Conservation Activity/Forest Stewardship Plan

Stewardship FOREST

Prepared for:
Viker Enterprises, Inc.
% Harris W. Viker
462 Woodhill Drive
Roseville, Minnesota 55113-2348

August 1, 2016

Phone: (651) 483-1741

Legal description of property:
S½ SE¼ and SE¼ SW¼ of Section 10; N½, E¼ NW¼ SE¼ and E½ SE¼ of Section 15; E½ NE¼ of Section 16; Government Lot 1, S½ NE¼, NE¼ NE¼, N½ SE¼, SE¼ SE¼, NE¼ SW¼, and SE¼ NW¼ of Section 22; E½ NE¼ and S½ NW¼ of Section 23 in Township 144N, Range 40W (LaGarde Township), Mahnomen County.

Total acreage: 1,136.4

Stewardship acres:* 907.0

This Conservation Activity/Forest Stewardship Plan was designed to help guide the management activities of the natural resources on your property. The plan is based on your goals in accord with the surrounding environment. The project recommendations are for your consideration. The estimates of timber volume are provided to assist with the planning process – a detailed timber cruise should be completed if any timber is sold....

The goals you identified for managing your property are:

Extremely important -

- To maintain the current forest types.
- To feature the appearance of big trees.
- To reduce visual disturbance and slash from management treatments.

Very important -

- To enhance the habitat for variety of wildlife species.
- To permanently preserve the upland openings.
- To comply with Minnesota's site-level forest management guidelines (FMGs) to protect the wetlands and water quality.
- To realize periodic income from wood production.
- To maintain eligibility for enrollment in the Sustainable Forest Incentive Act (SFIA) payment program.

* Stewardship acreage includes only areas able or intended to grow trees.
Estimated SFIA acreage: 907; 2c acreage: 907. DNR-Forestry RAN: 111.

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(218) 935-2561

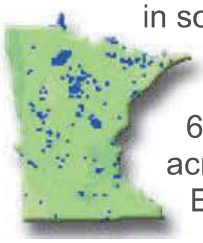
(8:00 am - 4:30 pm, weekdays)

Plan preparer's signature:

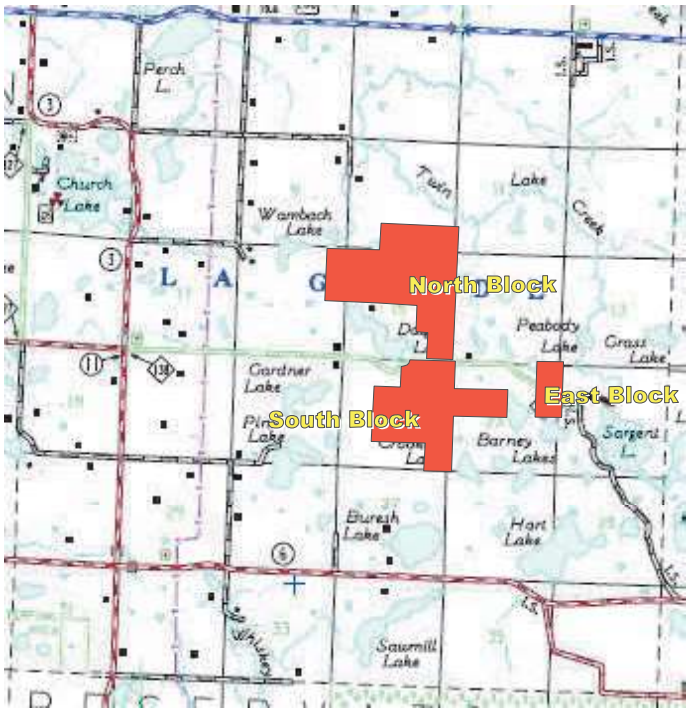
Landowner's signature:

DC's signature:

General Property Description: *Where is it and What's There?*



This plan is an update one prepared by Northern Forestry in 2005 for this large forest property in south-central Mahnomen County. The property, owned by the family for decades, is primarily found in one contiguous block bisected by a county road and an 80-acre parcel separated from the rest by one-quarter mile. For the purpose of this plan, the 620 acres north of the county road will be referred to as the North Block, the 436.4 acres south of the road as the South Block, and the 80 acres bisected by the road as the East Block (see the map below).



Approximate location of management blocks MnDOT

Several factors make a new plan timely: natural succession dictated the updating of some of the covertypes; new ecological native plant community classification information is available; more recently flown aerial photography provides more precise delineation of the types; online access to older aerial photography (including from 1939) provides an improved historical perspective of the property; and, finally, maintaining eligibility for the Sustainable Forest Incentive Act program requires a plan that is 10 years old or less (907 acres were enrolled in the SFIA in 2005).

The property is located about 11 miles southeast of the city of Mahnomen. To reach the property from the intersection of US Highway 59 and State Highway 200 in Mahnomen, travel southeast on Highway 59 for three miles to County Road 11 (250th Street), then east seven miles to where it becomes gravel County Road 138, then continue east about two and one-half miles to near the northwestern corner of the South Block. The southwestern corner of the North Block is about one-third mile farther east, and the western boundary of the East Block is about one and one-third miles farther east.

Access to the southern 40 acres of the North Block is via a gated road that appears well maintained. This road exits the property on the west and crosses about one-half mile of the neighbor's property before entering the western portion of the North Block (a formal access agreement with this landowner would be beneficial for long-term management of the property). A system of well maintained roads provides excellent dry weather access to much of the western portion of the North Block. The northeastern portion of this block has some old logging trails that are currently partially being maintained as four-wheeler trails for hunting.

Access to the South Block is via a gated logging road. The main portion of the road accesses the western and southern portions of this block. Much of this old logging road is currently being maintained as a four-wheeler trail for hunting. Small flowages overflow the road in portions. Additional non-maintained logging roads are found throughout the property. In addition, on the eastern side of the South Block is a well maintained farm road that crosses the property from the north to the south to provide access for farm work to the south. Some upgrading will be

necessary to provide access to the eastern portion of the property from the existing internal trail system. With the addition of some culverts and gravel, much of the property would be accessible year-round, except for the wettest portions. State and county regulations apply to any movement of soil in or around a wetland.

The East Block has a partially overgrown trail that, with some clearing, could provide good access to much of the property. This is a hilly property that contains a significant slope to the top of a ridge. A small log landing is located in the northwestern corner of the eighty.

