Lambton County Heritage Forest Management Plan

(Supplementary to the 1994 Management Plan)

St. Clair Region
Conservation Authority

Final DRAFT

Executive Summary

This Lambton County Heritage Forest Management Plan is a supplementary document to the 1994 Management Plan. This plan updates some of the information found in the 1994 document, providing recommendations for sustainable management.

The overall goal of this management plan is to conserve, protect and rehabilitate the Lambton County Heritage Forest (LCHF) as a diverse natural heritage forest representing the Lake Huron sand dune system with its various savannah and forest types including Species at Risk that depend upon the habitats they provide. (Based on the 1994 Management Plan)

To further assist with obtaining specific goals and objectives, the property has been separated into 14 Vegetation Management Units (VMU) which are listed below.

Vegetative Management Unit Summary

VMU	ELC (Appendix B)	Name	Dominant Species *	Area (ha)	Key Management Recommendations and Habitat Features
1	FOD1-1	Red Oak Forest	Or_3, Ow_2, Obl_1	42.4	Some small areas open enough to be Savannah
2	FOM1	Mixed Oak Pine Forest	Obl_4, Pr_2, Ow_1	61	Wild lupines
3A	FOD1	Red Oak White Oak Forest	Or_4 Ow_2 Obl_1	14	Basal area does not account for large number of sapling sized trees
3B	FOD1-2	White Oak Forest	Ow_5, Or_3Wb_1	5	The majority of dwarf hackberry is located here
4	SWD3-2	Silver Maple Mineral Deciduous Forest	Ms_3, Ag_1, Aw_1	28.1	VMU with the most records of Hooded Warblers over the last 15 years
5	FOD1-3	Black Oak Forest	Obl_4, Ow_3,Or_1	42.9	Large area of possible savannah habitat
6	FOD7-2	Floodplain Forest	Aw_4, Bd_2, Or_1	16.8	Same site characteristics as VMU4 different forest type
7	FOC3-1	Hemlock Coniferous Forest	He_5, Aw_1,	1.6	Manage for hemlock
8	FOC2-2	Cedar -Tamarack Coniferous Forest	Cw_4, Pw_2, Lt_2	4.7	Manage for tamarack and cedar
9	FOM4	Cedar Oak Mixed Forest	Cw_5, Or_2, Ow_1	2.4	Cedar is being shaded and dying out
10	FOD1-1	Deciduous Forest	Or_3, Aw_1, He_1	2.9	A location to manage for hemlock
11	FOD4-2	Lowland Deciduous Forest	AW_3 Mr_2Or_1	2.9	Significant component of red elm
12	TPS1-2	Black Oak White Pine Savannah	Obl_6, Ow_2, Cb_1	5.2	Has the most open canopy where Savannah conditions still exist
13	FOM 1	Red Pine Mixed Forest	Pr_3, Ow_2, Obl_2	7.5	Contains the climbing hill

* Short forms for species contained in Appendix C, subscripted numbers refer to percentage (e.g.,$_3$=30%)

Based on previous reports and the information compiled in 2009 some general recommendations and guidelines have been drafted. Before any activity is undertaken a prescription outlining the goals and objectives of the operation will be written. This includes, monitoring or actual management operation, the area to be treated or monitored, type of treatment and timing.

General Recommendations

Forest Management Recommendation

To meet the goals and objectives of this plan, forest management will be required. Proper silviculture techniques will be used throughout the property. Provincial Guideline Manuals will be used for managing the Vegetation Management Units (VMUs). The larger management units (VMU 1, 2, 3, 4, 5, and 6) should be divided into two to three smaller compartments for any management which disturbs the canopy layer. A rotational cycle can be developed in which one of the sub-units is treated in any ten-year period. Property managers will work with adjacent landowner towards a common goal/ strategy.

Controlled Burn as a Management Option

While evidence of the oak savannah/ pine barrens still exist within the Lambton County Heritage Forest (VMU 2, 5 and 12) years of fire suppression and lack of tree mortality has permitted an oak forest to develop from the areas of savannah/pine barrens. Increasing shade is gradually eradicating the shade intolerant prairie species as well as early succession phase forest species. By opening up the canopy again in areas which still contain prairie species, through selective cutting and / or low intensity controlled burn, these areas could be restored to functional savannah. However, before burning any area, a burn plan outlining the section to be burned as well as goals, objectives, manpower requirements and condition requirements will have to be written.

Controlled burn has been widely regarded as an effective means of maintaining an early succession habitat such as savannah ecosystems (Payne and Bryant 1994). Fire influences savannah composition in many ways including reducing woody plant cover, increasing the abundance of some species while decreasing the abundance of others (such as garlic mustard), and exposing mineral soil. Fire also volatilizes nitrogen (returning it to the atmosphere) while leaving much phosphorus and potash behind in the ash. Together with opening the canopy, these two processes should strongly favor plants associated with nitrogen fixing bacteria, such as lupine. When using controlled burn as a management tool, it is important to recognize the balance between Species at Risk (SAR) mortality in the short term, and improvement in the quality of their savannah habitats in the long term. (Givnish et al. 1988, Andow et al. 1994, Maxwell and Givnish 1996, Swengel and Swengel 1997, Schultz and Crone 1998) In addition, the use of a prescribed burn for habitat restoration will require different considerations than when fire is used for habitat maintenance. Some of the key factors to consider in developing habitat restoration and maintenance plans that include prescribed fire as a tool are:

1. Site history and current condition
2. Characteristics of prescribed fire
3. Amount of direct SAR mortality likely to occur during the fire

4. Potential for SAR to reoccupy the site
5. Response of other important plants currently on the site to fire
6. Other habitat responses

Because each VMU presents a unique combination of many of these key factors, it is important to develop site specific fire management plans for each area to be burned.

Management Recommendations for the Rehabilitation and Preservation of Oak Savannah/Pine Barrens

- Preserve current oak savannah/pine barrens habitat - only a few scattered pockets amounting to less than 10 ha.
- There are at least four VMUs where remnant savannah still exists (1, 2, 5 and 12). Even in these VMUs the opportunities are limited.
- Enlarge and improve current savannah/pine barrens habitat.
- Use test plots to determine the preferred method of oak/pine savannah rehabilitation and maintenance by choosing at least three test plots for oak pine savannah habitat. Making sure the soil structure, size of plot, wind activity, topography and species composition is similar. One plot will be used as a low intensity prescribed burn area. The second will have selective cutting. The third will have both. The three areas can then be monitored annually for effects on Species at Risk, soil productivity, regeneration, and insect pest and disease levels.

Short-term Management of Ash

- With over 25% of this stand being ash, it is advisable to remove the merchantable ash before it is killed by emerald ash borer. Half of the area could be harvested one year and the other half 2-3 years later to reduce any negative impacts on wildlife. A commercial thinning will not remove the majority of ash stems and the residual will still succumb to EAB but the openings created by trees killed by emerald ash borer should be smaller because the commercial thinning would allow other trees to fill some of the canopy gaps first.
- Removal of ash saplings will help oak regeneration, because ash is a fast growing species it will grow up and shade out the oak seedlings. Emerald ash borer may make this unnecessary.
- With the high basal area of 29m^2/ha in this VMU many of the trees will die over the next 20 years. This would be a good VMU to remove ash species before they become infested with emerald ash borer and to provide release for tulip, red pine, white pine, hemlock, white birch and shagbark hickory.
- Some of the larger ash could be removed if a harvest is to proceed elsewhere in the forest and timber is being removed through this VMU.

Management Recommendations for the use of Recreation Trails

- The entrances to the property require better structures to discourage use by unauthorized vehicles (e.g., ATV and snowmobiles) and dune climbing. More signage would also be useful. Work with local municipality and enforcement to stop use by motor vehicles.

- Complete a monitoring project on the population of dwarf hackberry along the trails in respect to its dependence on site disturbance and effect of the trail systems on this Species at Risk.
- Label trails completely including junctions where trails intersect.
- Monitor and repair/add signage where required.
- Block off any area of trail that is no longer in use using large logs or blocks, and install signs.
- Maintain trails annually by trimming overgrown vegetation, removing any fallen trees or branches.
- Monitor trail for hazard trees and remove any within 30 meters of the trail.

Management Recommendations for Species at Risk (SAR)

- Create a monitoring program for SAR within the LCHF and monitor annually
- Maintain necessary habitat and wildlife features for SAR
- Where possible create habitat for SAR that were once identified in the LCHF such as lupines for Karner Blue butterflies. Most of the butterflies require herbaceous plants associated with savannah and should respond to the treatments to increase the herbaceous species.
- Dwarf hackberry has been located from a recent survey and exceeds previously recorded amount. It is therefore not necessary at this time to create any management practices specifically for dwarf hackberry. The monitoring project recommended under the recreation trail section should still be developed and implemented.
- Likewise, although only one butternut was found during the survey there is not much point in doing anything for butternut until someone produces a strain of butternut with at least some resistance to butternut canker.
- During the 2006 nesting survey by Bird Studies Canada only two Cerulean Warbler nests were reported on the property and two more just north of the property. In the 1994 report only one nest was reported. They appear to like large diameter oaks with little understorey. Obviously any savannah improvement is a detriment to nesting of Cerulean Warbler. One of the reasons for recommending that no more than 1/3 of the forest receive canopy opening management is that it will leave 10-20 years of closed canopy.
- Hooded Warbler likes small canopy gaps with a brushy understorey (the opposite of Cerulean). 15 nesting pairs were found in the 2006 Bird Studies Canada project. In 2008 3 pairs of nesting hooded warblers were located in VMU 4 right along Mud Creek in the last week of July.
- Five pairs of Acadian Flycatcher were reported by bird studies Canada in the LCHF in 2006. This is another interior nesting species which likes a closed canopy. It appears to be increasing in number both in the LCHF and Ontario in general.
- There are other interior forest nesting birds, which will benefit from conditions which improve conditions for the previous three.
- The Giant Swallowtail butterfly appears to live on American prickly-ash. This species was quite common in VMUs 1, 4 and 6 and is in no danger of dying out soon.

Management Recommendations for Hemlock

- Hemlock dominates VMU 7, is a canopy species in VMU 10 and occurs as small groves in a few other locations, although it is more common farther north in the Great Lakes St Lawrence forest region. It is uncommon here for a number of reasons. It is however, a significant plant for wildlife, especially during the winter.
- Its groves should not only be protected, but they should be expanded 50-100 percent.

Management Recommendations for Cedar

- Both white and red cedars are being shaded out of existence by taller trees. If they are to survive on site, some of their shading competitors will need to be removed.
- Red cedar should establish in openings for savannah but may not survive controlled burns unless they are protected.
- The most significant threat to eastern white cedar regeneration is the white tailed deer. It may be necessary to protect some white cedar regeneration from the local deer herd until it is two meters tall. A regeneration survey should be conducted to determine if white cedar is regenerating. Also to determine if deer browse is a concern. If the cedar are severely browsed then a deterrent may need to be applied.

Management Recommendations for Invasive and Exotic Species

- Remove all purging and glossy buckthorn. They can be pulled out by the roots if small or cut off and the stump painted with herbicide.
- Remove the invasive Norway spruce in VMU 2.
- Monitor for any other invasive species listed in Appendix J

Management Recommendations for Insect Pests and Diseases

- Wherever Nectria canker is found, if possible, remove the infected individual preventing further spread of the disease.
- Continue to monitor for Emerald Ash Borer and if harvesting or thinning is to be done in the foreseeable future, ash species should be favored for removal.
- Gypsy moth does not seem to be a current problem in the LCHF. It should still be monitored because of the high oak population. If populations increase there are many methods to help control listed in Appendix K.

For further detailed information refer to the 2009 Lambton County Forest Management Plan.

Acknowledgements

The Author owes a great deal of thanks to other contributors to this report. First, Sarah Rupert and her associates collected the information for the 1994 report which has been used in part in this report. Bird Studies Canada supplied some recent data on the nesting locations of hooded warbler, cerulean warbler and Acadian flycatcher. Larry Cornelis supplied considerable information on herbaceous plants while he was looking for plant species designated as Species at Risk (SAR). Chris Mills collected most of the information about the dwarf hackberry growing on site. Mike Nelson did a quick bird nesting study to provide an update on the bird species using the Lambton County Heritage Forest (LCHF) in 2008. Al Woodliffe supplied some background information on oak savannah and pine barrens as well as management issues related to the maintenance of both. And finally thanks to Ashlea Rabideau who helped collect some data and helped piece together records from the last two decades.

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1.0 Introduction

This plan provides direction for the management of the Lambton County Heritage Forest (LCHF) for the next 10 to 20 years. It is supplemental to the previous management plan created by the staff of the Lambton County Planning Department in 1994.

Management recommendations focus on the desire to maintain the biological diversity of the property, with emphasis on protecting the unique Lake Huron sand dune system. The value of both savannah and forest habitats including their representative Species at Risk (SAR) are recognized. The plan underlines the need to conserve, protect and rehabilitate the LCHF as a diverse natural heritage forest.

1.1 Objectives

Management objectives can generally be classified into one of the following categories as outlined in '*A Guide to Stewardship Planning for Natural Areas*' published by the Ontario Ministry of Natural Resources (MNR):

1. Environmental Protection
2. Forest Products
3. Recreation
4. Wildlife
5. Nature Appreciation

(Note: The MNR guide lists a sixth category, "investment," but because there is no intention of selling the property it is not considered in this document.)

1. *Environmental Protection*
   Environmental protection is the primary management objective. The LCHF has very significant ecological features that need to be conserved. Key priorities are:
   - To maintain habitat for SAR (Appendix A).
   - To ensure diversity within the vegetation types is maintained, with emphasis on the oak savannah, oak forest, sand dunes and wetland or lowland deciduous areas.
   - To participate in recovery programs to re-establish or re-introduce SAR or species rare to this region (Appendix A).

   Conflictingly, management designed to benefit one SAR habitat can degrade another. For example, SAR warblers and Acadian flycatcher avoid savannah habitat required by many of the SAR butterflies and plants. In fact, the enlargement of savannah would increase habitat for brown-headed cowbirds which are nest parasites of bird species dependent on interior forest habitat.

2. *Forest Products*
   The objective is to use revenue derived from forest management (e.g. opening the forest canopy to maintain or enlarge savannah areas) to support additional management actions (e.g. control or removal of invasive species, controlled burns, trail maintenance, signage etc.) within the LCHF or other natural areas owned by the County.

3. *Recreation*
   The recreational objective is to prohibit heavy recreational usage (e.g. ATVs) and the establishment of unmanaged trails. Limited parking for visitors and the prohibition of ATV/dirt bikes discourages some recreational use, but the three large trail systems do the opposite. Hikers, cross-country skiers, snowmobilers, horseback riders, motorcyclists and ATV users frequent the property.

4. *Wildlife*
   Maintenance of the SAR populations and their habitats is the first priority of wildlife management. In general, habitat features such as cavity trees (Figure 1-1), stick nests, "super-canopy" trees, clumps of conifers, ephemeral pools (Figure 1-2) will be preserved and promoted. As noted in the *environmental protection* objective: actions positively affecting populations of one or two SAR species will negatively affect others.

5. *Nature Appreciation and Education*
   The success of this management plan relies, to some degree, on the education of the public and stakeholders. Therefore, it is important to communicate the goal/objectives of the management plan. Information hikes and other events on the property in the winter, spring and fall will provide a great opportunity to raise awareness of the ecological importance of the area as well as management strategies and progress.

Figure 1-1. Cavity trees provide good wildlife habitat

Figure 1-2. Ephemeral ponds will be preserved

2.0 Property Location and Description

The LCHF is a 237.4 hectare property located near the southern shore of Lake Huron near Port Franks, Ontario (Map 2-1). The large and diverse forest habitat makes this site rich in plant and wildlife species including many SAR. A number of trails used recreationally for hiking, horseback riding, biking etc. (both managed and unmanaged) weave throughout the property (Map 2-2).

The LCHF was characterized as being open oak woodland with savannah areas in the 1994 LCHF Management Plan. Its vegetation types include oak savannah/pine barrens, oak forest, natural stands of hemlock, cedar, pine and wetland forest (green ash, cottonwood, and silver maple along Mud Creek) and marsh communities. Eight species of birds, four plant species, two herptiles and two species of butterflies, designated 'at risk' by the Committee on the Standard of Endangered Wildlife in Canada (COSEWIC) have been identified within the forest in the past (Appendix A).

The LCHF is recognized as part of an Area of Natural and Scientific Interest (ANSI) and an environmentally sensitive area (ESA). It is designated in the County Official Plan as part of an "Anchor Area" and "Primary Natural Heritage Corridor." The Municipality of Lambton Shores has designated the entire area of the LCHF as Hazard, Environmental Protection or Wetlands in their official plan. It is recognized by a large number of people, organizations and government agencies as a significant natural area.

2.1 Lambton County Heritage Forest History

The Canada Company purchased the property to remove the timber and then sell the land for agriculture. The dunes portions of their holdings were of no value for agriculture and remained undeveloped. The County of Lambton purchased the LCHF from the Canada Company in the 1930s. In the 1950s, many coniferous trees were planted including White Pine (*Pinus strobus*), Red Pine (*Pinus resinosus*) and Norway Spruce (*Picea abies*). This was an effort to close in the open areas of the property. It was later determined that these open areas were either oak savanna or pine barrens. The removal of planted pine to return the planted areas to savanna/pine barrens was attempted. In 1984, the LCHF and surrounding forest was designated as an ANSI named the Port Franks Wetlands and Forested Dunes (Lindsay, K.M., 1984).

According to the 1994 management plan commercial logging took place in 1983 just before the designation and again in 1987. Since 1971, there has been an ongoing effort to create Management Plans (County of Lambton, 1994) either internally or through the Ontario Ministry of Natural Resources (MNR). The only existing record of a plan is the 1994 Management Plan created by the staff of the Lambton County Planning Department.

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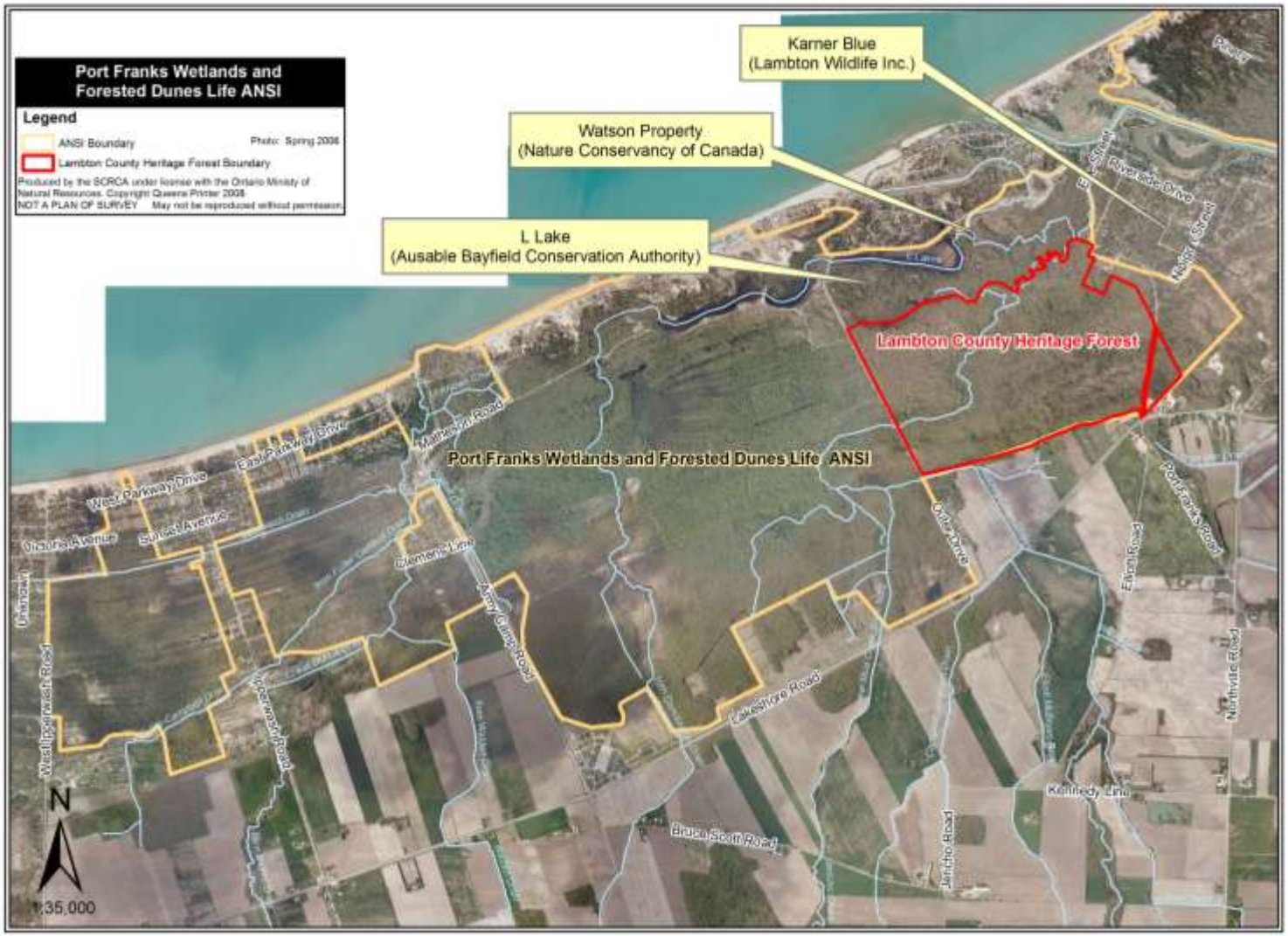
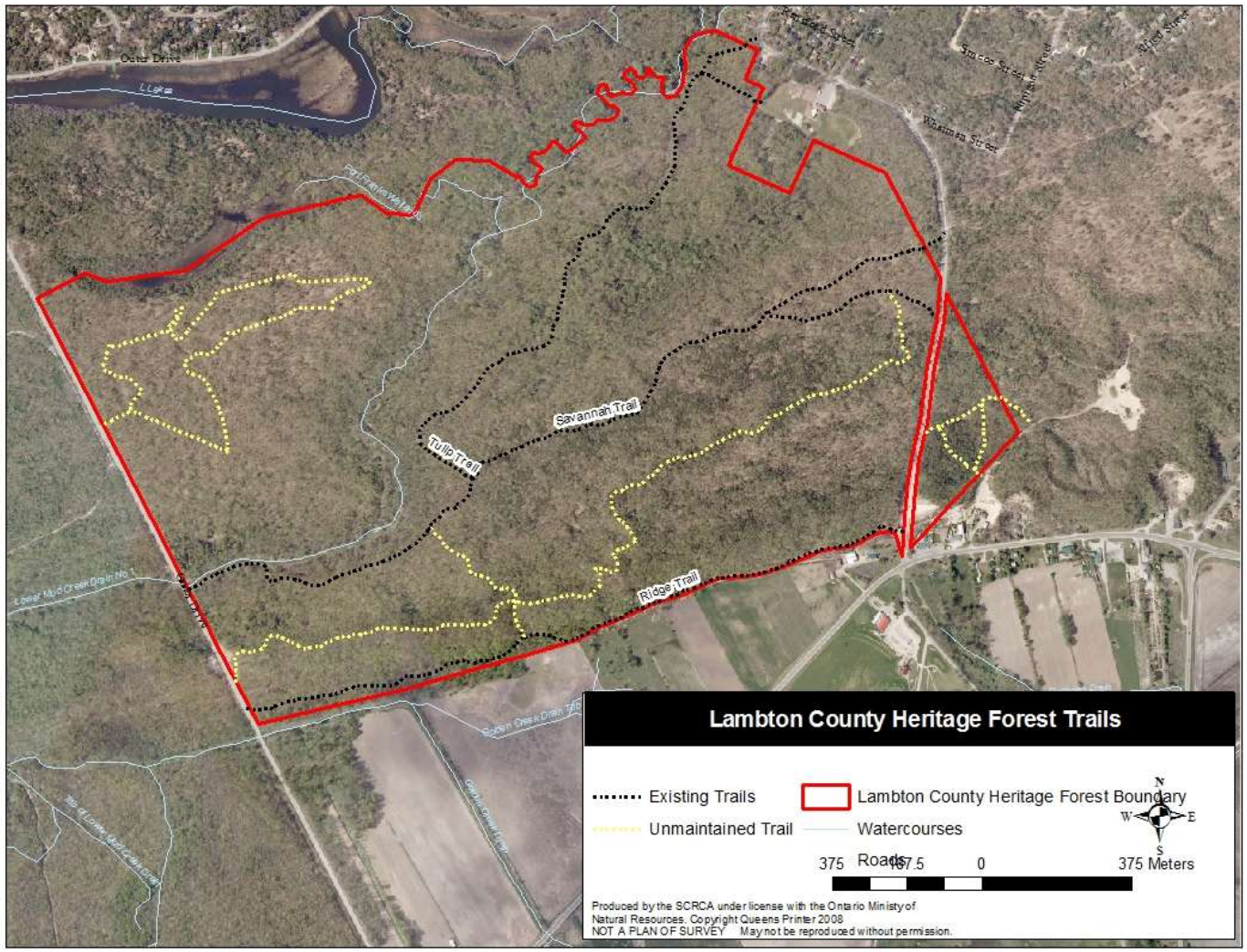


Map 2-1. Port Franks and Forested Dunes ANSI



Map 2-2. Lambton County Heritage Forest Trails

While actual records of logging were not available from the County of Lambton for the LCHF, the 1994 report refers to logging taking place in the LCHF most recently in 1987. Most of the logging occurred in the southeast quadrant of the property in the oak pine forest and black oak/white pine savannah (referred to as VMU 2 and 12 later in this report). There was also evidence throughout the forest of selective cutting occurring in the last 30 years. A number of charcoal encrusted stumps in the northwest corner of black oak forest (also referred to as VMU 5) indicate a fire in the last 50 years. However, considering the number of small pines which were cut down in the 1990s and the number of larger pines which were girdled (Figure 2-1), it is unlikely the fire occurred recently. It was probably low intensity. Some existing tree stumps were aged by counting the growth rings. The ring counts indicate that some of the pine germinated prior to 1890 (Table 2-1).

