Improving Minnesota's White Pine[1]

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Stine, R.A.. 1997. Improving Minnesota's White Pine. In: Landis, T.D.; Thompson, J.R., tech. coords. National Proceedings, Forest and Conservation Nursery Associations. Gen. Tech. Rep. PNW-GTR-419. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific North west Research Station: 34-37. Available at: http://www.fcnanet.org/proceedings/1997/stine.pdf

Abstract-Interest in white pine has been growing in Minnesota during the last decade, leading to a recent task force report containing comprehensive regeneration strategies and recommendations. One recommendation is that the number of white pine trees and the number of acres with young white pine trees should be doubled within the next seven years. Also, the number of acres in white pine cover type should be doubled within the next 50 years. In 1997, the Minnesota legislature appropriated $1.12 million to begin implementing this recommendation. The appropriation will be divided among private, county, and Minnesota Department of Natural Resources (DNR) lands.

A significant amount of the funding will be spent on regeneration practices, including planting of seedlings. Planting will occur in a variety of contexts, ranging from pure white pine to mixed species plantings. On county and state lands, more than 1,700 acres will be planted with white pine in spring, 1998. More than 1.2 million seedlings are needed to complete the planting program, although there are not that many seedlings growing in Minnesota ready for outplanting in 1998. The number of acres to be planted or white pine seedlings needed on private lands is not known at this time.

A second recommendation calls for research on deer predation, regeneration systems, genetic improvement, and blister rust management. The legislature appropriated $380,000 for such research. Genetic research is emphasizing two areas. One is developing material that is genetically resistant to blister rust, since there is currently no eastern white pine material with proven blister rust resistance. A second project is developing material that is faster growing, particularly under conditions of partial shade. It will be used in combination with silvicultural systems that help avoid blister rust.

Things are looking up for white pine. Interest levels are high, planting programs are expanding, and funding is available for some much needed research. To have any long term impact, the current level of enthusiasm needs to be sustained over an extended period. Perhaps the best way to do that is to show positive results from the new initiatives through a concerted effort by everyone involved.

INTRODUCTION

Interest in white pine has been growing in Minnesota during the last decade. Along the way, a symposium was held that attracted more than 600 participants, harvesting was curtailed, comprehensive regeneration strategies and recommendations were developed, and finally, funding was made available for a variety of activities related to growing white pine.

These developments represent a significant shift in attitude about growing white pine. Before the mid- 1980s, attention focused primarily on the difficulties in growing white pine, including deer browse, white pine weevil (*Pissodes strobi*), and white pine blister rust (*Cronartium ribicola*). The general consensus was that growing white pine, for the most part, was simply not worth the effort.

However, a few voices in the wilderness continued to extol the virtues of white pine and scientific evidence about how to grow it became more available. Starting with a small group of people talking about genetic improvement possibilities for the species, interest continued

to expand. It culminated with the 1992 White Pine Symposium in Duluth, attracting more than 600 participants. The Symposium remains perhaps the largest regional gathering of natural resource professionals ever held in Minnesota.

The Symposium acted as a catalyst for individuals and organizations to put more effort into growing and managing white pine. Planting, pruning, and deer browse protection all increased. Genetic improvement programs to develop blister rust resistant material and faster growing material intensified. Progress was made in all areas, but some citizens were still concerned about the number of white pine trees being harvested. In 1996, legislation was introduced to place a moratorium on white pine harvesting on state-owned lands until the Minnesota DNR developed a management plan for the species.

In response, the DNR formed a work group to develop regeneration strategies for white pine. The work group developed a set of recommendations, summarized below (State of Minnesota 1996):

1. Appropriate silvicultural systems, including long term monitoring and care, should be used to ensure retention and regeneration of white pine on suitable sites throughout its pre-settlement range in Minnesota.
2. The number of white pine trees and the number of acres with young white pine trees should be doubled within the next seven years. The number of acres in white pine cover type should be doubled within the next 50 years.
3. Over the long term, management activities should increase the acreage and spatial dispersion of older white pine stands. They should also create an age distribution of white pine stands that is more balanced than the current distribution.
4. Harvesting activities should be planned and conducted within the context of silvicultural systems designed to increase the growth and/or regeneration of white pine.
5. Critical research in the areas of deer predation, regeneration systems, genetic improvement, and blister rust management should be conducted and reported as quickly as possible.
6. Educational materials and programs that explain and promote white pine management should be developed and distributed to resource managers and private land owners.
7. Site level ecological classification systems should be completed because of their usefulness in identifying suitable white pine sites.
8. Best Management Practices (BMP) type audits should be used to evaluate the success of specific regeneration activities. Forest Inventory and Analysis data should be used to evaluate the accomplishment of goals related to the abundance, age distribution, and spatial dispersion of white pine.
9. Budgeting and funding decisions should support activities that help accomplish the goals stated above.

NEW FUNDING

In 1997, the Minnesota legislature appropriated $1.5 million to begin implementing the recommendations. The appropriation divides the funds among various land owner groups and

provides funding for specific research, as shown below.