The property boundaries do not appear to be clearly marked. The previous plan focused on the overall timber distribution and basic ecology. This plan, which involved more data collection, provides more details on the tree species' size, distribution, and condition. Some forest types have been combined and type boundaries changed to reflect the new information. Overall, the property contains a mixture of northern hardwood poletimber with pockets of sugar maple and quaking aspen saplings and small poletimber. The predominant tree species have shifted over the years from aspen to sugar maple and basswood with significant areas of northern red and bur oak. There are also some older quaking aspen, paper birch, black and green ash, and ironwood trees. Many of the older aspen and northern hardwood trees are near or past maturity. The basswoods, in particular, have suffered significant top dieback from drought stress. Most of the older aspen was harvested 21 to 27 years ago. The majority of the younger trees on the property are now sugar maple and patches with a significant component of quaking aspen. Much of the aspen that sprouted after the harvesting was suppressed or killed by shade from the residual overstory hardwoods, providing favorable conditions for the shade-loving sugar maple and ironwood trees. The non-timber-producing ironwood is somewhat common. Only a little oak, birch, ash, or basswood regeneration is present.

Other important components are the numerous lowland pockets, many of which have been flooded over the past 30 years by beaver activity. Several woodland ponds or small lakes are found totally or partially within the property, providing many options for recreation and wildlife habitat enhancement. However, many of the lowlands that held open water 10 years ago are now marshes or sedge meadows — much of the flooded timber and brush is now gone.

Heron rookery in North Block NFI

The wetlands of this property provide habitat for an extensive variety of waterfowl. The great blue heron rookery in the northeastern corner of the North Block, while greatly reduced in suitable standing dead trees since the previous plan was developed, still retains a few nests. Many species of waterfowl and avian predators live on and around the property. More trumpeter swans and Canada geese were observed than in the past.

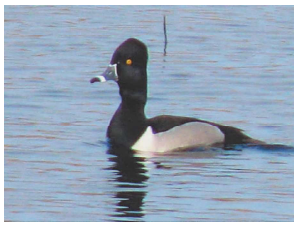
The lakes, ponds, marshes, and county road and right-of-way are not capable of, or intended for forest production, so are not included in the Stewardship program acreage.

Landscape Region: *How Does Your Forest Fit In?*

Minnesota is ecologically rather unique. It contains three major vegetative areas: the mixed boreal conifer region of the northeast, the former prairielands of the southeast and far west, and the band of broadleaf forest in between. These "biomes" have been further divided into smaller

units based on glaciation, bedrock formations, climate, topography, and vegetation. These smaller units, or subsections, provide a common basis for predicting plant succession and understanding ecological relationships.

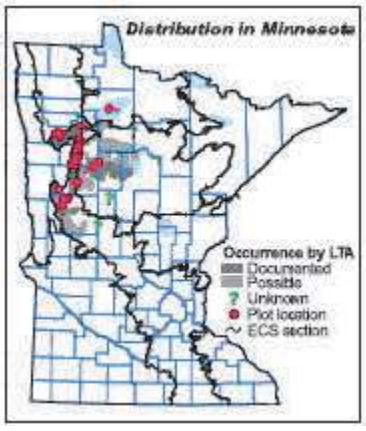
Your property is located in the **Hardwood Hills** subsection (see the ★ on the map of the "Upper Three Levels of ECS for Minnesota" in the vinyl plan cover holder for the approximate location). One major landscape concern is the loss of wetlands and/or restoration of wetlands. This subsection had thousands of acres of wetlands before settlement that were heavily used by waterfowl. Waterfowl numbers are very low presently, so a major emphasis is to restore their habitat. Other concerns are lakeshore development and water quality issues. For more information about this landscape area, see the handout in the "Ecology" section of your reference binder.



Ring-necked duck NFI

The subsections are further divided into ecological native plant communities. A native plant community is a group of plants that interact with each other and with their environment in ways not greatly altered by modern human activity or by introduced organisms. These groups of plants form recognizable units, such as oak savannas, pine forests, or marshes, that tend to repeat over space and time. Native plant communities are classified and described by considering vegetation, hydrology, landforms, soils, and natural disturbance regimes. Examples of natural disturbances include wildfires, droughts, windstorms, and floods.

Your property is in the **Central Mesic Hardwood Forest - Western** (MHc37). This native plant community is represented by mesic hardwood forests dominated by sugar maple and basswood on well-drained loamy soils on rolling to hummocky stagnation moraines. In its natural state the groundcover is variable, with large-flowered bellwort and Pennsylvania sedge the most important species. Other common species include early meadow-rue, zigzag goldenrod, wild sarsaparilla, rugulose or yellow violets, and rattlesnake fern. Overall, groundlayer species richness is considerably lower than in other central and southern mesic hardwood forest classes in Minnesota. The shrub layer is typically interrupted to continuous (50 to 100% cover), with abundant sugar maple saplings. Ironwood, chokecherry, and leatherwood are also common. The subcanopy is patchy to continuous (25 to 100% cover) and dominated by sugar maple, often with ironwood and basswood. The canopy is interrupted to continuous (50 to 100% cover), usually dominated by sugar maple and basswood, often with paper birch and less frequently with quaking aspen, northern red oak, bur oak, American elm, or ironwood. In rare instances, the canopy is dominated by northern red oak or quaking aspen.



In the past, catastrophic disturbances were rare in MHc37. An analysis of Public Land Survey records indicates that the rotation of catastrophic fires was about 515 years, and the rotation of catastrophic windthrow was in excess of 1,000 years. Events that result in partial loss of the tree canopy, especially light surface fires, were much more common, with an estimated rotation of about 70 years. Based on the historic composition and age structure of these forests, MHc37 had three growth stages.

0-55 years—Young forests recovering from fire, dominated by quaking aspen mixed with paper birch, American elm, basswood, red oak, and sugar maple.

55-135 years—Mature forests consisting of sugar maple mixed with many other trees, including old quaking aspen, paper birch, American elm, basswood, some bur oak, and minor amounts of white spruce.

>135 years—Old forests, similar in composition to mature forests, but with less sugar maple and more white spruce. (Although white spruce was not recorded in samples from modern forests, its range in Minnesota overlaps at least partially with the range of MHc37. White spruce may be absent from modern samples because of bias in plot placement; it is also possible that white spruce was more important in the community in the past.)

This information provides a broad guideline for the potential near-future conditions of the forests on the parcels. Many factors can alter the path which a forest takes over time. Destructive winds, drought, flooding, insect attack, nonnative plants, and natural and introduced diseases can change species progression. At times, nature's course might not fulfill a landowner's goals for his or her property and additional management might be desirable. For more information on Minnesota's native plant communities, visit the DNR's web page at www.dnr.state.mn.us/npc /uplandforest.

Soils and Topography: *The Basis for Woodland Productivity*

Forest soil profile NFI

The topography is moderately to somewhat steeply hilly (see the topographical maps in the front cover pocket of your binder). Portions of the property rise steeply from the lowlands or have steep hillsides. Except for the sharp drops to the lowlands, the hills do not present a significant barrier to most forest management activities. Roads and trails should be carefully planned to avoid erosion.