Figure 2-1. Large White Pine girdled in the 1990s. Samples from dead trees were counted for several species and the data shown in Table 1

Table 2-1. Sample Tree Ages and Growth Rates

Species	*Diameter inside bark*	*Diameter outside bark*	*Age*	*Ave Annual growth rate (cm*	*Best 10 years*	*Annual growth rate best ten years (cm)*
Red pine	30	32.5	70	0.428	20-29	1.3
Red pine			108			
Red pine			106			
White pine	39	45	84	0.46	15-24	0.6
White pine	30	34	95	0.315	8-178	0.8
Hemlock*	33	39	88	0.375	10-19	.4
Red oak	40	42	78	0.512	31-40	1.0
Black oak	31	33	93	0.333	25-34	0.56
White oak	47	50	98	0.479	30-39	0.6**
White oak	37	39	63	0.58	23-32	0.98
Ash	28	31	66	0.42	?	0.7
Ash	26	29	60	0.43	5-14	0.5
Blue-beech	10.35	11	68	0.15	1-10	.44
Black cherry	20	21	52	0.38	1-10	1.0
Black cherry	17.2	?	43	0.4	1-10	0.75
White birch	32	34	54	0.59	20-30	0.6
Soft maple	30	32	76	.4	1-20	0.6***

* Age taken 12 feet off the ground
** The last 10 years were 0.56 cm per year- killed by a beaver.
*** The growth rate was uniform over the first 20 years.
There are larger live trees of each species than those we were able to count the rings. This indicates there are older trees of each of these species.

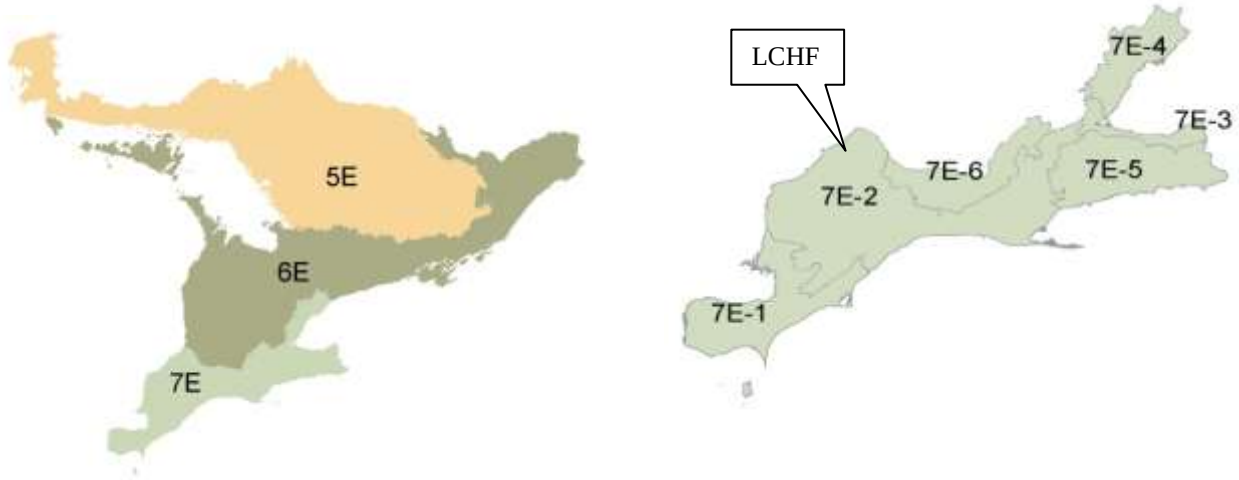
2.2 Carolinian Life Zone

The LCHF lies within the Carolinian Life Zone, the northern-most edge of the deciduous forest region in eastern North America, also commonly referred to as Carolinian Canada. According to the Ministry of Natural Resources, the Carolinian Life Zone is small compared to the other vegetation zones, making up only one percent of Canada's total land area yet carrying greater numbers of both flora and fauna species than any other ecosystem in Canada. It is estimated there are over 2,000 species of plants including 80 tree species. About 400 species of birds have been sighted in this region (Ministry of Natural Resource, n.d.). The region supports one-third of the rare, threatened and endangered species found in Canada (Carolinian Canada, 1994). The prevalence of SAR in the region results from the species being at the extreme north end of their range. Thus they are "at risk" in Canada, but not necessarily worldwide. The main contributing factor to the diversity of species in this area is the climate. This zone has the warmest average temperatures with the longest frost-free season and mildest winters in Ontario.

Natural vegetation communities in the Carolinian Life Zone include tall grass prairies, wetlands, savannah, deciduous forest, mixed forest and even coniferous forest. The Carolinian Life Zone is also called eco-region 7E (Map 2-3, left) (Carolinian Canada, 1994). An eco-region can be defined by the soils and bedrock patterns that influence the vegetation. Eco-region 7E is divided into six ecological site districts (Map 2-3, right), defined on the basis of surface geology. The LCHF is located in Ecological site district 7E-2. Major physiographic features include: clay plains, sand plains, till plains, and limestone plains (Carolinian Canada, 1994). Common tree

species associated with eco-district 7E-2 include; sugar maple (*Acer saccharum*), American beech (*Fagus grandifolia*), white ash (*Fraxinus americana*), Eastern hemlock (*Tusga canadensis*), white pine (*Pinus strobus*) and - in the past - white elm (*Ulmus americana*). None of these common species are "Carolinian". The "Carolinian" species such as tulip tree (*Liriodenron tulipifera*), chinquapin oak (*Quercus muehlenbergii*), dwarf chinquapin oak (*Quercus prinoides*), sassafras (*Sassafras albidum*), common hoptree (*Ptelea trifoliata*) and flowering dogwood (*Cornus florida*) are at the northern end of their range. They are, therefore, very restricted in the sites on which they will grow. Wetlands and water make up only two percent of this eco-region.

In 1984, Carolinian Canada listed 38 'critical natural areas' which were unprotected in Ontario. Today, the Port Franks Wetlands and Forest Dunes, of which the LCHF is a part is "Area 23" - formerly listed as a 'critical natural area' now called 'core natural area' by Carolinian Canada.



Map 2-3 Map of Eco-Regions/Eco-Districts. Eco-Regions for Central and Southern Ontario (left) and Map of Eco-Region 7E's Eco-Districts (right). (Ecological Land Classification Primer 2007)

2.3 Area of Natural and Scientific Interest (ANSI)

ANSIs are areas recognized by the Ministry of Natural Resources (MNR) that represent significant geological (earth science) and biological (life science) features. They are designated to help protect representative and special natural areas, plants and animals. MNR identifies ANSIs that are 'provincially significant' by surveying regions and evaluating sites to decide which have the highest value for conservation, scientific study and education (MNR, 2006). Originally, in 1984, the Port Franks Wetlands and Forested Dunes ANSI was 480 hectares in size. In 1998, it was expanded to 1,700 hectares (MNR, n.d.).

According to the Carolinian Canada website:

> Although the ANSI report lists several vegetation complexes, only three are found in the LCHF portion:

1) *Mud Creek Lowlands Complex:* This complex is associated with the floodplain of Mud Creek. Interesting species found in this area include trees such as the swamp white oak (rare provincially and nationally). VMUs 4, 6, 7, 9, 11 and part of VMU 1 are in this complex.

2) *Upland (Forested) Dune Ridge Complex:* This complex is composed of an oak-pine forest running parallel to Lake Huron. A portion of open canopy on the leeward side of the dune ridge supports Blue Lupine (*Lupinus perennis*) which is important to the Karner Blue Butterfly (*Lycaeides melissa samuelis*). It also supports Prairie Junegrass (*Koeleria macrantha*) and Needle & Thread Grass (*Stipa comata*). All are rare, either nationally, provincially or locally. VMUs 3, 10 and part of 2 are located in this complex.

3) *Upland Interdunal Complex:* This complex has become one of the most disturbed sections of the ANSI. A number of communities exist within this complex such as: oak-pine forest, coniferous-deciduous forest, interdunal meadow and deciduous-evergreen forest. These communities support a number of the same species as listed above but a few different ones exist. These species include the provincially and nationally rare rough blazing star and Dwarf Chestnut Oak (*Quercus prinoides*) as well as the regionally rare Cylindric Blazing-star (*Liatris cylindracea*).

   This is the area where oak savannah/pine barrens habitat occurs. Savannahs and prairies develop on sites which are subject to environmental stresses, typically fire, drought, spring flooding, clear cutting and warmer than usual local climates. Prairie occurs where these effects are most severe, while savannah exists where these stresses are not so pronounced and can have a crown cover of anywhere from 11% to 35% (Ecological Land Classification for Southern Ontario, 1998). In the Carolinian region, trees which characterize savannahs are the oaks and hickories, and occasionally pines, pin oak, swamp white oak, and bur oak dominate wetter sites. Black oak, white oak, and pignut hickory are found on intermediate sites and the dryer sites may also have White pine or red pine. In very dry sites, eastern red cedar may also occur with oak and pine. VMUs 2, 5, 8, 12 and 13 and part of 1 are representative of this complex. Other Savannah associated plant species are listed in Table 2-2 (ABCA, 2001)

Table 2-2. Savannah Associated Species in the Carolinian Zone

Flora	**Found on LCHF**	**Found on Adjacent Properties**
Dense blazing star		✓
Rough blazing star	✓	
Cylindrical blazing star	✓	
Grey headed coneflower		
Bird's foot violet		
Green milkweed	✓	
Tall green milkweed		
Spotted bee-balm		
Wild lupine	✓	
Prairie dock		
Sullivant's milkweed		
Goat's rue		
Small white lady's slipper		
Pink milkwork		
Showy goldernrod		
Tall sunflower	✓	
Big bluestem	✓	
Little bluestem	✓	
Prairie cordgrass		
Fringed brome grass		
Yellow puccoon	✓	
Wild bergamot	✓	
Hairy bedstraw	✓	
Butterfly weed	✓	
Fauna		
Henslow's sparrow		
Fox snake		
Coral hairstreak		✓
Bronze copper		
Bog copper		
Banded hairstreak		✓

2.4 Geology and Soils

According to the Carolinian Canada website write-up on the "Port Franks Wetland and Forested Dunes":

> Another major factor in the diversity of this region started at the end of the last glacial period, about 12,000 years ago. The Port Franks Dunes are underlain by Paleozoic limestone rock known as the Hamilton & Dundee Group. This underlying rock formed the wave-cut terraces of glacial lakes Algonquin and Nippissing which covered this area thousands of years ago. On the present day landscape, the shorelines of these glacial lakes are virtually inseparable except for a large ridge of material between Thedford and Grand Bend. This ridge of material is responsible for the formation of the dunes between Kettle Point and Grand Bend after the retreat of Lake Nippissing (ABCA, 2001).

The first sand dunes were formed as a result of north-westerly winds blowing the sand inland before the climate warmed enough for vegetation to consolidate the sand. The process moved the extremely coarse sand into some of the tallest dunes in southern Ontario. This deposit of dunes during the last 11,000 to 12,000 years ultimately resulted in the accumulation of plants and associated wildlife uncommon even in this portion of Ontario. These soils were also so poor for agriculture they were not purchased for that purpose and were allowed to reforest after the original clearing.

Two soil types exist in the Port Franks area including the LCHF. A sandy loam soil with poor drainage, known as the Granby series, is located within the wetland areas such as VMU 4 and VMU 6. Outside of that is the Plainfield series, a sandy soil with excessive drainage.

2.5 Other Public and Natural Lands in North Lambton

The LCHF is part of a larger system of dune ridges existing from Grand Bend to Kettle Point. Most of the area is covered in some kind of native vegetation from open grasslands to closed forests. Over the last 60 years human influences have increased along the entire system. The LCHF is bordered to the north by the L Lake Management Area (Ausable- Bayfield Conservation Authority) and the Watson property (Nature Conservancy of Canada) (Map 2-1). To the south of the LCHF the land is much flatter and more productive therefore has been cleared for agriculture.

L Lake Management Area borders the northwest corner of the LCHF and has been owned and managed by the Ausable Bayfield Conservation Authority (ABCA) since 1987. It is 28 hectares with rolling sand dunes and wetland areas including an oxbow wetland - the only one of this kind in the area (ABCA, 2001).

The Watson Property is 56.3 hectares in total and is located to the north of the LCHF, north of Mud Creek. The property is owned by the Nature Conservatory of Canada and managed by Lambton Wildlife Inc. The Karner Blue Sanctuary is a 14.9 hectare property owned and managed by Lambton Wildlife Inc (LWI).

The Thedford Conservation Area is a 17 hectare property managed by the ABCA from Lakeshore Road along the southwestern shore of the Ausable River Cut. There is no camping at this site however it provides a system of nature trails and a picnic area.

The Pinery Provincial Park extends along Lake Huron northeast of the LCHF. Over 2,500 hectares in size, the Pinery contains much of the remaining oak savanna habitat to be found in North America. The Pinery offers 1,000 camping sites along with a 10 km beach, 38 km of trails canoeing, kayaking, fishing, and one of the largest year-round interpretive programs in Ontario.

2.6 History of Port Franks

According to the Port Franks Wetland and Forest Dune write-up on the Carolinian Canada website:

> Before the settlement of the Port Franks area by Europeans, this area was used by the natives of the Attawandron Nation. The Attawandron did not establish a permanent settlement in the Port Franks area but instead used Port Franks and in particular the LCHF as the secret location of their flint chipping workshops. With the flint found in the area, the Attawandron made weapons for the Huron and Iroquois tribes.
>
> In 1872, the Canada Company diverted the flow of the Ausable River by cutting off a section and forcing it to outlet in Lake Huron at Port Franks. This allowed land that was once swampy to become viable farmland (ABCA, 2001)

Port Franks was registered as a village with the County of Lambton in February, 1877. In 1892, a second cut to the lake was created at Grand Bend to alleviate the flooding in the area. Salt was discovered in Port Franks in1881 and the plant lasted for approximately 12 years. By this point in history, Port Franks was becoming known as a tourist community. After the end of World War II, the economic boom that followed witnessed Port Franks growing rapidly into the community and tourist attraction that it is today (Carolinian Canada, 2001).

3.0 Vegetation Management Unit Inventory

In order to develop recommendations, the management area was subdivided into Vegetation Management Units (VMUs). The forest was originally divided into several compartments based on visual differences in the aerial photos. The Environmental Land Classification (ELC) system was used as a further basis for categorization; biological sub-groupings were formed according to the composition plant communities and habitat characteristics. Detailed inventories using standard forestry techniques were conducted and specific objectives were then developed for each VMU (Map 3-1 and Table 3-1).

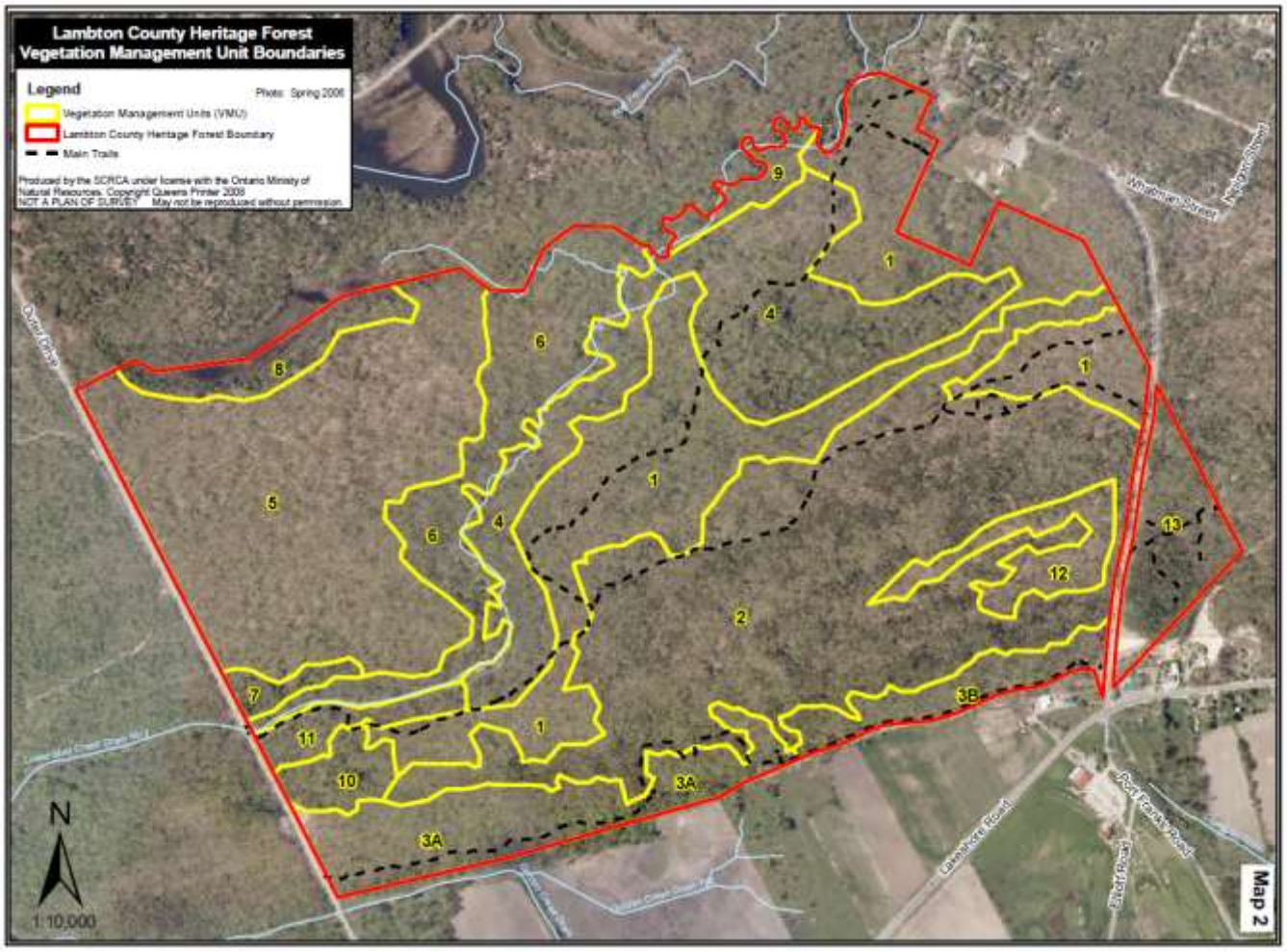
3.1 Data Collection

Compass transects were laid out to cross the various compartments. A data collection plot was established every 80 meters along each transect line. Most of the information was collected by establishing prism plots. Each tree within each plot was recorded by species, diameter class and quality class. Shrubs, vines, herbaceous plants, insects and disease, wildlife and regeneration were also recorded within these plots.

Quality class was simply AGS (Acceptable Growing Stock) or UGS (Unacceptable Growing Stock). AGS trees are those which will have equal or greater value in 10 years, whereas, the UGS will decline in value over 10 years due to their decline, death or a defect like a cavity. Those with cavities are valuable to this forest because of their wildlife value. The main reason for differentiating the quality classes was to show the differences in overall health of various species and the various size classes.

The first observation of any species of plant was recorded within each VMU regardless of whether it occurred in a prism plot or not. All plot information was recorded for each separate VMU. When a plot of different species composition, soil type or moisture level than any of the previous plots was encountered its information was recorded on a monitoring form (Appendix D). It was later determined whether it represented a large enough area for a separate VMU or if it should be included with a previously established VMU.

Plants found in the LCHF are listed in Appendix E to H. Information was collected on the distribution of dwarf hackberry on the property in the fall and winter of 2007-08 and in the summer of 2008 with funding from the Province through their SAR program. The SCRCA was also able to collect some additional information on birds and herbaceous plants using the site in the early summer of 2008. Unfortunately, due to the timing of the release of the funding most of the nesting season was past when the survey was conducted. The bird results are listed in Appendix I. Since the funding was for SAR, there was insufficient time to conduct a complete plant search. Although a few new species for the site were encountered and recorded, there were no records of SAR.



Map 3-1. Vegetation Management Unit Boundaries

Table 3-1. Vegetative Management Unit Summary

VMU	*Name*	*Area (Ha)*	*ELC (Appendix B)*	*Dominant Species **	*Basal Area (BA) (m^2/ha)*	*Key Management Recommendations and/or Habitat Features*
1	Red Oak Forest	42.4	FOD1-1	Or_3, Ow_2, Obl_1	26.6	Some small areas open enough to be savannah
2	Mixed Oak Pine Forest	61	FOM1	Obl_4, Pr_2, Ow_1	25.2	Wild lupines
3A	Red Oak White Oak Forest	14	FOD1	Or_4 Ow_2 Obl_1	18.2	Basal area does not account for large number of sapling sized trees.
3B	White Oak Forest	5	FOD1-2	Ow_5, Or_3Wb_1	28.5	Majority 7,700 Dwarf hackberry
4	Silver Maple Mineral Deciduous Forest	28.1	SWD3-2	Ms_3, Ag_1, Aw_1	28.5	This is the VMU with the most records of hooded warblers over the last 15 years
5	Black Oak Forest	42.9	FOD1-3	Obl_4, Ow_3,Or_1	19.1	Large area (ha) of possible savannah habitat
6	Floodplain Forest	16.8	FOD7-2	Aw_4, Bd_2, Or_1	29.7	Very different from VMU 4
7	Hemlock Coniferous Forest	1.6	FOC3-1	He_5, Aw_1,	32	Manage for hemlock
8	Cedar - Tamarack Coniferous Forest	4.7	FOC2-2	Cw_4, Pw_2, Lt_2	29	Manage for tamarack and cedar
9	Cedar Oak Mixed Forest	2.4	FOM4	Cw_5, Or_2, Ow_1	32	Only 1 plot was possible in this VMU.
10	Deciduous Forest	2.9	FOD1-1	Or_3, Aw_1, He_1	24.5	A location to manage for hemlock
11	Lowland Deciduous Forest	2.9	FOD4-2	AW_3 Mr_2Or_1	22.6	Significant component of red elm
12	Black Oak White Pine Savannah	5.2	TPS1-2	Obl_6, Ow_2, Cb_1	18	The VMU with most open canopy where Savannah conditions still exist.
13	Red Pine Mixed Forest	7.5	FOM1	Pr_3, Ow_2, Obl_2	28.8	This VMU contains the climbing hill.

* Short forms for species contained in Appendix, subscripted numbers refer to percentage (e.g.,$_3$=30%)

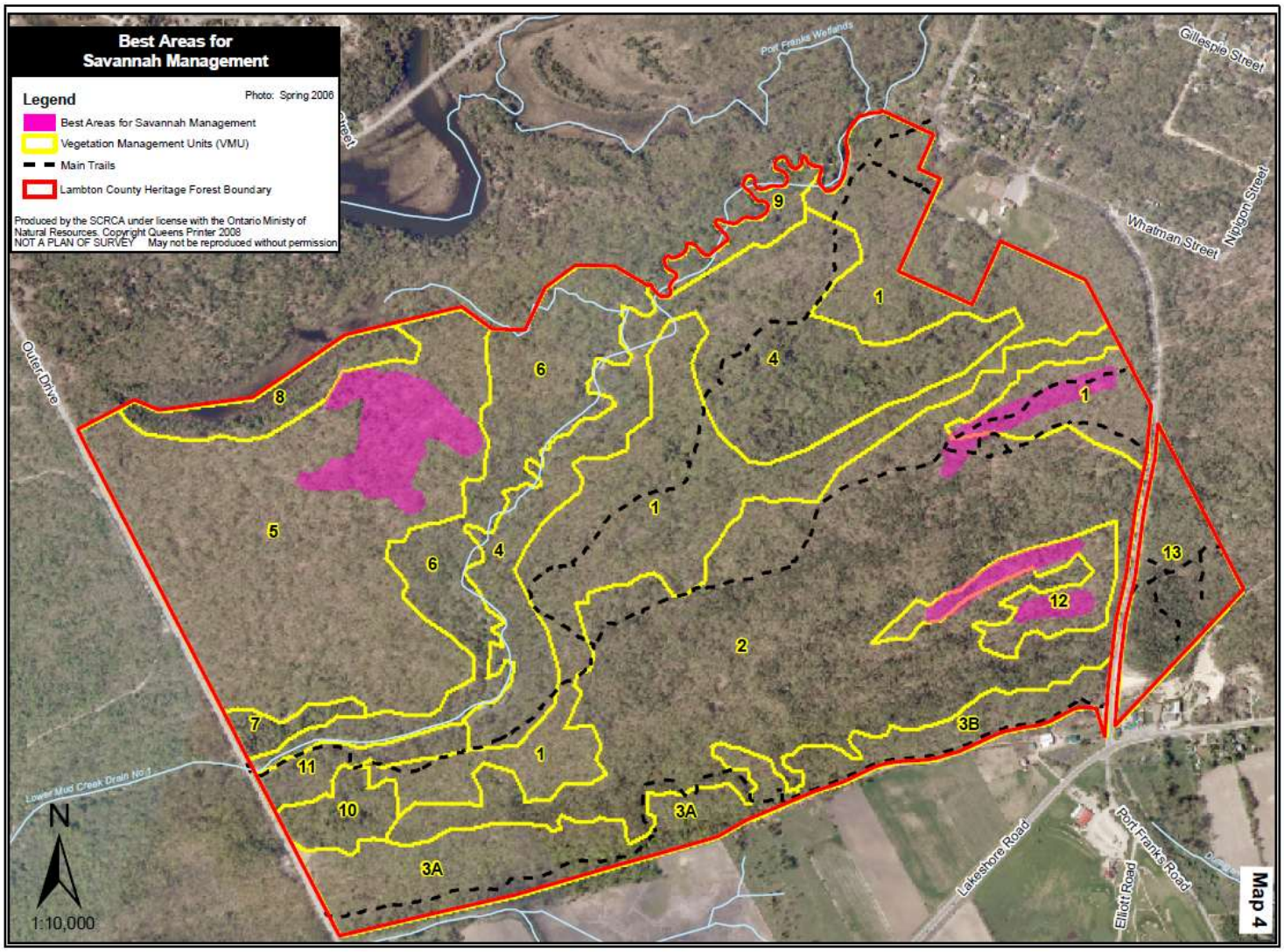
Species of herbaceous plants identified in 2008, which were not recorded in 1994, will have the scientific name printed after the common name in the body of the report. In the interest of space and time the scientific names for species listed in the 1994 document have not been placed beside the common name in the report (Appendix F).

