A MANAGEMENT PLAN FOR THE SOUTH LONG LAKE FOREST NATURAL AREA

Prepared by:
Grand Traverse Conservation District
1222 Veterans Drive
Traverse City, MI 49684
bpurdy@gtced.org
231-941-0960
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FORESTRY STEWARDSHIP PLAN
Objectives

The objectives of this management plan are:
1. To improve, expand and develop opportunities for passive public recreation.
2. To protect natural areas, water quality and wildlife habitat.
3. To preserve scenic views and open spaces.

Management Recommendation Summary

This document lays out a general plan for achieving the objectives stated above. Management will be focused on two primary areas: providing passive recreation opportunities and protecting natural features. To this end, management activities will be minimal and needed only for user amenities and activities needed to maintain the integrity of natural features on the property. Annual work plans will be created and approved to address specific management tasks needed on the property.

Property History

The property originally contained upland forest and wooded swamp wetlands before European settlement. The vegetation was unspoiled until the mid-1800s when settlers began clearing the land. This clearing consisted of logging, subsequent burning of slash and stump removal. Logging occurred in all areas of the property with any tree species of several inches in diameter or larger being harvested. This harvest included the removal of all trees in areas with level topography (in preparation of agriculture) and most trees on sloped grades. Following this period of logging, the non-sloping areas were extensively used for traditional agriculture, which included grazing, crop cultivation, and orchard establishment. In more recent history, the property has been owned by the Hall family who managed the forest for timber and enjoyed the property for recreation activities.

Property Acquisition

In 2006 the Township had the opportunity to purchase a 108-acres of undeveloped land that adjoined an existing 120-acre natural area off South Long Lake Road. The Township Board authorized the submittal of a millage to the voters of the Township to purchase lands to “preserve water quality and wildlife habitat and protect forests, natural areas and watersheds from development”. Thanks to the hard work of the Grand Traverse Regional Land Conservancy and many volunteers the millage was passed on November 7th, 2006. Today the South Long Lake Forest is now 228 acres of primarily forested land which includes both upland and wetland habitats. There are several existing trails and two-tracks on the property.
2006 Ballot Language for Natural Area Proposal

Shall the limitation on the amount of taxes which may be imposed each year for all purposes on real and tangible personal property in the Township of Long Lake be increased as provided in Section 6, Article IX of the Michigan Constitution, and the Township Board be authorized to levy within the boundaries of the Township of Long Lake as a new millage a tax of not to exceed forty-six tenths of mill ($0.46 per $1,000.00 of taxable valuation) on the taxable value of such property for a period of twenty (20) years beginning with the levy made on December 1, 2006 (which will generate estimated revenues of $152,893.05 in the first year) for the purpose of purchasing or causing the purchase of land to preserve natural areas, wildlife habitat, forestland, and water quality of lakes and streams, including the 212-acre Gilbert Pines Boy Scout Property and 108 acres of forestland on South Long Lake road? (Emphasis Added)

Public Input and Plan Development

After the South Long Lake Forest property was acquired the Township sought to develop a plan to guide management activities at the natural area. The Township engaged the services of the Grand Traverse Conservation District to solicit public input and develop a management plan for the property. To that end, three public input sessions were held including an on-site visit at the property. Based on public input gathered at these meetings, ballot language, deed restrictions, and safety and maintenance considerations, this plan was created to set out the broad goals and values related to the management of the South Long Lake Forest Natural Area. This plan should be reviewed often and modified as needed to reflect public expectations and protect the features of the property.

Administration

Governing Body
The South Long Lake Forest is governed by Long Lake Township. The Township retains control of all management and budgeting decisions for the property.

Advisory Committee
The Township may wish to authorize the creation of a citizen advisory committee. The advisory committee would make management recommendations to the Township for final approval. The Township may appoint members of the advisory committee and review appointments on an annual basis.

Maintenance
A property manager may be appointed by the Township to perform or oversee, all maintenance required at the South Long Lake Forest. This person or entity shall prepare an annual maintenance report for submittal to the Township.

