

LIMERICK FOREST TWENTY YEAR FOREST MANAGEMENT PLAN



Arbex Forest Resource Consultants Ltd.
Oxford Mills, Ontario
July 2007



TABLE OF CONTENT

PART A – FOREST MANAGEMENT CONTEXT

1.0. INTROUCTION	1
2.0. DESCRIPTION OF LIMERICK FOREST	3
2.1. GEOGRAPHIC LOCATION AND AREA	3
2.2. THE LIMERICK FOREST LONG RANGE PLAN DESIGNATED USE AREAS (DUAs)	8
2.3. ADMINISTRATION	18
2.3.1. <i>Official Plans</i>	18
2.3.2. <i>Limerick Forest Long Range Plan</i>	18
2.3.3. <i>The Limerick Forest Advisory Committee (LFAC)</i>	19
2.4. FOREST MANAGEMENT HISTORY	19
3.0. BIOPHYSICAL CONTEXT	21
3.1. CLIMATE.....	21
3.2. HYDROLOGY.....	21
3.3. PHYSIOGRAPHY AND SOILS	21
3.4. LIFE SCIENCE FEATURES DESCRIPTION	23
3.4.1. <i>Ecological Land Classification</i>	23
3.5. HISTORIC FOREST CONDITION.....	24
3.6. CURRENT TIMBER RESOURCE DESCRIPTION	25
3.6.1. <i>Age Class Distribution</i>	29
3.6.2. <i>Production Forest Site Class Distribution</i>	33
3.6.3. <i>Production Forest Stocking Level Distribution</i>	34
3.7. DESCRIPTION OF PRODUCTION FOREST WORKING GROUPS	35
3.7.1. <i>Conifer Working Groups</i>	35
3.7.2. <i>Hardwood Working Groups</i>	37
3.8. WILDLIFE RESOURCES	38
3.9. AREAS OF NATURAL AND SCIENTIFIC INTEREST (ANSI)	39
3.10. WETLANDS	41
4.0. THE SOCIO-ECONOMIC CONTEXT FOR FOREST MANAGEMENT	46
4.1. POPULATION DEMOGRAPHICS OF THE UNITED COUNTIES.....	46
4.2. THE FOREST INDUSTRY IN EASTERN ONTARIO	46
4.3. LIMERICK FOREST WOOD SALES REVENUE.....	48
4.4. RECREATION AND TOURISM.....	49
4.5. WILDLIFE & OTHER NON-TIMBER RESOURCES	51
4.6. AGGREGATE EXTRACTION.....	51
5.0. MANAGEMENT PLAN OBJECTIVES	53
5.1. THE LIMERICK FOREST LONG RANGE PLAN (LFLRP) VISION, OBJECTIVES AND STRATEGIES FOR OBJECTIVE ACHIEVEMENT	53
5.2. 2007 – 2027 FOREST MANAGEMENT PLAN GOAL AND OBJECTIVES	55
5.2.1. <i>Objectives for Environmental Management</i>	55
5.2.2. <i>Objectives of Recreation Management</i>	56
5.2.3. <i>Objectives for Timber Management</i>	57
5.3. RESOURCE MANAGEMENT ISSUES	58
5.3.1. <i>The Integration of Timber Management Strategies With Other Resource Users</i>	58
5.3.2. <i>ANSI and PSW Boundaries</i>	59
5.3.3. <i>Invasive Species</i>	60

5.3.4. Low Quality of Growing Stock.....	60
5.3.5. Age Class Distribution	61
5.3.6. Forest Resource Inventory and Values Data.....	62
5.3.7. Availability of Markets for Traditional Forest Products	63
5.3.8. Historic Recreational Trail Use Patterns.....	64
5.3.9. Nutrient Management	64
5.3.10. The Identification and Management of “Proposed Old Growth Forest Reserves” ...	65
5.3.11. Zoning and Municipal Official Plans.....	66
5.3.12. Lack of Quantitative data on recreational Use & Tourism Potential.....	66
6.0. MANAGEMENT OF THE NATURAL ENVIRONMENT	67
6.1. AREA OF CONCERN MANAGEMENT GUIDELINES	69
6.1.1. Areas of Natural and Scientific Interest (ANSI)	76
6.1.2. Wetlands.....	77
6.1.3. Riparian Zone Management	77
6.1.4. Management of Cultural Areas of Concern	78
6.1.5. Uncommon Vegetation	79
6.1.6. Soil Protection.....	79
6.2. SITE NUTRIENT MANAGEMENT.....	81
6.3. THE LFAC NUTRIENT MANAGEMENT POLICY	83
6.4. MANAGEMENT OF “PROPOSED OLD GROWTH RESERVES”	84
6.5. GUIDELINES FOR SITE PROTECTION DURING FOREST MANAGEMENT OPERATIONS	92
6.5.1. Logging Damage.....	92
6.5.2. Losses of Productive Forest Land	93
6.5.3. Logging Slash	93
6.5.4. Skid Trail Layout	93
6.5.5. Road Location & Water Crossings.....	93
6.6. WILDLIFE MANAGEMENT	94
6.6.1. Wildlife Management Objective	95
6.6.2. Wildlife Management Strategies	96
6.7. WILDLIFE MANAGEMENT GUIDELINES.....	96
6.8. STICK NEST MANAGEMENT GUIDELINES.....	97
6.8.1. Cooper’s Hawk Nests	97
6.8.2. Goshawk Nests.....	97
6.8.3. Osprey Nests.....	97
6.8.4. Heron Rookeries.....	98
6.8.5. Broad-winged / Red-Shouldered/ Sharp shinned Hawk Nests.....	98
6.9. MAINTENANCE OF CAVITY TREES AND SNAGS	98
6.10. MAINTENANCE OF MAST PRODUCING TREES.....	98
6.11. RETENTION OF CONIFER TREES WITHIN HARDWOOD STANDS	99
6.12. DEER WINTERING AREAS.....	99
7.0. RECREATION & TOURISM MANAGEMENT	100
7.1. RECREATION & TOURISM MANAGEMENT OBJECTIVES AND STRATEGIES	101
7.2. RECREATIONAL TRAIL USE AND MANAGEMENT GUIDELINES.....	103
7.2.1. Road and Trail Management	111
7.2.2. Guidelines for Other Recreational Activities	113
7.2.3. Guidelines for Outdoor Education.....	114
7.3. RECREATION USER FEES AND LIABILITY INSURANCE.....	115
8.0. TIMBER MANAGEMENT.....	116
8.1. PAST TIMBER MANAGEMENT ACTIVITIES (2001-2007).....	116
8.2. TIMBER MANAGEMENT OBJECTIVES AND STRATEGIES	117
8.3. FOREST MANAGEMENT SYSTEMS	120
8.3.1. Even-Age Silviculture.....	121