$600,000 the first year and $600,000 the second year are for programs and practices on state, county, and private lands to regenerate and protect Minnesota's white pine. Up to $280,000 of the appropriation in each year may be used by the commissioner to provide 50 percent matching funds to implement cultural practices for white pine management on nonindustrial, private forest lands at rates specified in the Minnesota stewardship incentives program manual. Up to $150,000 of the appropriation in each year may be used by the commissioner to provide funds to implement cultural practices for white pine management on county-administered lands through grant agreements with individual counties, with priorities for areas that experienced wind damage in July 1995. $40,000 each year is for a study of the natural regeneration process of white pine. The remainder of the funds in each fiscal year will be available to the commissioner for white pine regeneration and protection on department-administered lands. $150,000 the first year and $150,000 the second year is appropriated to the commissioner for a grant to the University of Minnesota's College of Natural Resources for research to reduce the impact of blister rust on Minnesota's white pine.

The DNR's final fiscal year 1998 allocation of funds is shown below. Some funding may shift from DNR lands to private lands in 1999 (Table 1).

Table 1.

Private Lands	$190,000
County Lands	$150,000
DNR Lands	$220,000
Research (Natural Resources)	$40,000
Research (Blister Rust)	$150,000
Total	$750,000

A significant amount of the funding will be spent on regeneration practices, including planting of seedlings. Planting will occur in a variety of contexts, ranging from pure white pine to mixed species plantings. On county and state lands, more than 1,700 acres will be planted with white pine in spring, 1998 using the following methods (Table 2):

Table 2.

Planting where white pine will be the main tree species	754 acres
Planting the groups of white pine on favorable sites within other upland conifer plantings	227 acres
Planting white pine under existing tree cover	330 acres
Including white pine in mixed species plantings where white pine will not be the main species	399 acres
Total	1,710 acres

More than 1.2 million seedlings are needed to complete the planting program, including 273,000 on county lands, 723,000 bareroot seedlings on state land, and 209,000 container seedlings, also on state land. The number of acres to be planted or white pine seedlings needed on private lands is not known at this time. Of interest to nursery growers is that there are not 1.2 million seedlings growing in Minnesota that will be ready for outplanting in 1998.

GENETIC RESEARCH

With a fairly sizable expansion of white pine planting, there is increased opportunity to plant genetically improved material. The Minnesota Tree Improvement Cooperative has two projects underway that will provide such material. One is concentrating on developing material that is genetically resistant to blister rust. A second project is developing material that is faster growing, particularly under conditions of partial shade.

Blister rust resistance

At this time, there is no eastern white pine material with proven blister rust resistance. A test of clones in the USDA Forest Service Oconto River seed orchard is less than a decade old, and is thus too young to provide definite results. A test of 800 families planted near Tofte, Minnesota in the early 1970s has yielded some trees without blister rust, but almost no resistance across members of the same family was found.

About 200 rust-free, high-vigor trees from Tofte were grafted and placed in a breeding arboretum at the Cloquet Forestry Center. They will be crossed with one another, and the resulting full-sib families will be screened for rust resistance. A significant portion of the research funding provided by the Minnesota legislature is supporting this breeding arboretum and research on early flower induction and early screening techniques. It is estimated that three or four generations of breeding and selection are needed to develop genetically resistant white pine.

In the interim, the Minnesota DNR and St. Louis County established seed orchards that include Minnesota sources from the USDA Forest Service Oconto River seed orchard. The seed from these orchards may have rust resistance, but it has not yet been documented. These orchards are just starting to produce seed, and will serve as a source of seed until the more

intensive breeding and selection work on the Tofte material can be completed.

Increased growth rate

Genetically resistant white pine will be very useful, but there are also management techniques that can be used to avoid blister rust, and several other pests. Fast growing trees have several advantages when managing white pine. In an understory situation they may be able to compensate somewhat for the loss of growth normally associated with partial shade. Faster growing seedlings are likely to grow beyond deer browse problems sooner than slower growing seedlings. Finally, pathological pruning can begin sooner and trees can be pruned up to nine feet (the level below which most infection occurs) more quickly on faster growing trees than on slower growing ones.

Using material from approximately 50 trees selected for good growth, Itasca County and Rajala Companies are establishing a clonal seed orchard. Once it begins flowering, a progeny test will be conducted to identify the fastest growing clones. Additional breeding, testing, and selection work will follow.

CONCLUSION

Things are looking up for white pine right now. Interest levels are high, planting programs are expanding, and funding is available for some much needed research. To have any long term impact, the current level of enthusiasm needs to be sustained over an extended period. Perhaps the best way to do that is to show positive results from the new initiatives. For the nursery industry, that means growing high quality white pine nursery stock using the best seed sources available. The Minnesota Tree Improvement Cooperative is committed to working with nursery growers to help make this happen.

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LITERATURE CITED

For more detailed information about white pine, readers are referred to the following publications:

Proceedings, White Pine Symposium: History, Ecology, Policy and Management. Duluth, MN. September 16-18, 1992. Stine, R. A. and M. J. Baughman (eds.). 202pp.

Minnesota's White Pine, Now and for the Future. A report by the White Pine Regeneration Strategies Work Group. Dec. 19, 1996. State of Minnesota, Department of Natural Resources. 66pp.

Recommendations to Improve Public Involvement in White Pine Timber Management Planning on Minnesota DNR Timber Lands. A report by the White Pine Timber Management Planning Public Involvement Process Work Group. August 15, 1997. State of Minnesota, Department of Natural Resources.