Proposed Guidelines
1. Camping is allowed at designated areas by permit only. No open fires.
2. All non-foot traffic trail users must stay on designated improved trails, and must respect any special access restrictions.
3. Motorized vehicles are prohibited except for traffic on County Roads or for authorized management purposes.
4. Dogs are permitted, but must be kept under control. Pet owners are required to clean up after their pets.
5. Bow hunting is allowed by permit only and in accordance with State law. Permits may be obtained at the Township Office. Trapping and firearm hunting is not allowed.
6. Fishing is allowed in accordance with the laws of the State and the rules of the Michigan Department of Natural Resources.
7. No plants or other non-game specimens are to be removed unless authorized by management.
8. Littering is strictly forbidden. This includes dumping of compostable material and household waste.
9. Glass containers and alcoholic beverages are prohibited.

**Enforcement**

The rules for the South Long Lake Forest should be approved by the township and written into local ordinance so that they may be enforced by law enforcement agencies.

**Emergency Access**

Emergency access will be provided at the parking areas. One emergency access road should be maintained between the Parking lots on the property. Emergency service agencies shall be provided with a key to any locked gates.

**Publicity**

Because the South Long Lake Forest has been used for recreation for many years, it is unlikely that a publicity campaign is needed at this time. However, trail maps and brochures should be available at the Township office and website.

**Boundary Demarcation**

The boundaries of the property should be clearly marked every 50 to 100 feet to avoid trespass concerns and so that users know when they are within or leaving the natural area.

**Future Property Acquisitions**

Efforts should be made to acquire adjacent, undeveloped properties from willing landowners. This could create a buffer between the natural area and existing houses along bass lake road.

**Recreation Management**

**User Groups**

The grounds and trails of the South Long Lake Forest are intended to provide for those activities that are considered as “passive recreation.” Passive recreation, in this case, is defined as non-consumptive of the resource and non-organized. The opposite of passive is active recreation, which includes improvements such as soccer and baseball fields. The Natural Area will accommodate many low impact users including but not limited to:

- Hikers
- Equestrians
- Trail Runners
- Nature Enthusiasts
- Dog Owners
Mountain Bikers  

Cross Country Skiers

No fees will be assessed to users of the property. Motorized bike, ORV, and snowmobile traffic is not allowed except on County Roads or unless required for management/maintenance activities. Paintball is also prohibited.

In order to ensure that user needs are being met, it is important that the Township stay abreast of the numbers and types of users on the property. This may be accomplished with comment cards and a place to file them at each trailhead or through public input meetings or advisory committees.

Current Trails
The current trail system evolved from logging roads, and areas of repeated use. The trail system is well used, but of poor quality. Early stages of erosion are evident at several locations on the existing trails primarily from motorized vehicles.

Proposed Trail System
It is recommended that existing trails be utilized when appropriate and expanded or closed as needed to create a system of looped trails. The creation of a boundary trail would provide a scenic loop trail and a clear delineation of the public/private boundary line. This trail could also serve as a firebreak. The Township may wish to partner with outside organizations specializing in trail design to ensure trails are sustainable and user friendly.

Future Trail Construction
Future trail construction should be kept to a minimum and done in manner that minimizes environmental impact and disruption to user activities. If new trails become established by frequent visitor use, these new trails should either be blocked or properly marked and maintained to prevent erosion. A map of current and potential future trails may be found at the end of this document.

Trail Surfaces
Trail surfaces should be designed first and foremost to limit erosion. Secondarily, they should be easily maintained and provide an enjoyable experience for all user groups. Woodchips are an easily renewable and inexpensive way to surface trails. Wood chips should be used where necessary to prevent erosion, and trail surfaces should be left “natural” when practical.

Adjacent Lands and Trail Considerations
As noted above, it may be desirable for a boundary trail to be developed. This trail should be near the property boundary, but well posted and far enough away from private property that it is unlikely that trail users would stray onto private land.

Trailheads & Parking
Parking areas and corresponding trailheads should be established at the following locations.
1. South Long Lake Road at the Webster property.
2. Luhrs Trail near Bass Lake Road.