The upland soil is well drained Naytahwaush loam (718B, C, and E) — which has excellent characteristics for growth of northern hardwoods. This soil has a firm, clay-loam subsoil which is capable of perching snowmelt and rainfall. The soil is subject to severe rutting and compaction during wet periods. The shallow valleys, some of which contain temporary streams, overlay a poorly drained clay loam that is very susceptible to rutting and erosion. Overall, erosion potential is moderate. Aspen and basswood are very productive on Naytahwaush. White spruce is moderately productive, but not naturally common in this area. Vegetative competition and planted tree seedling mortality are severe. Eastern white pine, white spruce, and northern red oak are suggested for reforestation purposes.

The pockets of lowland hardwoods contain somewhat poorly drained Mahkonce silt loam (737) or poorly drained Auganaush loam (767). Both of these soils are subject to rutting and compaction during wet periods. Both are rated as moderately productive for growing black ash — a lowland hardwood species prevalent in these pockets. Because of the potential for frost action, special construction and maintenance of logging roads are needed. Timber harvesting should be limited to periods when the ground is solidly frozen.

Ponded mucks cover most of the lowland basins, which have poor or no tree growth — these muck soils are usually water saturated year-round, limiting the type and growth of tree species. On your property, most of these areas are listed as very poorly drained Haslie, Seelyville, and Cathro ponded muck (1113). Black ash is moderately productive on Seelyeville muck (the predicted site index is 55 feet).

Temporary, or better yet permanent, fords should be used to cross the intermittent streams on the property. Rock crossings are preferred to culverts for permanent crossings because they require less maintenance and are not subject to plugging by beavers. Temporary winter access logging roads that cross wetlands are not subject to wetland permitting procedures (however, the roads must be abandoned after logging to comply with the wetland regulations). Any new permanent road building within a wetland is regulated by county and state regulations. Permits might be required from various government agencies. Also, properties enrolled in the Sustainable Forest Incentive Act must abide by the site-level forest management guidelines (FMGs) developed by the Minnesota Forest Resources Council (available on the Web at http://mn.gov/frc/forest-management-guidelines.html).

When key to management options, the soil type is noted in the descriptions of the forest types that follow. The number following the soil series name refers to the soils map found in the "Soil" section of the accompanying three-ring binder. The letters refer to the percentage of slope commonly found in these soils. For example, "B" usually designates a 2 to 8 percent slope, "C" is 8 to 15 percent, and "E" is 15 to 30 percent. Contact Dustin Jasken at the Mahnomen County office of the USDA Natural Resources Conservation Service (NRCS), at (218) 935-2987, for more detailed soils information.

Natural Heritage Information: *Special Plants and Animals*

The DNR's Rare Natural Features database lists six recorded rare plant or wildlife features on or in the immediate vicinity of your property: a colonial nesting area (rookery), two birds, and two sites of biodiversity significance. The heron rookery, mentioned on page 3, is in the pond along the northern boundary of the North Block (Type 11). Great blue herons often build their big stick nests in groups in flooded timber — until the trees eventually fall. Rookeries are not afforded any special legal protection, but are quite uncommon and provide a unique opportunity to observe these big, interesting birds more closely.

Trumpeter swan NFI

The rare birds reported on or in the vicinity of your property are red-shouldered hawks and trumpeter swans. The red-shouldered hawk was placed on Minnesota's special concern species list in 1984 — it's relatively rare in the state so its population is being monitored by the DNR's Natural Heritage and Nongame Research Program. Red-shouldered hawks prefer large tracts of mature hardwoods with scattered wetlands. The Mississippi watershed is the northwestern-most extent of the hawk's eastern range. Trumpeter swans are hard to miss; they're big — five feet long with a seven-foot wingspan — and have a loud, bugle-like call. Listed as a Minnesota threatened species in 1996, the trumpeter swans' status was changed to special concern in 2013 — monitoring indicated that the nesting population is still relatively low but stable or slightly increasing. See the handouts on red-shouldered hawks and trumpeter swans and *The Uncommon Ones: Minnesota's Endangered Plants and Animals* in the "Ecology" section of the accompanying Stewardship binder for more information.

All of the North Block and much of the South and East Blocks are in documented areas of high biodiversity significance: Twin Lake Creek Woods north of the county road and Hart Lake Northwest Woods to the south — see the map in the "Ecology" section of your binder. The high significance ranking (the second highest of four levels) is for sites that "contain very good quality

occurrences of the rarest species, high-quality examples of rare native plant communities, and/or important functional landscapes." In this case, part of the forest complex on your property represents a fairly large, relatively undisturbed block of mixed west-central Minnesota northern hardwoods (dominated by sugar maple and American basswood). Most of Mahnomen County's stands of "big woods" hardwoods that were documented at the time of European settlement were converted to agriculture or fragmented into small blocks. Large non-fragmented blocks provide important habit for red-shouldered hawks, wood thrushes, least flycatchers, northern goshawks, woodland voles, and many warblers.

There might be additional rare elements on your property — features on private lands in particular are often missing from the database. If you encounter evidence of a rare natural feature, please report it to the Regional Nongame Specialist, Christine Herwig, at (218) 308-2641, or e-mail her at christine.herwig@state.mn.us.

Cultural Heritage Information: *Who Was Here Before?*

A cultural resource is any human resource that is 50 years old or older. This includes Civilian Conservation Corps (CCC) camps, Native American camp sites, and burial grounds. All burial grounds are protected by federal and state laws so you must avoid disturbing these areas. The graves might appear as mounds of dirt, shallow depressions, or small openings in the forest canopy. They commonly occur along lakes and streams or in maple-basswood stands.

The State's Cultural Heritage Resource database does not list any occurrences on or in the immediate vicinity of your property. However, if you suspect a burial site, or other significant feature, please call Mike Magner, DNR Forest Archaeologist, at (218) 327-4449, extension 243, or e-mail him at mike.magner@state.mn.us, for assistance. Refer to the "Heritage Resources" section of the accompanying ring binder for more information.

Indian mound *OH Historical Society*

Most cultural artifacts are found within the top 16 inches of soil. This topsoil layer is very sensitive to all kinds of heavy equipment operation, including logging, bulldozing, and site preparation. Whenever possible, take the "light on the land" approach to protect cultural artifacts and the soil's most sensitive layer.