8.3.2. <i>Uneven or All-Age Silviculture</i>	121
8.4. MANAGEMENT GUIDELINES FOR LIMERICK FOREST WORKING GROUPS	123
8.4.1. <i>Hard Maple Working Group</i>	124
8.4.2. <i>The Poplar Working Group</i>	125
8.4.3. <i>Soft Maple Working Group</i>	127
8.4.4. <i>Other Hardwood Working Group</i>	127
8.4.5. <i>Cedar Working Group</i>	128
8.5. PLANTATION MANAGEMENT	129
8.5.1. <i>Red Pine Working Group</i>	130
8.5.2. <i>White Pine Working Group</i>	132
8.5.3. <i>Jack Pine (includes Scots Pine) Working Group</i>	134
8.5.4. <i>White Spruce Working Group</i>	135
8.5.5. <i>Other Plantations</i>	136
8.6. DETERMINATION OF THE ANNUAL ALLOWABLE CUT	137
8.6.1. <i>Forest Inventory</i>	137
8.6.2. <i>Derivation of the Long Term Sustainable Yield (Annual Allowable Cut)</i>	140
8.7. UTILIZATION STANDARDS	142
8.8. IDENTIFICATION OF ELIGIBLE HARVEST AREAS	142
8.9. ROADS MANAGEMENT	146
8.10. TIMING OF HARVEST OPERATIONS	146
9.0. RESOURCE PROTECTION.....	147
9.1. FIRE PROTECTION	147
9.2. PROTECTION FROM INSECTS AND DISEASE	148
9.3. ICE STORM DAMAGE MANAGEMENT	151
9.4. MANAGEMENT OF INVASIVE PLANT SPECIES	151
9.5. MANAGEMENT OF NUISANCE ANIMALS	152
9.6. PROTECTION FROM ILLEGAL CUTTING AND DUMPING OF GARBAGE	153
10.0. MONITORING AND ASSESSMENT	154
11.0. FOREST MANAGEMENT PLAN ADMINISTRATION.....	158
11.1. ADMINISTRATION	158
11.2. MANAGEMENT PLAN PERIOD	159
11.3. RECORD KEEPING	160
11.4. LAND ACQUISITIONS AND DISPOSAL	160
12.0. RECOMMENDATIONS	161
BIBLIOGRAPHY	164
APPENDICES	168
APPENDIX A	
LIST OF ACRONYMS	
APPENDIX B	
LIST OF FOREST COMPARTMENTS	
APPENDIX C	
PRODUCTION AND PROTECTION AREAS MAPS FOR LIMERICK FOREST	
APPENDIX D	
LFAC TERMS OF REFERENCE	

APPENDIX E

ECOLOGICAL LAND CLASSIFICATION MAPS

APPENDIX F

LIMERICK FOREST TRACT AGE CLASS DISTRIBUTION MAPS AND WORKING GROUP AGE CLASS CHARTS

APPENDIX G

NATURAL HERITAGE INFORMATION CENTRE REPORTS WETLANDS & ANSI AREAS

APPENDIX H

AOC MANAGEMENT GUIDELINES SUMMARY TABLE FOR KNOWN AND POTENTIAL VALUES

APPENDIX I

MAPS OF LFAC PROPOSED OLD GROWTH RESERVES

APPENDIX J

TRAIL DENSITY MODEL

APPENDIX K

LONG TERM SUSTAINABLE YIELD CALCULATION

APPENDIX L

GLOSSARY

LIST OF TABLES

Table 1. Limerick Forest Designated Tracts.....	3
Table 2. Area of Limerick Forest by County and Township (2006).....	4
Table 3. Limerick Forest Area Summary.....	7
Table 4. Limerick Forest Designated Use Areas – Description, Regulations and Restrictions	9
Table 5. Area (Ha) of DUAs by Tract	11
Table 6. Climatic Statistics (Environment Canada Climate Normals 1971-2000).....	21
Table 7. Approximate Percentage Distribution of Soil Series in Limerick Forest.....	22
Table 8. Limerick Forest’s Community Series.....	24
Table 9. Limerick Forest All Land Classification (Hectares).....	26
Table 10. Estimated Gross Total Volume by Working Group for the Production Forest.....	26
Table 11. Area (Ha) and GTV (m ³) of Conifer Working Groups by Tract (All Land Classifications).....	27
Table 12. Area (Ha) and GTV (m ³) for Hardwood Working Groups by Tract (All Land Classifications)	27
Table 13. Production Forest Average Volume/Ha (m ³) by Working Group and Age Class	28
Table 14. Production Forest - Mean Annual Increment (m ³ /ha/yr) by Working Group and Age Class	29
Table 15. Age Class Distribution (Ha) of Conifer Working Groups (All Land Classifications).....	31
Table 16. Age Class Distribution (Ha) of Hardwood Working Groups (All Land Classifications). 31	
Table 17. Production Forest Age Class Distribution (Ha) of Conifer Working Groups.....	33
Table 18. Production Forest Age Class Distribution (Ha) of Hardwood Working Groups.....	33
Table 19. Production Forest Site Class Distribution by Working Group (Hectares).....	34
Table 20. Percent Stocking Distribution by Working Group (Production Forest) (Hectares)	35
Table 21. Species at Risk Which May Occur in Limerick Forest.....	39

Table 22. Provincially Significant Wetlands associated with Limerick Forest	41
Table 23. Non-provincially Significant Wetlands associated with Limerick Forest.....	45
Table 24. Volume in m ³ of Wood Fibre Purchased by Eastern Ontario Mills (2003-2004)	47
Table 25. OMNR – Forest Resource Processing Facilities (Mills) List of the Active Mills in the Kemptville District (April 1, 2006)	47
Table 26. Large Capacity Sawmills in the OMNR Pembroke District.....	48
Table 27. Estimated Annual User Visits – Limerick South Tract (2003)	50
Table 28. Sand and Gravel Reserves in Limerick Forest.....	52
Table 29. LFLRP Objectives and Strategies for Objective Achievement	53
Table 30. Site Impact Guidelines.....	80
Table 31. Old Growth Age-of-Onset and Duration For Forest Ecosites in Ecoregions 6E and 7E.	85
Table 32. PROPOSED OLD Growth Reserve Stand List	88
Table 33. Stand Level Damage Standards for Partial Harvesting Systems.....	93
Table 34. Existing Trail Designations and Distances by Tract	103
Table 35. Managed Snowmobile Trails within Limerick Forest	110
Table 36. Forest Management Activities 2001 - 2007	117
Table 37. Listing of Stands Requiring Assessment 2007-2011	138
Table 38. Estimated Maximum Annual Allowable and Periodic Harvest by Working Group (2006-2011).	141
Table 39. Potential Eligible Harvest Stands by Operating Period for the Twenty year Management Period.	144
Table 40. Some Common Diseases of Limerick Forest	150
Table 41. Forest Compartments with EMAN Plots.....	156