Each trailhead/parking area should include a garbage bin as well as, an information station/kiosk. Trail maps and dog waste bags should also be made available at trailheads. The parking areas should be bordered by fence or large rocks to clearly delineate their bounds and prevent vehicles from entering the trails. Parking areas should be sized according to expected demand and spatial limitations. If possible the parking areas should be visible from a main road.

Restrooms and Other Facilities
It is recommended that pit toilet facilities be installed at the South Long Lake Road parking area.

Forest Management

Management Unit Review
A Forest Stewardship Plan has been created for the South Long Lake Forest Natural Area and is included at the end of this document. The plan divides the property into several management units and lays out recommended management practices for each. It should be noted however, that these management activities are only suggestions and that the pros and cons to implementing these recommendations must be weighed against the overall objectives of the property i.e. passive recreation, preserving water quality and wildlife habitat, and protecting scenic open spaces.

Timber Harvesting
Timber harvesting for monetary gain should be done only with the guidance of the attached Forest Stewardship Plan and should not negatively affect the natural integrity or recreational uses of the property. Harvesting for uses within the property (e.g. fencing, erosion cribs, etc.) may be useful. Harvesting for this purpose shall be conducted only with approval of the Township. Management should be granted the right to remove trees if the safety of the visitor is in question. The removal of dead trees along trails is an important issue. However, dead trees (standing and fallen) are important to the ecological health of the natural area and should be retained if not deemed hazardous.

Insect and Disease Control
Damage from insects and diseases can be extremely serious to the health of a forest. However, there are no known problems existing at the South Long Lake Forest. The manager should monitor for new insect or disease damage. A few of the insects and diseases that are or could become possible problems are listed here:
Insects:
- Gypsy Moth – An exotic from Europe, the gypsy moth is the main defoliator of forests in the Northeastern U.S.
- Emerald Ash Borer – Another non-native species, emerald ash borers originally come from East Asia. As its name implies, it only harms ash trees.
Diseases:
- Oak Wilt – This disease kills thousands of oaks each year in the Eastern U.S. The disease, once established, spreads to other oaks mostly through contact with infected trees’ roots. This is especially so in the Natural Area because sandy soils are more conducive to this type of spread.

Non-Native Plant Control
Where practical the manager should remove non-native invasive species. The two species of most concern are Spotted Nap Weed and Autumn Olive. While there may not be significant amounts of these species established, management should monitor the situation to ensure that colonies do not become established.

Wildlife Management
A wildlife inventory has not been performed on the property. A comprehensive wildlife survey should be conducted to identify any “endangered” or “special concern” species. Once finished, the management plan may be adjusted if necessary. In general, the feeding of wildlife on the property should be discouraged.

Hunting and Trapping:
A. Bow hunting shall be allowed in accordance with State law, and only with a written permit from Long Lake Township. In addition, the removal of wildlife may be used as a tool for management purposes if other avenues are cost prohibitive or otherwise not practical. Trapping is not allowed on the property.

Note: Certain species such as deer and beaver can degrade habitat and recreational opportunities if populations become too large.

Special Concern Species:
When the property was crossed checked against the Michigan Natural Features Inventory it was found that Club Moss (*Lycopodiella margaritae*) is present on the property. Management activities should be carried out in a manor that protects this sensitive species.

Watershed Management

Surface Water
There are several surface water features on the property, including emergent wetlands and small ponds. Trails and other recreational resources should be planned and maintained in such a way that minimizes impacts to these water features.

Fishing
Fishing may be allowed on the property. It shall be conducted according to all state and MDNR rules and regulations.

**Erosion**
Erosion caused by human activities and the introduction of excess sediment to water bodies is the primary threat to surface waters on the property. An established trail system with appropriate surfaces will minimize erosion caused by foot or bike traffic. Constructing boardwalks or bridges will also minimize stream bank damage and sediment delivery by protecting stream-crossing points on any future trails.

**Adjacent Lands Impact**
The water features on the property may also be impacted by land use or management changes on lands adjacent to the property. The township should work closely with adjacent landowners to minimize negative impacts from these lands.

**Education/Interpretation**

**Signs**
1. **Informational Signs**
   Trails should be clearly marked to provide a safe and comfortable atmosphere for the visitor; international symbols should be used on signs. Any rules should be clearly displayed at each parking area.

