory approach to meeting future demand. Such scenarios would involve an expeditious response to counteract larger scale natural forest destruction, invasive species, climate change and other man-made and natural forest disasters. In-place infrastructure can better accommodate quick adaptation to predictable and

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[8] Explanation: The best-case timing for harvest ("lifting") is four to five weeks in the spring. This is up to a 25-day window to harvest the seedlings. With the single production location at Badoura, one million seedlings are lifted in the fall for winter storage and five million seedlings are harvested in the spring. Thus six million seedlings harvested is the practical annual limit for Badoura.

[9] To produce more than 6 million seedlings annually at Badoura, weather and labor force are essential limits. Harvest is a four to five week season. The problem is not growing space, it is the harvest. At a level of 7 million annual spring harvest, 300,000 per day would be harvested (contrast to 200,000 per day currently). Significant expansion of short-term labor would be needed for that much more work. Seedlings would be *bulk-lifted*. Storage would require a much larger cooler space, beyond current capacity. Any delay in harvest means the seedlings could flush and spoil. It would be practical in this scenario to move seedlings into the cooler buildings where they would keep for weeks – time to get them counted, graded and packaged. This describes a changeover to a high-volume system – to lift all of it in fourteen working days and ship in 25 days. In summary, for a Badoura seedling harvest to be significantly greater than six million seedlings annually, there could be a fundamental process change, requiring greater cooler space and additional short-term seasonal labor as essential requirements.

unpredictable demand changes. Building additional capacity at Badoura can help to address these current and future problems of uncertain magnitude.

The Division of Forestry considers that the single site nurseries program at Badoura would be a permanent 6 million annual seedling harvest facility. As noted earlier, the one-site nurseries program can break even at 4.6 to 4.7 million seedlings harvested annually. When both Badoura and Andrews were operating, the program supported the two nurseries at a breakeven of 5.6 million in annual seedling production.

The demand for seedlings depends on not only the housing and timber markets, but also the traditional sources of funding for private and government planting programs. The Federal Farm Bill reauthorization, which could provide significant federal cost share funds to drive up the volume of private tree planting, has been delayed for four years. If these cost share funds become available, plantings could go up significantly.

Another significant consideration driving the level of private tree planting is agricultural practices and prices. Recently the prices for soybeans and corn were high enough to cause farmers to uproot trees and plant corn. Some of this was land in conservation reserve programs—that is, lower productivity land that farmers were paid to leave wild. Now, much of this land is being farmed. Additionally, windbreaks are being plowed up for the same reasons.

Another factor currently limiting demand is the after-effect of 2011 legislation that strictly limited sales to private buyers (repealed in 2013, but several other statutory limitations on sales are still in effect). According to the program staff, some private landowners mistakenly believe that they cannot buy seedlings from the nursery program. Other customers and potential customers of the nursery program think the 2011 law is still in effect; others think that both DNR nurseries were closed. The nursery program is increasing communications to overcome some of the misperceptions.

Badoura current building infrastructure and activities

The current building infrastructure at the Badoura Nursery supports potential growth in seedling production, distribution and sales, and other support activities.

Building	Activities
1-Storage/cones	Stores 2,200 bushels of purchased cones on trays until seeds are extracted
2-Seed extractor/cooler	Extracts seeds and provides cool storage for preservation
3-Cooler storage	Provides seasonal storage for seedlings from fall to spring
4-Distribution/customer pickup	Distribution center for mailing and customer pickup, cooler, some packing
5-Packing shed (packaging)	Houses majority of fieldworkers counting, sorting, grading, pruning, boxing seedling orders
6-Garage	Provides equipment and vehicle space
7-Offices	Provides offices for staff

Seedling production operations

Seedling production at Badoura, explained above, would benefit from expanding packaging shed space, increasing cooler and office space, and paving between buildings. Seedling production and sales is the revenue-generating component of nursery operations.

Seed production operations

Seed acquisition and processing/production are necessary components of nursery operations and also critical to tree improvement activities. Moving forward, the seed *processing* infrastructure at Badoura may not need any more than what is currently in place. On the other hand, the seed kilns are somewhat outdated and improvements should be evaluated on a cost-benefit basis for the programs.

Coordination with Tree Improvement Program and implications

Gen. Andrews Nursery has been the site for tree improvement activities and would be the site for expanded tree improvement activities and seed orchard development, contingent on the availability of funds. The MN DNR's Tree Improvement Program (TIP) operations are funded from the nurseries sale of seed and seedlings. Expansion of TIP initiatives will be limited by the ability of the nurseries program to recover investment costs through the sale of seedlings or seed from improved orchards. The nurseries program purchases and processes seeds for plantings, including improved varieties of seedlings. In the past, the nursery paid private parties to maintain orchards and collect cones, which then would belong to the nursery. An expanded tree improvement program may change the basis for at least some of the seed acquisition over the long term. Seed acquisition and processing by itself does not generate revenues for the nurseries program, but is the origin of planting materials.