LIST OF FIGURES

Figure 1. Location of Limerick Forest Tracts in Eastern Ontario.....	6
Figure 2. Forest Land Classification Distribution for Limerick Forest (All Land Classification)	8
Figure 3. Designated Use Areas in Limerick North Tract.....	12
Figure 4. Designated Use Areas in Limerick South Tract	13
Figure 5. Designated Use Areas in Limerick North Augusta	14
Figure 6. Designated Use Areas in Limerick Cranberry Lake	15
Figure 7. Designated Use Areas in Limerick Grenville County	16
Figure 8. Designated Use Areas in Leeds County	17
Figure 9. Age Class Distribution of Conifer Working Groups	30
Figure 10. Age Class Distribution of the Hardwood Working Groups	30
Figure 11. Production Forest Age Class Distribution of Conifer Working Groups	32
Figure 12. Production Forest Age Class Distribution (Ha) of Hardwood Working Groups.....	32
Figure 13. Areas of Concern in Limerick North Tract.....	70
Figure 14. Areas of Concern in Limerick South Tract	71
Figure 15. Areas of Concern in Limerick North Augusta	72
Figure 16. Areas of Concern in Limerick Cranberry Lake	73
Figure 17. Areas of Concern in Limerick Grenville County	74
Figure 18. Areas of Concern in Limerick Leeds County.....	75
Figure 19. Limerick North Tract Trail System.....	104
Figure 20. Limerick South Tract Trail System	105
Figure 21. Limerick North Augusta Trail System.....	106
Figure 22. Limerick Cranberry Lake Trail System	107
Figure 23. Limerick Grenville County Trail System	108
Figure 24. Limerick Leeds County Trail System.....	109
Figure 25. EMAN Plot Locations in Limerick South Tract	157



United Counties of Leeds and Grenville

LIMERICK FOREST



Limerick Forest Twenty Year Forest Management Plan 2007-2027

Plan Author:


Bruce Byford R.P.F.
Arbex Forest Resource Consultants Ltd.



We recommend this Forest Management Plan be approved for implementation:

For the Limerick Forest Advisory Committee:



LFAAC Chairperson

Nov 1/07
Date


For the United Counties of Leeds and Grenville:


Geoff McVey
Acting Forest Manager

Nov 17/07
Date


Stephen F. Fournier
Chief Administrative Officer

November 17/07
Date


J. Douglas Struthers
Warden

Sept. 17/07
Date

1.0. INTRODUCTION

The following Forest Management Plan (FMP) was prepared for the United Counties of Leeds and Grenville (UCLG) to provide for the sustainable forest management of Limerick Forest. The plan was prepared under contract by Arbex Forest Resource Consultants Ltd.

The term of the management plan is April 1st, 2007 to March 31st, 2027. Formal revisions to this plan are proposed in 2012, 2017, and 2022. This renewal term will provide the means for reporting on progress in meeting planned objectives and for reviewing and improving the twenty-year forecasts of this plan.

The primary goal in every forest management plan is to achieve a healthy, sustainable forest ecosystem. The Limerick Forest Long Range Plan provides the overall direction and context for forest management in Limerick Forest. The goal of this forest management plan is *“To enhance the economic and social welfare of the residents of the United Counties of Leeds and Grenville through the improvement, sustainable use, development and protection of Limerick Forest’s wildlife, timber, non-timber and ecological resources”*. This goal is to be achieved through the implementation of adaptive, ecologically sound management principles and strategies.

The Limerick Forest Advisory Committee (LFAC) FMP Steering Committee established the strategic direction for forest management planning and provided valuable input and review during the planning process. This committee was comprised of the following individuals:

- Mr. Geoff McVey – Acting Forest Manager UCLG
- Mr. Stew Hamill – Chair LFAC Ecology Sub-Committee
- Mr. Kevin Eastman – Chair LFAC Recreation Sub-Committee
- Mr. Fred McFarland – Chair Administration Sub-Committee
- Mr. Dale Cameron – Member Ecology Sub-Committee and Education/Communications Sub-Committees.

Public input in the management planning process was solicited through a public notice in local newspapers, meetings with LFAC sub-committees and open houses in an effort to ensure that the forest management plan recognized the requirements and values of other users of Limerick Forest.

Accurate forest inventory information is essential for the sustainable management of the Forest and the successful implementation of this forest management plan, five year operational plans and annual plans.

Issues related to the accuracy and availability of forest resource and values information and data will require that the UCLG endeavour to update its resource information database during the first five year planning term. Inventory updates and revisions are to be reflected in the scheduled revisions to this forest management plan.

2.0. DESCRIPTION OF LIMERICK FOREST

2.1. Geographic Location and Area

Limerick Forest occupies 5,782 ha of public land within the United Counties of Leeds and Grenville (UCLG) (Figure 1). Land purchases/transfers to establish the Forest began in 1939. The last land acquisition occurred in 1990.

Limerick Forest is comprised of seven consolidated tracts (Table 1). Tracts may be contiguous parcels of land or parcels which have been grouped together on the basis of their geographic proximity. The parcels of land in the main tracts were further subdivided into “compartments” (currently numbered 1-175) for management purposes. Some land parcels contain several distinct compartments. Division of a parcel into separate compartments was based on internal features such as access roads, or streams (A listing of Limerick Forest compartments is provided in Appendix B). In some instances compartments were further divided into sub-compartments to delineate different stand types or other attributes (i.e. bogs, meadows etc). Table 1 provides a listing of the designated tracts within the Forest.

Table 1. Limerick Forest Designated Tracts

Tract	Area (ha)
Limerick Forest South	1,474.4
Limerick Forest North	1,122.6
Cranberry Lake	1,260.2
North Augusta	860.2
Leeds	623.2
Grenville	423.5
Other Leeds	17.8
Total:	5,782.3

Figure 1 (page 6) shows the locations of the various Limerick Forest tracts within eastern Ontario. Table 2 presents the area of Limerick Forest by county and township.

Table 2. Area of Limerick Forest by County and Township (2006)

County	Municipality	Area (Ha)
Leeds	Township of Athens	201
	Township of Rideau Lakes	296
	Township of Elizabethtown-Kitley	289
Grenville	Township of Merrickville-Wolford	2,212
	Municipality of North Grenville	947
	Township of Edwardsburgh-Cardinal	294
	Township of Augusta	1,543

The major tracts of LF are briefly described below:

Limerick Forest South

Limerick Forest South is situated north of the hamlet of Roebuck. It is the largest land assembly of Limerick Forest (1,471.4 ha) and contains 58 compartments. This tract is the most extensively used area within Limerick Forest for recreational activities and outdoor education activities. Access to the tract is via Limerick Road (north end), Cooper Road (central portion), or from Forsythe Road (Roebuck) off of County Road 18. At the north end of the tract, access is from Limerick Road via County Road 20. The former OMNR Limerick Forest Headquarters and the Limerick Forest Chalet are situated off Limerick Road.

The production forest of the South Tract is split nearly equally between plantations and natural stands. The plantations of red pine, white pine and white spruce occupy 422 ha (~29%) and are some of the oldest and most productive plantations found in Limerick Forest. Natural stands occur on 495 ha (~34%). The natural forest consists primarily of cedar, soft maple and other hardwood (black ash) working group stands.