2. **Interpretive Signs**
   The Township or property manager shall decide on topics for interpretive signage. Interpretative signage will be limited in order to keep the natural character of the property intact.

**Trailhead Kiosks**
Trailhead kiosks or information stations will be an important aspect of the trail system. They are what the visitor will encounter upon arrival and the last thing they see as they leave. This unique situation presents an opportunity to not only orient the visitor through the use of trail maps, but to educate the user on management practices and etiquette.

**Group Use**
Group use will be welcomed at the South Long Lake Forest Natural Area. Organized groups of more than 50 people should contact the Township or manager before use of the property.

**Research**
Research regarding the natural and recreational qualities of the South Long Lake Forest Natural Area should be encouraged. The Township shall review all research projects before they are carried out. This research will be beneficial to the ongoing management and improvement of the property.
South Long Lake Forest
Existing Trails
South Long Lake Forest
Potential Future Trails

- South Long Lake Forest
- Potential Future Trails
- County Road
Forest Management Plan Written for Long Lake Township
8870 N. Long Lake Rd.
Traverse City, MI 49684

Planned Property Location: The SE ¼ of the NW ¼ and the N 1/2 of the SW 1/4 of Section 35, Long Lake Township, Grand Traverse County, Michigan

109 Acres at the South East End of Long Lake

Plan Written By:
Daniel Schillinger
Schillinger Forestry, LLC
615 West Eleventh Street
Traverse City MI, 49684
(231) 633-8733
A turn of the century white pine stump and perhaps the white pine trees again will become a super canopy within this property.
Introduction to the Long Lake Township Land

These 109 acres adjoins a 120-acre parcel already owned by the Township. With the two parcels combined this stand is poised to be an oasis for wildlife surrounded by development. There are signs of adequate wildlife use on the property and during the creation of this plan an owl was seen hunting a lower area for small mammals. There where plenty of coyote and deer signs across the parcel. Tree and stand diversity is quite good throughout this property making it an area for many species of wildlife to use due to the variance of stands and variance of species within those stands. The Township hopes to use this parcel for passive recreational use and wildlife habitat. Timber income may happen if good management is achieved by removing some trees. Timber income is not the reason the Township owns the property nor will it be the focus of management on the parcel.

The northern end of this parcel has two pine-dominated units. One is a red pine plantation that is long overdue for management and suffering from a bark beetle infestation. The other is a higher water table area with white pine occupying the canopy with many wetland plants underneath. The majority of the rest of the parcel is a diverse hardwood stand with a few higher water table areas where conifers prevail in the tree canopy. These lower areas are where wildlife use is quite apparent.

Much of this property is inaccessible from a plowed county road. There is a small portion of the parcel adjoining South Long Lake Road. There are two-tracks coming from Luhr’s Road and from adjacent properties that need to be managed. These should be gated off if this is the public’s desire but these barriers should be able to be moved occasionally for logging access. There is a particular need within the pine stand for logging access. The rest of the trail information and two-track blocking strategy can be found in the recreational portion of this plan.
Management Timing on all the Stands and Other Forest Health Issues

Most of these stands have or have the capacity to have oaks in them. For the oaks present any cutting, harvesting or machine work should not be done when the leaves are on the trees or even about to come on, to inhibit the spread of the oak wilt disease and keep damage to remaining trees to a minimum. Oak wilt will not bother other species of trees but cutting during the growing season, especially in the spring, has the potential to greatly degrade the standing value of any woodlot. With oak wilt in the county already and very near this property, any cutting or pruning of oaks will increase the likelihood of the oaks getting the disease and is strictly not allowed.

There is another pest that could potentially move into the area called Emerald Ash Borer. This insect can kill any type of ash tree fairly quickly. This pest should not cause a panicked harvest on this or any land, but it should warrant some consideration when the next scheduled harvest time comes. A good idea is to remove more ash trees than normal, to achieve some value out of them rather than having them killed by Emerald Ash Borer. With EAB many miles away this should not be a huge concern for this property, especially since the canopy is much less than 5% ash in any stand.

