

Restoration Guidance for Trees Species found in Minnesota's Coastal Forest

Introduction

Knowing what trees should be planted in the coastal forest depends on knowledge of the forest types found in this area. This information can be found in the [Native Plant Communities or Minnesota: The Laurentian Mixed Forest Province](#). This document is a consolidation of information from the documents, [Desired future condition and Restoration Guidance for the North Shore Till Plain](#), and [Desired future Condition and Restoration Guidance for the Split Rock Till Plain](#). These documents were authored by the North Shore Forest Collaborative Technical Committee. The till plains are ecological subdivisions known as Land Type Associations (LTA's). They are divided at Beaver Bay. The Split Rock Till Plain is from Beaver Bay to near Duluth and the North Shore Till Plain between Beaver Bay and Grand Portage. They form a strip of land 1 to 5 miles wide with an averaging width of 3 miles wide inland from Lake Superior.

Climate change may shift the mix of native species to different proportions than exist today. For example, some very rare species or species not present in the coastal forest today may be appropriate in the future. Rare and uncommon native plants discovered should be considered high priority for protective measures.

For ease of use the following guidance is presented for the entire shore rather than for the north and south till plain areas. A brief description of restoration efforts needed in Northern Hardwood and Mixed (hardwood and conifer) Forests is presented, followed by recommendations for tree species.

Knowing what species to plant is helpful however knowing the specific site conditions each tree needs to grow and thrive will also be required. Specifically, what site is best suited for the growth of these trees. This requires knowledge of the tree, soils, soil moisture, aspect, light requirements, ability to survive competition and other microsite factors. Matching the tree to the site will become increasingly important as the climate warms. The guidance for planting site selection can come from the North Shore Forest Collaborative Site Visit Advisor or other natural resource professionals.

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Page 1 of 7

Species Recommendations by Forest Type: Hardwood or Mixed Forest

Hardwood Forests

These are forests typically dominated by maple or are forests becoming maple dominated. They occur in the higher elevations of the till plain. These forests had a more diverse mix of tree species listed below. Encourage a mix of species by seedling, planting and encouraging natural regeneration. Natural regeneration can be encouraged by scarifying the soil and protecting the seedlings that sprout. Use existing canopy gaps or create canopy gaps as needed. Protect newly planted trees and wild seedlings with fencing. Restoration objectives should result in an increased frequency of desired species either as individual trees, small groups of trees, or small to medium-sized patches of trees.

High priority species to encourage in hardwood forests include the following conifer and hardwood species.

Conifer Tree Species

White pine (*Pinus strobus*), white spruce (*Picea glauca*), and white cedar (*Thuja occidentalis*).

Hardwood Tree Species

Yellow birch (*Betula alleghaniensis*), paper birch (*Betula papyrifera*), and black ash (*Fraxinus nigra*). As a minor or infrequent component, encourage American elm (*Ulmus americana*), ironwood (*Ostrya virginiana*), basswood (*Tilia americana*), bur oak (*Quercus macrocarpa*) and red oak (*Quercus rubra*). Maples need not be protected and other species such as black ash and paper birch may be protected where desired.

Mixed Forests

These forests occupy most of the lakeside landscape. Much of this area regenerated to aspen and birch following major fires that occurred 90 or more years ago. Fires of the scale that occurred in the early 1900's were not the norm for this forest type. Prior to the logging era and fires this area was once dominated by cedar, pine, spruce and a mix of other tree species as listed below. Restoration objectives should result in an increased frequency of priority species as individual trees, small groups of trees, and small to medium-sized patches. Restore and maintain a mix of species by seeding, planting, and encouraging natural regeneration. Natural regeneration can be encouraged by scarifying the soil and protecting the seedlings that sprout. Fencing is needed for all species except white spruce to protect them from deer and hare. With white spruce, an increased frequency of planting and protection should not be needed.

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High priority conifer and hardwood species to encourage in mixed forests include:

Conifer Tree Species

White cedar, white pine, white spruce, and tamarack (*Larix laricina*) are the priority conifer species for restoration in mixed forest.