The original intent in naming the different VMUs was to use the Ecological Land Classification (ELC) system. Several of them came out as Dry-Fresh Oak Deciduous Forest eco-sites. Therefore, the ELC title was used but the actual VMU name was varied to avoid confusion about which VMU was being discussed. Appendix B contains descriptions for the ELC designations found in the LCHF.

None of the different VMUs turned out to be shade tolerant hardwood stands and there is no reason to try to convert them to shade tolerant hardwood stands. There is, in fact, a desire by many people to maintain or reduce the basal area (and crown closure) to maintain prairie species in some locations or even increase their populations (Map 3-2).

The primary purpose of this inventory and report was to determine the current state of the forest and extrapolate where each VMU is going over the next 20 years. Populations of shrubs, vines, herbaceous plants and wildlife tend to be the result of the condition and density of the tree portions of the community and there was therefore less time and energy spent collecting information on these groups of species. For the purposes of this report it was generally assumed that the list of plants from the 1994 report was still current (Appendix E). Unfortunately, there was little empirical data in the 1994 report indicating location and abundance of various species. There is also some question as to whether blue hearts and dense blazing star were ever actually recorded on this property. However, regardless of these questions, the list is still an extremely important resource.

Note: If the recommendations of this plan are adopted, more detailed inventories will be required in the year before management activities are undertaken. Prescriptions for each VMU will be prepared. The areas to be treated will be marked and the treatment will follow in the appropriate season.



Map 3-2. Best Areas for Savannah Management

3.2 Vegetation Management Units

VMU 1. Red Oak Forest

ELC FOD 1-1, Dry-Fresh – Red Oak – Deciduous Forest Type

Area 42.7 hectares

Summary VMU 1 is located in the central portion of the LCHF (Map 3-1). The predominant geographical features of this VMU are small rolling sand dunes in the lower western part of this area, and large dune ridges in the eastern area near and at the Port Franks Road.

This compartment contains hemlock stands, ephemeral pools and wetland species near the border of VMU 4. Along the Savannah trail (Map 2-2) where it crosses from VMU 1 into VMU 2 is an area of about 1.4 hectares where there are enough prairie species to try to open the crown more to manage as savannah/ pine barrens.

This is primarily an even aged stand composed mostly of shade intolerant and mid-tolerant tree species with only a few shade tolerant species noted. Eastern red cedar, black ash and white birch are all very shade intolerant species. They are being crowded out by the taller more shade tolerant species.

The wide variety of tree shrubs and herbaceous plants in the regeneration layer are indicative of the diversity of species in the canopy layer as well as the diversity of conditions on the ground.

The only butternut tree encountered on this entire property was located near the entrance to the Tulip Tree Trail (Map 2-2) in this VMU. It has Butternut Canker (*Sirococus clavignenti-juglandacearum*). The Tulip Tree Trail (Map 2-2) runs through this VMU and in the 2008 woodland species at risk report prepared by the St. Clair Region Conservation Authority dwarf hackberry was found growing along the Tulip Trail. Along with Dwarf Hackberry, Acadian Flycatcher nests were found in this VMU in 2006.

The soils on this site are of the Plainfield sand series and are well to excessively drained.

Species Composition

Species	*%*
Red oak	30
White oak	20
Black oak	10
Red maple	10
Black cherry	5
Basswood	5
Large-toothed Aspen	5
White ash	5
Other species*	10

*Black ash, butternut, trembling aspen, balsam poplar, American beech, American blue-beech, white birch, yellow birch, cottonwood, Eastern red cedar, Eastern hemlock, bitternut hickory, shagbark hickory, ironwood, juneberry, hard maple, bur oak, chinquapin oak, red pine, white pine, tulip tree and black walnut.

Basal Area

Basal area reading varied from 16-40 and averaged 26.6m^2/ha

The three oak species make up 80% of the top three diameter classes but only 40-60% of the smallest two classes and are virtually non-existent in the regeneration layer except in a few open areas where they are being severely browsed by the local deer herd.

Size Class	POLEWOOD	SAWLOG CLASS				TOTAL
	Polewood 10-24 cm	Small sawlog 26-36 cm	Medium sawlog 38-48 cm	Large sawlog 50-60 cm	X-Large sawlog 62 cm+	
AGS BA (m^2/ha)	5.4	12.8	3.3	1.6	0.2	23.3
UGS BA (m^2/ha)	1.4	1.3	0.3	0.3	0	3.3
Total BA (m^2/ha)	6.8	14.1	3.6	1.9	0.2	26.6

Shrubs and Vines

Alternate-leaf dogwood, aromatic sumac, arrow-wood, blueberry, bunchberry, bristly gooseberry, choke cherry, common juniper, grape, ground hemlock, Japanese honeysuckle, dwarf hackberry, leatherwood, maple leaf viburnum, poison ivy, American prickly-ash, round leaf dogwood, raspberry, red elderberry, spice bush, witch hazel, wintergreen.

Herbaceous Plants

Black-eyed Susan, bellflower, false Solomon's seal, geranium, goldthread, grasses, greenbrier, hog peanut, horse tail, wild lily-of-the- valley, may apple, miterwort, running strawberry, sensitive fern, lady fern, long beech fern, water parsnip, water hemlock, skunk cabbage, bog hemp, marsh fern, Solomon's seal, skunk cabbage, white trillium, zigzag leaf, marginal wood fern, spinulosa wood fern, royal fern, maidenhair fern, sensitive fern, Jack-in-the-pulpit.

Regeneration	white birch, basswood, American beech, choke cherry, maple leaf viburnum, white ash, eastern hemlock, bitternut hickory, shagbark hickory, ironwood, red maple, balsam poplar, white pine, white oak, tulip tree , witch hazel
Diseases and Insects	black knot on choke cherry, butternut blight, gypsy moth, fall web worm fungus on white oak (unidentified), false tinder fungus on black oak, nectria (target canker) on basswood, white birch and white ash (Figure 3-1).
Wildlife and Habitat Features	cavity trees, fallen woody debris, mast trees, ephemeral pools, snags, evidence of deer, beaver stumps, wood frogs

Ten Year Management

- This compartment should be divided into three sections. Treatments that affect the canopy layer should be scheduled in only one of the sections during each ten year period.
- Removal of ash saplings will help oak regeneration, because ash is a fast growing species it will grow up and shade out the oak seedlings. Emerald ash borer may make this unnecessary.
- Remove some of the medium sized non-oak trees to open the canopy and encourage oak and dwarf hackberry regeneration and create ‘pockets’ or openings for hooded warbler habitat.
- ATV prohibition should be better enforced in the dune area to prevent further erosion.
- Remove trees interfering with hemlock stems to allow for enlargement of the hemlock groves.
- Dwarf hackberry populations should be monitored and any impact from trail use assessed.
- Remove Japanese honeysuckle and any other exotics found.
- Monitor annually for invasive, exotics, insects and diseases
- Monitor for hooded warbler, cerulean warbler and Acadian flycatcher breeding
- Design a management/ burn plan for the area along the Savannah Trail (Map 2-2), which could be managed for savannah/ pine barrens habitat.

Figure 3-1. Nectria target canker on white ash (also found on basswood and white birch in VMU1)

VMU 2. Mixed Oak Pine Forest

ELC FOM1, Dry Oak-Pine Mixed Forest Ecosite

Area 61 hectares

Summary VMU 2 is a dry upland area composed mostly of oak and pine species. It is the largest VMU in this management plan and reaches on its east boundary to Port Franks Road and almost to Outer Drive on the west (Map 3-1). The Savannah Trail (Map 2-2) runs through the VMU.

This VMU is one of the VMUs in the LCHF containing canopy openings large enough to contain enough prairie species to be classified as savannah. It is also one of only two truly mixed forest VMUs on the property. It was reportedly heavily planted to various coniferous species including red and white pine. However, it is also likely that some of the larger red pines are natural. In the 1990s, thousands of pine were felled and left on the ground. There is no evidence that this opening of the canopy increased the germination and establishment of dwarf hackberry, and there are still thousands of conifers in this VMU. Many of these appear to be natural regeneration released by the felling operation.

The 1994 LCHF Management Plan bird study recorded cerulean warbler during the breeding season in this VMU. However, no nests were confirmed. Garlic mustard, an aggressive invasive exotic plant, was observed in this VMU along with gypsy moth. Butterfly weed is an important host species for countless species of butterflies including: black swallowtails, tiger swallowtails, checkered white, small cooper, silver spotted skipper and monarchs, the last two of which are designated SAR.

Species Composition

Species	***%***
Black oak	40
Red pine	20
White oak	10
White pine	10
Other species*	20

*white ash, red ash, large tooth aspen, basswood, white birch, eastern red cedar, white cedar, black cherry, eastern hemlock, bitternut hickory, Juneberry, hard maple, red maple, bur oak, chinquapin oak, jack pine, Norway spruce, cotton wood, black walnut and sassafras.

Basal Area Basal area readings varied from 16 – 38 averaging at 25.2 m^2/ha

15% of the basal area was considered to be UGS - with the majority (31%) in the polewood class. The species with highest UGS component was black oak (20%) with red pine (10%) and white oak (10%) being tied for second. This is primarily a two aged stand with 40% of the basal area in the polewood class and 55 % in the combined small sawlog and medium classes. No pines larger than medium were recorded.

Size Class	POLEWOOD	SAWLOG CLASS				TOTAL
	Pole wood 10-24 cm	Small sawlog 26-36 cm	Medium sawlog 38-48 cm	Large sawlog 50-60 cm	X-Large sawlog 62 cm+	
AGS BA (m^2/ha)	7.6	8.6	3.8	1	0.2	21.2
UGS BA (m^2/ha)	2.4	1.2	0.2	0.1	0.1	4
Total BA (m^2/ha)	10	9.8	4	1.1	0.3	25.2

Shrubs and Vines Arrow-wood, choke cherry, dwarf hackberry, fragrant sumac, purging buckthorn, grape grey dogwood, ground blueberry vine honeysuckle, maple leaf viburnum, poison ivy, prickly-ash, prickly gooseberry, rose, round leaf dogwood, thimble berry, wintergreen.

Herbaceous Plants Bracken fern, butterfly weed, Columbine, garlic mustard, greenbrier, false Solomon's seal, wild lily of the valley, starry false Solomon's seal, woodland sunflower, wild bergamot, butterfly weed, pipsissewa, early goldenrod, blue stemmed golden rod, heart-leaved aster, hairy rock cress.

Regeneration Choke cherry, hard maple, soft maple, red oak, white pine, white ash, witch hazel

Insects and Diseases Artist's conk on black oak, black knot on choke cherry, conk fungus on black oak, galls (black knot appearance) on aspen, gypsy moth

Wildlife and Habitat Features Deer browsing on oak and pine seedlings.

Ten Year Management

- Some type of enforcement should be added to this area along with new signs posted to eliminate ATV and dirt bike use in the area.
- Removal of Norway spruce and purging buckthorn
- Control of garlic mustard
- Because of the numbers of prairie species located in some small sections of this VMU they should be managed as savannah / pine barrens - notably along the trail and adjacent to VMU 12. The large fuel loads resulting from the felling of the pines may complicate burning in this VMU and it might be a good idea to do the first burns in VMU 5.
- This VMU has very little ash and is not likely to self-thin. Some of the area should be managed to produce large-sized, good quality white and red pine for seed production and wildlife. To do this some deciduous trees will need to be removed. This VMU should be divided into 3 sections with crown touching management – other than savannah management - taking place in each section once every 30 years.
- VMU 13 is very similar to VMU 2 across the road and the two should be managed in conjunction. However, because of the relatively small size and long property boundaries VMU 13 should not be considered for savannah management.

VMU 3A. Red Oak White Oak Forest

ELC FOD-1

Area 14 hectares

Summary Originally VMU 3 extended the entire width of the property from the Port Franks Road to Outer Drive. However during the winter of 2007- 2008 an extremely dense population of dwarf hackberry was recorded in what is now VMU 3B.

This portion of VMU 3 was extensively harvested using the diameter limits imposed by the County tree-cutting bylaw prior to the 1983 ANSI study. According to the 1994 plan this area had been "clear-cut" and had since become re-vegetated with witch hazel and various herbaceous species. It is obvious from the basal area readings and size distribution that is currently present that the area was not "clear-cut" as was stated in the 1994 management report. It is also obvious that this area is not re-vegetating entirely with witch hazel.

There are still specimens of white and red pine in this area though many of the stems were girdled or felled. Two pine stumps in this VMU that had been felled in the 1990's were aged and turned out to be 108 and 106 years old showing that pine was natural to the forest in this area (Figure 3-2). Along with the historical aspect the most practical and important function of these species in the LCHF is the winter shelter it provides for the wildlife in this VMU. It has also been noted that the addition of one coniferous tree per acre in hardwood forests results in an increase in nesting birds by 12 species per acre in Eco-Region 6E.

Hooded warbler nests have been regularly reported in both sections of VMU 3 and in 2006 one cerulean warbler nest was also recorded.

Species Composition

Species	***%***
Red oak	45
White oak	20
Black oak	10
White ash	5
Basswood	5
Red maple	5
Other species*	10

*Black ash, trembling aspen, large tooth aspen, balsam poplar, American beech, American blue beech, white birch, yellow birch, cottonwood, eastern red cedar, white cedar, black cherry, eastern hemlock, bitternut hickory, shagbark hickory, ironwood, June berry, hard maple, bur oak, chinquapin oak, black walnut, jack pine, red pine, white pine, and tulip tree.

Basal Area

Basal area readings varied from 8 to 38 with an average of 18 m^2/ha.

Only 8% of the recorded stems were UGS, 28% of the black oak were UGS and 14% of the basal area is in the medium and large classes.

Size Class	POLEWOOD	SAWLOG CLASS				TOTAL
	Pole wood 10-24 cm	Small sawlog 26-36 cm	Medium sawlog 38-48 cm	Large sawlog 50-60 cm	X-Large sawlog 62 cm+	
AGS BA (m^2/ha)	4.1	4.9	5.1	1.9	0	23.3
UGS BA (m^2/ha)	0.5	0.8	0.1	0	0	1.4
Total BA (m^2/ha)	4.6	5.7	5.2	1.9	0.6	18

Shrubs and Vines

Alternate-leaved dogwood, aromatic sumac, black raspberry, bristle gooseberry, witch hazel, choke cherry, common juniper, dwarf hackberry, grape, honeysuckle vine, staghorn sumac, maple leaf viburnum, purging buckthorn, poison ivy, raspberry, round leaf dogwood

Herbaceous Plants

May-apple, wild geranium, false Solomon's-seal, Jack-in-the pulpit, trillium, blue cohosh, zigzag goldenrod, blue-stemmed goldenrod, Virginia knot-weed, wild ginger, bloodroot, bellwort, poke milkweed, horse gentian, wild yamroot (*Dioscrea villosa*)

Regeneration

White ash, hard maple, witch hazel.

Insects and Diseases:

Black knot on choke cherry, nectria on basswood, fall webworm

Wildlife and Habitat Features

Moles, pileated woodpeckers feeding holes, sapsucker holes, deer tracks, bedding sites

Ten Year Management

- Control the invasion of purging buckthorn, and any other invasive species which is found.
- Monitor for hooded warbler nesting.
- Monitor for any trails which go over the ridges because this is against policy.

Figure 3-2. 106 year old red pine stump identified in VMU 3A

VMU 3B. White Oak Deciduous Forest

ELC FOD1-2, Dry-Fresh – Red Oak – Deciduous Forest Type

Area 5 hectares

Summary This VMU is located on the eastern half of VMU 3. The VMU was separated from the rest of VMU 3 because of the high density of dwarf hackberry found along the south-facing slope in this section. The estimated population in VMU 3B was about 7700 plants. This site may be one of the most abundant populations of dwarf hackberry in Canada (SCRCA 2008). What makes it doubly intriguing is the fact that the basal area readings are higher here than along the same slope farther west and one would expect less dwarf hackberry in the increased shade.

Species Composition

Species	***%***
White oak	50
Red oak	30
Black walnut	10
Other species*	10

*American beech, eastern red cedar, eastern white cedar, black cherry, bitternut hickory, shagbark hickory, ironwood, June berry, hard maple, black oak, chinquapin oak, red pine, white pine and basswood

Basal Area Basal area readings varied from 14 to 34 averaging 28.5 m^2/ha

Size Class	POLEWOOD	SAWLOG CLASS				TOTAL
	Pole wood 10-24 cm	Small sawlog 26-36 cm	Medium sawlog 38-48 cm	Large sawlog 50-60 cm	X-Large sawlog 62 cm+	
AGS BA (m^2/ha)	6	7.5	6.5	5.5	1	26.5
UGS BA (m^2/ha)	1	0.5	0.5	0	0	2
Total BA (m^2/ha)	7	8	7	5.5	1	28.5

Shrubs and Vines Alternate dogwood, aromatic sumac, black raspberry, bristly gooseberry, choke cherry, common juniper, dwarf hackberry, leatherwood, grape vine, honeysuckle, maple leaf viburnum, purging buckthorn, round leaf dogwood, staghorn sumac, witch hazel, raspberry family, poison ivy

Herbaceous Plants Aster, bloodroot, blue cohosh, bracken fern, Canada moonseed, false salmon's seal, garlic mustard, bergamot, geranium, greenbrier, helleborine, lily of the valley, may apple, mullien, Solomon's seal, red trillium, running strawberry, white trillium, butterfly weed, bracken fern, pipsissewa, pointed leaved tick-trefoil.

Regeneration Hard maple and dwarf hackberry are the two most common species in the regeneration layer. Regardless of which species is larger now the maple will eventually overtop the hackberry and kill it.

Insects and Diseases Black knot on choke cherry, nectria on basswood, fall webworm

Wildlife and Habitat Features Pileated woodpeckers feeding holes, downed woody debris, moles, deer tracks and bedding sites, turkey tracks, sapsucker holes

Ten Year Management

- Dwarf hackberry has been doing exceptionally well in this VMU and probably will not need assistance for the next ten years (Figure 3-3). The population should however be monitored annually because with an average basal area of 28.5 m^2/ha it is only a matter of time before shade starts to eliminate it.
- Control the invasion of garlic mustard and purging buckthorn.
- Monitor for hooded warbler nesting.

Figure 3-3. 21cm DBH dwarf hackberry in VMU 3B

VMU 4. Silver Maple Mineral Deciduous Forest

ELC SWD3-2, Silver Maple – Mineral Deciduous Swamp Type

Area 28.1 hectares

Summary VMU 4 is a floodplain with some pools staying wet until August. However, it also contains small mounds with species requiring dryer site conditions growing. The cedar component in this VMU appears to be dying out from shade. American prickly-ash is the main shrub throughout this VMU. It is likely that the population of giant swallowtails (Figure 3-4) on the property depend on this VMU because of the dense population of prickly-ash. Mud Creek flows along the north end of this VMU and the middle of the VMU is an ephemeral pool/wetland area. This area has been classified as lowland deciduous forest (Crabe 1983). In 1993 there was logging in this area and the canopy is partly open as a result. However it is highly unlikely this area was ever savannah nor could it be. In the 1994 LCHF management plan bird study, red-headed woodpecker was identified in this VMU and one nest was recorded in the area. However with a current average basal area of 28.5 m^2/ha we would not expect to find a red headed woodpecker here. Nests of hooded warblers and Acadian flycatchers are regularly recorded in this section and nearby portions of VMUs 6 and 1. Some of the ash stems in this VMU have flared bases indicating they may be pumpkin ash. The only tulip trees recorded in this stand were medium or larger indicating it has been a long time since there has been enough light on the forest floor to support establishment of this species.

Species Composition

Species	***%***
Soft maple	30
Green ash	15
White ash	10
Basswood	10
Red maple	10
Other species*	25

*Black ash, trembling aspen, balsam poplar, American blue-beech, white birch, yellow birch, cottonwood, black cherry, red elm, white elm, hemlock, bitternut hickory, bur oak, swamp white oak, white oak, sycamore, tulip tree, black walnut, red ash and red oak - (possibly pumpkin ash).

Basal Area

Basal area readings varied from 14 – 38 averaging 28.5 m^2/ha.

An average of 14% of the basal area was UGS. Unlike previous stands where most of the UGS was in the pole and small sawlog classes the UGS remained high in the larger size classes.

Size Class	POLEWOOD	SAWLOG CLASS				TOTAL
	Polewood 10-24 cm	Small sawlog 26-36 cm	Medium sawlog 38-48 cm	Large sawlog 50-60 cm	X-Large sawlog 62 cm+	
AGS BA (m^2/ha)	7.1	10	4.7	1.5	1.3	24.6
UGS BA (m^2/ha)	1.6	1.3	0.5	0.3	0.2	3.9
Total BA (m^2/ha)	8.7	11.3	5.2	1.8	1.5	28.5

Shrubs and Vines

Bladdernut, bristle gooseberry, purging buckthorn, choke cherry, red osier dogwood, high bush cranberry, leatherwood, dwarf hackberry, poison ivy, prickly-ash, spice bush, buttonbush, Virginia creeper, grape vine, red elderberry

Herbaceous Plants

Bloodroot, blue flag, equisetum, false Solomon's seal, geranium, green briar, jack-in –the-pulpit, lily of the valley, meadow-rue, skunk cabbage, Solomon seal, water hemlock, wood cleavers, wood nettles, zigzag leaf, marsh fern, royal fern, sensitive fern maidenhair fern, naked flowered tick-trefoil

Regeneration

Black ash, green ash, white ash, white birch, yellow birch, basswood, American blue beech, purging buckthorn, black cherry, tulip tree

Insects and Diseases

Black knot on choke cherry, Dutch elm disease, nectria on basswood

Wildlife and Habitat Features

Beaver, black squirrel, wood ducks, wood frogs, ephemeral pools, snags, conifers, fallen woody debris, mast trees, cavity trees

Ten Year Management

- Where cedars are being shaded out they should be released by selection cutting to encourage the re-growth of hemlock and cedar.
- Mud Creek running at the North end of the VMU provides habitat for species such as the eastern hog nosed snake and the five lined skink. Monitoring for these species should be carried out.

- With over 25% of this stand being ash, it is advisable to remove the merchantable ash before it is killed by emerald ash borer. Half of the area could be harvested one year and the other half 2-3 years later to reduce any negative impacts on wildlife. A commercial thinning will not remove the majority of ash stems and the residual will still succumb to EAB but the openings created by trees killed by emerald ash borer should be smaller because the commercial thinning would allow other trees to fill some of the canopy gaps first.

- In 2005 surveyors found what they classified as buttressed green ash. These trees should be re-evaluated to see if they are pumpkin ash.

- Buttonbush was noted in this VMU. It grows in the deepest ephemeral pools. In order to retain this species the canopy has to be opened up because buttonbush is a shade intolerant. The author has observed the general decline in buttonbush populations over the last 35 years in many woodlots as the surrounding trees grew taller and the shade becomes denser. It is the result of a combination of a number of factors. The institution of tree cutting bylaws, good forest management practices and the low demand for firewood and removal of livestock from woodlots have meant that forest canopies do not get opened as much as they did until the middle of the 20th century and the gaps close quicker.

- Control the invasion of purging buckthorn and any other invasive species which are found.

Figure 3-4. American prickly-ash found in VMU4 likely supports the population of giant swallowtails. (Photo credit: Donald Craig, August 2008).

VMU 5. Black Oak Forest

ELC FOD1-3, Dry-Fresh – Black Oak – Deciduous Forest Type

Area 42.9 hectares

Summary This VMU consists of mostly white oak, black oak and black cherry providing a semi-closed canopy of upland oak forest. A beaver girdling oak trees has provided a large canopy gap where white and black oak seedlings are regenerating. This was the best example of white and black oak regeneration observed on the entire property.

Aerial photos of the property taken in 1947 show this to be the most open habitat in the LCHF at that time. Most of the open sections were undoubtedly savannah or pine barrens habitat. Aerial photographs from 1947 through 2006 show a clear trend to increased canopy closure. In 1947, about 50% (21 hectares) of this VMU could have been considered savannah/pine barrens. By 2006, only about 14% (six hectares) show enough open canopy to be considered savannah. Even within this area the shade is dense enough in places to have eliminated most of the prairie species.

Many of the older tall oaks are leaning as a result of high winds coming from the lake on a regular basis. Shorter trees are not contorted this way because of the wind shelter provided by the larger trees. The topography of this VMU is small rolling sand dunes with interdunal depressions. There are numerous old burned stumps in this VMU indicating the presence of fire within the last 50 -75 years.

UGS stems made up about 15% of the total in this VMU. However, as is the case in several other VMUs, black oak dominated the UGS trees with 25% and white oak was second with 10% UGS. 30% of all UGS material was in the polewood size class.

There is still regeneration of shade intolerant black and white oak in this VMU.

Two stick nests were discovered in this VMU and also need to be taken into consideration with the possibility of prescribed burns and/or logging.

Species Composition

Species	***%***
Black oak	40
White oak	35
Red oak	10
Black cherry	5
Other species*	10

*White pine, cottonwood, white ash, sweet crab apple, large toothed aspen, basswood, eastern red cedar, eastern hemlock, shagbark hickory, ironwood, hard maple, red maple, red pine, tulip tree.