Adjacent Property: *What's the Neighbor's Land Like?*

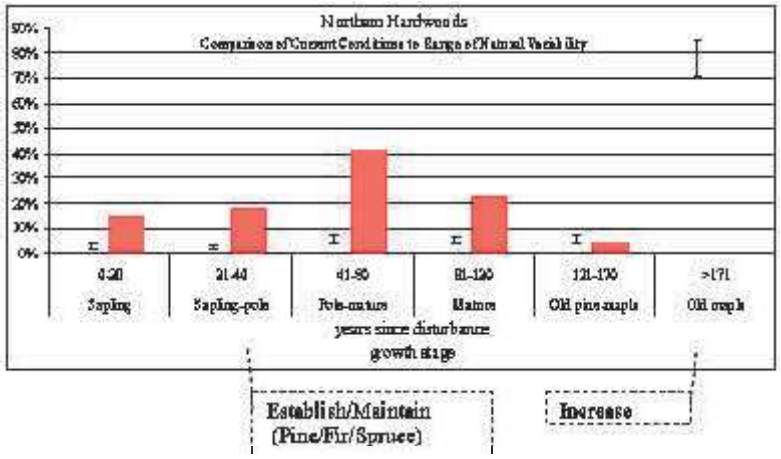
The adjacent land ownerships, and their current management practices, should be considered when developing a long-term management program for your property. By examining the mix of tree species and ages within a general area, better strategies can be developed to enhance forest species' diversity and wildlife habitat. In this case, the surrounding mix of private and public (DNR-Forestry adjoining a South Block forty) woodland is similar in character and vegetation to this property. The land farther to the west is primarily agricultural land with some pockets of woodland. The public land is generally managed for timber production. The private land is managed for a variety of goals, with recreation the most dominant. Deer utilize your property for cover and browse.

The various ponds and lakes in and adjacent to the property are under the jurisdictions of various agencies. The Mahnomen County Shoreline ordinance applies to public waters with a surface area of 25 acres or greater. So, Daigle Lake is under the county's jurisdiction. It was classified as a natural environment (NE) lake. Shoreline development and vegetative management regulations are established by classification — NE lakes are the most restrictive. Some of your land is within the shoreland impact zone. The Mahnomen County Zoning and Sanitation Department, (218) 935-5639, oversees the shoreline ordinances for building, septic, and vegetative management. The office also issues the permits for such activities and should be consulted before planning any development within one-quarter mile of the shore. See the handout *DNR Waters - A Guide for Buying and Managing Shoreland*, in the "Water" section of your binder, for more information.

Barney Lakes and some of the other small lakes are also public waters (see the Public Waters Inventory map in the front cover pocket of your binder). These wetlands are regulated by two agencies. Activities in the wetlands (below the ordinary high water level) are regulated by the Department of Natural Resources (DNR). Contact Roger Hemphill, DNR Ecological and Water Resources Area Hydrologist in Detroit Lakes, at (218) 846-8484, or visit the DNR Water's website, at www.dnr.state.mn.us/waters/index.html, for more information. Activities adjacent to the wetland are regulated by the Minnesota Board of Water Resources (BWSR) through the local Soil and Water Conservation District (SWCD). The Mahnomen County SWCD's number is (218) 694-6584. BWSR's website contains a lot of information about wetlands and wetland regulation; it is located at www.bwsr.state.mn.us.

The North and South Blocks, in particular, are also dotted with wetlands that are too small to map — see the National Wetlands Inventory maps in the "Water" section of your binder. These wetlands are protected under Minnesota's Wetland Conservation Act (WCA). The Mahnomen County SWCD should also be contacted regarding the WCA before implementing any land management practices in these areas.

The Minnesota Forest Resources Council's *Recommended Desired Outcomes, Goals and Strategies* (March 25, 2003) indicates that the coniferous and old-growth components of this plant community are practically nonexistent — see the graph below.



The long-term goals for this community include:

- Increase >171 year growth stage.
- Maintain some better quality aspen stands; use even-age management.

- Establish or maintain white pine, balsam fir and white spruce as stand components starting at the 21-40 growth stage.
- Create a more natural composition of plant community starting at the 40-80 year growth stage.

The strategies to achieve these goals include:

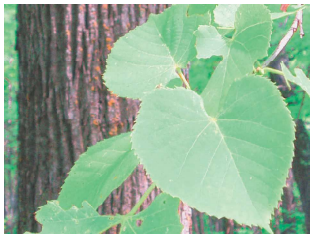
- Manage rich basswood/maple to older growth stages.
- Manage on an uneven age system.
- Manage richer sites for yellow birch component.
- Selectively harvest northern hardwoods stands as they age.
- Perform shelterwood harvests in northern hardwoods and underplant with pine and spruce where site aspect and soils are appropriate.
- Maintain aspen inclusions on good sites to provide age class and structural diversity.

See the brochure *Managing Your Forest in a Big Picture Context*, in the “Forest Facts” section of your reference binder, for more information.

1 228.0 Northern Hardwood Poletimber/Sugar Maple Saplings

Sugar maple in Type 1 NFI

This type represents areas of low to moderate density northern hardwoods dominated by American basswood and sugar maple. Overall, currently the type consists of a 10- to 60-percent overstory of sugar maple and basswood with a scattering of other species over sugar maple and ironwood saplings and small poletimber. The other species present are paper birch, northern red oak, and green and black ash. A few American elms remain but Dutch elm disease continues to kill them. The mature quaking aspen trees were harvested from this type about 25 years ago. Some harvesting of basswood and red oak occurred about 30 years ago. Mixed throughout, in the areas where the aspen was dense, are small areas of moderately to well stocked small quaking aspen poletimber and sugar maple (some of the larger areas of aspen have been moved to Type 7). Overall, the aspen regeneration stimulated by the most recent harvest has been overcome by sugar maple and ironwood. Only scattered basswood, bur oak, and green and black ash saplings and small pole-size trees were observed in the field plots. The majority of the overstory trees are 90 to 100 years old, with scattered 150-year-old (and older) sugar maples and bur oaks. There is almost no understory, except for a few scattered leatherwood shrubs. The productivity and quality of the basswoods, which are now mature, are good where they are with other trees. Basswood of this productivity matures at age 90 and a significant percentage develops center rot by 110 years. Past droughts might have accelerated the decline of the basswood, many of which have dead tops. In the areas where the basswoods are only scattered, they have deteriorated badly and are in generally poor condition. Much of the basswood is in the 11- to 13-inch diameter range, with a small component of 16- to 19-inch diameter trees. The larger diameter class will produce good quality sawtimber and is ready for harvest. The quality of the sugar maple, while good for this area, is generally poor for timber production. Sugar maple of this productivity matures at about 130 years. A few selected trees might produce moderate quality sawtimber. The groundcover is mostly fallen leaves with pockets of and scattered forbs such as large-flowered bellwort, sarsaparilla, yellow violet, carrion flower, and bloodroot. The ferns include bracken, lady, ostrich, interrupted, and rattlesnake. Pennsylvania sedge is common. Many small wetlands are found throughout. Many trails with small openings (former log landings) provide good access to much of the type — some of the openings are managed for deer forage. There are pockets of poorly drained soils that have black ash in the overstory and lowland grasses and sedges for groundcover — the soils in these areas are easily rutted during wet weather. There is a moderate amount of dead and down trees that provides an important habitat feature for many wildlife species.