Hardwood Tree Species

Yellow birch, and American elm, black ash, red oak and bur oak are the priority hardwood species for restoration in the mixed forest. Black ash and green ash (*Fraxinus pennsylvanica*) will likely need attention if, and when the emerald ash borer is controlled.

Other Tree Species for the mixed forest

The following should be considered for planting as a minor stand component in appropriate locations: basswood, ironwood, paper birch, heart-leaf birch (*Betula cordifolia*), black ash, green ash, red maple (*Acer rubrum*), sugar maple (*Acer saccharum*), jack pine (*Pinus banksiana*), red pine (*Pinus resinosa*), and Canada yew (*Taxus canadensis*).

Other species will be included as we develop better knowledge of how best to maintain a diverse forest as the climate changes. We seek large patches of predominantly mature, diverse forest across the coastal forest landscape that have potential for growth and diversity of these native plant communities.

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Species Recommendations for all Forest Types

- White cedar is the highest priority species north of Beaver Bay and third highest priority south of Beaver Bay. North of Beaver Bay more emphasis for planting and maintenance should be focused on white cedar, south of Silver Bay more emphasis for planting and maintenance should be focused on white pine. White cedar can be maintained as the climate warms in lowlands and on uplands with groundwater seeps and subsurface drainage. Decimating effects from herbivory can be modified by protection. It is desired to increase the amount of white cedar on most upland sites, and to restore or maintain its presence on lowland sites.
- White pine is the highest priority species to manage for increase south of Beaver Bay and 3rd highest priority north of Beaver Bay. Its numbers and distribution have decreased markedly from the 1850's. Planting will increase abundance on most sites. Protect planted and naturally regenerated seedlings with fencing. White pine should occur as individuals, small clumps, or small patches. Prune lower branches to increase air flow and to discourage blister rust. White pine habitat and growth is predicted to increase with a warming climate, although the future impact of white pine blister rust is not known. Therefore, if available, plant white pine that has been selected for resistance to blister rust.
- White spruce is the second highest priority species for occurrence, not management, in the coastal forest. Planting and protection are not typically needed where mature (20 plus year old trees) will provide a seed source. Plant white spruce in appropriate areas where it is currently lacking. Also, white spruce is less prone to damage by deer and hare. White spruce habitat and growth is predicted to decline with a warming climate. While climate change may reduce its vigor, it should survive well enough to persist in the native species mix. Its "second highest priority" status relates to desired frequency. White spruce should occur as individuals and small groups, and smaller stands. It may range between uncommon to abundant.
- Tamarack and yellow birch are the fourth highest priority species to manage for restoration. Tamarack is well suited to wetter sites. Though both do well in deeper soils. Restoration efforts will include planting and protection. Natural regeneration can be encouraged by exposing bare mineral soil in a process known as scarification. Tamarack and yellow birch should occur as clumps or small patches on suitable sites. See below for more on yellow birch.

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Page 4 of 7

- Balsam fir (*Abies balsamea*) does not need restorative management. Balsam fir is ubiquitous and will remain so even after extensive areas have been killed by spruce budworm. Balsam fir seeds survive in the soil, germinate readily, and can survive in dense shade. Balsam fir may decline in frequency as the climate warms.
- Balsam poplar (*Populus balsamifera*) also does not need restorative management. Balsam poplar is best adapted to wetter sites and can be an aggressive species keeping other species from regenerating. Balsam poplar may decline in frequency as the climate warms.
- Paper birch increased in area significantly after fires along the North Shore of Lake Superior during the early 1900's. Paper birch is expected to decline on most sites due to climate warming, age, drought, and insects. On most sites paper birch will stump sprout so there is little need to plant it. Plant other native species on sites where paper birch has declined. Where paper birch is desirable, for example for aesthetic or cultural reasons, establish it on moist, not wet, sites. On these sites paper birch will thrive and attain the size needed for quality birch bark. Plant it if there is an appropriate gap in the canopy or encourage birch regeneration near mature birch trees by scarifying the soil. Paper birch should occur as individuals, clumps, and may dominate small to medium sized patches.
- Yellow birch can be found on moist and wetter inclusions in the mixed forest and hardwood forests. Either plant this species in canopy gaps on appropriate sites or scarify the soil in moderate to full sun near mature trees. This will provide a suitable site for yellow birch regeneration. Yellow birch should occur as individuals or groups on favorable sites. Protect planted and natural regeneration of this species with fencing.
- Heart-leaved birch should occur as individuals, clumps, and may dominate small to medium sized patches. Heart-leaved birch is a distinct species from paper birch. Treat heart-leaved birch as under paper birch above. Planting and protection for this species may be desired for aesthetic, and ecological purposes.
- Quaking aspen (*Populus tremuloides*) should be managed to reduce its dominance. Leaving single stems or small clumps of aspen to "succeed" out their existence while diverse stands are developed around them is desired. In forest stands dominated by aspen planting a diversity of species in gaps, protecting priority tree species that are regenerating will help transition aspen stands to mixed forest or hardwood forest. Aspen may occur as individuals, or in small groups. Small to medium aspen patches should be targeted for diversity planting to reduce aspen dominance.