A third disease could move into the area called beech bark disease. This is a two factor disease that starts with a scale insect, secondly a fungus gets into the wounds from the scale insects and can eventually kills large beech trees. To prepare for the coming of this disease the larger rougher barked beech trees should be harvested during the next scheduled harvest. The younger soother barked trees usually don’t get this disease since the rain washes away the crawler stage of the scale insect before they can cover themselves with their protective scale. Should the beech trees on this property get this disease, the moving of beech firewood or logs is prohibited from mid summer to late fall. This is the time of year that the scale insects are in their crawler stage and can re-infect neighboring trees when the infected wood is moved to a new location. This disease is quite an issue in Michigan, but the beech component on this property is less than 15-20% of the tree canopy so there should be no rash decisions to cut any one species completely off of the property.

Finally, any mechanical work of any kind should not be done on this land during the spring “bark slip” period. This is the time of year when the leaves are just about to or have recently come out. The tree trunk is growing quickly and the bark is therefore quite loose on the tree accelerating any mechanical injury to the stem. Therefore, between April 15th and June 15th machine driven work of any kind should not take place on this property.

These forest health issues need to be addressed when management takes place on this property even though none of these problems are immediately near this land. The landowner is encouraged to keep in contact with the Conservation District and/or a Professional Forester to keep up on any new treatment measures for these or other forest health issues. Should any widespread control measures be found for these diseases these professionals should be the first to know about them.
Management Unit #1

An overstocked red pine plantation

With a Bark Beetle Problem
Management Unit Information

Management Unit Number: 1  Number of Acres: 7

============Major Objectives of Unit=============
Manage for high value pine products and allow the hardwoods to re-claim the stand.

============Existing Conditions=============
Size Class: R9  
Soil Type: CpA, KaA, RwB  
Site Quality: Excellent  Stand Quality: Excellent  Stand Density: 230-430 ft²/acre

Management Unit Description:

This is a red pine plantation that is extraordinarily overstocked, with a few scattered white pines surviving the initial planting. It was originally planted on 6’ x 6’ spacing with every other row planted as white pine. Since the planting, the white pine has almost entirely been out competed by the red pine. The average diameter is about 10” with sizes ranging from 5-13”. Merchantable tree height is 40-55’ tall making it prime size and density for management. The canopies of these trees are competing heavily. This competition has likely been the cause of the present bark beetle infestation. The herbaceous and hardwood understories are suppressed. Eventual thinnings will encourage more hardwood establishment underneath these trees.

============Planned Management Activities=============
There is an immediate management need in this stand due to the high density and bark beetle infestation. This stand should be managed for higher dollar red pine products while controlling the bark beetle problem. Red Pine stands are thinned when the merchantable height is greater than 35’ and the branches are physically touching. Merchantable height is the amount of stem a tree has before it reaches the first live branch and is saleable commercially. Since these trees have exceeded that height, a thinning is needed. This first thinning typically removes a third of the trees by removing one of every third row within the stand. In this case extra aggressive cutting will be needed in the northwest corner of the stand where an expanding bark beetle population is beginning to decimate this portion of the stand. These trees are already prime candidates for being sold as utility poles once they increase their diameters after the first thinning. After the first thinning a second harvest should be done in 10-15 years. This thinning happens when the branches of adjoining trees physically touch once more. This thinning removes another third of the trees by cutting one of every third tree within the rows. This cut should also re-assess the bark beetle damage and cut more trees if need be. This cut will likely have plenty of valuable red pine products expanding the income of that harvest substantially. While these thinnings are taking place the hardwood and white pine regeneration becomes more advanced and will take over the site after the pine rotation is complete provided the pine cutters use care not to damage these small trees.

Not cutting within this stand will be a huge mistake. The bark beetle numbers will continue to grow as they infest more and more trees eventually working across the entire stand and likely slowing the growth or killing the naturally seeded white pine in the area. Removing the infested trees during the winter removes a large number of the beetles form the stand and will improve the overall health of this and neighboring stands.
Management Unit #2

Lowland area with a high water table and white pine canopy.
Management Unit Information

Management Unit Number:  2   Number of Acres:  5

===============Major Objectives of Unit===============
Retain this stand for wildlife use and wetland protection.