Soils within the South Tract are predominately deep sands.

Limerick Forest North

The North Tract is situated southeast of the Village of Merrickville. This tract is comprised of 34 compartments and occupies an area of 1,122 ha. Productive forest land occupies 339 ha. The natural forest consists mainly of stands of hard maple, cedar, ash and soft maple. Plantations of jack pine, scots pine, red pine, white pine and white spruce occupy 345 ha. The forests within North Tract are typically less productive than those of Limerick South due to its shallower soils and poorer drainage conditions.

The Merrickville Bog ANSI is associated with this tract. Recreational use in the North Tract is more limited primarily due to access constraints.

Limerick Forest Cranberry Lake Area

This tract consists of unconsolidated compartments situated in and around Cranberry Lake (27 compartments). The most significant feature of the area is the Cranberry Lake Swamp. Approximately 20% of the swamp is situated within the boundaries of Limerick Forest.

The total area of the tract is 1,261 ha. Two hundred and eighty-four hectares are classified as productive forest land.

Limerick Forest North Augusta Area

Comprising approximately 862 ha, the North Augusta tract is situated entirely within the Township of Augusta. The tract contains 28 unconsolidated compartments, and includes the Indian Creek Wetland and the Charleville Creek Wetland Complex. Five hundred and twenty-three hectares are classified as productive forest land. Plantations of red pine, white pine, and spruce occupy 292 ha. The natural forest is dominated by stands of cedar and encompasses 397 ha.

Leeds Tract & Other Leeds

The Leeds compartments are unconsolidated and dispersed over a large geographic area which encompasses the municipalities of Athens, Elizabethtown-Kitley, and Rideau Lakes. The Leeds Tract is comprised of 13 compartments occupying 624 hectares. The Other Leeds Tract is comprised of a single 18 ha compartment. Two hundred and ninety-seven hectares in Leeds is classified as productive forest land while only 7 ha in Other Leeds have the productive forest designation. Forest cover in the Leeds Tract consists predominately of hard maple stands and plantations of white pine. White spruce plantations are the most common forest cover type in the Other Leeds Tract.

Grenville Tract

The Grenville Tract is comprised of 14 unconsolidated compartments. These compartments are situated between the North and South tracts and the Cranberry Lake Area. The area for Grenville Tract is 423 ha, of which 204 ha is classified as productive forest land. White spruce jack pine and red pine plantations are the most common forest cover types.

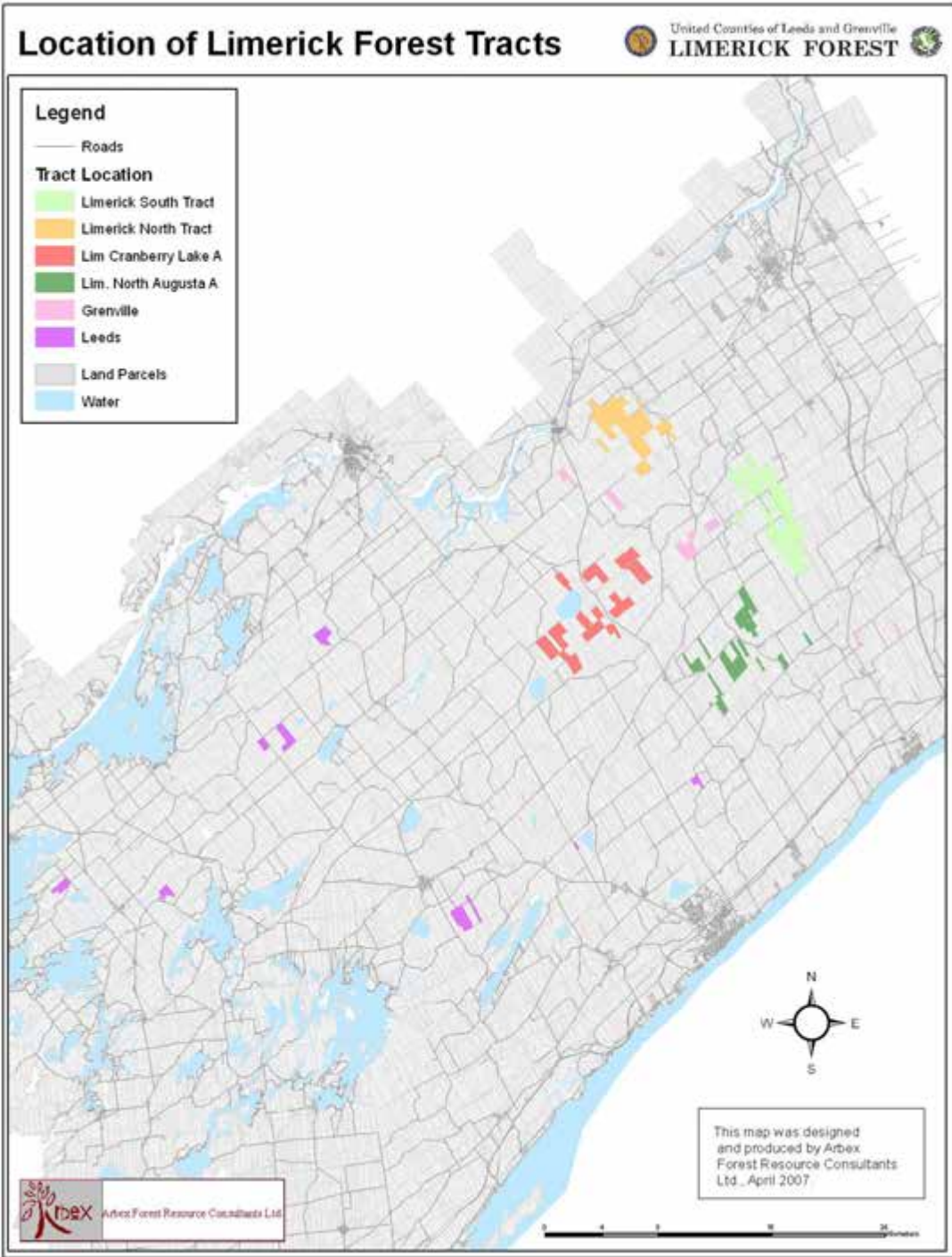


Figure 1. Location of Limerick Forest Tracts in Eastern Ontario.

In 1990, Limerick Forest compartment boundaries were digitized using AutoCAD. Sub-compartment boundaries were not digitized and forest resources information was not input into the system. Arbex Forest Resource Consultants Ltd. Geographic Information System (GIS) staff updated the digital boundaries, digitized sub-compartment boundaries (as required for management) and populated digitized compartment polygons for the development of this forest management plan. Table 3 provides the area summary for Limerick Forest by land type (Figure 2).