Basal Area Basal area readings varied from 8 – 32 averaging at 19.1 m^2/ha

Size Class	POLEWOOD	SAWLOG CLASS				TOTAL
	Pole wood 10-24 cm	Small sawlog 26-36 cm	Medium sawlog 38-48 cm	Large sawlog 50-60 cm	X-Large sawlog 62 cm+	
AGS BA (m^2/ha)	2.9	5.9	5.5	1.6	0.2	16.1
UGS BA (m^2/ha)	1.3	1.2	0.2	0.2	0.06	3
Total BA (m^2/ha)	4.2	7.1	5.7	1.8	0.3	19.1

Shrubs and Vines Aromatic sumac, blueberry, choke cherry, common juniper, dwarf hackberry, downy serviceberry, fragrant sumac, bearberry, gooseberry, honeysuckle vine, maple leaf viburnum, nannyberry, purging buckthorn, partridgeberry, poison ivy, raspberry, round leaf dogwood, Virginia creeper, wild grape, wild rose, wintergreen, princes pine, witch hazel, prickly-ash.

Herbaceous Plants Bloodroot, bastard toadflax, black-eyed Susan, butterfly weed, kidney leaved buttercup, dwarf cinquefoil, columbine, bracken fern, sensitive fern, greenbrier, garlic mustard, hawkweed, little bluestem, green milkweed, helleborine, wood lily lily of the valley, miterwort, meadow-rue, golden ragwort, false Solomon's seal, strawberry, wood betony, harebells, butterfly weed, Tarrey's rush, long fruite, anemone, woodland sunflower, balsam ragwort, wild bergamot, big bluestem, bracken fern, cylindric blazing star, hairy hawkweed, yellow puccoon, little bluestem, switch grass, bracken fern, starry-flowered false Solomon's seal

Regeneration Choke cherry, white oak, white pine, black oak, red oak, alternate dogwood, soft maple, black cherry, downy serviceberry, witch hazel

Insects and Diseases Ash rough bark, black knot on choke cherry, fungus on black oak, tinder fungus on red oak, oak galls, Eastern tent caterpillar

Wildlife and Habitat Features White tailed deer, swallowtail butterfly, black squirrel, bull frog, pileated woodpecker , turkey, cavity trees, snags, fallen woody debris, stick nests, super canopy trees, dens and dug holes, mast trees, conifer stands

Ten Year Management

- Control invasive and exotic species in this VMU (i.e., purging buckthorn and garlic mustard).
- This is one of four VMUs where there are enough herbaceous prairie species present to promote oak savannah/ pine barren
- In the areas where there is a low percentage of canopy cover savannah habitat may be achievable through prescribed burning or other manipulation to maintain the savannah.
- The low amounts of regeneration in some areas as well as the already exposed mineral soil and lack of fuel may make it possible for savannah habitat to be maintained by felling a few of the tightly spaced trees.
- A study area comprised of three test plot areas should be established to determine the optimum method of preserving the savannah habitat. In the first area controlled burn would be utilized as the management tool. In the second only selective cutting would be utilized. In the third, both selective cutting and controlled burn would be utilized. These areas can then be studied to determine the best practices in this VMU in terms of maintaining savannah.
- There are some scattered young hemlocks adjacent to VMU 7. When management is to occur in either VMU efforts should be made to encourage the existing hemlock as well as regeneration and the eventual expansion of VMU 7 into what is now VMU 5. If the hemlock does increase into VMU 5 the VMU line will eventually be moved to increase VMU 7 & and decrease the area of VMU 5.
- This forest is fairly similar to the forest in VMU 1 across Mud Creek but there are no active trails and very little dwarf hackberry. Specific management should be undertaken to increase the component of dwarf hackberry.

VMU 6. Floodplain Forest

ELC FOD 7-2, Fresh-Moist – Lowland Deciduous

Area 16.8 hectares

Summary This area sits in a floodplain along Mud Creek and is classified as a lowland deciduous forest. The LCHF management plan of 1994 describes this VMU as a "hummocky floodplain with silt and organic accumulation along Mud Creek" (LCHF, 1994). It is however a very different stand from VMU 4 across Mud Creek. The biggest difference is the almost complete lack of silver maple and green ash. There is also a small, almost pure, red pine stand in this VMU.

Species Composition

Species	***%***
White ash	40
Basswood	15
Red oak	15
Tulip tree	5
Black oak	5
Black cherry	5
Other species*	15

*large tooth aspen, red pine, white pine, shagbark hickory, beech, green ash, black ash, white birch, American blue-beech, red elm, white elm, eastern hemlock, ironwood, hard maple, red maple, bur oak, white swamp oak, Juneberry, balsam poplar and black walnut

Basal Area Basal area readings varied from 20 – 30 averaging at 29.7 m^2/ha.

Size Class	POLEWOOD	SAWLOG CLASS				TOTAL
	Pole wood 10-24 cm	Small sawlog 26-36 cm	Medium sawlog 38-48 cm	Large sawlog 50-60 cm	X-Large sawlog 62 cm+	
AGS BA (m^2/ha)	5.7	12.3	6.3	2.3	0	26.6
UGS BA (m^2/ha)	1.7	1.4	0	0	0	3.1
Total BA (m^2/ha)	7.4	13.7	6.3	2.3	0	29.7

The UGS component of this VMU is 10% but there was virtually none in the larger size classes.

Shrubs and Vines	Alternate dogwood, bladdernut, choke cherry, common juniper, fragrant sumac, grape, high bush cranberry, prickly gooseberry, honeysuckle, maple leaf viburnum, nannyberry, round-leaf dogwood, purging buckthorn, poison ivy, prickly-ash, raspberry, rose bush, dwarf hackberry, button bush, witch hazel, Virginia creeper
Herbaceous Plants	Bloodroot, bracken fern, buttercup, columbine, garlic mustard, greenbrier, hog peanut, wood nettle, jack-in-the-pulpit, meadow-rue, phlox, sasparilla, touch-me-not, wild geranium, wood cleavers, marsh fern, royal fern, bog hemp, iris, hog peanut, and hemlock parsley (*conioeslinum chinense*) [RARE].
Regeneration	Basswood, choke cherry, white elm, witch hazel, white ash
Insects and Diseases	Canker (target) on basswood, Dutch elm disease, False tinder fungus on large tooth aspen.
Wildlife and Habitat Features	Beaver stumps, pileated woodpecker, ash with feeding, nesting, basal cavities, cavity trees, snags, fallen woody debris, ephemeral pools, super canopy trees, dens and dug holes, other food sources, conifer stands
Ten Year Management	• Monitor the status of Dutch elm disease to see if it is killing red elm as well as white elm in this VMU. • Remove invasive purging buckthorn and garlic mustard. • With the high basal area of 29m^2/ha in this VMU many of the trees will die over the next 20 years. This would be a good VMU to remove ash species before they become infested with emerald ash borer and to provide release for tulip, red pine, white pine, hemlock, white birch and shagbark hickory. • No dwarf hackberry was noted in this VMU although there probably is some if there is a dry hummock with enough sunlight. • Buttonbush was noted in this VMU. It grows in the deepest ephemeral pools. In order to retain this species the canopy has to be opened up because buttonbush is very shade intolerant.

VMU 7. Hemlock Coniferous Forest

ELC FOC 3-1

Area 1.6 hectares

Summary

This small VMU has a high percentage of eastern hemlock trees (Figure 3-5). Hemlock provides some of the best winter cover for wildlife. In a dense hemlock stand temperatures can be five degrees warmer than in a regular deciduous stand. During the winter it was noted deer had bedded down disproportionately more often in and around the hemlocks than in other areas of the forest. Turkey scratching was also more common under hemlocks. Other birds probably find seeds and insects strewn about by the turkeys scratching that they would not find under the snow.

Hemlock regeneration in this VMU was non-existent. This is probably the result of cool temperatures and dense shade not allowing many seedlings to establish and wintering deer browsing off those that do germinate. Hemlock seeds require 60 to 90 days of cold saturation to break embryo dormancy. Germinative capacity is typically 30% and seeds do not live longer than one year in the soil seedbank (Mladenoff, 1990). Optimal temperature for germination is 15 degrees Celsius. For hemlock seed establishment, at least a partial over-story and a warm moist site is necessary (Godman and Lancaster, 1990). Development from seeding to mature tree in hemlocks is slow, with the growth rate being as slow as 1 to 2 cm per year. However a vigorous sapling in full sun can grow up to 45 cm in height per year (Anderson et al. 1990).

Species Composition

Species	***%***
Eastern hemlock	50
White ash	10
Trembling aspen	5
American beech	5
Basswood	5
Red maple	5
Red oak	5
White oak	5
Tulip tree	5
Other species*	5

*Cottonwood, bitternut hickory, red elm, white birch

Basal Area Basel area readings from 28 – 42 averaging 32 m^2/ha

Size Class	POLEWOOD	SAWLOG CLASS				TOTAL
	Pole wood 10-24 cm	Small sawlog 26-36 cm	Medium sawlog 38-48 cm	Large sawlog 50-60 cm	X-Large sawlog 62 cm+	
AGS BA (m^2/ha)	6	17	6	2	0	31
UGS BA (m^2/ha)	1	0	0	0	0	1
Total BA (m^2/ha)	7	17	6	2	0	32

Shrubs and Vines Round leaf dogwood, alternate dogwood

Herbaceous Plants Bloodroot, false Solomon's seal, garlic mustard, maiden hair fern, may apple, running strawberry, white trillium, wild geranium

Regeneration American blue-beech, ironwood, basswood
(These are shade tolerant species and also species less desirable by deer as browse.)

Wildlife and Habitat Features Wood frog, deer, turkey, fox

Ten Year Management

- Remove some of the tallest ash and other species of trees that are crowding the eastern hemlock and causing the crown to die from mechanical interference.
- Conduct a general selection cut of all size classes to improve the overall health of this VMU.
- Encourage hemlock regeneration.
- Remove all garbage in the VMU. Clean up pile of appliacnes at southwest corner of VMU 8 at Outer Drive. Post more signs prohibiting dumping, particularly where people access this VMU. More barriers may be required.
- There are some scattered young hemlocks adjacent to VMU 7. When management is to occur in either VMU 5 or 7, efforts should be made to encourage the existing hemlock as well as regeneration and the eventual expansion of VMU 7 into what is now VMU 5.
- Remove or control garlic mustard or any other invasive species identified in this management area.

Figure 3-5. High percentage of eastern hemlock found in VMU 7 provides excellent winter cover for wildlife.

VMU 8. Cedar/Tamarack Conifer Forest

ELC FOC2-2, Dry-Fresh – Oak – Hardwood Deciduous Forest Type

Area 4.7 hectares

Summary This VMU is on the border with the L Lake property managed by the ABCA. This area once had a high population of red and white pines however due to girdling most of these species are now dead or dying. There are still natural tamaracks growing in this VMU.

Species Composition

Species	***%***
White cedar	45
White pine	20
Tamarack	15
White birch	5
Red maple	5
Other species	10

*Red pine, tulip tree, yellow birch, eastern hemlock.

Basal Area Basal area readings varied from 26 – 32 averaging 29 m^2/ha

Size Class	POLEWOOD	SAWLOG CLASS				TOTAL
	Pole wood 10-24 cm	Small sawlog 26-36 cm	Medium sawlog 38-48 cm	Large sawlog 50-60 cm	X-Large sawlog 62 cm+	
AGS BA (m^2/ha)	16	4	1	0	0	21
UGS BA (m^2/ha)	8	0	0	0	0	8
Total BA (m^2/ha)	24	4	1	0	0	29

Shrubs and Vines Spice bush, witch hazel, round-leaf dogwood, and bunch berry

Herbaceous Plants Fern, goldthread, Joe pye weed, jewel weed, marsh fern, star-flower, bracken fern, royal fern, barren strawberry

Regeneration Wildlife and Habitat Features White ash and white cedar, snags, ephemeral pools/ forest swamps, fallen woody debris, mast trees, super canopy trees, other food sources

Ten Year Management

- Due to this site being not only small, but also very rare in this region any management should be coordinated with the ABCA which also has part of the same ecosite on their L-Lake property.

- The white pine and red pine should be allowed to regenerate itself providing a wind block for the interior forest and diversifying habitat.

- Some shade intolerant species like red pine and tamarack are not good at self thinning. They have a tendency to grow tall with very slender stems and then tip over in a wind storm or just die out over a few short years. It would, therefore, be a good idea to perform a light non-commercial thinning to release some of the stems and keep them healthy longer.

VMU 9. Cedar Oak Mixed Forest

ELC FOM 4, Dry-Fresh White Cedar Mixed Forest Ecosite

Area 2.4 hectares

Summary This is a special area along the south side of Mud Creek that is an extension of VMU 4. The difference is in the amount of white cedar growing in this VMU. There was also more white birch 10 -15 years ago. Most of the birch has succumbed to the shade of taller species (Figure 3-6). The white cedar component is also dying out because of shading by the taller trees.

Species Composition

Species	***%***
White cedar	50
Red oak	15
White oak	15
Other species*	20

*White pine, ironwood, red maple, chinquapin oak, white birch.

Basal Area Basal area readings averaged of 32 m^2/ha

Size Class	POLEWOOD	SAWLOG CLASS				TOTAL
	Pole wood 10-24 cm	Small sawlog 26-36 cm	Medium sawlog 38-48 cm	Large sawlog 50-60 cm	X-Large sawlog 62 cm+	
AGS BA (m^2/ha)	16	10	4	0	0	30
UGS BA (m^2/ha)	2	0	0	0	0	2
Total BA (m^2/ha)	18	10	4	0	0	32

Shrubs and Vines Arrow-wood, high bush cranberry, nannyberry, purging buckthorn spice bush, American prickly-ash, Virginia creeper

Herbaceous Plants Hog peanut, greenbrier

Regeneration White pine

Wildlife and Habitat Features Trees felled by beaver

Ten Year Management

- Selection cutting would be effective to open the canopy and provide cedar a longer life and a chance at regeneration. If biological diversity is important, retention of the cedar component in this VMU is very important.

- Remove purging buckthorn or any other invasive species identified in this management area.

Figure 3-6. White cedars and birch being shaded out by taller deciduous species

VMU 10. Deciduous Forest

ELC FOD 1-1, Dry-Fresh – Red Oak – Deciduous Forest Type

Area 2.9 hectares

Summary This small VMU is on a predominantly north facing slope on the west side of the LCHF. The southern peak of this area has some of the highest elevations within the forest. Scattered pockets of dwarf hackberry were found in this VMU on the south face of hummocks located throughout the dune.

Species Composition

Species	***%***
Red ask	35
White ash	10
Eastern hemlock	10
Black oak	10
White oak	10
Large tooth aspen	5
Basswood	5
Black cherry	5
Other species*	10

*American beech, white birch, bitternut hickory, ironwood and hard maple

Basal Area Basal area readings varied from 14 – 32 averaging at 24.5 m^2/ha

Size Class	POLEWOOD	SAWLOG CLASS				TOTAL
	Pole wood 10-24 cm	Small sawlog 26-36 cm	Medium sawlog 38-48 cm	Large sawlog 50-60 cm	X-Large sawlog 62 cm+	
AGS BA (m^2/ha)	6.5	8	4.5	3	1.5	23.5
UGS BA (m^2/ha)	0	0.5	0	0.5	0	1
Total BA (m^2/ha)	6.5	8.5	4.5	3.5	1.5	24.5

Shrubs and Vines Grape, honeysuckle, maple leaf viburnum, poison ivy, dwarf hackberry, wintergreen, witch hazel

Herbaceous Plants Bell flower, bracken fern, columbine, dandelion, false Solomon's seal, greenbrier wild lily of the valley, sasparilla, Solomon's seal, wild ginger, miterwort, horse balm trillium, white baneberry, Indian pipe, blood root, blue cohosh

Regeneration Basswood, Eastern hemlock, ironwood, soft maple, dwarf hackberry, witch hazel.

Wildlife and Habitat Features No wildlife or wildlife features were observed during the brief visit.

Ten Year Management

- The dwarf hackberry in this VMU should be monitored to ensure survival and long term health of this population.
- Removal of some of the trees will open the canopy and preserve the dwarf hackberry habitat.
- This is a major pocket of hemlock, which could be expanded both in density and in area. If the hemlock population is expanded it will be at the expense of dwarf hackberry in the long term. However, the loss of a few hectares of dwarf hackberry habitat is probably not significant on this property where there are literally thousands of dwarf hackberry stems in other VMUs.

VMU 11. Lowland Deciduous Forest

ELC FOD 4-2, Dry-Fresh – White Ash – Deciduous Forest Type

Area 2.9 hectares

Summary Although this appears to be an extension to VMU 4 along Mud Creek (Map 3-1), the most common two species in VMU 4 –silver maple and green ash - are replaced by white ash and red maple. The latter two prefer drier soils than the former. There is also very little UGS material in this VMU probably because of the open canopy forecast by the low basal area readings. With the exception of red elm the species distribution in the lower size classes were similar to those in the upper classes indicating that no significant change in stand composition is imminent.

Species Composition

Species	***%***
White ash	30
Red maple	20
Red oak	15
Red elm	10
Basswood	10
American beech	5
Other species*	10

*black ash, white birch, white elm, hawthorn, bitternut hickory, bur oak, European crack willow, black walnut.

Basal Area Basal area reading varied from 18 – 26 averaging 22.6 m^2/ha

Size Class	POLEWOOD	SAWLOG CLASS				TOTAL
	Pole wood 10-24 cm	Small sawlog 26-36 cm	Medium sawlog 38-48 cm	Large sawlog 50-60 cm	X-Large sawlog 62 cm+	
AGS BA (m^2/ha)	7.3	5.3	6	3.3	0.7	22.6
UGS BA (m^2/ha)	0	0	0	0	0	0
Total BA (m^2/ha)	7.3	5.3	6	3.3	0.7	22.6

Shrubs and Vines Alternate dogwood, black elderberry, purging buckthorn, choke cherry, grape, spicebush, sumac, bladdernut, Virginia creeper

Herbaceous Plants Bloodroot, burdock, Canada anemone, dog bane, equisetum, moonseed, sensitive fern, red baneberry, wood lily, Jack-in-the-pulpit

Regeneration	Red elm, red oak, white ash, basswood
Wildlife and Habitat Features	The presence of Mud Creek along one side of this VMU makes it an important area for wildlife.
Ten Year Management	• The main issue with this VMU is the presence of purging buckthorn, which should be removed. • Some of the larger ash could be removed if a harvest is to proceed elsewhere in the forest and timber is being removed through this VMU.

VMU 12. Black Oak White Pine Savannah

ELC TPS1-2, Dry Black Oak Pine Tallgrass Savannah Type

Area 5.2 hectares

Summary This VMU was logged in 1987 and some scars were reported on the dunes in the 1994 LCHF report. The logging has opened up the canopy a bit and oak species are regenerating. Many pine stems were felled in this VMU during the pine clearing project of the 1990s. In the 1994 LCHF management plan wild lupine, the sole food for the extirpated Karner blue butterfly (*Lycaeides melissa samuelis*), was noted growing in the sunny clearings. It was observed again in 2008 in this VMU.

Species Composition

Species	***%***
Black oak	65
White oak	15
Black cherry	10
White pine	5
Other species*	5

*Juneberry, red pine, eastern red cedar, and chinquapin oak.

Basal Area Basal area readings varied from 0-24 with an average of 18 m^2/ha

Size Class	POLEWOOD	SAWLOG CLASS				TOTAL
	Pole wood 10-24 cm	Small sawlog 26-36 cm	Medium sawlog 38-48 cm	Large sawlog 50-60 cm	X-Large sawlog 62 cm+	
AGS BA (m^2/ha)	3	9	3	0	0	15
UGS BA (m^2/ha)	2	1	0	0	0	3
Total BA (m^2/ha)	5	10	3	0	0	18

Shrubs and Vines Aromatic sumac, poison ivy, dwarf hackberry, choke cherry

Herbaceous Plants Cylindric blazing star, rough blazing star, grasses, wild lupine, yellow puccoon, hairy bedstraw, wild bergamot, butterfly weed, woodland sunflower, harebells, smooth aster, black-eyed Susan, balsam ragwort, gray goldenrod, cow wheat, big bluestem little bluestem, lyre-leaved rock cress, heart leaved aster, bracken fern

Diseases and Insects	black knot on choke cherry
Wildlife and Habitat Features	none recorded

Ten Year Management

- This VMU has the most prairie species and wild lupine and should be considered savanna/pine barrens for maintenance and habitat work. However, the high fuel load and presence of surrounding pine forest may dictate that other locations should be considered first for controlled burning.

Figure 3-7. A typical large white pine with an understorey of deciduous trees and shrubs.

VMU 13. Red Pine Mixed Forest

ELC FOM 1, Dry Oak-Pine Mixed Forest Ecosite

Area 7.5 hectares

Summary This VMU is separated from the rest of the LCHF by the Port Franks Road (Map 3-1). There is a section of dune adjacent to the road at the south end of the VMU where people climb the dune to run down it again (Figure 3-8). The almost continuous traffic has eliminated all vegetation and as a result the dune is suffering severe erosion in this location. It is now fenced off from the rest of VMU 13 as a result of a recommendation in the 1994 report. In 2010, the active area was more tightly defined by re-fencing.

Species Composition

Species	***%***
Red pine	30
White pine	20
Black oak	20
White oak	15
Black cherry	5
Other species*	10

*domestic apple, white ash, eastern red cedar, bitternut hickory, Juneberry, Manitoba maple, chinquapin oak.

Basal Area Basal area readings varied from 22 – 38 averaging at 28.8 m^2/ha

Size Class	POLEWOOD	SAWLOG CLASS				TOTAL
	Pole wood 10-24 cm	Small sawlog 26-36 cm	Medium sawlog 38-48 cm	Large sawlog 50-60 cm	X-Large sawlog 62 cm+	
AGS BA (m^2/ha)	8.7	8	4.7	0.7	0	22.1
UGS BA (m^2/ha)	6	0.7	0	0	0	6.7
Total BA (m^2/ha)	14.7	8.7	4.7	0.7	0	28.8

Shrubs and Vines Purging buckthorn, dwarf hackberry, fragrant sumac, honeysuckle, poison ivy, wintergreen, glossy buckthorn.

Herbaceous Plants Bracken fern, grasses, downy arrow-wood, lily of the valley, princess pine.

Diseases and Insects Black knot on choke cherry, false tinder fungus on black oak

Regeneration Red cedar, choke cherry, black oak, white oak, white pine

Ten Year Management

- This VMU is very similar to VMU 2 across the road and should be managed in conjunction with that VMU. However because of the relatively small size and long property boundaries it should not be considered for savannah management.

- As in many areas of the forest the dwarf hackberry seem to be associated with edges – both along the road and along trails. As time passes the trees along the trails get taller with longer branches increasing the shade and gradually eliminating the dwarf hackberry. Although not required immediately the canopy of this VMU should be opened for the dwarf hackberry.

- The dune climbing is causing the dune to collapse and putting the long-term stability of the dune at risk. Dune climbing should be eliminated entirely, but since this is a long standing activity it may be difficult to do so.

- Remove or control garlic mustard or any other invasive species identified in this management area.

- No longer allow the use of unauthorized vehicles by way of signage and access restriction.

Figure 3-8. Erosion of section of dune in VMU 13 caused by dune climbing

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4.0 General Management Strategies

To achieve the goals and objectives, a series of management options for each vegetation management unit have been outlined. By following the management options for each VMU the overall health and diversity of the forest should be maintained. There are also some strategies, which need to be considered for the entire property or at least more than one VMU.

4.1 Previous Management

As listed in the 1994 LCHF report and corresponding with the 1984 ANSI report the objectives for the LCHF were:

1. To ensure the continuation of the diversity of species in the LCHF, especially those associated with oak savannah, the Carolinian Life Zone and SAR.
2. To protect the significant ecosystem types found within the LCHF as identified in the 1983 ANSI study and the 1994 field surveys and report
3. To protect SAR and their associated habitats within the LCHF
4. To allow and encourage scientific research dealing with the ecology of oak savannah and its associated flora and fauna to occur in the LCHF
5. To promote to the general public an understanding of the significant ecological features of the LCHF and ways in which users can positively or negatively affect the area
6. To allow safe, passive, non-destructive and low maintenance recreational opportunities within the LCHF
7. To create a monitoring system to update the current data base of the forest on an ongoing basis
8. To mitigate negative impacts from human use of the LCHF
9. To participate in recovery programs which will re-establish or re-introduce significant oak savannah habitat and species to the LCHF

In the 1994 management plan, management strategies divided the property into two sections based on recreation. In the 7.5 hectares north-east of the Port Franks Road (now designated VMU 13) active recreation including dune climbing was permitted (Figure 4-1). The much larger portion of LCHF only permitted passive recreation with the exception of winter season horseback riding and snowmobiling on the ridge and Savannah trails.

The 1994 plan noted that both red pine and white pine were native to the site but also noted that numerous coniferous seedlings had been planted in the open areas the authors deemed to be natural savannah. They therefore recommended thinning of the pines by a commercial operator. It was decided later to simply cut and leave the pine rather than try to market them. Although the 1994 report recommended removal of planted pine (VMUs 2, 5 and 12) the current survey found felled and girdled pine throughout the property.

Problems in the forest as outlined in the 1994 report consisted of, dune erosion and excavation, garbage disposal within the forest, gypsy moth, recreational use such as camping, ATV's,

snowmobiles and horseback riding. A general summary of the findings during the current inventory as they relate to the issues expressed in the 1994 plan is listed below.

1. Very little evidence of dune erosion was observed during the recent survey. Some areas along the two municipal roads were obviously re-vegetated by planting while other areas seem to have re-vegetated on their own. In localized areas, the dune climbing is causing the dune to collapse and putting the long-term stability of the dune at risk. Dune climbing should be eliminated entirely, but since this is a long standing activity it may be difficult to do so.

2. One small area with garbage was located off of Outer Drive north of Mud Creek (VMU7). There is also a small issue with litter blowing off Port Franks Road and Outer Drive. Port Franks Community Policing Committee now cleans the area two times a year.

3. Although still present, gypsy moth has not had a significant effect on the populations of any of the oak species living on the property.

4. No evidence of recent camping or campfires was observed.

5. ATVs still use the forest although their current use is not having a serious adverse affect on the forest. No evidence of snowmobiling or cross-country skiing was observed during the one winter visit to the site.