===============Existing Conditions===============
Size Class:  W 6-9   Soil Type: Groundwater, RwB
Site Quality: Good   Stand Quality: Fair-Good   Stand Density: 0-120 ft²/Acre

Management Unit Description:

This stand has a high water table and there is naturally seeded white pine trees scattered throughout the unit. There is plenty of understory plants due to the high water table. Some species include alder, blueberry, wintergreen, sensitive fern and other wetland shrubs. Towards the edges of this unit big toothed aspen begin to appear as the amount of soil above the water table increases.

==============Planned Management Activities==============

Due to the droughty conditions these past few years this unit does not have standing water within it. Under normal conditions much of this unit would be difficult to walk through let alone complete any management within this unit. Due to the high water table and sensitive nature of this unit no forest management activities are planned for this unit, short of protecting the wetland area from degradation.
Management Unit #3

Oak dominated forest with white pine in the understory. Big toothed aspen are much more apparent in the northern end of this stand (left photo) with the aspen becoming more scattered in the southern portion of this unit (right photo).
Management Unit Information

Management Unit Number: 3  Number of Acres: 87

==========Major Objectives of Unit==========
Manage for passive recreational use with hiking trails and possibly utilize the tree resource for some eventual income.

==========Existing Conditions==========
Size Class: M9  Soil Type: RwB, Ta
Site Quality: Good-Excellent  Stand Quality: Good  Stand Density: 100-160ft²/acre

Management Unit Description:

This unit is a diverse mix of over stocked hardwood trees. Species present include; red oak, big-toothed aspen, red maple and the occasional white birch, white pine and red pine. Herbaceous understory is lower in diversity due to the sandy soils but species present include; white pine saplings, wintergreen, bracken fern, blueberry and some scattered witchhazel shrubs. The northern portion of this unit tends to have more aspen within the canopy than the southern and western portions of this unit. Aspen densities appear to increase along the edges of this unit or when changing into other parcels. Terrain is relatively flat with some very manageable hills and valleys. There are several unique areas within this stand. These are naturally occurring and planted clumps of white pine canopy trees. Refer to map for the exact locations of these clumps.

==========Planned Management Activities==========

This stand could make the Township some perpetual income every 10-15 years provided it is managed well during each of those management entries. Many trees within this unit are mature and some are likely declining in value since they are aging beyond their income “prime”. To manage this stand to protect its beauty and receive some income the Township should hire a professional forester to administer the management activity on the property. This forester should mark trees for removal to 1) improve the health, safety and quality of the remaining stand and 2) reduce the canopy competition to bring the stand density to 90-100ft²/acre. There are many options to remove these selected trees without much damage to the remaining stand. Horse logging or very careful mechanical operators should only be allowed to work on the property and the forester can offer insight on the best operator to choose.

This stand can also be left unmanaged but this is not suggested. Without management the older aspen trees will naturally die out of the stand due to their short life cycle and competition. During the process of these aspen dying out they will need to be monitored for safety near trails benches, parking lots etc. As they die off naturally the leftover stems do leave excellent homes for wildlife, in fact standing dead trees should be left as such whenever they are not in danger of falling on persons or property regardless of species across the entire parcel. Cutting the aspen will encourage new sprouts to proliferate throughout the cut area and greatly increase the opportunity for wildlife to use this area for cover and forage. The location of these areas should be determined by a professional but guided by the Township and its constituents.
Management Unit #4

Lowland species of trees with a high water table and significant tree wind-throw.
Management Unit Information

Management Unit Number: 4  Number of Acres: 9 Total acres

============Major Objectives of Unit============= 
Retain in its current state, for wildlife and ecosystem benefits. Allow recreational use where it is non-degrading to do so.

============Existing Conditions===============
Size Class: Lowland Species-9  Soil Type: RwB, Ta
Site Quality: Good  Stand Quality: Fair-Good  Stand Density: 120-190ft²/acre

Management Unit Description:

This unit occurs where the water table approaches the soil surface in a depression within Unit #3. The plant composition suggests this area has standing water during much of the year when rainfall is at normal levels. Tree species within this unit are; white pine and hemlock predominating with white cedar, white birch, red maple, scattered throughout the stand. Much of the tree understory is hemlock, with the herbaceous understory having; alder, willow and cattails in the wettest areas.