Table 3. Limerick Forest Area Summary

Land Classification	Area (Ha)	Percentage (%)
Water <i>(Not included in Area calculation)</i>	13	
Non-Forested Land		
<i>Wetlands & Swamps</i>	1,517	26.2
<i>UCL (Hydro, Parking, Gravel, Garage)</i>	24.0	0.4
Total:	1,541	26.6
Forested Land		
Production Forested Land		
<i>Productive Forest Land</i>	1,185.6	20.5
<i>Protection Forest</i>	943.5	16.3
Total:	2,129.1	36.8
Non-Production Forest Land		
<i>Protection Forest Reserve</i>	611.6	10.6
<i>Ecological Reserve¹</i>	1,313	22.7
Total:	1,924.6	33.3
Barren and Scattered²	187.6	3.2
Total:	5,782.3	100.0

¹ Areas of non-production forest land which have been designated as special management areas due to their ecological significance. Modified forestry operations (e.g. ANSI reserves) and traditional recreational activities may be permitted in some zones. In other areas no forestry activities are allowed (e.g. proposed old growth reserves).

² Barren and Scattered – Productive forest land, which because of natural or artificial disturbance contains only scattered trees (stocking below 0.25) or no trees at all with either shrub cover or bare soil with no significant amount of regeneration.

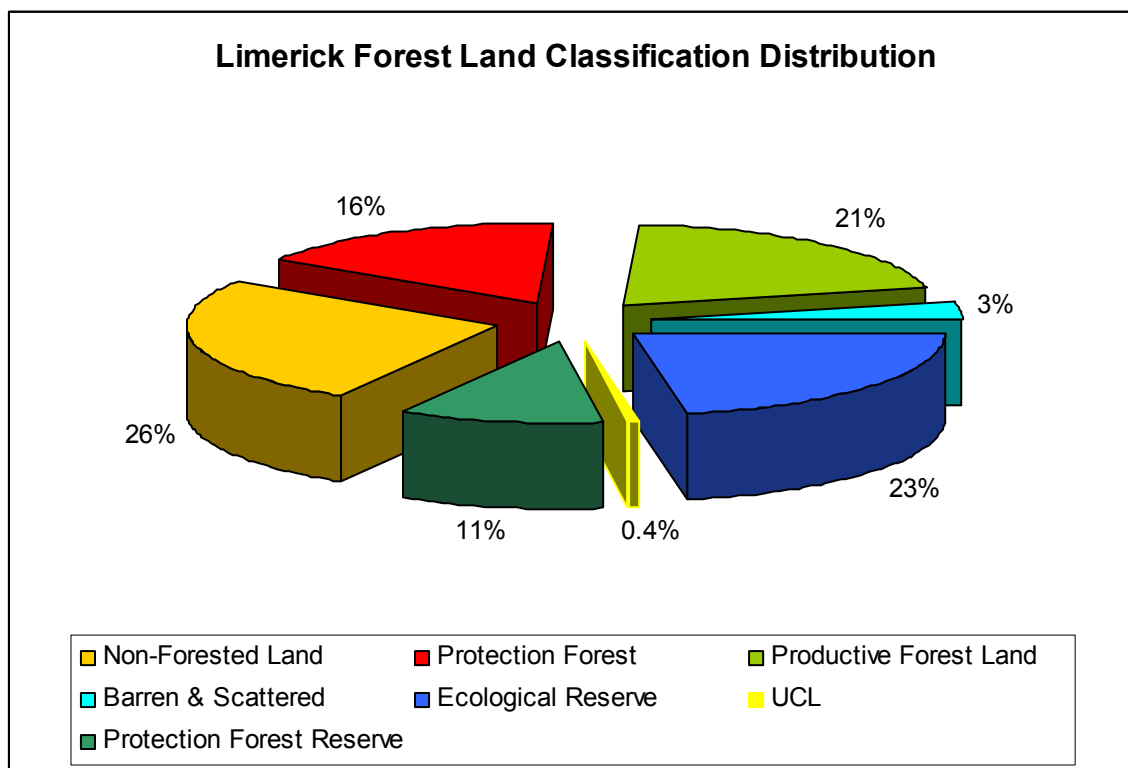


Figure 2. Forest Land Classification Distribution for Limerick Forest (All Land Classification)

Appendix C contains maps showing the breakdown of Limerick Forest’s protection and production forest areas by tract location.

2.2. The Limerick Forest Long Range Plan Designated Use Areas (DUAs)

The Limerick Forest Long Range Plan (LFLRP) identifies tentative broad designated use areas (DUAs) based on current activities and their patterns within Limerick Forest and provides policy statements for the general management of these areas (Figures 3 – 8). The designations are as follows; Ecological Protection Area, Forest Management Areas, Multiple use Recreation Area, Single Use Recreation Area, Aggregate Extraction Area and Service Area.

These designations were based on current patterns of activity within the Forest, site resource attributes and/or values and public input. With few exceptions (e.g. sensitive wetlands) most DUAs support a variety of uses, however, some restrictions on activities may be adopted to prevent long-term ecological damage, to avoid diminishing recreational experiences, or to address safety concerns.

The LFLRP acknowledges that the current lack of a full data set on resource attributes and other information (i.e. recreational use data) imposes some limits with respect to the application of the zoning strategy. On the basis of the

available data, this management plan maintains the LFLRP DUA designations. The designation of use areas will be finalized on the basis of further data collection and interpretation and additional public consultation in conjunction with the preparation of five year operating plans.

Table 4 provides a description of the DUAs, the recognized acceptable uses, and any associated regulations or restrictions related to land use as identified in the LFLRP. Table 5 provides the area of each designation by tract.

Table 4. Limerick Forest Designated Use Areas – Description, Regulations and Restrictions

Designated Use Area	Primary and Secondary Uses	Description	Regulations / Restrictions
Ecological Protection Area	Resource Protection Secondary Uses: Selected recreation, fur harvesting, scientific study, education	Areas of high ecological value that warrant protection due to their importance related to ecological functioning / biodiversity/rare species and habitats. This area would also include areas that are vital to the protection of groundwater aquifers, aquifer recharging, surface water recharging and wetlands important for flood control.	Motorized recreation is restricted Specific areas that are important for scientific research have limited access by permit only. No resource extraction allowed except for sustainable fur harvesting and hunting.
Forest Management Area	Forest Management Secondary Uses: Recreation, fur harvesting	Areas important for the management of commercial timber	Recreational activities are allowed. Fur harvesting allowed on a sustainable basis Resource roads and trails allowed.

Multi Use Recreation Area	Recreation Secondary Uses: Timber extraction, fur harvesting, other uses as identified		Approved trails and structures (including parking facilities and staging areas) allowed as these relate to recreation.
Single Use Recreation Area	Specific recreational activities Secondary Uses: As identified and compatible		Approved structures allowed as these relate to the recreational activity.
Aggregate Extraction Area	Aggregate Extraction Secondary Uses: Other uses permitted but only where primary use does not pose a safety issue.		
Service Area	Service to the public and to Limerick Forest management. Secondary Uses: none		

Source: LFLRP.