6. Horse riding is still an activity in the forest.

7. People were observed walking their dogs without leashes.

The 1994 plan concentrated on two key forest management issues: controlled burn to reduce forest canopy and removing planted pine. Controlled burn appears to have not been followed up on and the removal of pine was only partially completed. Unfortunately, many native pine were also destroyed.

Figure 4-1. The 1994 Lambton County management plan permitted passive recreation

4.2 Controlled burn as a Management Option

While evidence of the oak savannah/ pine barrens still exists within the LCHF (VMU 2,5&12) years of fire suppression and lack of tree mortality has permitted the oak forest to develop from the areas of savannah / pine barrens. Increasing shade is gradually eradicating the shade intolerant prairie species as well as early succession phase forest species. By opening up the canopy again through selection cutting and/or low intensity fire in areas, which still contain prairie species, these areas could be restored to functional savannah. However before burning any area a burn plan outlining the section to be burned as well as goals, objectives, manpower requirements and condition requirements will have to be written.

Controlled burn has been widely regarded as an effective means of maintaining an early succession habitat such as savannah ecosystems (Payne and Bryant 1994). Fire influences savannah composition in many ways including reducing woody plant cover, increasing the abundance of some species while decreasing the abundance of others (such as garlic mustard), and exposing mineral soil. Fire also volatilizes nitrogen (returning it to the atmosphere) while leaving much phosphorus and potash behind in the ash. Together with opening the canopy, these two processes should strongly favor plants associated with nitrogen fixing bacteria, such as lupine. When using controlled burn as a management tool, it is important to recognize the balance between Species at Risk (SAR) mortality in the short term, and improvement in the quality of their savannah habitats in the long term. (Givnish et al. 1988, Andow et al. 1994, Maxwell and Givnish 1996, Swengel and Swengel 1997, Schultz and Crone 1998) In addition, the use of a prescribed burn for habitat restoration will require different considerations than when

fire is used for habitat maintenance. Some of the key factors to consider in developing habitat restoration and maintenance plans that include prescribed fire as a tool are:

7. Site history and current condition
8. Characteristics of prescribed fire
9. Amount of direct SAR mortality likely to occur during the fire
10. Potential for SAR to reoccupy the site
11. Response of other important plants currently on the site to fire
12. Other habitat responses

Because each VMU presents a unique combination of many of these key factors, it is important to develop site specific fire management plans for each area to be burned.

4.3 Recommendations for the Rehabilitation and Preservation of Oak Savannah / Pine Barrens

- Preserve current oak savannah / pine barrens habitat - probably only a few scattered pockets amounting to less than 10 ha. in VMUs 1,2,5 and 12 (Map 3-3).
- There are at least four VMUs where remnant savannah still exists (1, 2, 5 and 12). Even in these VMUs the opportunities are limited.
- Enlarge and improve current savannah/pine barrens habitat.
- Use test plots to determine the preferred method of oak/pine savannah rehabilitation and maintenance by choosing at least three test plots for oak/pine savannah habitat. Ensure the soil structure, size of plot wind activity, topography and species composition is similar. One plot will be used as a low intensity prescribed burn area. The second will have selective cutting. The third will have both. The three areas can then be monitored annually for effects on SAR, soil productivity, regeneration, and insect pest and disease levels.

4.4 Recommendations for the use of Recreation Trails

- The entrances to the property require better structures to discourage use by unauthorized vehicles. More signage would also be useful.
- Complete a monitoring project on the population of dwarf hackberry along the trails in respect to its dependence on site disturbance and effect of the trail systems on this SAR.
- Label trails completely including junctions where trails intersect.
- Monitor and repair/add signage where required.
- Block off any area of trail that is no longer in use or needs maintenance using large logs or blocks, and install signs.
- Maintain trails annually by trimming overgrown vegetation, removing any fallen trees or branches.
- Monitor trail for hazard trees and remove any within 30 meters of the trail.

4.5 Recommendations for SAR

- Although there are several SAR living on the property, it is not possible to manage for all of these species at one time in the same section of the property. Butternut and dwarf hackberry as well as the herbaceous prairie species grow in open, sunny locations. Hooded warbler and cerulean warbler require large expanses of large diameter trees. However, even these two species have separate requirements. The cerulean warbler requires an unbroken stand with little understory, but hooded warbler requires canopy gaps large enough to produce dense shrubbery in the understorey. It therefore needs to be understood that conditions, which are good for one, are not good for another. It also needs to be understood that doing nothing will not maintain the current conditions for very long.
- Create a monitoring program for SAR within the LCHF and monitor annually - if possible. There should be Provincial money available from the Species at Risk fund for this type of work.
- Maintain necessary habitat and wildlife features for SAR
- Where possible create habitat for SAR that were once identified in the LCHF such as lupines for Karner blue butterflies.
- Most of the butterflies require herbaceous plants associated with savannah and should respond to the treatments to increase the herbaceous species.
- The Giant swallowtail butterfly appears to live on American prickly-ash. This species was quite common in VMUs 1, 4 and 6 and is in no danger of dying out soon. The population of giant swallowtails should continue to find suitable habitat for the foreseeable future.
- In the winter of 2007- 2008 population of dwarf hackberry on this property was estimated to be over 8,500. It was noted that in most compartments dwarf hackberry seemed to be associated with trails. However, in VMU 3B there is an estimated population of almost 7,700 dwarf hackberry growing without any association to trails. During the summer of 2008 hundreds more dwarf hackberry were found in new locations. Some were found in the pockets of savannah. They seemed to be browsed more by deer than those growing in more shaded locations. There also seemed to be a strong correlation with a southern aspect. Roundleaf dogwood seemed to replace dwarf hackberry on slopes with a northern aspect. It is therefore not necessary at this time to create any management practices specifically for dwarf hackberry.
- Likewise, although only one butternut was found during the survey there is not much point in doing anything for butternut until a strain of butternut with at least some resistance to butternut canker is developed. At that time, some seedlings could be planted in suitable locations.
- *Cerulean Warbler:* During the 2006 nesting survey by Bird Studies Canada only two nests were reported on the property and two more just north of the property. In the 1994 report, only one nest was reported. They appear to like large diameter oaks with little under storey. Any savannah improvement is a detriment to nesting of Cerulean warbler. One of the reasons for recommending that no more than one

third of the forest in any VMU (other than savannah areas) receive canopy-opening management is that it will leave 10-20 years of closed canopy.

- Hooded warbler prefers small canopy gaps with a brushy understorey (the opposite of cerulean). Fifteen nesting pairs were found in the 2006 Bird Studies Canada project. In 2008, three pairs of nesting hooded warblers were located in VMU 4 right along Mud Creek in the last week of July.
- Five pairs of Acadian Flycatcher were reported by Bird Studies Canada in the LCHF in 2006. This is another interior nesting species, which likes a closed canopy. It appears to be increasing in number both in the LCHF and Ontario in general.
- There are other obligate interior forest nesting birds, which will benefit from conditions which improve habitat for the Cerulean/Hooded Warbler and the Acadian Flycatcher.

4.6 Recommendations for Hemlock

- Hemlock - this species dominates VMU 7, is a canopy species in VMU 10 and occurs as small groves in a few other locations. Although it is more common farther north in the Great Lakes St Lawrence Forest Region it is uncommon here for a combination of reasons.
- It is a significant plant for wildlife especially during the winter.
- Its groves should not only be protected they should be expanded 50-100%.

4.7 Recommendations for Cedar

- Both white and red cedars are being shaded out of existence by taller trees. If they are to survive as species, some of their shading competitors will need to be removed.
- Red cedar should establish in openings for savannah but will probably succumb to the fires unless they are protected.
- The primary enemy of eastern white cedar regeneration is the white tailed deer. It may be necessary to protect some white cedar regeneration from the local deer herd until it is two meters tall.

4.8 Recommendations for Invasive and Exotic Species

- Remove all purging and glossy buckthorn. They can be pulled out by the roots if small or cut off and the stump painted with herbicide.
- Remove Norway spruce in VMU 2.
- Monitor for any other invasive species listed in Appendix J

4.9 Recommendations for Insect Pests and Diseases

- Wherever Nectria canker is found if possible remove the source preventing further spread of the disease.

- Continue to monitor for EAB and if harvesting or thinning is to be done in the foreseeable future ash species should be favored for removal.
- Although gypsy moth is present it does not seem to be a current problem in the LCHF however it should still be monitored because of the high oak population. If populations increase there are many methods to help control listed in Appendix K.

4.10 Recommendations adopted by Council October 19, 2011

1. Continue/strengthen environmental (including control of invasive species) and wildlife enhancement while allowing safe and passive use by the Public.

2. Restrict use as follows:
   - Dogs - must be leashed
   - Motorized vehicles (ATVs, dirt bikes, snowmobiles, etc.) - not permitted
   - Horseback riding - permitted on trails only at walking speed
   - Hunting - not permitted
   - Bicycles - permitted on trails only at recreational speeds (no extreme or bicycle-cross)

3. Focus on pedestrian use initially and consider multi-use trails in the future should demand warrant.

4. Erect signage with regards to: intended use, hours (daylight use only), ownership, property boundaries, interpretive areas, and trail designation.

Appendix A. Species At Risk of the LCHF

Least Bittern *(Ixobrychus exilis)* – These birds nest in freshwater marshes and swamps, where dense tall emergent vegetation is interspersed with clumps of woody vegetation and open water. In Ontario they are most strongly associated with cattails (Gibbs et al. 1992b). The least bittern's suitable habitat would most likely be found in VMU 4 or 8 in the LCHF. The least bittern was found breeding in the LCHF VMUs 4 or 8, in the first Atlas of Breeding Birds of Ontario 1981-1987, however was not found in the new publication from 2001-2005.

Northern Bobwhite *(Colinus virginianus)* - This species inhabits a variety of edge and grassland habitats, including non-intensively farmed agricultural lands. Bobwhites are year round residents of Ontario. At present, there are probably fewer than 1,000 Bobwhites in southwestern Ontario, of which about half are considered to be native, wild birds. The largest population remains on Walpole Island (MNR 2006). The best area for rehabilitation in the LCHF includes VMUs 3A, 3B or part of area VMU 5 where original savannah habitat existed. Northern Bobwhite was found in the LCHF in the first Atlas of Breeding Birds of Ontario but not in the new publication 2001-2005. There has been a 65% decreases in the probability of observation of this bird (Atlas of Breeding Birds 2007).

Acadian Flycatcher *(Empidonax virescens)* – This is a bird of the forest interior, and requires large tracts of closed canopy mature, shady, forest with open to sparse understory. It selects a forked branch in a tree or shrub, often close to a stream or woodland pool, as the site in which to build its hanging nest. The probability of observing this bird has increased by 86% between atlases. Acadian Flycatcher was confirmed in the LCHF in the second Atlas of Breeding Birds of Ontario but not the first.

Red-shouldered Hawk *(Buteo lineatus)* - This species was removed from COSEWIC list in 2007 however is still listed with SARA as special concern. The red-shouldered hawk chooses nest sites in large areas of undisturbed mature forest, preferably near water. The species is protected under the fish and wildlife conservation act. For forest management it is preferable to maintain a buffer zone around active nest sites (MNR 2006). A red-shouldered hawk was observed in the 1994 LCHF management plan in the area of VMUs 9, 10, 11 and 7. Red-shouldered hawk was found in the LCHF block in the second atlas of breeding birds but not the first (Atlas of Breeding Birds 2007).

Red-headed Woodpecker *(Melanerpes erythrocephalus)* – The Red-headed woodpecker lives and breeds in open woodlands, woodland edges or Oak Savannah's. Red-headed woodpeckers nest in cavities they have cut out of a dead tree or a live tree with large dead branches. This species returns to the same nest each year. Best management practices, such as leaving at least 6 cavity trees per hectare of land increase the red-headed woodpeckers nesting sites. The population of red-headed woodpecker greatly increased in the beginning of the 20th century possibly because of chestnut blight and dutch elm disease causing decline of American chestnut and elm trees and providing the red-headed woodpecker with more snag trees for nesting (Smith et al. 2000). The spread of emerald ash borer may provide rebound conditions for this species (Atlas of Breeding Birds 2007). One red-headed woodpecker was reported in VMU one in the

1994 LCHF management plan. This species was found in the LCHF block in the 1981-1987 Atlas of Breeding Birds of Ontario but not in the 2001-2005 publication. It was however still recorded within a ten kilometer radius to the east and west of the LCHF. Probability of observation for this species has decreased by 64% in the current atlas (Atlas of Breeding Birds 2007).

Cerulean Warbler *(Dendroica cerulean)* - Cerulean Warblers are forest-interior birds that require large, relatively undisturbed tracts of mature, closed canopy to semi open canopy deciduous forest. Cerulean warblers prefer an open understory and are often associated with large oak and bitternut hickory trees. This species generally nest 5-18 meters above the ground and three meters from the main trunk partly concealed by leaves (Atlas of Breeding Birds 2007). In the 1994 LCHF management plan one cerulean warbler was observed in VMU 2. Cerulean warbler probable breeding was recorded in the LCHF in the new Atlas of Breeding Birds survey but not in the first. The probability of observing this species has decreased by 47% in the Carolinian region from 1987 to 2005 (Atlas of Breeding Birds 2007).

Prothonotary Warbler *(Protonotaria citrea)* – This species is at the northern end of its range in the LCHF area and faces extirpation on Ontario. In 1997 there was a national recovery team developed for this species. The current Ontario population is concentrated at about five sites, and consists of fewer than 20 pairs in any given year. This species formerly nested at up to 10 locations and the population numbered up to 100 pairs (MNR 2006). This warbler has quite specific habitat requirements, nesting in a small hole at the base of dead trees in flooded woodlands or deciduous swamp forests; it is the only cavity-nesting warbler in North America (Canadian Wildlife 2006). In the 1981-1987 Atlas of breeding birds prothonotary warbler was found breeding within 10 km of the LCHF. It was not recorded in the LCHF area at all in the 2001-2005 publication.

Hooded Warbler *(Wilsonia citrine)* – The LCHF has been recognized as having national importance for the maintenance of this species in Ontario (Environment Canada 2006). The Hooded Warbler breeds mainly in the interiors of large upland tracts of mature deciduous and mixed forest, and in ravines. It selects habitats in which small openings in the forest canopy have permitted a dense growth of low understory shrubs, where it nest less than one meter above the ground. It will abandon areas once the vegetation becomes too thin or too tall. This species was observed in the 1994 LCHF management plan in VMUs 5, 3, 10, 1, 9 and 11 with a total of 10 sighted. It is the most abundant of all the SAR bird species in this forest. This species has been confirmed in both atlases and is recorded to be increasing in population size within the last few years as well as expanding in range (Atlas of Breeding Birds 2007).

Blandings Turtle *(Emydoidea blandingii)* - In general, the favored wetlands occupied by the Blanding's Turtle are eutrophic, and are characterized by shallow water with an organic substrate and high density of aquatic vegetation (Ernst et al. 1994; Herman et al. 1995). Occasionally, individuals can be found dwelling in upland wooded areas but are normally just passing through upland areas to nest.

Eastern Hog-nosed Snake *(Heterodon platirhinos)* - Prefer sandy, well-drained habitats such as beaches and dry woods because this is where they lay their eggs and hibernate. However, they

must also have access to wet areas such as swamps to hunt frogs, toads and lizards. The loss of sandy woodlands and oak savannahs is the greatest limiting factor to this species at risk.

Dense Blazing Star *(Liatris spicata)* – This species is normally found in the tall grass prairie community. It is only found in a few small isolated populations across Ontario. Once again decline in dense blazing star is believed to be directly related to the loss of the oak savannah habitat. This species requires open areas and has done well on sites disturbed by flood or fire.

Bluehearts *(Buchnera Americana)* – This species grows in wet meadows, especially along the edges of wet depressions between sand dunes. Bluehearts is sometimes hemiparasitic on the roots of tree species such as White Pine (Pinus strobus) and White Oak (Quercus alba), and diverts some of the tree's nutrients into its own growth and reproduction (Brownell 1997).

Butternut *(Juglans cinerea)* – Butternuts grow well in shallow valleys, along stream banks and on gradual slopes. They are shade intolerant species and grow best in deep moist soils in open sunlight. Butternuts are currently endangered because of butternut canker, an exotic disease infecting 95% of all known butternut trees.

Dwarf hackberry *(Celtis tenuifolia)* - Prefers sandy soils and open habitats such as successional woodlands and disturbed sites.

Monarch *(Danaus plexippus)* – Monarchs can be found wherever there are milkweed plants for the caterpillars to feed, and wildflowers for a nectar source for the adults. Monarchs often live on abandoned farmland that is reverting back to prairie or meadow habitat, or roadsides. They can also be found in city gardens and parks. The main threat to this species in Ontario is the use of pesticides.

Silver Spotted Skipper *(Eparyreus clarus)* **–** You are most likely to find this butterfly in disturbed woodlots, or prairie waterways. The caterpillars use host plants like black or honey locust while the butterfly's source of food includes everlasting pea, common milkweed, red clover, buttonbush, blazing star, and thistles.

Mulberry Wing (*Poanes Massasoit*) – This butterfly lives on sedges in freshwater marshes or bogs and can also be found on wet roadsides. The caterpillars feed on upright narrow leaved sedges and adults will eat any nectar.

Giant Swallowtail (*Heraclides cresphontes*) – Habitat includes rocky and sandy hillsides near streams or gullies, pine flats, towns, and citrus groves in the south. Caterpillars host on plants in the citrus family such as prickly ash and hop tree while adults enjoy nectar from goldenrod, swamp milkweed and a variety of other flowers.

Tawny emperor (*Asterocampa clyton*) – Tawny emperors live in densely wooded riparian areas, dry woods, open woods, cities, fencerows, and parks. The main host plants to the caterpillar are dwarf hackberry (SAR) and common hackberry. Adults prefer tree sap or rotting fruit and very rarely will visit a flower for nectar. These butterflies are also known for landing on a persons arm to lap up sweat.

Table A-1. SAR found in the 1994 Lambton County Heritage Management Plan and Ratings According to COSEWIC and Provincial S Rank for the Butterflies

	Scientific Name	***Common Name***	***Species at Risk Act Rating***
BIRDS *not found in LCHF in the 2008 breeding birds atlas	*Lxobrychus exilis*	Least Bittern	THR *
	Empidonax virescens	Acadian Flycatcher	END
	Melanerpes erythrocephalus	Red-headed Woodpecker	SC *
	Buteo lineatus	Red-shouldered hawk	SC *
	Lanius ludovicianus	Loggerhead Shrike	THR *
	Dendroica cerulea	Cerulean Warbler	SC
	Protonotaria citrea	Prothonotary Warbler	END *
	Wilsonia citrina	Hooded Warbler	THR
HERPITILES	*Heterodon platirhinos*	Eastern Hog-nosed Snake	THR
	Emydoidea blandingii	Blanding's Turtle	THR
PLANTS	*Buchnera americana*	Bluehearts	END
	Liatris spicata	Dense Blazing Star	THR
	Juglans cinerea	Butternut	END
	Celtis tenuifolia	Dwarf Hackberry	THR
BUTTERFLIES	*Asterocampa clyton*	Tawny emperor	S-2 S-3
	Danaus plexippus	Monarch	SC
	Eparyreus clarus	Silver spotted skipper	S-4
	Poanes massasoit	Mulberry wing	S-3
	Heraclides cresphontes	Giant swallowtail	S-2

* These have not been reported on the property since 1994. COSEWEIC (Council On the Status of Endangered Wildlife In Canada)

Rankings and Meanings:
Endangered- Faces imminent extirpation or extinction
Threatened- Likely to become endangered if limiting factors are not reversed
Special Concern- May become threatened or endangered species because of a combination of biological characteristics and identified threats
SRANK: The provincial ranking, determined by the Natural Heritage Information Center (NHIC).
GRANK: The global ranking, determined by the NHIC.
G1 or S1 – Extremely rare; usually 5 or fewer occurrences in the overall range or very few remaining individuals; or because of some factor(s) making it especially vulnerable to extinction.
G2 or S2 – Very rare; usually between 5 and 20 occurrences in the overall range or with many individuals in fewer occurrences; or because of some factor(s) making it vulnerable to extinction.
G3 or S3 – Rare to uncommon; usually between 20 and 100 occurrences; may have fewer occurrences, but with a large number of individuals in some populations; may be susceptible to large-scale disturbances
G4 or S4 – Common; usually more than 100 occurrences; usually not susceptible to immediate threats.
G5 or S5 – Very common; secure under present conditions

Table A-2. Other Rare Species of the Carolinian Life Zone Found in the Port Franks Wetlands and Forested Dunes ANSI

Latin Name	***Common Name***
Panax quinquefolius	American ginseng
Quercus prinoides	Dwarf chinquapin oak
Tsuga Canadensis	Eastern hemlock
Cornus florida	Flowering dogwood
Rhus aromatica	Fragrant sumac
Polygala paucifolia	Fringed polygala
Asclepias viridiflora	Green milkweed
Galium pilosum	Hairy bedstraw
Conioselium chinense	Hemlock parsley
Arabidopsis lyrata	Lyre-leaved rock cress
Desmodium nudiflorum	Naked-flowered trefoil
Ceanothus americanus	New jersey tea
Panicum virgatum	Panic grass
Desmodium paniculatum	Panicled tick-trefoil
Chimaphila umbellata	Pipsissewa
Asclepias exaltata	Poke milkweed
Liatris aspera	Rough blazing star
Sassafras albidum	Sassafras
Cardamine bulbosa	Spring cress
Vitis aestivalis argentifolia	Summer grape
Liriodendron tulipifera	Tulip Tree
Lupinus perennis	Wild lupine
Chimaphila maculata	wintergreen

Other species listed within the LCHF as significant – Aside from COSWIC and SARA designations for wildlife there are other classifications for significant species. Argus and Pryer compiled a list in 1990 of Rare and Vascular plants in Canada. In 1987 Argus and Pryer along with White and Keddy compiled the Atlas of rare vascular plants of Ontario. There is also, vascular plant of Lambton County (1992), a list of rare species for Lambton County by John and Dorthy Tiedje. All of these species are listed in the chart below.