American basswood NFI

Pileated woodpecker NFI

Value to wildlife: With its multiple vegetative layers, this diverse habitat harbors a great zoo of wildlife species. Grouse and voles find good cover from aerial predators. Nocturnal animals, such as bobcat and fox, bed down in the

underbrush during the day, sleeping near the nests of ground-dwelling species such as ovenbirds. Moisture-loving insects, amphibians, and reptiles lurk among the leaves and fallen logs. Aged trees, and those with disease or injury, are often pocked with natural cavities. Because of their high wood strength, old hardwood snags (oak, ash, maple) might remain standing for years. They provide room and board for woodpeckers and nest sites for flying squirrels, owls, wood ducks, raccoons, chickadees, nuthatches, and other tree-dwellers.[1]

Age: 90-100/25 years; Site Quality: Medium (SI=60); Total Timber Volume: 15-20 cords/acre, Average Tree Diameter: 11-13/4 inches

Management Options:

1. Allow natural succession to continue and the now-mature paper birch, basswood, and red oak, which are in decline, will die over the next 20 to 30 years. Sugar maple will gradually become even more dominant. The aspens will mature in about 15 to 20 years and then begin to decline. Eventually sugar maple will dominate the aspen areas. According to Minnesota DNR research on a similar native forest community, natural regeneration opportunities for trees ranging from single-tree gaps to large gaps up to an acre. Several silvicultural systems could be used to approximate the natural loss of maturing trees and regeneration typical of the transition maple-basswood forests of this age.

2. In the next five years, harvest selected basswood, ash, and red oak in the overstory in one-third or more of the type to promote improved regeneration and provide continued tree age diversity for wildlife habitat. Harvest the scattered, poor quality sugar maples. Selection harvesting best matches the natural small-gap mortality pattern and would favor sugar maple over all other species. Reserve the wooded lowlands for wildlife habitat and other wetland benefits.

3. In the next five years, patch-cut one third or more of the type. Basswood naturally regenerates from stump sprouts in large or small patches. Red oak and red maple, and possibly paper birch, should regenerate well in larger patch-cuts. Under this option, one- to five-acre patches would be clearcut to promote diverse regeneration. The existing young hardwood stems would be felled to encourage the growth of new healthy stems.

4. In areas dominated by sugar maple, thin the understory to promote larger, heathier hardwoods. Reserve and favor the scattered basswoods and oaks over the sugar maples. Reduce the tree stocking level to 300 healthy stems per acre or less.

5. A few years after any harvesting, thin any basswood and oak stump sprouts to one or two dominant stems formed low on each stump to produce healthier, more productive trees.

6. Expand some of the existing openings to at least two acres by bulldozing the surrounding vegetation. The areas should be strategically located to be used as

[1] Benyus, Janine M., *Northwoods Wildlife - A Watcher's Guide to Habitats* (with permission).

both wildlife openings and permanent log landings. When established, these areas provide a number of key spring and fall habitat requirements for white-tailed deer and ruffed grouse. After being cleared of debris and stumps, the openings will need to be disked and seeded to a cover crop. A mixture of clover, legumes, and grasses is usually seeded. The need to mow these areas yearly is optional. A good "catch" of the seeding might remain productive for two to four years before it needs to be disked and re-seeded. If farming equipment is readily available, winter wheat or rye would provide even better nutrition for the deer. The advantage of these crops is their availability to the deer in the fall and early spring. The disadvantage is that they require intensive yearly attention.

Plan Preparer's Recommendation:

A combination of Options 2, 3, and 4 will help meet your goals of realizing periodic income from wood production, maintaining the current forest types, featuring the appearance of big trees, and maintaining habitat for a variety of wildlife species. The areas dominated by sugar maple should be thinned and the areas with other species should be clearcut. The healthy, older sugar maple and bur oak trees could be reserved in the shelterwood areas. The NRCS might provide cost-share funding for felling of poor quality young hardwoods and subsequent stump sprout thinning (Option 5). Reserve some of the old, rotten trees to promote more habitat to help meet the goal of expanding the number of wildlife species on the property — retain at least five snags per acre for the 43 bird species and at least 26 mammal species that use them for nesting, denning, and feeding sites. Periodic thinning will improve the quality of the timber in the stand. Option 6 would help to meet your goal of permanently preserving the upland openings (and would expedite timber management operations).

For More Information, Refer to Your Binder:

Section	Title
Tree Species	Northern Hardwoods
	Lowland Hardwoods
	Oaks
	Aspen
Wildlife	Managing Your Woodland for Wildlife
	Woodlands and Nongame Wildlife
Harvest	
Forest Stand Improvements	Timber Stand Improvement: Deciduous

2 70.0 Mature Basswood/Red Oak Poletimber/Sawtimber


Northern red oak in Type 2 NFI

This type is generally a well stocked, moderately high quality northern hardwood type dominated by northern red oak and American basswood. For this plan, the main stand has been expanded to the west and two other smaller stands with similar characteristics have been added. There is a significant secondary component of sugar maple pole- and sawtimber over much of the type. A minor amount of quaking aspen, bur oak, paper birch, green and black ash, and ironwood is present. The basswoods and red oaks, which are near-mature to mature, range in age from 85 to 120 years. The productivity and quality of the basswood, in particular, remain good. Basswoods of the productivity here mature at age 90 and a significant percentage develop center rot by 110 years. Much of the basswood is in the 12- to 15-inch diameter range. The red oaks are mostly mature, with the recommended harvest age of 90 to 100 years. The quality of the red oak is medium for this area. Some top dieback and scattered mortality occurred in the red oaks during the drought years of the 1980s. Some of the oaks have died from Armillaria root rot. The growth rates of the red oaks also dropped significantly. Much of the oak is in the 12- to 14-inch diameter range. The aspens in this type are overmature and in decline, or have died — the older aspens are no longer a factor in the management of this type. When aspen's age exceeds 60 years, a proportion of the tree often contains white rot (*Phellinus tremulae*) — as indicated by the horseshoe-shaped conks on the trunks. Natural mortality, white rot, and windthrow have resulted in a significant net loss of aspen timber volume over the past 20 years.