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- American elm has declined since the introduction of Dutch-elm disease to Minnesota in the 1960's. American elm was found on many sites in the coastal forests area. It does well on moist sites and wetter inclusions, but not on permanently saturated sites. American elm should occur as individuals, or small groups on favorable sites. American elm restoration efforts may include planting seedlings from survival parents that are likely to contain some tolerance to Dutch elm disease.
- Basswood should be maintained where it occurs. It may be among those species encouraged for expansion depending on its reaction to climate change. It may be planted as a minor component in better soils particularly in the Split Rock Till Plain south of Beaver Bay.
- Jack pine is a minor component of the coastal forest. It should be maintained in scattered, ecologically appropriate locations, usually on sites of drier, shallow soil, and exposed bedrock. Protection of trees in small areas is sufficient for restoration efforts.
- Red pine was a small component of the coastal forest. Red pine may be maintained where it occurs. It should not be planted in high numbers that create monotypic stands. It may be planted as a very scattered component of other conifer stands in deeper well drained sites. Existing red pine stands should be diversified with species appropriate for the site.
- Black ash and green ash should be maintained to the extent possible. Emerald ash borer has not yet been found along the North Shore. Once established, emerald ash borer is expected to kill nearly all ash. Black ash occurs as individuals or in stands. There is research into resistance breeding. Identifying lingering black ash after EAB survives will be important. On sites where it is found, monitor these sites to observe the growth, decline and regeneration of this species¹.
- Planting alternate species is recommended. Species that might fill the black ash niche include tamarack, bur oak, northern white cedar, and balsam poplar.
- Sugar maple is not in need of restoration. It has and is expanding its range and dominance throughout upland sites. A warming climate is predicted to further increase its occurrence and growth. Diversify sugar maple stands by fostering planting the species recommended above as suited to the site. In addition to several of the species included above, planting

¹ Carolyn Pike, USDA Forest Service

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Page 6 of 7

maple as a minor component may be recommended for restoring balsam stands killed by spruce budworm.

- Red maple is likely to increase through natural regeneration. Red maple can be aggressive (begin to dominate a site). Planting it is generally not recommended but it may be planted to increase species diversity where other options are limited or unsuccessful.
- Black spruce (*Picea mariana*) is often found with white spruce. It is also typical on wet sites where tamarack and white cedar are often co-inhabitants. It is an important native conifer. On sites where it is found, monitor these sites to observe the growth, decline and regeneration of this species.
- Bur oak and ironwood may be among those species that expand along the North Shore as a result of climate warming. Bur oak has been observed to be naturally seeding on private property along the North Shore. Both species will grow in upland sites. Bur oak will also grow in mixed, hardwood and wet forests. Fence both bur oak and ironwood seedlings when they are found. As a minor component, either may be planted to diversify the hardwood or mixed forests.

*The bur oak found in Carlton, St Louis, Lake and Cook Counties is a naturally occurring variety of bur oak, known as *Quercus macrocarpa* var. *oliviformis*. This small seeded variety is found between Duluth and Two Harbors as well as in scattered sites along the shore. Bur oak in most of its range has an acorn 1 to 2 inches in diameter as compared to the *oliviformis* variety which is 3/8 to 1 inch in diameter. Planting the *oliviformis* variety from local seed sources is recommended. Click to see [Historic context and the range of bur oak](#).*

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