Table A-3. Rare Vascular Plants of Ontario, Canada and Lambton County found in LCHF

Latin Name	*Common Name*	*Atlas of Rare Vascular Plants of Ontario*	*Rare Vascular Plants of Canada*	*Rare Vascular Plants of Lambton County*
Liriodendron tulipifera	Tulip Tree	X	X	
Quercus prinoides	Dwarf chinquapin oak	X	X	X
Panax quinquefolius	American ginseng	X	X	
Pinus resinosa	Red pine			X
Pinus strobus	White pine			X
Tsuga Canadensis	Eastern hemlock			X
Sassafras albidum	Sassafras			X
Cornus florida	Flowering dogwood			X
Rhus aromatica	Fragrant sumac			X
Lupinus perennis	Wild lupin	X	X	
Galium pilosum	Hairy bedstraw	X	X	
Panicum virgatum	Panic grass		X	
Liatris aspera	Rough blazing star	X	X	
Asclepias viridiflora	Green milkweed	X		
Arabidopsis lyrata	Lyre-leaved rock cress			X
Cardamine bulbosa	Spring cress			X
Chimaphila maculata	wintergreen			X
Chimaphila umbellata	Pipsessewa			X
Desmodium nudiflorum	Naked-flowered trefoil			X
Desmodium paniculatum	Panicled ticktrefoil			X
Ceanothus americanus	New jersey tea			X
Vitis aestivalis argentifolia	Summer grape			X
Polygala paucifolia	Fringed polygala			X
Asclepias exaltata	Poke milkweed			X

Appendix B. ELC Code Descriptions

ELC Code	ELC Description
FOD1-1	Dry-Fresh - Red Oak - Deciduous Forest Type
FOD1-2	Dry-Fresh - White Oak - Deciduous Forest Type
FOD1-3	Dry-Fresh - Black Oak - Deciduous Forest Type
FOD1-4	Dry-Fresh - Mixed Oak - Deciduous Forest Type
FOD2-2	Dry-Fresh - Oak - Hardwood Deciduous Forest Type
FOD4-2	Dry-Fresh - White Ash - Deciduous Forest Type
FOD5-1	Dry-Fresh - Sugar Maple - Deciduous Forest Type
FOD5-5	Dry-Fresh - Sugar Maple - Hickory Deciduous Forest Type
FOD5-7	Dry-Fresh - Sugar Maple-Black Cherry - Deciduous Forest Type
FOD5-8	Dry-Fresh - Sugar Maple-White Ash - Deciduous Forest Type
FOD6-5	Fresh-Moist - Sugar Maple-Hardwood - Deciduous Forest Type
FOD7-2	Fresh-Moist - Ash - Lowland Deciduous Forest Type
FOD7-4	Fresh-Moist - Black Walnut - Lowland Deciduous Forest Type
SWD3-2	Silver Maple - Mineral Deciduous Swamp Type
FOM1	Dry Oak-Pine Mixed Forest Ecosite
FOM4	Dry-Fresh White Cedar Mixed Forest Ecosite.
FOC2-2	Dry- Fresh Cedar Coniferous Forest Ecosite
TPS1-2	Dry Black Oak Pine Tallgrass Savannah Type

(Lee, H.T., et al, 1998)

Appendix C. Tree Species of LCHF, 2008

Abbreviation	Common Name	Scientific name
Ab	Ash, black	*Fraxinus nigra*
Ag	Ash, green	*Fraxinus pennsylvanica*
Ap	Ash, pumpkin	*Fraxinus profunda*
Aw	Ash, white	*Fraxinus americana*
Al	Aspen, large-tooth	*Populus grandidentata*
At	Aspen, trembling	*Populus tremuloides*
Bd	Basswood	*Tilia americana*
Be	Beech, American	*Fagus grandifolia*
Bw	Birch, white	*Betula papyrifera*
By	Birch, yellow	*Betula alleghaniensis*
Bu	Blue-beech, American	*Carpinus caroliniana*
Bn	Butternut	*Juglans cinerea*
Cr	Cedar, eastern red	*Juniperus virginiana*
Ce	Cedar, eastern white	*Thuja occidentalis*
Cb	Cherry, black	*Prunus aerotina*
Pd	Cottonwood	*Populus deltoides*
Es	Elm, red (slippery)	*Ulmus rubra*
Ea	Elm, white	*Ulmus americana*
	Hawthorn	*Crataegus spp.*
He	Hemlock, eastern	*Tsuga canadensis*
Hb	Hickory, bitternut	*Carya cordiformis*
Hs	Hickory, shagbark	*Carya ovata*
Id	Ironwood	*Ostrya virginiana*
Bj	Juneberry	*Amelanchier spp.*
Mr	Maple, red	*Acer rubrum*
Ms	Maple, silver	*Acer Saccharinum*
Mh	Maple, sugar (hard)	*Acer saccharum*
Obl	Oak, black	*Quercus nigra*
Ob	Oak, bur	*Quercus macrocarpa*
Oc	Oak, chinquapin	*Quercus muehlenbergii*
Odc	Oak dwarf chinquapin	*Quercus prinoides*
Or	Oak, red	*Quercus rubra*
Osw	Oak, swamp white	*Quercus bicolor*
Ow	Oak, white	*Quercus alba*
Pr	Pine, red	*Pinus resinosa*
Pj	Pine ,Jack	*Pinus banksiana*
Pw	Pine, white	*Pinus strobus*
Pb	Poplar -Balsam	*Poulus balsam ifera*

Abbreviation	Common Name	Scientific name
Ss	Sassafras	*Sassafras albidum*
Sn	Spruce, Norway	*Picea abies*
Sw	Spruce, white	*Picea glauca*
Sy	Sycamore	*Platanus occidentalis*
La	Tamarack	*Larix laricina*
Tp	Tulip tree	*Liriodendron tulipifera*
Wb	Walnut, black	*Juglans nigra*

Appendix D. Monitoring Form LCHF

Date	
Time	
Name	
Weather Conditions	

Species Check List: Vegetation:
Check list of all previous vegetation found please record any other noted in spaced provided

SPECIES NAME	VMU NUMBERS	SPECIES NAME	VMU NUMBERS	SPECIES NAME	VMU NUMBERS
Ash, black		Pumpkin ash		Ground blueberry (lowbush)	
Ash, green		Spruce, Norway		Ground hemlock	
Ash, white		Sycamore		High bush cranberry	
Aspen, largetooth		Tamarack		Honeysuckle	
Aspen, trembling		Tulip tree		Honeysuckle vine	
Basswood		Walnut, black		Japanese honeysuckle	
Beech, American		Alternate dogwood		Leatherwood	
Beech-blue American		Aromatic sumac		Maple leaf viburnum	
Birch, white		Arrow-wood downy		Nannyberry	
Birch, yellow		Black raspberry		Purging buckthorn	
Butternut		Bladdernut		Partridgeberry	
Cedar, eastern red		Blueberry		Poison ivy	
Cherry, black		Bristle gooseberry		Prickly-ash	
Cottonwood		Bunchberry		Prickly gooseberry	

SPECIES NAME	VMU NUMBERS	SPECIES NAME	VMU NUMBERS	SPECIES NAME	VMU NUMBERS
Elm, red (slippery)		Choke cherry		Ground hemlock	
Elm, white		Common juniper		High bush cranberry	
Hawthorn		Dogwood, red osier		Honeysuckle	
Hemlock, eastern		Dwarf hackberry		Honeysuckle vine	
Hickory, bitternut		Elderberry black		Japanese honeysuckle	
Hickory, shagbark		Elderberry red		Leatherwood	
Ironwood		Fragrant sumac		Maple leaf viburnum	
Juneberry		Glossy buckthorn		Nannyberry	
Purging buckthorn		False Salmons seal		Water hemlock	
Partridgeberry		Fern		Wild geranium	
Poison ivy		Garlic mustard		Wood betony	
Prickly-ash		Golden ragwort		Wood cleavers	
Prickly gooseberry		Goldthread		Wood lily	
Princes pine		Grasses		Wood nettles	
Raspberry		Greenbrier		Zigzag leaf (broad-leaved goldenrod)	
Rose bush		Hairy puccoon			
Round leaf dogwood		Hawkweed (Canadian)			
Spice bush		Helleborine			
Staghorn sumac		Hog Peanut			
Thimble berry		Horse tail			
Virginia creeper		Jack in the			

SPECIES NAME	VMU NUMBERS	SPECIES NAME	VMU NUMBERS	SPECIES NAME	VMU NUMBERS
		pulpit			
Wild grape		Kidney leaved buttercup			
Wild rose		Leatherwood			
Wintergreen		Lily of the valley			
Witch hazel		May Apple			
Aster		Maiden Hair Fern			
Bell flower		Meadow-rue (tall)			
Black-eyed susan		Miterwort			
Bloodroot		Moonseed (Canadian)			
Blue cohosh		Mullien			
Blue flag (large blue)		Phlox Spreading			
Bracken fern		Running strawberry			
Burdock (common)		Sarsparilla (bristly)			
Buttercup		Sensitive fern			
Butterfly weed		Skunk cabbage			
Canada anemone		Solomon's Seal			
Canada moonseed		Starflower			
Columbine		Strawberry			
Dandelion		Sumac			
Dog bane		Touch me not (spotted)			
Dwarf cinquefoil		Trillium red			
Equisetum		Trillium white			

Wildlife Features:

WILDLIFE FEATURE	VMU # AND DETAILS
Cavity Tree	
Fallen Woody Debris	
Snag	
Mast Trees	
Other Food Sources	
Conifers	
Stick Nest	
Emphemeral Pools/Streams	
Super Canopy Trees	
Dens and Dug holes	

Wildlife Signs:

Record any signs of wildlife or wildlife seen or heard with VMU number

Wildlife Signs	VMU #

Trails Check List:

	Savannah Trail	Ridge Trail	Tulip Trail
Signs are still posted and in good condition			
No fallen debris across/blocking trail			
No hazard trees near trail that could pose threat to hikers			
Signs of unauthorized use			
Signs of erosion on dunes due to trail use			
Garbage on trails			
Gates closed and working condition			
All trails that should be closed off are			
No new trails being created by unauthorized use			

Other Notes:

Appendix E. List of Plants of the LCHF, 1994

FAMILY	*Genus /Species*	*Family #*	*FAMILY COMMON*	*COMMON NAME*	*Complex*	*Voucher*
ACERACEAE	Acer rubrum	278	MAPLE FAMILY	Red maple	2,3	
ACERACEAE	Acer saccharum	278	MAPLE FAMILY	Sugar maple	3	
ACERACEAE	Acer saccharinum	278	MAPLE FAMILY	Siilver maple	3	
ASTERACEAE	Achillea mellefolium	342	COMPOSITE FAMILY	Common yarrow	2	
POLYPOIDIACEAE	Adiant pedatum	13	FERN FAMILY	Maidenhair fern	3	
ROSACEAE	Agrimonia gryposepala	196	ROSE FAMILY	Agrimony	1,3	TRTE
POACEAE	Agropyron cristatum	377	GRASSES	Wheat grass	2	TRTE
POACEAE	Agropyron repens	377	GRASSES	Witch grass	2	TRTE
ROSACEAE	Amelanchier sanguinea	196	ROSE FAMILY	Shadbush	2	TRTE
POACEAE	Ammophila breviligulata	377	GRASSES	Marram grass	5	TRTE
POACEAE	Andropogon geradi	377	GRASSES	Turkey-foot grass	2	TRTE
POACEAE	Andropogon scoparius	377	GRASSES	Bluestem	2,5	TRTE
RANUNCULACEAE	Anemone cylindrica	50	CROWFOOT FAMILY	Thimbleweed	2	TRTE
RANUNCULACEAE	Anemone quinquefolia	50	CROWFOOT FAMILY	Wood anemone	3	
RANUNCULACEAE	Anemone virginana	50	CROWFOOT FAMILY	Thimbleweed	1	TRTE
ASTERACEAE	Antennaria pantaginfolia	342	COMPOSITE FAMILY	Plantian leaved pussytoes	2	TRTE
LEGUMINOSAE	Apios americana	204	PULSE FAMILY	Groundnut	3	TRTE
RANUNCULACEAE	Aquilegia canadensis	50	CROWFOOT FAMILY	Columbine	1,2	TRTE
CRUCIFERAE	Arabis Ivrata	156	MUSTARD FAMILY	Rock-cress	2,5	TRTE
ARALIACEAE	Aralia nudicalis	292	GINSENG FAMILY	Wild sarsaparilla	3	TRTE
ERICACEAE	Arctostaphylos uva-ursi	166	HEATH FAMILY	Bearberry	1,2,5,	TRTE

FAMILY	Genus /Species	Family #	FAMILY COMMON	COMMON NAME	Complex	Voucher
CARYOPHLLACEAE	Arenaria serpyllifolia	97	PINK FAMILY	Sandwort	2	TRTE
ARACEAE	Arisaema triphyllum	363	ARUM FAMILY	Jack-in-the-pulpit	3	TRTE
ASTERACEAE	Artemesia campestris	342	COMPOSITE FAMILY	Wormwood	5	TRTE
ARISTOLCHIACEAE	Asarum canadense	42	BIRTHWORT FAMILY	Wild ginger	3	
ASCLEPIADACEAE	Asclepia exaltata	298	MILKWEED FAMILY	Poke milkweed	3	TRTE
ASCLEPIADACEAE	Asclepia incarnata	298	MILKWEED FAMILY	Swamp milkweed	3	
ASCLEPIADACEAE	Asclepias tuberosa	298	MILKWEED FAMILY	Butterflyweed	2	
ASTERACEAE	Aster dumosus	342	COMPOSITE FAMILY	Bushy aster	4	TRTE
ASTERACEAE	Aster ericoides	342	COMPOSITE FAMILY	Heath aster	5	TRTE
ASTERACEAE	Aster laevis	342	COMPOSITE FAMILY	Smooth aster	5	TRTE
ASTERACEAE	Aster lanceolatus	342	COMPOSITE FAMILY	Panicled aster	2	TRTE
ASTERACEAE	Aster lateriflorus	342	COMPOSITE FAMILY	Starved aster	3	TRTE
ASTERACEAE	Aster macrophyllus	342	COMPOSITE FAMILY	Large leaved aster	1,2,3	TRTE
ASTERACEAE	Aster umbellatus	342	COMPOSITE FAMILY	Flat-topped white aster	3	TRTE
POLYPOIDIACEAE	Athyrium felix-femina	13	FERN FAMILY	Lady fern		TRTE
BETULACEAE	Betula papyifera	84	BIRCH FAMILY	White birch	1,3,4,5	TRTE
ASTERACEAE	Bidens cernua	342	COMPOSITE FAMILY	Bur-marigold	3	TRTE
ASTERACEAE	Bidens coronata	342	COMPOSITE FAMILY	Beggars tick	3	TRTE
URTICACEAE	Boehmeria cylindrica	75	NETTLE FAMILY	False nettle	3	TRTE
POACEAE	Bromus ciliatus	377	GRASSES	Fringed brome grass	4	TRTE
POACEAE	Bromus kalmii	377	GRASSES	Kalm's brome grass	2	TRTE
POACEAE	Bromus latiglumis	377	GRASSES	Brome grass	4	TRTE
POACEAE	Bromus prbescens	377	GRASSES	Canada brome grass	1	TRTE
SCROPHULARIACEAE	Buchnera americana	318	FIGWORT FAMILY	Bluehearts	5	
CRUCIFERAE	Cakile edentula	156	MUSTARD FAMILY	Sea rocket	5	

FAMILY	Genus /Species	Family #	FAMILY COMMON	COMMON NAME	Complex	Voucher
POACEAE	Calamagrotis canadensis	377	GRASSES	Blue-joint	4	TRTE
POACEAE	Calamovilfa longifolia	377	GRASSES	Sand-reed	1,2,5	TRTE
ORCHIDACEAE	Calopogon tuberosus	408	ORCHIS FAMILY	Grass pink	5	TRTE
CAMPANULACEAE	Campanual aparinoides	330	BLUEBELL FAMILY	Marsh bellflower	4	TRTE
CAMPANULACEAE	Campanula rotundifolia	330	BLUEBELL FAMILY	Harebell	2	
CRUCIFERAE	Cardamine bulbosa	156	MUSTARD FAMILY	Spring cres	3	TRTE
CYPERACEAE	Carex castanea	376	SEDGE	Sedge	5	TRTE
CYPERACEAE	Carex comosa	376	SEDGE	Sedge	3	TRTE
CYPERACEAE	Carex hystericina	376	SEDGE	Sedge	3	TRTE
CYPERACEAE	Carex lasiocarpa	376	SEDGE	Sedge	5	TRTE
CYPERACEAE	Carex pseudo-cyperus	376	SEDGE	Sedge	3,4	TRTE
CYPERACEAE	Carex richardsonii	376	SEDGE	Sedge	5	TRTE
CYPERACEAE	Carex stricta	376	SEDGE	Sedge	3,4	TRTE
CYPERACEAE	Carex viridula	376	SEDGE	Sedge	5	TRTE
BETULACEAE	Carpinus catolinaiana	84	BIRCH FAMILY	Blue beech	3	
JUGLANDACEAE	Carya cordiformis	79	WALNUT FAMILY	Bitternut hickory	3	TRTE
JUGLANDACEAE	Carya ovata	79	WALNUT FAMILY	Shagbark hickory	3	
BERBERIDACEAE	Caulaphyllum thalictroides	52	BARBERRY FAMILY	Blue cohosh	3	TRTE
RHAMNACEAE	Ceanothus americanus	257	BUCKTHORN FAMILY	New jersey tea	1,2	
RHAMNACEAE	Ceanothus herbaceus	257	BUCKTHORN FAMILY	Narrow leaved New Jersey tea	1,2	
CELASTRCEAE	Celastrus scandens	242	STAFF TREE FAMILY	Climbing bittersweet	3	TRTE
ULMACEAE	Celtis tenuifolia	71	ELM FAMILY	Dwarf hackberry	2	
ASTERACEAE	Centaurea maculosa	342	COMPOSITE FAMILY	Star thistle	2	
SCROPHULARIACEAE	Chelone glabra	318	FIGWORT FAMILY	Turtlehead	4	
PYROLACEAE	Chimaphila umbellata	167	WINTERGREEN FAMILY	Pipsissewa	1,2	

FAMILY	Genus /Species	Family #	FAMILY COMMON	COMMON NAME	Complex	Voucher
ASTERACEAE	Chrysanthemum leucanthemum	342	COMPOSITE FAMILY	Ox-eyed daisy	2	
ASTERACEAE	Cichorium intybus	342	COMPOSITE FAMILY	Chicory	2	
ASTERACEAE	Chrysanthemum leucanthemum	342	COMPOSITE FAMILY	Ox-eyed daisy	2	
ASTERACEAE	Cichorium intybus	342	COMPOSITE FAMILY	Chicory	2	
APLACEAE	Cicuta bulbifera	293	PARSLEY FAMILY	Bulb-bearing water hemlock	4	TRTE
ONOGRACEAE	Circaea lutetiana ssp. Canadensis	220	EVENING PRIMROSE FAMILY	Enchanter's nightshade		
ASTERACEAE	Cirsium discolor	342	COMPOSITE FAMILY	Field thistle	3	TRTE
ASTERACEAE	Cirsium muticum	342	COMPOSITE FAMILY	Swamp thistle	4	TRTE
SANTALACEAE	Comandra umbellata	232	SANDALWOOD FAMILY	Bastard toad flax	1,2	TRTE
CONVOLVULACEAE	Convolvulus spithamaeus	302	CONVOLVULUS	Wild morning glory	3	
RANUNCULACEAE	Coptis triflia	50	CROWFOOT FAMILY	Goldthread	3	TRTE
CORNACEAE	Cornus alternifolia	226	DOGWOOD FAMILY	Alternate leaved dogwood	4	TRTE
CORNACEAE	Cornus florida	226	DOGWOOD FAMILY	Flowering dogwood	3	TRTE
CORNACEAE	Cornus foemina	226	DOGWOOD FAMILY	Gray dogwood	5	TRTE
CORNACEAE	Cornus obliqua	226	DOGWOOD FAMILY	Silky dogwood	4	TRTE
CORNACEAE	Cornus rugosa	226	DOGWOOD FAMILY	Round-leafed dogwood	1	TRTE
CORNACEAE	Cornus stolonifera	226	DOGWOOD FAMILY	Red osier dogwood	3,4	TRTE
ROSACEAE	Crataegus	196	ROSE FAMILY	Hawthorn	2	TRTE
ROSACEAE	Crataegus mollis	196	ROSE FAMILY	Downy hawthorn	2	TRTE
BORAGINACEAE	Cynoglossum officinale	309	BORAGE FAMILY	Hound's tongue	1,3	TRTE
CYPERACEAE	Cyperus lupuilnus	376	SEDGE	Umbrella sedge	2,3	TRTE
ORCHIDACEAE	Cypripedium arietinum	408	ORCHIS FAMILY	Ram's head	4	
ORCHIDACEAE	Cypripedium calceolus	408	ORCHIS FAMILY	Lg.Yellow Lady Slipper	4	

FAMILY	Genus /Species	Family #	FAMILY COMMON	COMMON NAME	Complex	Voucher
POACEAE	Dactylus glomerata	377	GRASSES	Orchard grass	4	TRTE
APLACEAE	Daucus carota	293	PARSLEY FAMILY	Wild carrot		
POACEAE	Deschampsia flexuosa	377	GRASSES	Crinkled hair grass	2	TRTE
LEGUMINOSAE	Desmodium canadense	204	PULSE FAMILY	Canada trefoil	3	TRTE
LEGUMINOSAE	Desmodium glutinosum	204	PULSE FAMILY	Pointed-leaf trefoil	3	TRTE
CARPRIFOLIACEAE	Diervilla lonicera	337	HONEYSUCKLE FAMILY	Bush honeysuckle	1	TRTE
POACEAE	Digitaria sanquinalis	377	GRASSES	Crab grass	3	TRTE
DROSERACEAE	Drosera rotundifolia	128	SUNDEW FAMILY	Round-leaved	5	TRTE
POACEAE	Echinochloa crusgali	377	GRASSES	Barnysrd grass	3	TRTE
POACEAE	Echinochloa wiegandii	377	GRASSES	W.barnyard grass	3	TRTE
CUCCRBITACEAE	Echioncystis lobata	149	GOURD FAMILY	Wild cucumber	3	TRTE
CYPERACEAE	Eleocharis pauciflora	376	SEDGE	Rush	5	TRTE
POACEAE	Elymus canadensis	377	GRASSES	Wild rye	4	TRTE
POACEAE	Elymus virginicus	377	GRASSES	Virginia wild rye	4	TRTE
ONOGRACEAE	Epilobium ciliatum	220	EVENING PRIMROSE FAMILY	Willow herb	3.5	TRTE
ONOGRACEAE	Epilobium leptophyllum	220	EVENING PRIMROSE FAMILY	Narrow leaved fireweed	4	TRTE
ORCHIDACEAE	Epipactus helleborine	408	ORCHIS FAMILY	Helleborine orchis	1,2,3	TRTE
EQUISETACEAE	Equisetum hyemale	4	HORSETAIL FAMILY	Scouring rush	2	TRTE
EQUISETACEAE	Equisetum laevigatum	4	HORSETAIL FAMILY	Scouring rush	5	TRTE
EQUISETACEAE	Equisetum variegatum	4	HORSETAIL FAMILY	Small horsetail		
ASTERACEAE	Erigeron philadelphicus	342	COMPOSITE FAMILY	Philadelphia fleabane		
ASTERACEAE	Erigeron strigosus	342	COMPOSITE FAMILY	Daisy fleabane	2	
CRUCIFERAE	Erysimum chieranthoides	156	MUSTARD FAMILY	Wormweed mustard		
LILIACEAE	Erythronium albidum	394	LILY FAMILY	Dog's tooth violet		

FAMILY	Genus /Species	Family #	FAMILY COMMON	COMMON NAME	Complex	Voucher
CELASTRCEAE	Euonymus obovatus	242	STAFF TREE FAMILY	Running strawberry bush	1,3	TRTE
ASTERACEAE	Eupatorium maculatum	342	COMPOSITE FAMILY	Joe-pye-weed	4	
ASTERACEAE	Eupatorium rugosum	342	COMPOSITE FAMILY	White snakeroot	3	TRTE
FAGACEAE	Fagus grandifolia	82	BEECH FAMILY	American beech	3	
POACEAE	Festuca rubra	377	GRASSES	Red fescue	3	TRTE
ROSACEAE	Fragraria virginiana	196	ROSE FAMILY	Wild strawberry	2	TRTE
OLEACEAE	Fraxinus americana	317	OLIVE FAMILY	White ash	2,3	TRTE
OLEACEAE	Fraxinus nigra	317	OLIVE FAMILY	Black ash	3	TRTE
OLEACEAE	Fraxinus pennsylvanica	317	OLIVE FAMILY	Red ash	1	TRTE
RUBIACEAE	Galium obtusum	335	MADDER FAMILY	Bedstraw	3,4	TRTE
RUBIACEAE	Galium trifidum	335	MADDER FAMILY	Bedstraw	4	TRTE
RUBIACEAE	Galium triflorum	335	MADDER FAMILY	Sweet -scented bedstraw	3	TRTE
ERICACEAE	Gaultheria procumbens	166	HEATH FAMILY	Wintergreen	1,2	
ERICACEAE	Gaylusssacia baccata	166	HEATH FAMILY	Black huckleberry	2	TRTE
GENTIANACEAE	Gentianopsis crinita	295	GENTIAN FAMILY	Fringed gentian	5	
GERANIACEAE	Geranium maculatum	288	GERANIUM FAMILY	Wild geranium	3	TRTE
ROSACEAE	Geum canadense	196	ROSE FAMILY	White avens	1	TRTE
ROSACEAE	Geum laciniatum	196	ROSE FAMILY	Rough avens	3	TRTE
RUBIACEAE	Glaium circaezans	335	MADDER FAMILY	Wild licorice	1,2	TRTE
RUBIACEAE	Glaium palustre	335	MADDER FAMILY	Marsh bedstraw	4	TRTE
RUBIACEAE	Glaium pilosum	335	MADDER FAMILY	Hairy bedstraw	2	TRTE
POACEAE	Glyceria striata	377	GRASSES	Manna grass	3	TRTE
ASTERACEAE	Gnaphalium obtusifolium	342	COMPOSITE FAMILY	Catfoot	3	TRTE

FAMILY	Genus /Species	Family #	FAMILY COMMON	COMMON NAME	Complex	Voucher
CISTACEAE	Helianthum canadense	132	ROCK ROSE FAMILY	Rockrose	3	TRTE
ASTERACEAE	Helianthus decapetalus	342	COMPOSITE FAMILY	Thin-leaved Sunflower		TRTE
ASTERACEAE	Helianthus divaricatus	342	COMPOSITE FAMILY	Woodland sunflower	1,2	TRTE
ASTERACEAE	Helianthus giganteus	342	COMPOSITE FAMILY	Giant sunflower	3	TRTE
ASTERACEAE	Helianthus strumosus	342	COMPOSITE FAMILY	Pale-leaved Sunflower	3	TRTE
ASTERACEAE	Hieracium scabrum	342	COMPOSITE FAMILY	Rough hawkweed	2	TRTE
GUITTIFERAE	Hypernicium kalmianum	119	ST. JOHN'S WORT FAMILY	Kalm St. John's Wort	5	TRTE
GUITTIFERAE	Hypernicium perforatum	119	ST. JOHN'S WORT FAMILY	C.St.John's Wort		
LILIACEAE	Hypoxis hirsuta	394	LILY FAMILY	Stargrass	4	TRTE
POACEAE	Hystrix patula Moench	377	GRASSES	Bottle brush grass	2	TRTE
BALSAMINACEAE	Impatiens capensis	291	TOUCH-ME-NOT FAMILY	Jewelweed	3	
IRIDACEAE	Iris versicolor	395	IRIS FAMILY	N.blue flag	4	TRTE
JUGLANDACEAE	Juglans nigra	79	WALNUT FAMILY	Black walnut	1	
JUNCACEAE	Juncus alpinoarticultus	374	RUSH FAMILY	Alpine rush	5	TRTE
JUNCACEAE	Juncus balticus	374	RUSH FAMILY	Rush	4,5	TRTE
JUNCACEAE	Juncus brachycephalus	374	RUSH FAMILY	Rush	5	TRTE
JUNCACEAE	Juncus tenuis	374	RUSH FAMILY	Path rush	3	TRTE
PINACEAE	Juniperus communis	17	PINE FAMILY	Common juniper	1,2,5	
PINACEAE	Juniperus virginiana	17	PINE FAMILY	Red cedar	1,2,5	
POACEAE	Koeleria marcantha	377	GRASSES	Prairie june grass	2	TRTE
ASTERACEAE	Lactuca biennis	342	COMPOSITE FAMILY	Blue lettuce	2	TRTE
ASTERACEAE	Lactuca serriola	342	COMPOSITE FAMILY	Prickly lettuce	3	TRTE
PINACEAE	Larix laricina	17	PINE FAMILY	Tamarack	3,4	
LEGUMINOSAE	Lathyrus palustris	204	PULSE FAMILY	Swamp pea	4	TRTE