Root rot in Type 2 NFI

A second layer of small, shorter trees contains light to moderate density one- to three-inch diameter (400 stems per acre) and three to five-inch (100 stems per acre) sugar maples. Light density ironwoods of one- to five-inch diameter are found throughout. The understory is primarily light density leatherwood. With the shade produced by the combination of the moderately dense overstory and the very dense sugar maple dominated understory, the groundcover is mostly fallen leaves with low density forbs such as large-flowered bellwort. The oaks' acorns provide a high quality source of nutrition for a wide variety of wildlife species.

Age: 85-110 years; Site Quality: Basswood - Excellent (SI=64), Red oak - Good (SI=60); Density: High (BA=90-110); Total Timber Volume: 25-30 cords/acre (80% basswood/red oak); Ave. Tree Diameter: 12-14"

Management Options:

1. Allow natural succession to continue and the aspen and birch trees will die out in less than 10 years. The basswoods and oaks have lifespans that exceed 150 years under normal climatic conditions. The open pockets created by aspen mortality will gradually fill in with shade-tolerant species such as sugar maple and ironwood.

2. Thin the basswood and red oak trees to provide improved growing room for the remaining high quality trees. Harvest the overmature aspen at the same time. A forester should mark selected trees (about 30 percent of the basal area) for harvest to improve the hard mast (acorn) production and growing conditions for the remaining basswoods and oaks. About 20 percent of the area might not need immediate attention.

3. In the next five years, shelterwood harvest about one-third or more of the type. Red oaks are shade-intolerant and basswoods are somewhat shade-intolerant and regenerate best when openings are created to allow sunlight to reach the ground. Most of the natural regeneration will be from red oak and basswood stump sprouts with some additional seedlings from acorns (if present). The area could also be planted with red oak. Some tubular tree shelters might be used to prevent animal browsing on both the stump sprouts and planted seedlings. Where basswood regeneration is desired, the competing young hardwoods should be controlled by cutting.

Plan Preparer's Recommendation:

Option 3 would best meet the goals of maintaining the current forest types and realizing periodic income from wood production. Harvest during the winter to avoid soil rutting and compaction. Harvest in 1- to 20-acre patches. A major concern is deer browsing on the red oak stump sprouts. Larger harvest areas might reduce browsing. Option 2 will promote succession of the forest to sugar maple. Markets for these timber species vary considerably from year to year — sometimes it is better to wait than to sell at low stumpage prices.

For More Information, Refer to Your Binder:

Section	Title
Tree Species	Northern Hardwoods Oaks Aspen Lowland Hardwoods
Harvest	
Forest Stand Improvements	Timber Stand Improvement: Deciduous

3 47.0 Immature Mixed Oak/Basswood Poletimber

Bur oak NFI

This is a pole-size northern hardwood type from which the quaking aspen was harvested about 21 to 25 years ago. More recently flown aerial photography and more detailed plot sampling resulted in the altering of the boundaries and overall composition of this type. The tree species present, in descending order of frequency, are bur oak, American basswood, sugar maple, and northern red oak. The plot sampling revealed more red oak and somewhat less basswood poletimber than in the previous plan. Most of the older aspens have died. The amount of the overstory that was removed during the harvest ranged from 20 to 70 percent. Portions of the type are moderately well stocked with basswood poletimber in the 85-year-old age class. The basswoods are nearing maturity (90 years) and growth is slowing. A relatively high percentage of the basswoods are in clusters of two to four stems (resulting from stump sprouting). The overall size, quality, and productivity of the basswood is lower than in Types 1 or 2. The bur oaks are mostly immature (70 to 120-plus years) and appear to be in generally good condition. Bur oak of the productivity here matures at about 120 to 130 years. The scattered northern red oaks are also nearing maturity. Where 60 percent or more of the overstory was removed, aspen root sprouted. (The larger, well-stocked pockets of aspen have been moved to Type 7.) Over most the type, the aspen has been suppressed or replaced by sugar maple and ironwood. Most the understory is dominated by light to moderately stocked (300 stems per acre) three to five-inch diameter sugar maple and ironwood. A light density one- to five-inch in diameter ironwood is found throughout. The type has pockets of moderately dense beaked hazel shrubs. The groundcover is mostly fallen leaves with a light mixture of forbs and upland sedges.

Age: 85 years (average); Site Quality: Basswood - Good (SI=65); Total Timber Volume: 15-20 cords/acre; Stand Density: Variable (BA=70-110); Average Tree Diameter: 11-14 inches

Management Options:

1. Allow natural succession to continue and sugar maple might replace the basswood and, with the long-lived bur oak, dominate the type for the foreseeable future.

2. In 10 to 15 years, harvest much of the basswood and red oak. Reserve the standing larger diameter sugar maple. Where basswood regeneration is desired, the competing young hardwoods should be controlled by cutting.

Plan Preparer's Recommendation:

Option 2 will provide periodic income from wood production, help maintain the current make-up of the type, and improve the growing conditions for the bur oak. Reserve most of the oaks for wildlife habitat — they provide nutritious hard mast (acorns) and cavity nesting and denning sites.

For More Information, Refer to Your Binder:

Section	Title
Tree Species	Northern Hardwoods
	Oaks
Wildlife	Woodlands and Nongame Wildlife

4 21.0 Sugar Maple/Basswood Poletimber

Sugar maple in Type 4 NFI

This type represents areas of northern hardwoods dominated by sugar maple with a significant basswood and bur oak component. Sugar maple dominates most portions of the type with basswood in others. Other species present are paper birch, American elm, northern red oak, and black ash. The merchantable quaking aspen trees that were scattered and in pockets throughout were harvested from this and the other upland types 21 to 25 years ago. Some harvesting of basswood and red oak occurred about 30 years ago. The majority of the trees are 90 to 100 years old, with scattered 150-year-old (and older) sugar maples and bur oaks. The productivity and quality of the now-mature basswood is good. Basswoods of the productivity here mature at age 90 and a significant percentage develop center rot by 110 years. Many of the basswoods have dead tops — past droughts might have accelerated the decline. Much of the basswood is in the 12- to 14-inch diameter range, with a small component of 16- to 19-inch diameter — the larger diameter class will produce good quality sawtimber and is ready for harvest. The quality of the sugar maple, while good for this area, is generally poor for timber production — a few selected trees might produce moderate quality sawtimber. A few live American elms were observed — Dutch elm disease has been gradually killing the pole-size elms in this region for about 30 years. The understory is primarily light density leatherwood shrubs. Much of the aspen regeneration has died or is stunted. Sugar maple saplings are found in generally low to moderate density throughout, except for a few very dense pockets. The groundcover, like much of the rest of the property, is now mostly leaf litter. The terrain is rolling with sharp drops to the lowlands. The oaks' acorns provide a high quality source of nutrition for a wide variety of wildlife species.