Table 5. Area (Ha) of DUAs by Tract

Limerick Forest Tract	Designated Use	Area (Ha)
North Tract	Aggregate Extraction Area	0.0
	Ecological Protection Area	578.9
	Forest Management Area	193.2
	Multi-Use Recreational Area	393.6
	Service Area	0.0
South Tract		
South Tract	Aggregate Extraction Area	11.9
	Ecological Protection Area	610.9
	Forest Management Area	807.2
	Multi-Use Recreational Area	107.2
	Service Area	1.5
North Augusta		
North Augusta	Aggregate Extraction Area	0.0
	Ecological Protection Area	177.5
	Forest Management Area	300.9
	Multi-Use Recreational Area	405.4
	Service Area	0.0
Cranberry Lake		
Cranberry Lake	Aggregate Extraction Area	0.0
	Ecological Protection Area	452.6
	Forest Management Area	100.1
	Multi-Use Recreational Area	793.9
	Service Area	0.0
Grenville County		
Grenville County	Aggregate Extraction Area	0.0
	Ecological Protection Area	83.0
	Forest Management Area	118.4
	Multi-Use Recreational Area	208.5
	Service Area	0.0
Leeds County		
Leeds County	Aggregate Extraction Area	0.0
	Ecological Protection Area	137.2
	Forest Management Area	231.3
	Multi-Use Recreational Area	302.1
	Service Area	0.0