Badoura Expansion as Single-Site State Forest Nursery

Background and rationale

A brief recap of how seedlings are harvested in the fall and spring is useful to explain resource needs for Badoura.

> Millions of seedlings are harvested from the ground each spring and fall, and are brought to an assembly and packaging area, where seasonal workers bundle them in preparation for sale or storage. Fall harvested seedlings are packaged and stored in a cooler/freezer for transplantation in the spring. Packaging for fall and spring harvests must be done quickly after the seedlings are removed from the ground or the seedlings will be much less likely to survive or thrive upon transplantation. The work must be done in a short period, and depends on the availability of sufficient workers and physical infrastructure to quickly package and store (in large coolers to preserve viability) large quantities of harvested seedlings.

With the consolidation of operations from two nurseries to one nursery, thirteen fields (including 9–conifers and 4–hardwoods) are now planted at Badoura, whereas ten fields (9–conifers and 1–hardwoods) were planted at Badoura before Andrews was closed. The packaging and storage space needs at Badoura are greater with production of both hardwoods and conifers. The Andrews cooler formerly was filled with hardwoods; now all are at Badoura – an extra one million trees annually. Expansion of buildings would allow packaging and storage for up to 6 to 7 million seedlings annually at Badoura.

The demand for source-identified conservation quality bareroot seedlings has cycles and trends as well as routine and non-routine spikes for natural and man-made events, such as large fires, tree disease, blow-downs and others. In addition, the big-picture health and sustainability of Minnesota forests is being examined in light of climate change, which is altering the ecology of forests. Initiatives to strengthen forest growth and viability would require an increased supply of seed and seedlings well adapted to (sometimes changing) local conditions.

Building infrastructure option and costs

An expansion at Badoura would accommodate current demand as well as increased demand for source-identified conservation grade bareroot seedlings to sustain and improve forest health.[10]

The options are to expand the basic and essential Badoura building infrastructure or to maintain the current infrastructure. The “as is” option incurs no direct costs but involves opportunity costs due to the less efficient capacity to meet potential future demand. Added grading and packaging space and additional cooler/storage capacity are the most basic functionality for efficient

[10] The state forest nursery program does not produce containerized seedlings, and by statute may supply only bareroot seedlings for use on private lands. Minn. Stat. § 89.37, subd. 3. The department does not contemplate producing containerized seedlings.

increased production. Two possible configurations and cost estimates were initially prepared by DNR staff, and the lesser-cost option is presented here.

Features of a proposed expansion include:

- Additional space for grading and packaging seedlings, made necessary by the short time frame for processing after harvest required to maintain health of the seedlings. With more space, more employees can be working simultaneously.
- Increased cooler storage, necessary to maintain health of the seedlings after they are removed from the ground and before they are distributed for transplantation.
- Separation of hardwood processing from conifer processing. Hardwoods are slower to process (fall harvest that goes into the cooler space for spring sale). The major constraints are processing and refrigerated storage capacity for the fall harvest.
- Additional space for packaging materials.
- Additional office space within the production area.

The status of current building space utilization is summarized below.

Building	**Expansion Needs**
1-Storage/cones	Acceptable[11]
2-Seed extractor/cooler	Acceptable[12]
3-Cooler storage	Expansion needed
4-Distribution/customer pickup	Acceptable[13]
5-Packing shed (packaging)	Expansion needed
6-Garage	Satisfactory
7-Offices	Expansion needed

Expansion option

The Nurseries Program currently expects a longer-term stabilized volume at Badoura Nursery of approximately 6 million seedlings harvested annually. In order to fully configure and strengthen Badoura as the single-location seedling production site for the DNR at the stabilized harvest level of up to 6 to 7 million seedlings annually, and to provide for reasonably foreseeable future events, trends and contingencies, the following needs have been identified for the Badoura Nursery:

[11] If seed acquisition and production are expanded, the cones storage space may not be adequate. Current space could use an upgrade.
[12] Seed extractor/cooler would benefit from an upgrade if the program expands. However, this business plan update focuses on seedling production infrastructure and capabilities.
[13] Customer pickup and mailing distribution areas could be modernized and upgraded.

1-Expanded building space for single-location nursery program seedling production

- seedling packaging capacity
- cooler/freezer capacity
- office space for new or expanded building

2-Additional paved roads as needed

The current seedling packaging building capacity would be expanded and a new cooler/freezer building erected for an estimated cost of approximately $1,500,000 (2014-2015).