============Planned Management Activities============

Forest management is not needed in this unit at this time. Proximity to water make management of this stand difficult and tree values negate the need to get creative with active management. This area provides natural cover for wildlife refuge, water and food. Water and wetland areas are further described in other parts of this plan and management of these areas is explicitly described there.

Species of Note: There was a small amount of the endangered plant Club Moss (Lycopodiella margaritae) found within this unit. Since no management activity will take place within this area this plant should be free of degradation. A scarce species like club moss is worth noting and protecting within this unit.
Timeline for Forest Management
Long Lake Township
8870 N. Long Lake Rd.
Traverse City, MI 49684
Planned Property Location: The SE ¼ of the NW ¼ and the N 1/2 of the SW 1/4 of Section 35, Long Lake Township, Grand Traverse County, Michigan
109 Acres at the South East End of Long Lake

<table>
<thead>
<tr>
<th>Unit#</th>
<th>Management Activity</th>
<th>Year Planned</th>
<th>Year Complete</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Remove bark beetle infested trees, thin by a third</td>
<td>2007-2008</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Retain, protect for wildlife</td>
<td>Each Year</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Clear aspen in selected areas, commercial sawlog harvest</td>
<td>2009-2010</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Retain, protect for wildlife</td>
<td>Each Year</td>
<td></td>
</tr>
<tr>
<td>All Units</td>
<td>Leave standing dead trees as such that are not a safety hazard</td>
<td>Each Year</td>
<td></td>
</tr>
<tr>
<td>All Units</td>
<td>Do not cut/prune any trees from April 15th-October 15th to prevent oak wilt</td>
<td>Each Year</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Thin by another third and remove any trees still infested with bark beetles</td>
<td>2017-2018</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Commercial sawlog harvest</td>
<td>Every 10-15 years</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Remove the rest of the pine and allow natural seedlings to reclaim the unit</td>
<td>2027-2028</td>
<td></td>
</tr>
</tbody>
</table>
Long Lake Township

Unit #1
7 Acres

Unit #2
5 Acres

Unit #3
87 Acres

Unit #4
1 Acre

Aspen Clump

Natural White pine

White Pine Plantation

SE 1/4 of the NW 1/4 and the N 1/2 of the SW 1/4 of Section 35
Long Lake Township
Grand Traverse County, MI

Long Lake Township

Unit #1
7 Acres

Unit #2
5 Acres

Unit #3
87 Acres

Unit #4
1 Acre

Aspen Clump

Natural White pine

White Pine Plantation

SE 1/4 of the NW 1/4 and the N 1/2 of the SW 1/4 of Section 35
Long Lake Township
Grand Traverse County, MI
Long Lake Township Timing Map

SE 1/4 of the NW 1/4 and the N 1/2 of the SW 1/4 of Section 35
Long Lake Township
Grand Traverse County, MI

Unit #1
7 Acres

Unit #2
5 Acres

Unit #3
87 Acres

Unit #4
1 Acre

Unit #4
8 Acres

Manage for Multiple Uses

Stand boundaries

Thin ASAP

Retain

Manage for Multiple Uses
CpA - CpB2: Croswell loamy sands, (0 - 6 percent)  
CoA, CoB: Croswell loamy sands, overwash

The Croswell series consists of loamy sands and sands that are moderately dark colored and moderately well drained.

**Common Trees:**
Quaking aspen  Red pine  Jack pine  
Northern red oak  Black cherry  White pine  
Bigtooth aspen  Red maple

Trees to Plant:
Red pine, white pine, white spruce.

<table>
<thead>
<tr>
<th>Soil Name</th>
<th>Erosion Hazard</th>
<th>Equipment Limitation</th>
<th>Seedling Mortality</th>
<th>Windthrow Hazard</th>
</tr>
</thead>
<tbody>
<tr>
<td>CpA - CpB2</td>
<td>Slight</td>
<td>Slight</td>
<td>Moderate</td>
<td>Slight</td>
</tr>
<tr>
<td>CoA, CoB</td>
<td></td>
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</tr>
</tbody>
</table>

The Croswell series contains deep, well-drained, sandy soils that have rapid or very rapid internal drainage. The moisture supplying capacity is poor to very poor, and the soils are droughty during dry periods. Aeration is rapid, and natural fertility is low.