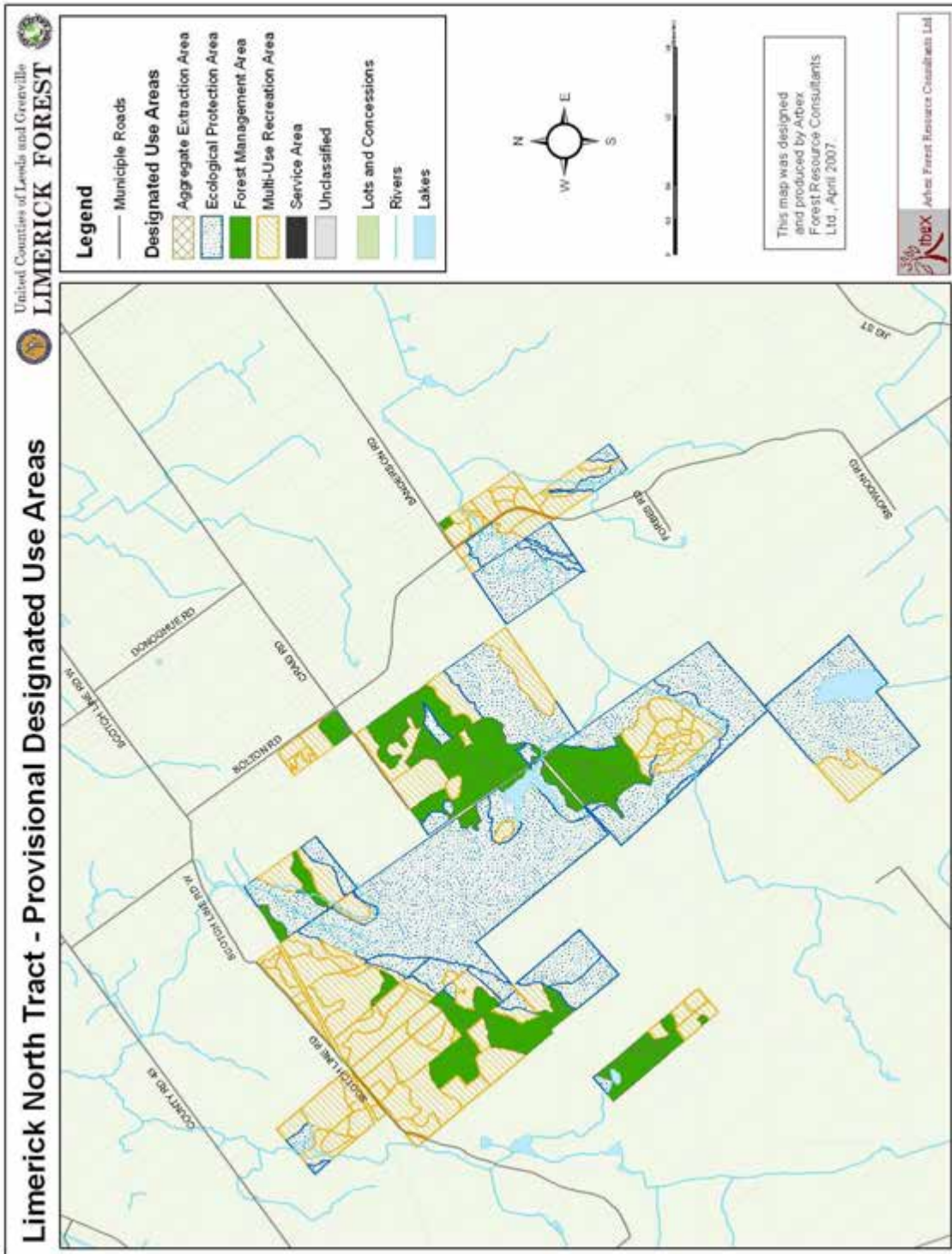


Figure 3. Designated Use Areas in Limerick North Tract

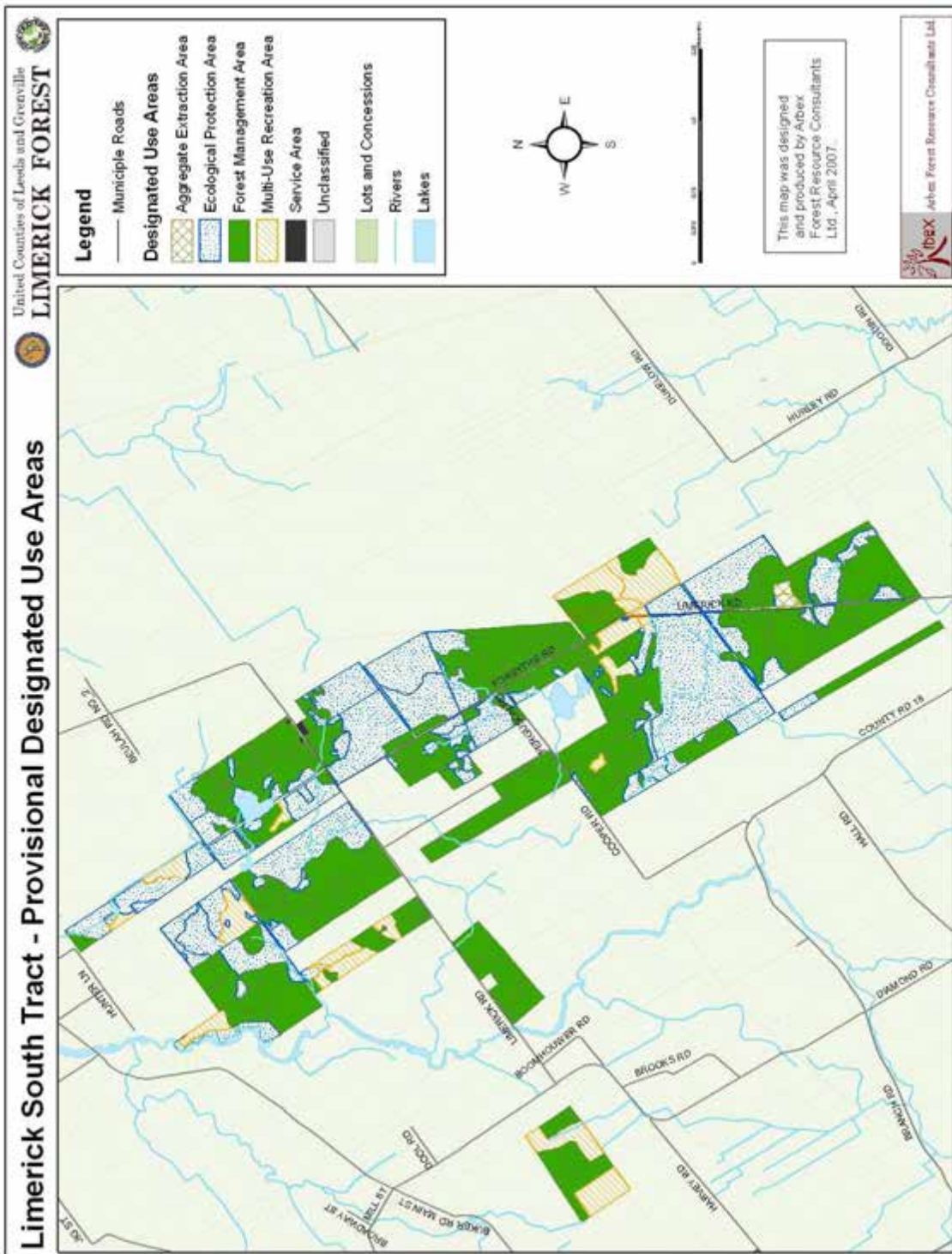


Figure 4. Designated Use Areas in Limerick South Tract

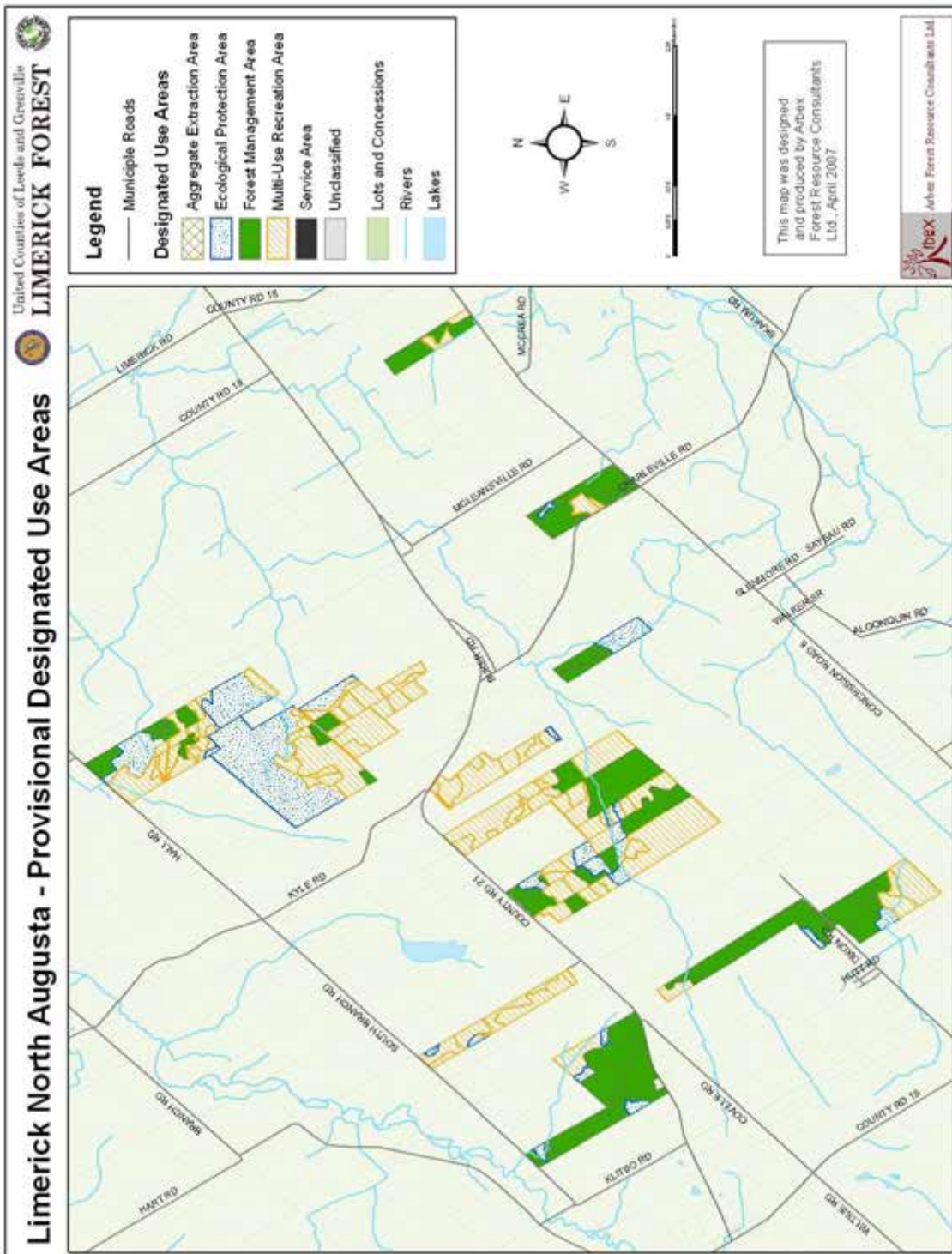