Badoura packaging addition	40’ x 90’	$ 430,000
Badoura freezer building including office space	40’ x 130’	1,070,000
		$1,500,000

Badoura single-site nursery infrastructure development—packaging shed and cooler/storage building

- The seedling grading/packaging shed expansion would “square” the current L-shaped building, with an addition of 3,600 square feet.
- The seedling cooler/storage building would be located in a central area between the packaging shed and offices, with 5,200 square feet of new space.

Evaluation and conclusions

The rationale for providing additional building space at Badoura is to strengthen its role as the DNR' s sole large-scale source-identified conservation grade bareroot seedling production facility and to equip the facility for future demand and contingencies. With additional space for packaging and cooler/storage, Badoura would more effectively meet current and future demand including current projections and various scenarios for increased demand.

The current packaging building and the freezer/storage building at Badoura accommodate current levels of production. However, if demand requires that Badoura produce larger quantities of seedlings for governmental and private uses, including both hardwoods and conifers, the current infrastructure could limit the ability to respond fully. Expansion of Badoura facilities would both complete the transition from a multi-location nursery program to a single location nursery and provide additional capacity to meet greater demand for source-identified conservation grade bareroot seedlings in large and predictable quantities. With the completed transition to a single-site DNR state forest nursery, Badoura Nursery now has an essential role in the maintenance and growth of Minnesota's future forest resources.

Financial and Operating Information Update

Historical FY2011-13 Nursery Program financial data and operating statistics (FY2013 based on 'best available')

	FY2011	FY2012	FY2013
Revenues and Expenditures			
Revenues			
Seedling Sales [1]	$1,957,090	$1,867,239	$1,801,782
Seed Sales	$271,530	$227,260	$208,000
Other revenues and adjustments[2]	$1,417	$5,058	$4,823
Total revenues	$2,230,037	$2,099,557	$2,014,605
Expenditures[3]			
Salary and other compensation [4]	$1,359,474	$1,071,436	$1,030,098
Other costs [5]	$737,571	$603,255	$537,632
Total expenditures	$2,097,045	$1,674,691	$1,567,730
Revenues minus expenditures	$132,992	$424,866	$446,875
Forest Nursery Account (cash basis)			
Balance start of FY	$1,085,540	$1,013,761	$1,280,199
Cash receipts during FY	$2,025,262	$1,953,692	$1,762,974
Expenditures during FY	$2,097,045	$1,687,254	$1,567,729
Balance end of fiscal year[6]	$1,013,759	$1,280,199	$1,475,444
Net change for FY	($71,781)	$266,438	$195,245
Percent change for FY	-7%	26%	15%
Accounts Receivable			
A/R start of fiscal year [7]	$35,436	$240,211	$646,373
A/R end of fiscal year	$240,211	$646,373	$893,181
Net change in receivables	$204,775	$406,162	$246,808
Percent change in receivables	578%	169%	38%
Seedling sales volume			
Available for sale	--	6,500,000	6,500,000
Public sales (government)	4,516,425	3,416,075	3,497,623
Private sales (non-government)	2,290,075	2,253,150	2,119,182
Total seedling sales volume[8]	6,806,500	5,669,225	5,616,805
Percent change from previous FY	13 %	-17%	-1%
Nursery program personnel by location [9]			
Badoura			
Full-time staff (FTE)	4	4	4
Part-time staff (FTE)	2.8	2.8	2.8
Seasonal staff (FTE)	9.5	9.5	9.5
Gen. Andrews			
Full-time staff (FTE)	3.9	3	0.5
Part-time staff (FTE)	2.2	2.2	0.6
Seasonal staff (FTE)	5	5	3
Nursery program staffing totals	27.4	26.5	20.4

Estimated FY2014-16 Nursery Program financial data and operating statistics

	FY2014	FY2015	FY2016
Revenues and Expenditures			
Revenues			
Seedling Sales [1]	$1,603,641	$1,504,000	$1,760,000
Seed Sales	$260,000	$260,000	$208,000
Other revenues and adjustments[2]	$4,473	$4,473	$4,560
Total revenues	$1,868,114	$1,768,473	$1,972,560
Expenditures[3]			
Salary and other compensation [4]	$1,078,307	$1,227,657	$1,264,487
Other costs [5]	$576,987	$616,799	$622,967
Total expenditures	$1,655,294	$1,844,456	$1,887,184
Revenues minus expenditures	$212,820	($75,983)	$88,376
Forest Nursery Account (cash basis)			
Balance start of FY	$1,475,444	$1,683,791	$1,607,808
Cash receipts during FY	$1,863,641	$1,768,473	$1,972,560
Expenditures during FY	$1,655,294	$1,844,456	$1,887,184
Balance end of fiscal year [6]	$1,683,791	$1,607,808	$1,693,184
Net change for FY	$208,347	($75,983)	$157,599
Percent change for FY	14%	-4.5%	5.3%
Accounts Receivable			
A/R start of fiscal year [7]	$893,181	$252,600	$252,600
A/R end of fiscal year	$252,600	$252,600	$252,600
Net change in receivables	$640,581	$0	$0
Percent change in receivables	-72%	--	--
Seedling sales volume			
Available for sale	5,500,000	5,000,000	6,000,000
Public sales (government)	2,400,000	2,500,000	2,900,000
Private sales (non-government	2,300,000	2,200,000	2,600,000
Total seedling sales volume [8]	4,700,000	4,700,000	5,500,000
Percent change from previous FY	-16%	0%	17%
Nursery program personnel by location [9]			
Badoura			
Full-time staff (FTE)	4.0	5.9	5.9
Part-time staff (FTE)	1.6	3.0	3.0
Seasonal staff (FTE)	13.4	13.4	13.4
Gen. Andrews			
Full-time staff (FTE)	0	0	0
Part-time staff (FTE)	0.5	0	0
Seasonal staff (FTE)	0	0	0
Nursery program staffing totals	18.5	22.3	22.3