FAMILY	Genus /Species	Family #	FAMILY COMMON	COMMON NAME	Complex	Voucher
LEGUMINOSAE	Lespedeza intermedia	204	PULSE FAMILY	Wand-like bush clover	2,3	TRTE
ASTERACEAE	Liatris aspera	342	COMPOSITE FAMILY	Rough blazing star	2	TRTE
ASTERACEAE	Liatris cylindracea	342	COMPOSITE FAMILY	Cylindric blazing star	1,5	TRTE
ASTERACEAE	Liatris spicata	342	COMPOSITE FAMILY	Dense blazing star	4	
LILIACEAE	Lilium philadelphicum	394	LILY FAMILY	Wood lily	2	TRTE
LAURACEAE	Lindera benzoin	37	LAUREL FAMILY	Spicebush	3	TRTE
MAGNOLIACEAE	Liriodendron tulipifera	26	MAGNOLIA	Tulip tree	3	
BORAGINACEAE	Lithospermum caroliniense	309	BORAGE FAMILY	Puccoon	1,2,5,	TRTE
CAMPANULACEAE	Lobelia kalmii	330	BLUEBELL FAMILY	Kalm's lobelia	5	TRTE
CAMPANULACEAE	Lobelia spicata	330	BLUEBELL FAMILY	Spike lobelia	5	TRTE
CARPRIFOLIACEAE	Lonicera dioica	337	HONEYSUCKLE FAMILY	Trumpet honeysuckle	1,2	TRTE
CARPRIFOLIACEAE	Lonicera tatarica	337	HONEYSUCKLE FAMILY	Tartarian honeysuckle	4	TRTE
LEGUMINOSAE	Lotus corniculatus	204	PULSE FAMILY	Birdsfoot trefoil	3	
ONOGRACEAE	Ludwigia palustris	220	EVENING PRIMROSE FAMILY	Water purslane	4	TRTE
LEGUMINOSAE	Lupinus perennis	204	PULSE FAMILY	Wild lupine	2,3	
JUNCACEAE	Luzula acuminata	374	RUSH FAMILY	Wood rush	2,3	TRTE
LYCOPOIACIAE	Lycopodium complanatum var flabeliforme	1	CLUB MOSS	Running club moss	3	TRTE
LYCOPOIACIAE	Lycopodium lucidulum	1	CLUB MOSS	Shining club moss	2	
LABIATAE	Lycopus americanus	311	MINT FAMILY	Water-horehound	4	
LABIATAE	Lycopus uniflorus	311	MINT FAMILY	Northern bugleweed	4	TRTE
PRIMULACEAE	Lysimachia ciliata	177	PRIMROSE FAMILY	Fringed loosestrife	3	TRTE
PRIMULACEAE	Lysimachia nummalaria	177	PRIMROSE FAMILY	Moneywort	3	TRTE
PRIMULACEAE	Lysimachia quadriflora	177	PRIMROSE FAMILY	Prairie loosestrife	4	TRTE
PRIMULACEAE	Lysimachia thrysiflora	177	PRIMROSE FAMILY	Tufted loosestrife	4	TRTE
LILIACEAE	Maianthemum canadense	394	LILY FAMILY	Canada mayflower	1,2	TRTE

FAMILY	Genus /Species	Family #	FAMILY COMMON	COMMON NAME	Complex	Voucher
LILIACEAE	Maianthemum racemosum	394	LILY FAMILY	False spikenard	3	TRTE
LILIACEAE	Maianthemum stellata	394	LILY FAMILY	False solomon's seal	1	TRTE
ROSACEAE	Malus coronaria	196	ROSE FAMILY	Wild crabapple	2	TRTE
POLYPOIDIACEAE	Matteuccia struthiopteris	13	FERN FAMILY	Ostrich fern	3	
SCROPHULARIACEAE	Melampyrum lineare	318	FIGWORT FAMILY	Cow-wheat		
MENISPERMACEAE	Menispermum	55	MOONSEED FAMILY	Moonseed	3	TRTE
LABIATAE	Mentha arvensis	311	MINT FAMILY	Field mint	4	
RUBIACEAE	Mitchella repens	335	MADDER FAMILY	Partridgeberry	1,2	TRTE
LABIATAE	Monarda fistulosa	311	MINT FAMILY	Wild bergamot	1,2	
MONOTROPACEAE	Monotropa uniflora	168		Indian pipe	3	
NYPHAEACEAE	Nuphar advena	46	WATER LILY FAMILY	Yellow pond lily	4	
NYPHAEACEAE	Nymphaea odorata	46	WATER LILY FAMILY	Fragrant water lily	4	
ONOGRACEAE	Oenothera biennis	220	EVENING PRIMROSE FAMILY	Evening primrose	1,2	
POLYPOIDIACEAE	Onoclea sensibilis	13	FERN FAMILY	Sensitive fern	3	TRTE
POACEAE	Oryzopsis asperifolia	377	GRASSES	Winter grass	1,2,5	TRTE
APLACEAE	Osmorhiza hongistylis	293	PARSLEY FAMILY	Sweet cicely	3	TRTE
OSMUNDACEAE	Osmunda regalis	6	FLOWERING FERN	Royal fern	3	
BETULACEAE	Ostrya virginiana	84	BIRCH FAMILY	Ironwood	3	
OXALIDACEAE	Oxalis corniculata	287	WOOD SORREL FAMILY	Wood sorrel	3	
POACEAE	Panicum capillare	377	GRASSES	Old-witch grass	3	TRTE
POACEAE	Panicum lanuginosum	377	GRASSES	Panic grass	5	TRTE
POACEAE	Panicum oliogosanthes	377	GRASSES	Few-flowered panic grass	3	TRTE
POACEAE	Panicum ovale	377	GRASSES	Panic grass	2	TRTE
SAXIFRAGACEAE	Parnassia glauca	195	SAXIFRAGE FAMILY	Grass of parnasus	5	
VITACEAE	Parthenocissus inserta	259	VINE FAMILY	Virginian creeper	3	TRTE

FAMILY	Genus /Species	Family #	FAMILY COMMON	COMMON NAME	Complex	Voucher
SCROPHULARIACEAE	Pedicularis canadensis	318	FIGWORT FAMILY	Wood betony	1,2,3	TRTE
POACEAE	Phalaris arundinacea	377	GRASSES	Reed canary grass	4	TRTE
VERBEBACEAE	Phryma leptostachya	310	VERVAIN FAMILY	Lopseed	3	
ROSACEAE	Physocarpus opulifolius	196	ROSE FAMILY	Ninebark	4	TRTE
PINACEAE	Picea glauca	17	PINE FAMILY	White spruce	3	
URTICACEAE	Pilea pumila	75	NETTLE FAMILY	Dwarf nettle	4	TRTE
PINACEAE	Pinus banksiana	17	PINE FAMILY	Jack pine	2	
PINACEAE	Pinus resinosa	17	PINE FAMILY	Red pine	1,2	
PINACEAE	Pinus strobus	17	PINE FAMILY	White pine	1,2	
PINACEAE	Pinus sylvestris	17	PINE FAMILY	Scotch pine	2	
PLANTAGINACEAE	Platago major	315	PLANTAIN FAMILY	Common plantain		
ORCHIDACEAE	Platanthera hookeri	408	ORCHIS FAMILY	Hooker's orchis	1	TRTE
PLANTANACEAE	Platanus occidentalis	64	PLANE TREE FAMILY	Sycamore	3	
POACEAE	Poa compressa	377	GRASSES	Canada bluegrass	2,3	TRTE
POACEAE	Poa pratensis	377	GRASSES	Kentucky bluegrass	1,2	TRTE
BERBERIDACEAE	Podophyllum peltatum	52	BARBERRY FAMILY	May apple	3	
ORCHIDACEAE	Pogonia ophioglossoides	408	ORCHIS FAMILY	Rose pogonia	5	TRTE
POLYGALACEAE	Polygala paucifolia	269	MILKWORT FAMILY	Fringed milkwort	3	
LILIACEAE	Polygonatum pubescens	394	LILY FAMILY	Soloman's seal	1	TRTE
POLYGONACEAE	Polygonum amphibium	98	BUCHWEAT FAMILY	Swamp smartweed	4	TRTE
POLYGONACEAE	Polygonum convolvulus	98	BUCHWEAT FAMILY	Blackbind weed	2	TRTE
POLYGONACEAE	Polygonum hydropiper	98	BUCHWEAT FAMILY	Water pepper	3	TRTE
POLYGONACEAE	Polygonum hydropiperoides	98	BUCHWEAT FAMILY	Mild water pepper	4	
POLYGONACEAE	Polygonum persicaria	98	BUCHWEAT FAMILY	Lady's thumb	3	TRTE
POLYGONACEAE	Polygonum punctatum	98	BUCHWEAT FAMILY	White smartweed	3	TRTE
PONTEDERIACEAE	Pontederia cordata	391	PICKERELWEED FAMILY	Pickerelweed	4	

FAMILY	Genus /Species	Family #	FAMILY COMMON	COMMON NAME	Complex	Voucher
SALICACEAE	Populus balsamifera	153	WILLOW FAMILY	Balsam poplar	3,5	TRTE
SALICACEAE	Populus deltoides	153	WILLOW FAMILY	Cottonwood	3	
SALICACEAE	Populus grandidentata	153	WILLOW FAMILY	Lg. tooth aspen	1,2	
SALICACEAE	Populus tremuloides	153	WILLOW FAMILY	Trembling aspen	2	
ROSACEAE	Potentilla ansernia	196	ROSE FAMILY	Silverweed	3,5	TRTE
ROSACEAE	Potentilla fruticosa	196	ROSE FAMILY	Shrubby cinquefoil	3	TRTE
ROSACEAE	Potentilla simplex	196	ROSE FAMILY	Common cinquefoil	3	TRTE
ASTERACEAE	Prenanthes alba	342	COMPOSITE FAMILY	Rattlesnake root	3	TRTE
ROSACEAE	Prunus pumila	196	ROSE FAMILY	Sand cherry	5	TRTE
ROSACEAE	Prunus virginiana	196	ROSE FAMILY	Choke cherry	1,2	TRTE
POLYPOIDIACEAE	Pteridium aquilinum	13	FERN FAMILY	Bracken fern	1,2	
LABIATAE	Pycanthemum virginianum	311	MINT FAMILY	Mountain mint	5	TRTE
PYROLACEAE	Pyrola rotundifolia	167	WINTERGREEN FAMILY		1,2,3	TRTE
PYROLACEAE	Pyrola secunda	167	WINTERGREEN FAMILY	One-sided pyrola	1,2	TRTE
FAGACEAE	Quercus alba	82	BEECH FAMILY	White oak	1,2,3	
FAGACEAE	Quercus bicolor	82	BEECH FAMILY	Swamp white oak	3	
FAGACEAE	Quercus macroarpa	82	BEECH FAMILY	Bur oak	3	
FAGACEAE	Quercus muehlenbergii	82	BEECH FAMILY	Chinquapin oak	1	TRTE
FAGACEAE	Quercus prinoides	82	BEECH FAMILY	Dw. Chinquapin oak	1,2	
FAGACEAE	Quercus rubra	82	BEECH FAMILY	Red oak	1,2,3	
FAGACEAE	Quercus velutina	82	BEECH FAMILY	Black oak	1,2,3,	
RANUNCULACEAE	Ranunculus abortivus	50	CROWFOOT FAMILY	Kidney leaf buttercup		
RANUNCULACEAE	Ranunculus hispidus	50	CROWFOOT FAMILY	Swamp buttercup	3	TRTE
ANACARDIACEAE	Rhus aromatica	280	CASHEW FAMILY	Fragrant sumac	1,2,3	
ANACARDIACEAE	Rhus radicans	280	CASHEW FAMILY	Poison ivy	1,2,3,	
ANACARDIACEAE	Rhus typhina	280	CASHEW FAMILY	Staghorn sumac	2	

FAMILY	Genus /Species	Family #	FAMILY COMMON	COMMON NAME	Complex	Voucher
GROSSULARIACEAE	Ribes americanum	188		Black currant	3	TRTE
GROSSULARIACEAE	Ribes cynobati	188		Prickly gooseberry	1	TRTE
ROSACEAE	Rosa acicularis	196	ROSE FAMILY	Wild rose	2,3	TRTE
ROSACEAE	Rosa blanda	196	ROSE FAMILY	Smooth rose	2	TRTE
ROSACEAE	Rosa palustris	196	ROSE FAMILY	Swamp rose	3	TRTE
ASTERACEAE	Rubeckia hirta	342	COMPOSITE FAMILY	Black-eyed Susan	2,3	
ROSACEAE	Rubus allegheniensis	196	ROSE FAMILY	Common blackberry	1,3	TRTE
ROSACEAE	Rubus flagellaris	196	ROSE FAMILY	Dewberry	1,2	TRTE
ROSACEAE	Rubus occidentails	196	ROSE FAMILY	Black raspberry	3	TRTE
ROSACEAE	Rubus pubescens	196	ROSE FAMILY	Dwarf blackberry	3	TRTE
POLYGONACEAE	Rumex orbiculats	98	BUCHWEAT FAMILY	Water dock	3	TRTE
SALICACEAE	Salix discolor	153	WILLOW FAMILY	Pussy willow	4	TRTE
SALICACEAE	Salix eriocephala	153	WILLOW FAMILY	Willow	3	TRTE
SALICACEAE	Salix fragilis	153	WILLOW FAMILY	Crack willow	4	TRTE
SALICACEAE	Salix petiolaris	153	WILLOW FAMILY	Slender willow	4	TRTE
CARPRIFOLIACEAE	Sambucus racemosa ssp. Pubens	337	HONEYSUCKLE FAMILY	Red-berried elder	1	TRTE
PAPAVERACEAE	Sanguinana canadensis	58	POPPY FAMILY	Bloodroot	3	
APLACEAE	Sanicula marilandica	293	PARSLEY FAMILY	Black snakeroot	3	TRTE
APLACEAE	Sanicula odorata	293	PARSLEY FAMILY	Clustered snakeroot	2	TRTE
LAURACEAE	Sassafras albidum	37	LAUREL FAMILY	Sassafras	3	
LABIATAE	Saturega vulgaris	311	MINT FAMILY	Basil	1,2,3,	TRTE
POACEAE	Schizachne purpurascens	377	GRASSES	Purple melic grass	2	TRTE
LABIATAE	Scutellaria galericulata	311	MINT FAMILY	Skullcap	4	TRTE
ASTERACEAE	Senecio pauperculus	342	COMPOSITE FAMILY	Balsam Ragwort	5	TRTE
POACEAE	Setaria viridis	377	GRASSES	Green foxtail	3	TRTE

FAMILY	Genus /Species	Family #	FAMILY COMMON	COMMON NAME	Complex	Voucher
ELAEGANACEAE	Shepherdia canadensis	205	OLEASTER FAMILY	Soapberry	2	
CARYOPHLLACEAE	Silene vulgaris	97	PINK FAMILY	Bladder campion	1,2	TRTE
IRIDACEAE	Sisyrinchium montanum	395	IRIS FAMILY	Blue-eyed grass	5	TRTE
SMILACACEAE	Smilax alsioneura	403	GREENBRIER FAMILY	Carrion flower	1,2,3	TRTE
SMILACACEAE	Smilax tamnoides	403	GREENBRIER FAMILY	Bristly greenbrier	3	TRTE
SOLANACEAE	Solanum dulcamara	301	NIGHTSHADE FAMILY	Bittersweet nightshade		
ASTERACEAE	Solidago caesia	342	COMPOSITE FAMILY	Blue-stemmed goldenrod	1,3	TRTE
ASTERACEAE	Solidago canadensis	342	COMPOSITE FAMILY	Canada goldenrod	3,4	TRTE
ASTERACEAE	Solidago gigantea	342	COMPOSITE FAMILY	Late goldenrod	1,2,3	TRTE
ASTERACEAE	Solidago juncea	342	COMPOSITE FAMILY	Early goldenrod	2,5	TRTE
ASTERACEAE	Solidago nemoralis	342	COMPOSITE FAMILY	Woodland goldenrod	1,2,5	TRTE
ASTERACEAE	Solidago ohioensis	342	COMPOSITE FAMILY	Ohio goldenrod	4,5	TRTE
ASTERACEAE	Sonchus arvensis	342	COMPOSITE FAMILY	Sow thistle	2	
ASTERACEAE	Sonchus oleraceus	342	COMPOSITE FAMILY	Cow thistle	2	
POACEAE	Sorghastrum nutans	377	GRASSES	Indian grass	3	TRTE
ROSACEAE	Spiraea alba	196	ROSE FAMILY	White spiraea	4,5	
POACEAE	Sporobolus cryptandrus	377	GRASSES	Sand-drop-seed	3	TRTE
STAPHYLEACEAE	Staphylea trifolia	272	BLADDERNUT FAMILY	Bladdernut	3	TRTE
POACEAE	Stipa spartea	377	GRASSES	Needle and thread grass	1,2	TRTE
CARPRIFOLIACEAE	Symphoricarpos albus	337	HONEYSUCKLE FAMILY	Snowberry	1,2	TRTE
ARACEAE	Symplocarpus foetidus	363	ARUM FAMILY	Skunk cabbage		
APLACEAE	Taenidia integerrima	293	PARSLEY FAMILY	Yellow pimpernel	1,2	TRTE
ASTERACEAE	Taraxacum officinale	342	COMPOSITE FAMILY	Dandelion	2	
RANUNCULACEAE	Thalictrum pubescens	50	CROWFOOT FAMILY	Tall meadow rue	3	
POLYPOIDIACEAE	Thelypteris palustris	13	FERN FAMILY	Marsh fern	3,4,5	TRTE

FAMILY	Genus /Species	Family #	FAMILY COMMON	COMMON NAME	Complex	Voucher
PINACEAE	Thuja occidentalis	17	PINE FAMILY	White cedar	3,4	
TILIACEAE	Tilia americana	121	LINDEN FAMILY	Basswood	3	
LILIACEAE	Todfieldia glutinosa	394	LILY FAMILY	False asphodel	5	TRTE
ASTERACEAE	Tragopogon dubius	342	COMPOSITE FAMILY	Goatsbeard	2	
GUITTIFERAE	Triadenum fraseri	119	ST. JOHN'S WORT FAMILY	Marsh St. John's Wort	4	TRTE
JUNCAGINACEAE	Triglochin maritima	349	ARROW GRASS FAMILY	Arrow grass	5	TRTE
LILIACEAE	Trillium grandiflorum	394	LILY FAMILY	White trillium	3	
CARPRIFOLIACEAE	Triosetum auratiacum	337	HONEYSUCKLE FAMILY	Wild coffee	3	TRTE
PINACEAE	Tsuga canadensis	17	PINE FAMILY	Hemlock	1,2	
ASTERACEAE	Tussilago farfara	342	COMPOSITE FAMILY	Coltsfoot	4	TRTE
TYPHACEAE	Typha angustifolia	380	CATTAIL FAMILY	Narrow-leaf cattail	4	
TYPHACEAE	Typha glauca x Gordon	380	CATTAIL FAMILY	Cattail	4	
TYPHACEAE	Typha latifolia	380	CATTAIL FAMILY	Common cattail	4	
ULMACEAE	Ulmus americana	71	ELM FAMILY	American elm	2	TRTE
ULMACEAE	Ulmus rubra	71	ELM FAMILY	Slippery elm	3	
LENTIBULARICEAE	Utricularia cornuta	327	BLADDERWORT FAMILY	Horned bladderwort	5	TRTE
LENTIBULARICEAE	Utricularia intermedia	327	BLADDERWORT FAMILY	Bladderwort	5	TRTE
LENTIBULARICEAE	Utricularia vulgaris	327	BLADDERWORT FAMILY	Bladderwort	5	TRTE
ERICACEAE	Vaccinium myrtilloides	166	HEATH FAMILY	Velvet leaf-blueberry	1,2	TRTE
HYDRCHARITACEAE	Vallisneria americana	346	FROG'S BIT FAMILY	Eelgrass	3	
SCROPHULARIACEAE	Verbascum thapsus	318	FIGWORT FAMILY	Common mullein	2	
VERBEBACEAE	Verbena hastata	310	VERVAIN FAMILY	Blue vervain	4	TRTE
VERBEBACEAE	Verbena utricifolia	310	VERVAIN FAMILY	White vervain	3	TRTE
ASTERACEAE	Veronia gigantea	342	COMPOSITE FAMILY	Tall ironweed	4	TRTE

FAMILY	Genus /Species	Family #	FAMILY COMMON	COMMON NAME	Complex	Voucher
CARPRIFOLIACEAE	Viburnum acerifolium	337	HONEYSUCKLE FAMILY	Maple-leaved viburnum	1,2	TRTE
CARPRIFOLIACEAE	Viburnum lentago	337	HONEYSUCKLE FAMILY	Nannyberry	3	TRTE
CARPRIFOLIACEAE	Viburnum rafinesquianum	337	HONEYSUCKLE FAMILY	Downy arrow-wood	3,4	TRTE
CARPRIFOLIACEAE	Viburnum trilobum	337	HONEYSUCKLE FAMILY	Highbush cranberry	3	TRTE
VIOLACEAE	Viola adunca	137	VIOLET FAMILY	Am.dog violet	1	TRTE
VIOLACEAE	Viola conspersa	137	VIOLET FAMILY	Dog violet	3	TRTE
VIOLACEAE	Viola pubescens	137	VIOLET FAMILY	Yellow violet	3	TRTE
VIOLACEAE	Viola sororia	137	VIOLET FAMILY	Wolly blue violet	3	TRTE
VITACEAE	Vitis aestivalis	259	VINE FAMILY	Summer grape	1,2,3	TRTE
VITACEAE	Vitis riparia	259	VINE FAMILY	Riverbank grape		
RUTACEAE	Zanthoxylum americanum	285	RUE FAMILY	Prickly ash	1	TRTE
APLACEAE	Zizia aurea	293	PARSLEY FAMILY	Golden alexander	1,2	TRTE

Recorded in 1994 Management Plan- Alphabetical by Genus

Appendix F. Herbaceous Plant List of the LCHF, 2008

Common Name	**Scientific Name**
Anemone, Canada	*Anemone canadensis*
Anemone, long fruited	
Aster	*Aster spp*
Aster, heart-leaved	*Gallium pilosum*
Aster, smooth	
Bane berry, red	
Baneberry, white	
Bed straw, hairy	
Bell flower	*Campanula*
Bellwort	
Black-eyed susan	*Rudbeckia hirta*
Blazing star cylindric	*Liatris cylindracea*
Blazing star, rough	*Liatris aspera*
Bluestem big	
Bluestem little	
Bergamot, wild	
Bloodroot	*Sanguinaria canadensis*
Blue flag (large blue)	*Iris versicolor*
Bog-hemp	*Boemeria cylindrica*
Burdock (common)	*Arctium minus*
Buttercup	*Ranunculus spp*
Butterfly weed	*Asclepias tuberosa*
Cinquefoil, dwarf	*Potentilla Canadensis*
Cohosh, blue	*Caulophyllum thalictroides*
Columbine	*Aquilegia Canadensis*
Cow-wheat	*Melampyrum lineare*
Dandelion	*Taraxacum*
Dog bane	*Apocynum cannabinum*
False Solomon's seal	*Smilacina racemosa*
False Solomon's seal, starry	
Fern, bracken	*Pteridium aquilinum*
Fern, lady	
Fern long beech	
Fern, maidenhair	
Fern, marsh	
Fern, royal	
Fern, sensitive	*Onoclea sensibilis*
Geranium, wild	*Geranium maculatum*

Common Name	Scientific Name
Golden rod, blue stemmed	
Golden rod, early	
Goldenrod, gray	
Golden rod, zigzag	
Goldthread	*Copis groenlandica*
Grass, switch	
Greenbrier	*Smilax rotundifolia*
Harebells	
Hawkweed (Canadian)	*Hieracium canadense*
Hawkweed, hairy	
Helleborine	*Epipactis helleborine*
Hemlock, water	
Hog Peanut	*Amphicarpa bracteata*
Horse balm	
Horse tail	*Equisetum spp*
Horse gentian	*Triosteum aurantiacum*
Indian pipe	
Jack –in- the- pulpit	*Arisaema*
Joe-pye weed, spotted	
Kidney leaved buttercup	*Ranunculus hispidus*
Knotweed, Virginia	
Lily of the valley	*Maianthemum canadense*
Lupin, wild	*Lupinus erennis*
May Apple	*Podophyllum peltatum*
Miterwort	
Meadow-rue (tall)	*Thalictrum polygamum*
Milkweed, green	*Asclepias virdiflora*
Milkweed, poke	*Asclepias exaltat*
Miterwort	*Mitella diphylla*
Moonseed (Canada)	*Menispermum canadense*
Mullien	*Verbascum*
Mustard, garlic	*Alliaria officinalis*
Parsley, hemlock *	*Conioeslium chinense*
Parsnip, water	
Pipsissewa	
Phlox, spreading	*Phlox diffusa*
Puccoon, yellow	*Lithospermum caroliniense*
Ragwort, balsam	
Rock cress, lyre-leaved	
Running strawberry-bush	*Euonymus obovatus*

Common Name	Scientific Name
Sarsparilla (bristly)	*Aralia hispida*
Skunk cabbage	*Symplocarpus foetidus*
Solomons Seal	*Polygonatum biflorum*
Star-flower	*Trientalis borealis*
Strawberry	*Fragaria virginiana*
Strawberry, barren	
Sunflower, woodland	
Tick-trefoil, naked-flowered	
Tick-trefoil, pointed leaved	
Touch-me-not (spotted)	*Impatiens capensis*
Trillium red	*trliium erectum*
Trillium white	*Trillium grandiflorum*
Water hemlock	*Cicuta maculate*
Wood betony	*Pedicularis canadensis*
Wood cleavers	*Galium aparine*
Woodfern , marginal	
Woodfern spinulosa	
Wood lily	*Lilium philadelphicum*
Wood nettles	*Laportea canadensis*
Yamroot, wild	*Dioscrea villosa*
Zigzag leaf (broad-leaved goldenrod)	*Solidago flexicaulis*