The potential productivity of this soil series is generally high for pine and medium for aspen and northern hardwoods.

On the steeper slopes (18 - 45%), the use of planting and harvesting equipment is moderately to severely limited. Erosion is a severe hazard on these slopes.
KaA - KaF2: Kalkaska loamy sand, (0 - 45 percent slopes)

Soils of the Kalkaska series are well drained and very sandy.

**Common Trees:**
- Sugar maple
- Quaking aspen
- Red pine
- White pine
- Beech
- Paper birch
- Red oak
- Red maple
- Bigtooth aspen

Trees to plant:
Red pine, jack pine.

<table>
<thead>
<tr>
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<th>Windthrow Hazard</th>
</tr>
</thead>
<tbody>
<tr>
<td>KaA - KaD2</td>
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<td>Moderate</td>
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</tr>
<tr>
<td>KaE, KaE2</td>
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<td>Moderate</td>
<td>Moderate</td>
<td>Slight</td>
</tr>
<tr>
<td>KaF, KaF2</td>
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<td>Severe</td>
<td>Moderate</td>
<td>Slight</td>
</tr>
</tbody>
</table>

The Kalkaska series contains deep, well-drained, sandy soils that have rapid or very rapid internal drainage. The moisture supplying capacity is poor to very poor, and the soils are droughty during dry periods. Aeration is rapid, and natural fertility is low.

The potential productivity of this soil series is generally high for pine and medium for aspen and northern hardwoods.

On the steeper slopes (18 - 45%), the use of planting and harvesting equipment is moderately to severely limited. Erosion is a severe hazard on these slopes.
**RwA - RwF2: Rubicon sand (0 - 45 percent)**

The Rubicon series consists of well-drained soils that have sand surface and subsurface layers and a sand subsoil.

**Common Trees:**
- Quaking aspen
- Bigtooth aspen
- Red maple
- Jack pine
- Balsam fir
- Paper birch
- Red pine
- N. red oak
- White pine

Trees to Plant:
- Red pine & white pine.

<table>
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<tr>
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</thead>
<tbody>
<tr>
<td>RwA - RwD2</td>
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<td>Moderate</td>
<td>Slight</td>
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<tr>
<td>RwE, RwE2</td>
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<td>Moderate</td>
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<tr>
<td>RwF, RwF2</td>
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<td>Severe</td>
<td>Moderate</td>
<td>Slight</td>
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</tbody>
</table>

The Rubicon series consists of well-drained, sandy soils that have rapid or very rapid internal drainage. The moisture-supplying capacity is poor or very poor. Natural fertility is low and aeration is rapid.

**The potential productivity of the Rubicon soils is highest for red and white pines and generally is very low for northern hardwoods.**

On the steeper slopes (18 - 45%), the use of planting and harvesting equipment is moderately to severely limited. Erosion is a severe hazard on these slopes.
Ta: Tawas-Roscommon complex

In the Tawas series are very poorly drained soils that consist of 12 to 42 inches of organic material over sand.

Common Trees:
Balsam fir  White cedar  Quaking aspen
Black ash  Red maple  Yellow birch
Black spruce

<table>
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</tr>
</thead>
<tbody>
<tr>
<td>Ta</td>
<td>Slight</td>
<td>Severe</td>
<td>Severe</td>
<td>Severe</td>
</tr>
</tbody>
</table>

The Tawas soils are level or slightly depressional. They have a permanently high water table within 24 inches of the surface, and ground water is near or above the surface for long periods, especially in spring and early summer.

In the lower, more nearly level areas, these soils are commonly ponded. Aeration is slow, natural fertility is moderate, and the moisture supplying capacity is high.

The potential productivity of this soil is low or very low because of ponding or a high water table. It is probably best suited for spruce, white cedar and balsam fir.

Excess water causes seedling mortality and plant competition to be severe. Equipment can be used only in the winter when soils are frozen.