Endnotes to financial and statistical tables

[1] Sales. FY2014–16 estimated sales assume an average seedling price $.315 for the Division of Forestry—which included value-added services that the division typically buys. The estimate also includes sales at an average seedling price of $.296 for all purchasers, and $200,000 in seed sales. The sales figures reflect the Forestry Division's FY2013 purchase of 1.72 million seedlings (as of Nov. 30, 2013) and the same amount each year after that. The 6 percent increases raises prices for the Forestry Division to $.334 (FY2013) and $.354 (FY2016). For all other purchases, the prices would be $.314 (FY2014) and $.332 (FY2016). The higher prices for the Forestry Division are based on additional services provided.

[2] Other revenues and adjustments. Other revenues represent interest earned on the nursery account. Interest would average approximately $10,000 annually for the plan period. Adjustments are assumed to be zero for FY2014–FY2016.

[3] Costs/expenditures. Costs (and expenditures) for FY2014 have been budgeted and are based on program costs for FY2013.

[4] Wages and other compensation. For FY2014–16, this line assumes a 4% annual increase in wages and a 1% annual decrease in "other compensation" as employee levels are reduced. The 4% increase is based on MMB methodology which uses step increases that are typically 3.5% plus increases in insurance costs.

[5] Other costs. This includes supplies and expenses, equipment and capital improvements, other costs and adjustments. Supplies and expenses: for FY2014–16, the reductions of this cost reflect the transition to one location, reduced operations and reduced staffing. This line item assumes a 1% increase in the cost for each planned year. Equipment and capital improvements: A 30% decrease in capital equipment needs is assumed in FY2014, when Andrews discontinues seedling production activities. This line item assumes a 1% cost increase for each of FY2015 and FY2016.

[6] Nursery Account Balance breakeven. The Nursery Program is required to be self-sufficient. In future years for which estimates are shown, the fund balance grows slightly year by year. The fund balance at the end of FY2016 is projected to be $1,667,692 based on available information and assumptions noted.

[7] Accounts receivable. Account receivable have increased over the past two years with the loss of 1.8 FTE staffing at Andrews Nursery. Accounts receivable backlogs will be reduced substantially with the hiring of a tree sales assistant at Badoura, beginning in January 2014.

[8] Badoura private sales and Gen. Andrews production. With the repeal of the 2011 legislation that limited sales to private landowners and soil and water control districts, the nursery program projects private seedling sales will remain at 2 million to 2.3 million for each of the plan years FY2014 to FY2016. The last seedling plantings at Andrews occurred in Fall 2010. No further seedling harvesting has occurred after FY2013. Badoura is now the sole location of large-scale DNR seedling production.

[9] Nursery Program staffing level changes. Additional staff will be hired at Badoura in the near future. Although not finalized, the new staffing would include an assistant office manager (0.9 FTE), two equipment operators (0.66 FTE each – 8 month positions) and an assistant supervisor (1.0 FTE) for FY2015.

DATE: February 6, 2014

LEGISLATIVE REPORT – Cost of Preparation

NAME OF LEGISLATIVE REPORT – _Minnesota Department of Natural Resources, Division of Forestry—2014 State Forest Nurseries Business Plan Update

Based on: _Legislatively Mandated Report

Minnesota Statute Reference: Minnesota Session Laws of 2013, Regular Session; chapter 114 Environment, Natural Resources, and Agriculture Finance and Policy Bill, section 4, subdivision 4. "Forest Management."; and as referenced Minnesota Session Laws 2011, First Special Session chapter 2, article 4, section 30.

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Description of Cost	Further explanation if necessary	Amount
Staff Time	48 hours @ $50.00/hr	$2,400
Other Purchased Services: MMB Management Analysis Group	Service Level Agreement	$15,000
	TOTAL TO PREPARE REPORT (*Note: Right click on amount cell and choose update to complete*)	$17,400