Appendix G. Shrubs and Vines of the LCHF, 2008

Common Names	*Scientific Names*
Dogwood, alternate	*Cornus alternifolia*
Sumac, aromatic	*Rhus aromatica*
Arrow-wood, downy	*Viburnum rafinesquianum*
Raspberry, black	*Rubus occidentalis*
Bladdernut	*Staphylea trifolia*
Blueberry velvet -leaf	*Vaccinium myrtilloides*
Buckthorn, glossy	*Rhamnus frangula*
Bunchberry	*Cornus canadensis*
Buttonbush	*Cephalanthus occidentalis*
Choke cherry	*Prunus virginiana*
Juniper, common	*Juniperus communis*
Dogwood, red osier	*Cornus stolonifera*
Dwarf hackberry	*Celtis tenuifolia*
Elderberry black	*Sambucus nigra*
Elderberry red	*Sambucus pubens*
Sumac, fragrant	*Rhus aromatica*
Gooseberry, prickly	*Ribes cynosbati*
Grape, summer	*vitis aestivalis*
Dogwood, grey	*Cornus foemina*
Blueberry, ground (lowbush)	*Vaccinium angustifolium*
Hemlock, ground	*Taxus canadenis*
Cranberry, high bush	*Viburnum trilobum*
Honeysuckle	*Lonicera diervilla*
Honeysuckle, Japanese	*Loniceria japonica*
Leatherwood	*Dirca palustris*
Maple leaf viburnum	*Viburnum acerifolium*
Nannyberry	*Viburnum lentago*
Buckthorn, purging	*Rhamnus cathartica*
Partridgeberry	*Mitchella repens*
Poison ivy	*Rhus radicans*
Prickly-ash, American	*Zanthoxylum americanum*
Princes pine	*Chimaphila umbellata*
Raspberry	*Rubus idauus*
Dogwood, round leaf	*Corus rugosa*
Spice bush	*Lindera benzoin*
Sumac, staghorn	*Rhus typhina*
Blackberry, common	*Rubus allegheiensis*
Virginia creeper	*Parthenocissus vitacea*
Wild rose	*Rosa canina*
Wintergreen	*Gaultheria procumbens*
Witch hazel	*Hamamelis virginiana*

Appendix H. Relative Shade Tolerance of Tree Species in the LCHF

Species	Latin	Shade Tolerance
Ash, black	*Fraxinus nigra*	Intolerant
Ash, green	*Fraxinus pennsylvanica*	Mid-tolerant
Ash, white	*Fraxinus americana*	Mid-tolerant
Aspen, largetooth	*Populus grandidentata*	Intolerant
Aspen, trembling	*Populus tremuloides*	Intolerant
Basswood	*Tilia americana*	Tolerant
Beech, American	*Fagus grandifolia*	Very tolerant
Beech-blue American	*Carpinus caroliniana*	Very tolerant
Birch, white	*Betula papyrifera*	Very intolerant
Birch, yellow	*Betula alleghaniensis*	Tolerant
Butternut	*Juglans cinerea*	Intolerant
Cedar, eastern red	*Juniperus virginiana*	Very intolerant
Cherry, black	*Prunus aerotina*	Mid-tolerant to intolerant
Cottonwood	*Populus deltoides*	Intolerant
Elm, red (slippery)	*Ulmus thomasil*	Mid tolerant
Elm, white	*Ulmus americana*	Mid-tolerant
Hawthorn	*Crataegus spp.*	Intolerant
Hemlock, eastern	*Tsuga canadensis*	Very tolerant
Hickory, bitternut	*Carya cordiformis*	Mid-tolerant
Hickory, shagbark	*Carya ovata*	Mid-tolerant
Ironwood	*Ostrya virginiana*	Very tolerant
Juneberry	*Amelanchier spp.*	Tolerant
Maple, red	*Acer rubrum*	Mid-tolerant
Maple, sugar (hard)	*Acer saccharum*	Very tolerant
Oak, black	*Quercus nigra*	Intolerant
Oak, bur	*Quercus macrocarpa*	Mid-tolerant
Oak, chinquapin	*Quercus muehlenbergii*	Mid-tolerant
Oak, red	*Quercus rubra*	Mid-tolerant
Oak, swamp white	*Quercus bicolor*	Mid-tolerant
Oak, white	*Quercus alba*	Mid-tolerant
Pine, red	*Pinus resinosa*	Very intolerant
Pine, white	*Pinus strobus*	Intolerant
Pumpkin ash	*Fraxinus profunda*	
Spruce, Norway	*Picea abies*	Mid -tolerant
Sycamore	*Platanus occidentalis*	Very intolerant
Tamarack	*Larix laricina*	Very intolerant
Tulip tree	*Liriodendron tulipifera*	Very intolerant
Walnut, black	*Juglans nigra*	Very intolerant

Appendix I. Birds of the LCHF

PIGEONS AND DOVES
Mourning Dove

HUMMINGBIRDS
Ruby-throated Hummingbird

WOODPECKERS
Red-bellied Woodpecker
Northern Flicker

TYRANT FLYCATCHERS
Acadian Flycatcher
Eastern Wood-Pewee
Eastern Kingbird
Great Crested Flycatcher

MOCKINGBIRDS AND THRASHERS
Gray Catbird

THRUSHES
Veery
Wood Thrush
American Robin

GNATCATCHERS
Blue-gray Gnatcatcher

CHICKADEES AND TITS
Black-capped Chickadee

NUTHATCHES
White-breasted Nuthatch

CROWS JAYS AND MAGPIES
Blue Jay
American Crow

VIREOS AND ALLIES
Red-eyed Vireo

SISKINS CROSSBILLS AND ALLIES
House Finch
American Goldfinch

NEW WORLD WARBLERS
Yellow Warbler
Chestnut-sided Warbler
Pine Warbler
American Redstart
Ovenbird
Common Yellowthroat
Hooded Warbler

TANAGERS AND ALLIES
Scarlet Tanager

BUNTINGS SPARROWS AND ALL SEEDEATERS
Eastern Towhee
Chipping Sparrow
Field Sparrow
Song Sparrow
Swamp Sparrow

SALTATORS CARDINALS AND ALLIES
Northern Cardinal
Rose-breasted Grosbeak
Indigo Bunting

TROUPIALS AND ALLIES
Red-winged Blackbird
Brown-headed Cowbird

--------- STATISTICS -------

Species seen - 38
Families w/seen species - 17
Observed by Mike Nelson, 2008

Appendix J. Invasive and Exotic Plant Species found in the Lambton County Heritage Forest

The rapid spread of invasive plants has become a major concern not only in southern Ontario but worldwide. Invasive plants are now considered one of the most serious threats to global biodiversity. They also contribute, either directly or indirectly, to increased erosion, spread of disease, flooding, and other ecological ailments. Further, invasive plants present major challenges and lead to significant costs for the agricultural, fishing and forestry industries (Donna Havinga, the Ontario Invasive Plants Working Group).

Garlic Mustard *(Alliaria petiolata)* - Garlic mustard poses a severe threat to native plants and animals in forest communities. Many native wildflowers that complete their life cycles in the springtime occur in the same habitat as garlic mustard. Once introduced to an area, garlic mustard out-competes native plants by aggressively taking over light, moisture, nutrients, soil and space. Wildlife species that depend on these early plants for their foliage, pollen, nectar, fruits, seeds and roots, are deprived of these essential food sources. Garlic mustard is a shade tolerant species that grows in moist woodlots, floodplains, and riverbanks but has also been known to occur in full sun.
Control methods have included prescribed fires, herbicide application (Glyphosate) and stem cutting. All have been proven effective but only short-term.

Norway Spruce (*Picea abies*) – This tree species has a long history of being planted in Canada, without displaying any tendency to become invasive or to negatively impact the environment. This exotic tree species is not reproductively compatible with our native spruces; therefore there would be no gene flow between a plantation of Norway spruce and the surrounding indigenous spruce forests (Natural Resources Canada 2006).

Glossy buckthorn also known as European alder *(Rhamnus frangula)* – Glossy buckthorn, a native of Europe, was imported to North America in the late 19th century for landscape planting, and has consequently become naturalized in southern Ontario as well as many other parts of Canada. Glossy buckthorn tends to grow best in various wetland habitats, including swamps, fens, and edges of bogs. It also occurs in a range of upland habitats such as woodland edges, fencerows, old fields and prairies.

Purging Buckthorn also known as Common Buckthorn *(Rhamnus frangula)* - Originally found in Europe, Asia and the eastern US this non-native invasive species is a deciduous shrub/tree growing up to 6 meters tall. Common buckthorn occurs in a range of upland communities including upland and floodplain forests, woodland edges, fencerows, prairies, and old fields. It is able to successfully invade habitats because of its tolerance of a wide range of moisture and light conditions, its prolific seed production, and because of the high viability and rapid germination of the seeds (Gourley and Howell, 1984). When common buckthorn invades a natural area it displaces the native species by the dense shade produced (Heidorn, 1991). It's also thought that common buckthorn may be able to produce substances that inhibit the growth or

development of many herbaceous woodland species (Boudreau and Willson, 1992). Several methods have been used to control common buckthorn in natural areas including fire, herbicide application, and girdling.

Japanese Honeysuckle (*Lonicera japonica*) – Introduced first into the New York area from Asia in the 1800s this invasive plant grows on roadsides, fencerows, open woodlots, thickets and gardens. It is considered to be an aggressive invasive exotic meaning it will take over and continue to dominate an area it invades and spread rapidly to new areas.

Invasive and Exotic Plant species found in the Lambton County Heritage Forest

VMU#	*Garlic Mustard*	*Norway Spruce*	*Glossy Buckthorn*	*Purging or Common Buckthorn*	**Japanese Honeysuckle**
1					x
2	x	x		x	
3	x			x	
4				x	
5	x			x	
6	x			x	
7	x				
8					
9					
10					
11				x	
12					
13			x		

Appendix K. Tree Insects and Diseases by VMU, 2006

VMU #	*Dutch elm disease **	*Butternut blight**	*Emerald Ash - Borer**	*Gypsy Moth**	*Target (Nectria) canker*	*Black knot*	*Artist conk*	*False tinder fungus*	*Galls*	*Ash rough bark*	*Fall Webworm*
1		x		x	x	x					x
2				x		x	x		x		
3					x	x					x
4	x				x	x					
5					x	x			x	x	x
6	x				x						
7											
8											
9											
10											
11											
12						x					
13						x		x			

The rate and extent of global trade and human migration have increased dramatically over the years. This expansion has increased the probability that organisms can be accidentally moved to and become established in areas outside of their natural range. When exotic forest pests become established, trees are abruptly exposed to a new invasive species and do not usually have the mechanisms to defend themselves. This with the absence of population-limiting factors may lead to large scale tree mortality that can severely impact forest ecosystems, such as Dutch elm disease, butternut canker, gypsy moth and emerald ash borer. The impact of native insect and disease outbreaks on forests can be detrimental or positive, depending on management objectives. They are part of the natural cycle that removes aged, weak, or otherwise susceptible trees. They recycle nutrients, provide habitat and are a source of food for forest wildlife (Troy Kimoto, 2004).

Artist Conk's (*Ganoderma applanatum*) The artist's conk fungus is common throughout hardwood stands in southern Ontario, affecting a wide variety of hosts. It is capable of causing decay in both living and dead trees. In the advanced stage the heartwood becomes whitish to cream in color, and spongy, with fine black zone lines running throughout the decay. Advanced decay columns can run for four metres or more in length in the trunk of the tree. When the decay within the tree is largely developed, living sapwood may also be attacked and destroyed. Severely decayed trees are prone to breakage by wind or heavy, wet snow loads (Canadian Forest Service 2007).

Black knot Black knot is caused by a fungus (*Apiosporina morbosa).* Infected trees are often stunted but rarely killed by the disease. Infection by the black knot fungus is easily recognized by the presence of rough, long, black, cylindrical swellings on the twigs and smaller branches of the infected tree. These knots vary in size and often reach 2 ½ centimeters in diameter and 20 centimeters in length. When the disease is severe, infection may also appear on some larger branches. When first produced, the knots are a greenish color; they later become jet black and very hard (Canadian Forest Service 2007). Black knot is most commonly found on choke cherry.

Butternut canker (*Sirococcus clavigignenti-juglandacearum)* The disease is a serious threat to butternut populations in North America and has killed up to 90% of the butternut population. Damage from the Sirococcus fungus was first noted in Wisconsin in 1967, but it was not until 1979 that the fungus itself was described. Scientists believe that the disease was introduced to North America much earlier than the first report. First reports in Canada occurred in 1990 in Quebec, then in 1991 in Ontario. Infection usually occurs first in the lower crown of trees, and then spreads downward. As the disease intensifies, multiple cankers will form on the branches, stem, and roots, and the infected tree will stop producing nuts. As the cankers grow and join together, affected branches will die, and eventually girdling the stem and killing the tree. Cankers also serve as entry points for other decay organisms (K.J. Harrison , J.E. Hurley 2006).

Dutch Elm Disease Dutch elm disease was introduced from Europe in the 1930's and has had a devastating effect on the health of forests, killing millions of elm trees across North America. Dutch elm disease is caused by the fungus (*Ophiostoma ulmi) (Ceratocystis ulmi)* which is transmitted by two species of bark beetles, the smaller European Bark Beetle (*Scolytus*

multistriatus) and the Native Elm Bark Beetle (*Hylurgopinus rufipes)* or by root grafting. Once the fungus is established within a tree, it spreads rapidly by means of the water-conducting vessels. The tree forms gums within these vessels as a response to the fungus, causing the tree to wilt and eventually die. This disease first went through Lambton between 1959 and 1969, eventually wiping out white and rock elm, and killing about 60% of red elm. Recent studies show that there are actually more elms around today than 50 years ago, but few trees live to full maturity. Instead they are killed by Dutch elm disease, but not before they have the chance to propagate a new generation, continuing the cycle of the disease, killing each generation with exception to a few survivors that are perhaps disease resistant trees (Gerald Waldron 2003).

Eastern Tent Caterpillar (*Malacosoma americanum)* The Eastern tent caterpillar is more of a nuisance than a threat. While it defoliates trees it rarely kills them unless the tree is already weakened by disease, climate or other environmental stresses. The caterpillars main host plant is black cherry, pin cherry and chokecherry but will feed on other fruit trees also.

Emerald Ash Borer (*Agrilus planipennis*) The emerald ash borer, an insect native to Asia, is a newly discovered threat to Canada's trees and forests. The insect was first identified in June 2002, in southeast Michigan. Canadian authorities then found that the borer was also killing ash trees in the Windsor area of southwestern Ontario. Since 2002 it has spread throughout Essex County and the municipality of Chatham Kent, Lambton County, Elgin County, Middlesex County, Norfolk and the city of Toronto. While currently not identified within the LCHF it is important to note its significance to the area and probability of this exotic insect affecting the health of ash species in the LCHF within the next five years.

Fall Webworm *(Hyphantria cunea)* Even severe infestations of fall webworm have little impact on trees because the damage occurs near the end of the annual growing season. However, the trees may be weakened, making them more susceptible to attacks by other insects or diseases.There are approximately 120 species of trees the moth will lay its eggs on including ash, speckled alder, willow, balsam poplar, trembling aspen and white birch (Canadian Forestry Services 2007).

False Tinder Fungus (*Phellinus igniarius*) A major heart rot, this fungus causes trees to decay and is mostly found on poplar and birch species. A single conk usually indicates a decay column of 5 meters (MNR, 2004).

Galls A gall is an overgrowth in plant tissues usually caused by insects or diseases. Insect galls are unsightly but do not kill plants normally, however, galls caused by disease organisms such as bacterial or fungi may present a more serious problem to the plants health. Galls can be found on any part of the plant.

Gypsy Moth (*Lymantria dispar)* Gypsy moth is native to Europe and southern Asia and was first introduced into North America in the Boston area in about 1869. It has since spread over much of the eastern portion of North America. It was first reported in Canada, in the province of Québec, in 1924. Gypsy moth larvae will feed on most deciduous and conifer trees, but prefer oak, popular, and birch. Since the early 1980s gypsy moth has annually caused scattered pockets

of defoliation in forested areas across portions of southern Ontario. Populations peaked in 1991, resulting in some 347,400 ha of moderate to severe defoliation in hardwood stands across Ontario. Since that time period, overall populations have declined, but remnant pockets of defoliation have occurred yearly at widely scattered locations (Canadian Forest Service). Naturally occurring factors help to control the numbers of gypsy moth in a number of ways. Populations are often destroyed indirectly by late spring frosts that kill the new foliage, causing the caterpillars to starve to death. Naturally occurring predators, such as insects, rodents, and some bird species, and insect parasites all play a role in helping to control infestations. The two most important controlling factors are a naturally occurring nuclear polyhedrosis virus and a fungus, *Entomophaga maimaiga*. These two organisms have been largely responsible for keeping gypsy moth populations in check across Ontario.

Mechanical controls for gypsy moth include the removal and killing of the larvae as they cluster on the trunks or major branches of the tree for molting or resting periods. Numbers can also be reduced by trapping the larvae on a band of sticky material, such as Tanglefoot, spread on the trunk of the tree. Overwintering egg masses may be removed by hand from late fall until early the following spring and destroyed by dropping them into a solution of bleach and water. The biological insecticide, *Bacillus thuringiensis*(B.t.), is now considered to be the best product used to control outbreaks of gypsy moth. It should be applied in late May or early June when the larvae are actively feeding.

Nectria canker (*Nectria galligena*) The fungus causes target-like cankers on many hardwoods. Nectria canker originally appears as a slightly sunken, elongated lesion. The surface of the outer bark is often discolored and may be open or covered with bark. Efforts by the tree to contain the infection result in the formation of a callus ridge during the growing season and if the tree is not successful, the fungus will re-infect healthy wood beyond the callus ridge the next year. This process produces the easily recognized 'target' shaped cankers.

Appendix L. Summary of Wildlife Habitat Features by VMU

VMU #	*Cavity Trees*	*Snags*	*Fallen Woody Debris*	*Stick nests*	*Ephemeral pools/forest swamps/streams*	*Super Canopy Trees*	*Dens and Dug Holes*	*Mast trees*	*Other food sources*	*Conifers*
1	X	X	X		X	X	X	X	X	X
2		X	X			X	X	X	X	X
3	X	X	X			X	X	X	X	X
4	X	X	X		X	X	X	X	X	X
5	X	X	X	3		X	X	X	X	X
6	X	X	X		X	X	X	X	X	X
7	X	X	X					X		X
8		X	X		Permanent water	X				X
9	X	X	X		X	X		X	X	X
10		X	X			X	X	X		X
11		X	X		X	X	X	X	X	X
12		X	X					X	X	X
13	X	X	X			X	X	X	X	X

Appendix M. Glossary

Acceptable Growing Stock (AGS) Trees which will have equal or greater value in 10 years.

Anthropogenic Caused or influenced by humans. Anthropogenic carbon dioxide is that portion of carbon dioxide in the atmosphere that is produced directly by human activities, such as the burning of fossil fuels, rather than by such processes as respiration and decay.

Arable land Land cultivated or suitable for cultivation

Associate(s) One or more plant species that commonly occur together, typically under similar ecological conditions

Barren Usually open sites on bedrock or unconsolidated material, such as sand, where the major limiting factor is drought. Stunted trees and tall shrubs may be present but not tall-grass prairie species.

Basal Area The area of a cross-section of a tree, including bark, at breast height. Basal area of a forest stand is the sum of the basal areas of all individual trees in the stand, usually reported as square feet per acre or square meters per hectare (m^2/ha).

Biodiversity Totality of the richness of biological variation, ranging from within species genetic variation through subspecies and species to communities and the patterns and dynamics of these on the landscape.

Biome A living community characterized by distinctive plant and animal species and maintained under the climatic conditions of the region.

Bedrock Consolidated rock underlying soils or exposed rock at the surface.

Bog Ombrotrophic peatlands generally unaffected by nutrient-rich groundwater that are acidic and often dominated by shrubs and mosses and that may include open growing stunted trees

Canopy Aerial branches of terrestrial plants together with their complement of leaves said to be a complete canopy when the ground is completely hidden by leaves when viewed from above.

Canopy closure The degree of canopy cover relative to openings

Climate Accumulated long-term effects of weather that involve a variety of heat and moisture exchange processes between the earth and the atmosphere

Community An assemblage of organisms that exist and interact with one another on the same site.

Competition The interaction among organisms resulting from common use of a limited resource. Intraspecific competition occurs within the same species while interspecific competition arises among different species.

Conifer A cone bearing plant .

Coniferous forest A plant community with a cover made up of 75% or more coniferous species.

Committee on the Status of Endangered Wildlife in Canada (COSEWIC):

Developed in 1997, COSEWIC is a committee of experts that determine the national status of wild Canadian species, subspecies, varieties or other designatable units that are suspected of being at risk of extinction or extirpation. COSEWIC uses a process based on science and Aboriginal or community knowledge to assess species at risk. All native mammals, birds, reptiles, amphibians, fish, arthropods, molluscs, vascular plants, mosses and lichens are included in COSEWIC's current mandate.

Deciduous Referring to perennial plants from which the leaves fall off at the end of the growing season

Deciduous forest A plant community with a cover made up of 75% or more deciduous species.

Diversity The richness of a species within a given area. Includes two concepts: richness of species and evidence in the abundance of the species.

Dominant A plant with the greatest cover or biomass within a plant community and represented throughout the community by large numbers of individuals. Visually more abundant than other species in the same layer and forming > 10% of the ground cover and > 35% of the vegetation cover in any one layer.

Dune A low hill or ridge of sand that has been sorted and deposited by wind

Eco-district A part of an eco-region characterized by distinctive geologic, soil, water, fauna and land use.

Eco-region A large area of land or water that contains a geographically distinct assemblage of natural communities that (a) share a large majority of their species and ecological dynamics; (b) share similar environmental conditions, and; (c) interact ecologically in ways that are critical for their long-term persistence.

Ecosystem A functional unit consisting of all the living organisms (plants, animals, and microbes) in a given area, and all the non-living physical and chemical factors of their environment, linked together through nutrient cycling and energy flow.

Erosion The wearing away of the earth's surface by running water, wind, ice, or other geological agents.

Exotic Species A species that did not originally occur in the areas in which it is now found, that arrived as a direct or indirect result of human activity

Flora The plants of a particular region, geological period, or environment

Fauna A collective term for animal life of any particular region or time

Habitat The area or natural environment in which an organism or population normally lives. A habitat is made up of physical factors such as soil, moisture, range of temperature, and availability of light as well as biotic factors such as the availability of food and the presence of predators.

Hemisparasitic Obtaining water or nutrients from roots of other plants and can live either independently or as a parasite.

Hummock A small, rounded or cone-shaped, low hill or a surface of other small, irregular shapes.

Horizon A layer of soil.

Invasive Species Non-native species of plants or animals that out-compete native species in a specific habitat.

Microclimate Localized climatic conditions ranging down to conditions at the stand or even individual plant environment level

Nutrient Usually refers to one of a specific set of primary elements found in soil that are required by plants for healthy growth, such as nitrogen, phosphorus, potassium, calcium, magnesium and sulphur

Ontario Butterfly Atlas (OBA) Ontario butterfly Atlas was produced in 1991 by the Toronto Entomologist Association. The Ontario Butterfly Atlas documents the occurrence and distribution of Ontario butterflies with maps, timetables, habitat and host plants descriptions and other information about each of the species known to occur in Ontario.

Old growth A self-perpetuating community composed primarily of late successional species that usually show uneven age distribution including large old trees without open grown characteristics.

Organic Matter Plant and animal residues, such as leaves, trimmings and manure, in various stages of decomposition.

Oxbow Wetland An abandoned stream channel bend that is now a lake (or a lake filled in by a peatland) in the shape of a crescent

Percolation The downward movement of water through the openings in soil or rock.

pH A measure of acidity or alkalinity or a solution based on the concentration of hydrogen ions.

Plot A vegetation sampling unit used to delineate a fixed area for the purpose of estimating plant cover, biomass or density. Plots can vary in their dimensions depending on the purpose of the study.

Prism Sweep Using a glass wedge prism of a known thickness to estimate basal area of a stand of timber. Volumes can then be estimated.

Sand Mineral particles with diameters ranging from 0.05 to 2.0 mm.

Shade Intolerant Plants not capable of growing successfully in the shade

Shade Tolerant Shade tolerant - plants capable of growing and successfully reproducing beneath the shading canopy of other species.

Species A group of organisms capable of interbreeding and producing fertile offspring. While in many cases this definition is adequate, more precise or differing measures are often used, such as based on similarity of DNA or morphology. Presence of specific locally-adapted traits may further subdivide species into subspecies.

Species at Risk Wild plants and animals that have been assessed by an independent body, (e.g. The Committee on the Status of Endangered Wildlife in Canada (COSEWIC)), and found to be at some risk of disappearing from the wild in Ontario or Canada.

Species at Risk Act (SARA) Developed in 2003 this federal Act is designed to prevent Canadian indigenous species, subspecies and distinct populations of wildlife from becoming extirpated or extinct, and to provide for the recovery of endangered or threatened species. SARA encourages the management of other species to prevent them from becoming at risk. It creates prohibitions to protect listed threatened and endangered species and their critical habitat.

Prohibitions, Provincial and Territorial Classifications under SARA
(1) If a wildlife species that is not listed has been classified as an endangered species or a threatened species by a provincial or territorial minister, no person shall
(*a*) kill, harm, harass, capture or take an individual of that species that is on federal lands in the province or territory;
(*b*) possess, collect, buy, sell or trade an individual of that species that is on federal lands in the province or territory, or any part or derivative of such an individual; or
(*c*) damage or destroy the residence of one or more individuals of that species that is on federal lands in the province or territory.

Unacceptable Growing Stock (UGS)
Trees that will decline in value over 10 years due to their decline, death or a defect like a cavity.

Appendix N. List of Abbreviations

AGS	Acceptable Growth Stock
ANSI	Area of Natural and Scientific Concern
ATV	All-terrain vehicle
BA	Basal Area
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
ELC	Ecological Land Classification
ESA	Environmentally Sensitive Area
LCHF	Lambton County Heritage Forest
LCHFMP	Lambton County Heritage Forest Management Plan
NHIC	Natural Heritage Information Center
OBA	Ontario Butterfly Atlas
MNR	Ontario Ministry of Natural Resources
SAR	Species at Risk
SARA	Species at Risk Act
SCRCA	St. Clair Region Conservation Authority
UGS	Unacceptable Growth Stock
VMU	Vegetation Management Unit

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