Age: 90-120+ years; Site Quality: Sugar Maple - Medium (SI=50), Stand Density: Medium (BA=60-100 sq. ft./ac.); Total Timber Volume: 10-15 cords/acre; Average Tree Diameter: 13 inches

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Management Options:

1. Allow natural succession to continue and sugar maple will dominate this type for several generations. The older basswood is now mature, and will gradually die over the next 30 years. The sugar maples have lifespans that exceed 150 years under normal climatic conditions. The areas where a dense canopy of hardwoods remains will regenerate to shade-tolerant species such as sugar maple and ironwood. The aspen trees will mature and decline in the next 25 to 35 years.

2. In about 5 to 10 years, thin the basswoods and a few selected sugar maple, red oak, and black ash trees to provide improved growing room for the remaining high quality trees. A professional forester should mark selected trees (about 30 percent of the basal area) for harvesting to improve the growing conditions for the

remaining basswood and sugar maple. About 50 percent of the area might not need immediate attention. Where basswood regeneration is desired, the competing young hardwoods should be controlled by cutting.

3. Utilize the healthy and vigorous sugar maples with low timber value for maple syrup production.

Plan Preparer's Recommendation:

Option 2 will meet your goals of maintaining the current forest types, featuring the appearance of big trees, and realizing periodic income from wood production. Harvest in the late summer, when the ground is dry, or when the ground is solidly frozen to avoid soil rutting and compaction. Protect the remaining hardwoods from damage during logging by crafting and enforcing a detailed timber sale contract.

For More Information, Refer to Your Binder:

Section	Title
Tree Species	Northern Hardwoods Oaks Aspen Lowland Hardwoods
Forest Stand Improvements	Timber Stand Improvement: Deciduous
Front Cover Pocket	How to Tap Maple Trees and Make Maple Syrup

5 7.0 Overmature Aspen Poletimber

Quaking aspen in Type 5 NFI

This type, which constitutes a long band on a ridge and slope just west of the central wetland, is predominately overmature quaking aspen poletimber with a lesser component of American basswood, northern red and bur oak, and sugar maple. The aspen is in poor condition with a high amount of rot and mortality overall. However, the stand remains relatively intact, and is very marketable for pulpwood. The understory still consists of light to medium density beaked hazel with medium density (500 stems per acre) one- to three-inch diameter sugar maple saplings. The groundcover is a mix of fallen leaves and a patchy carpet of forbs. The loam soil is best suited for handling heavy harvesting equipment in winter or during dry portions of the growing season. Some oversize (20-plus-inch diameter) aspens are found in portions of the type — some of this large material might not be marketable. The soil is productive for aspen — for the productivity here, 45 years is considered mature.

Age: 60+ years; Site Quality: Good (SI=75+); Total Timber Volume: 20-25 cords/acre; Average Tree Diameter: 14 inches

Management Options:

1. Allow natural succession to continue and the present stand of aspen will die out in the next 10 to 20 years, leaving a poorly stocked northern hardwood stand with a sugar maple understory.

2. Within five years, harvest the stand before a significant proportion of the timber is lost to rot and disease. Clearcut all of the aspen and run down the brush and small hardwoods to open the soil to sunlight to stimulate re-sprouting of the aspen. Reserve the oaks for wildlife habitat — hard mast (acorns) and nesting and denning cavities.

Plan Preparer's Recommendation:

Option 2 will best meet your goals of maintaining the current forest types and realizing periodic income from the wood production. It will also enhance the habitat for edge-dependent wildlife species such as deer, ruffed grouse, and chestnut-sided warbler. Harvest the sugar maple and basswood trees to help open the cutting areas to sunlight, stimulating aspen root sprouting. In addition to some of the oaks, reserve any standing dead or rotten trees as wildlife snags.

For More Information, Refer to Your Binder:

Section	Title
Tree Species	Aspen Aspen Management: Harvest and Regeneration
Harvest	
Wildlife	Northern Minnesota Young Forests Woodlands and Nongame Wildlife

6 21.0 Near-mature Aspen Poletimber


Quaking aspen in Type 6 NFI

This type, in three stands, is immature (40-year-old) quaking aspen. Two similar types from the previous plan were combined and a small stand near the northern property boundary was added to this type (combining similar stands simplifies management). The two eastern stands also contain pockets of and scattered individual sugar maple and basswood trees, with the northern stand having the addition of some bur and northern red oak trees. The western stand has the best stocking of aspen and a minor amount of paper birch. The productivity is generally good throughout. Aspen of this productivity matures at 45 years of age. The understory varies from moderate to heavy density sugar maple saplings and small poletimber. The groundcover is light density forbs, upland sedges, and leaf litter.

Age: 38-40 years; Site Quality: Good (SI=70); Total Timber Volume: 15-20 cords/acre; Average Tree Diameter: 7-13 inches

Management Options:

1. Allow natural succession to continue and the aspen will mature in five years and begin to deteriorate and die in 15 to 20 years.

2. In 10 to 15 years, harvest by clearcutting. Reserve the bur oaks, den trees, and snags for wildlife habitat. Allow to naturally regenerate to aspen and mixed hardwoods. Control the competing young hardwoods to promote thick, healthy aspen regeneration.

Plan Preparer's Recommendation:

Option 2 will best meet your goals of maintaining the current forest types, enhancing the habitat for a variety of wildlife species, and realizing periodic income from wood production. By spreading out the harvesting on the property, wildlife will have a more continuous supply of young, shrubby growth.

For More Information, Refer to Your Binder:

Section	Title
Tree Species	Aspen
	Aspen Management: Harvest and Regeneration
Wildlife	Northern Minnesota Young Forests

7 48.0 Small Aspen Poletimber


Quaking aspen in Type 7 NFI

This type has grown from sapling to small pole-size quaking aspen over the past 10 years. It represents most of the youngest concentrations of aspen in the block — several small stands have been added. The aspen is generally well stocked and in good condition. The tree density varies from fair to excellent. The stands in this type differ from the previous types because, except for a few pockets and scattered trees, most of the overstory was removed — allowing the sun-loving aspens to sprout and survive. Aspen of the productivity here matures at 45 years of age. Moderate density sugar maple and ironwood saplings are again found throughout. Other regeneration tree species, found mostly along the trails and in the old log landings, include American basswood, paper birch, black ash, and northern red and bur oak. Some residual poletimber was left scattered singly and in pockets after the harvest. The species left were American basswood, bur oak, paper birch, and sugar maple. The overstory density (or crown cover) ranges from 10 to 20 percent. The understory varies from beaked hazel and alternate-leaved dogwood shrubs in the higher areas to gray dogwood and willow in the lower areas. The groundcover is a medium density mixture of forbs such as large-flowered bellwort, rose twisted-stalk, wild ginger, and sarsaparilla — significantly denser and with more species variety than on most of the rest of the property. The open areas along the trails contain tall coneflower that, along with large-flowered bellwort, is one of the ground plants that helps to identify this native plant community.


Hardwood regeneration in Type 7 NFI

Value to wildlife: Young upland forests are prime feeding grounds for browsers. Deer often strip tender saplings of their leaves (they prefer aspen suckers that are less than one-year-old). Beavers, hares, and other mammals eat the bark, twigs, and leaves of aspen. Ruffed grouse consume aspen leaves as well as a variety of berries and seeds. The closely-packed trees also offer grouse and their broods a safe haven from sudden attack by goshawks or other avian predators. It is not uncommon, while walking on a trail through young aspen, to be startled by as many as a dozen ruffed grouse chicks all exploding into flight at once. Look for American redstarts, chestnut-sided warblers, and rose-breasted grosbeaks. Listen at night for whip-poor-wills.[1]


American redstart NFI

Age: 21-25 years; Site Quality: Good (SI=70+); Tree Density: Medium -High (1,000-1,500+ average stems/acre); Average Tree Diameter: 4-6 inches; Residual Stand Volume: 1-3 cords/acre

Plan Preparer's Recommendation:

To attain your goal of maintaining the current forest types, allow natural succession to continue and this area will produce aspen stands with fair to good density with

[1] Benyus, Janine M., *Northwoods Wildlife - A Watcher's Guide to Habitats* (with permission).

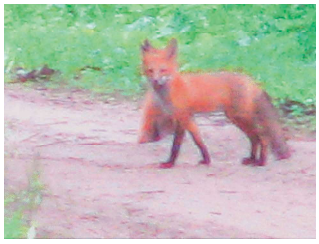
lesser components of the other species listed above. Reserve the type until the stand matures in about 20 to 25 years. The stands which comprise the type can then be evaluated for extended rotation at that time. Extended rotation would increase the age of harvest to about 60 years, proving habitat for area-sensitive wildlife species. The shade-tolerant hardwood component is not significant enough to consider release.

For More Information, Refer to Your Binder:

Section	Title
Tree Species	Aspen
	Aspen Management: Harvest and Regeneration
	Northern Hardwoods
	Oaks
Wildlife	Northern Minnesota Young Forests

8 4.0 Upland Grasses

This type is part of an idle hayfield along the western property boundary — neighboring agricultural production might be encroaching. The terrain is gently rolling. The groundcover is a dense mat of tall grasses. Abandoned fields often contain a variety of wildflowers. The soils are well drained loams. (Sustainable Forest Incentive Act regulations allow openings to be managed for wildlife forage but the harvest or sale of agricultural products is not allowed.)



Red fox NFI

Value to wildlife: Small openings offer many of the amenities of large openings — grassy nest sites, plentiful seeds and insects, between-season foods for grazers such as deer, openness for aerial hunters, good sites for burrows — but with the protective shelter of the forest always close at hand. The grassy vegetation in a woodland opening is also a unique offering. Deer are attracted to the early spring "green up" and the late season grasses and sedges of openings. The sunny edges often allow fruit bearing shrubs to produce prolific flowers and fruit. Songbirds nest and feed in the thickets. Watch for ruby-throated hummingbirds, northern flickers, indigo buntings, brown-headed cowbirds, red fox, red bats, and woodchucks.[1]

Management Options:

1. Reserve. Over time, one to three generations, natural regeneration of aspen sprouts from adjacent stands will gradually reclaim this field to forest. However, some of the area might continue to remain open for the foreseeable future because of the poor moisture retention of the soil and the sod cover.

2. Reforest portions of the area by planting red (Norway) pine and/or white spruce. Machine planting appears to be feasible on most of the area. Plant 600 to 800 trees per acre. It might be necessary to control the sod cover with herbicide to ensure adequate survival and growth of the trees.

3. Improve the overall wildlife habitat by planting pockets of bur oak (400 to 600 per acre) and a variety of fruiting trees and shrubs.

Plan Preparer's Recommendation:

Allowing natural succession to continue might be the most practical method of managing this isolated opening.

For More Information, Refer to Your Binder:

Section	Title
Front Cover Pocket	Upland Grass and Brush
Wildlife	Habitat Components for Wildlife: A New Approach to Landscaping
Regeneration	Tree Planting

[1] Benyus, Janine M., *Northwoods Wildlife - A Watcher's Guide to Habitats* (with permission).

9 9.0 Shrub Swamp/Lowland Hardwood Saplings


Speckled alder NFI

This type, in two areas, is a former forest type that was flooded in the recent past by beaver activity. The water levels have receded and woody vegetation is beginning to reclaim these areas. In the past, the type was primarily black ash with some quaking aspen, as well as tamarack and, possibly, balsam fir. The areas are currently relatively open with scattered pockets of speckled alder and bog birch. Many partially standing tree trunks, as well as tipped up root systems, provide vertical structure to the type. The groundcover is primarily lowland sedges and grasses. The soil is characterized by a high watertable that keeps the ground saturated much of the year.

Value to wildlife: Shrub swamps play an important role in the lives of many wildlife species, but few depend exclusively on these dense stands of alder and willow throughout the entire year. Star-nosed moles and shrews often build their "highways" under or on the ground beneath the shrubs. Above, warblers feather their nests in the leafy branches and flycatchers hawk for flying insects. In the winter, bent-over alder branches form snug tunnels for snowshoe hares. In the fall, look for acrobatic redpolls and chickadees dangling upside down as they pry tiny seeds from alder catkins. White-tailed deer and ruffed grouse eat the alder twigs and buds. In the summer, snowshoe hares pass by the alder in favor of the more palatable willow. American woodcocks probe the moist earth nightly with sensitive, pencil-thin bills in search of earthworms.[1]


Black-capped chickadee NFI

Age: 0-10 years; Site Quality: Poor; Average Tree Diameter: 1 inch; Tree Density: Scattered

Plan Preparer's Recommendation:

Reserve this area from management activities to maintain a diversity of wildlife habitat on the property. Black ash, although a lowland species, is fairly sensitive to changes in the watertable. It might be necessary to restore the water level to a lower level to maintain the present vegetative composition — this might be difficult if beavers have dammed the flowages on adjacent properties.

For More Information, Refer to Your Binder:

Section	Title
Tree Species	Tamarack
	Lowland Hardwoods
Water and Wetlands	Managing Your Woodland Wetland
Front Cover Pocket	Lowland Grass and Brush

[1] Benyus, Janine M., *Northwoods Wildlife - A Watcher's Guide to Habitats* (with permission).