Figure 5. Designated Use Areas in Limerick North Augusta

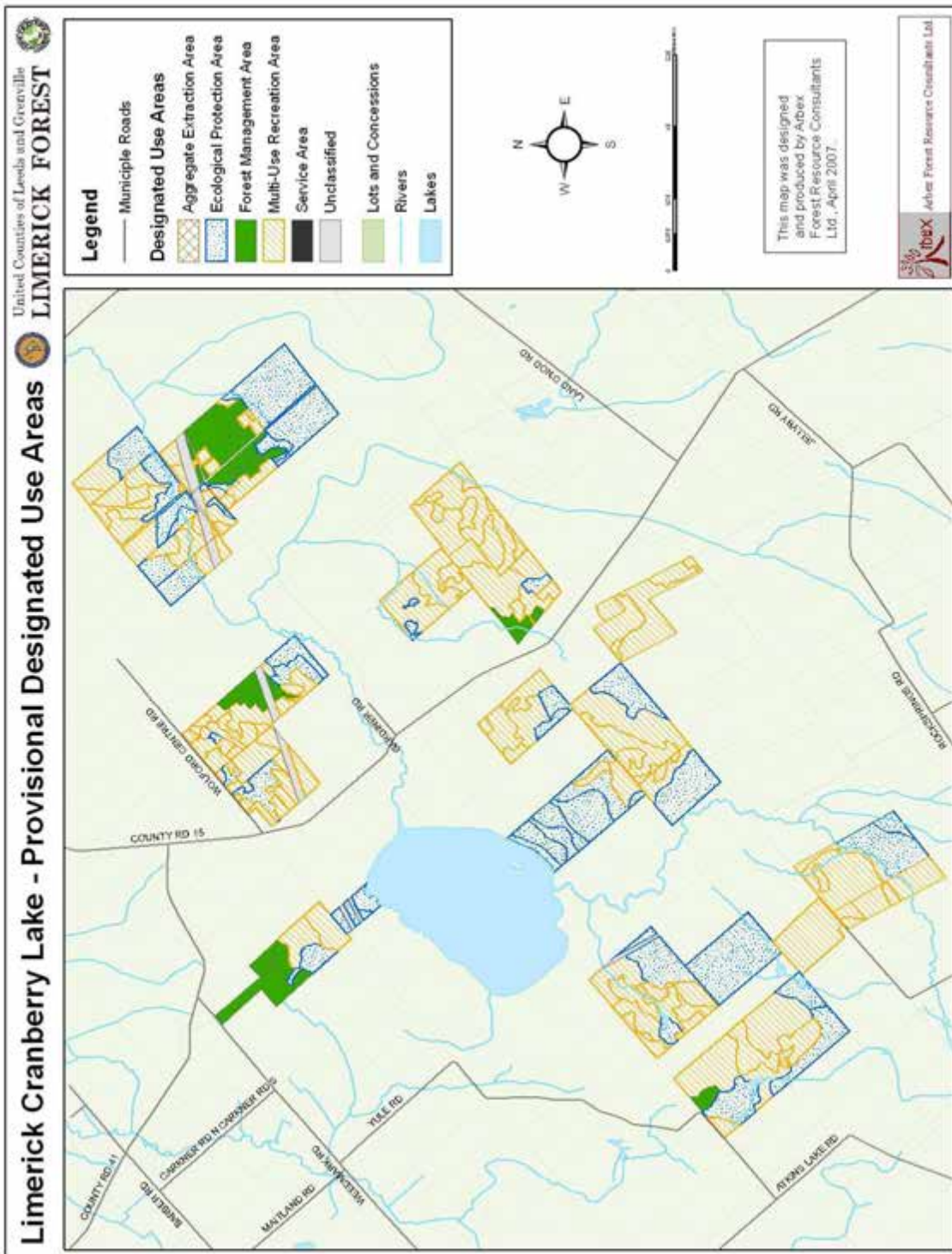


Figure 6. Designated Use Areas in Limerick Cranberry Lake

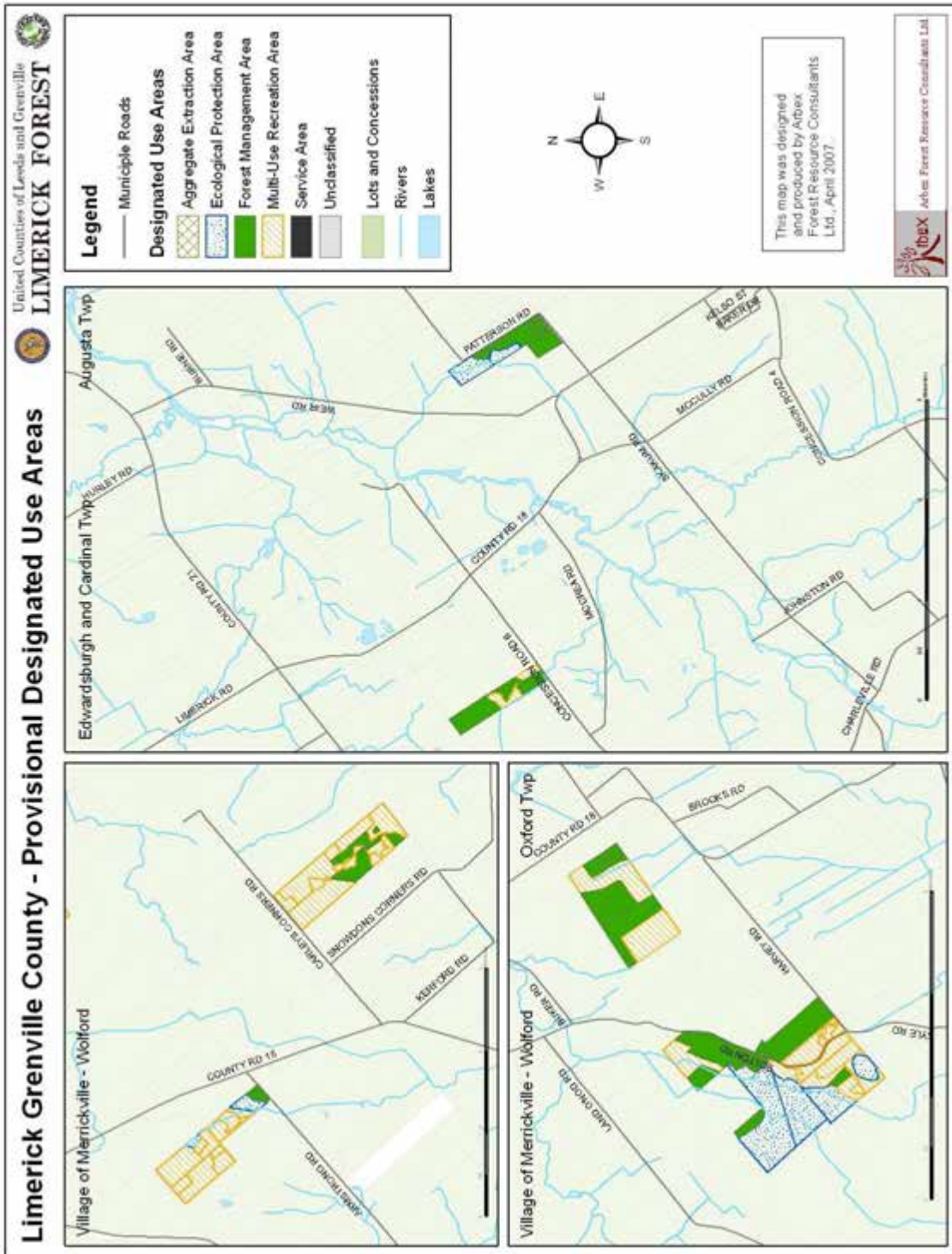


Figure 7. Designated Use Areas in Limerick Grenville County

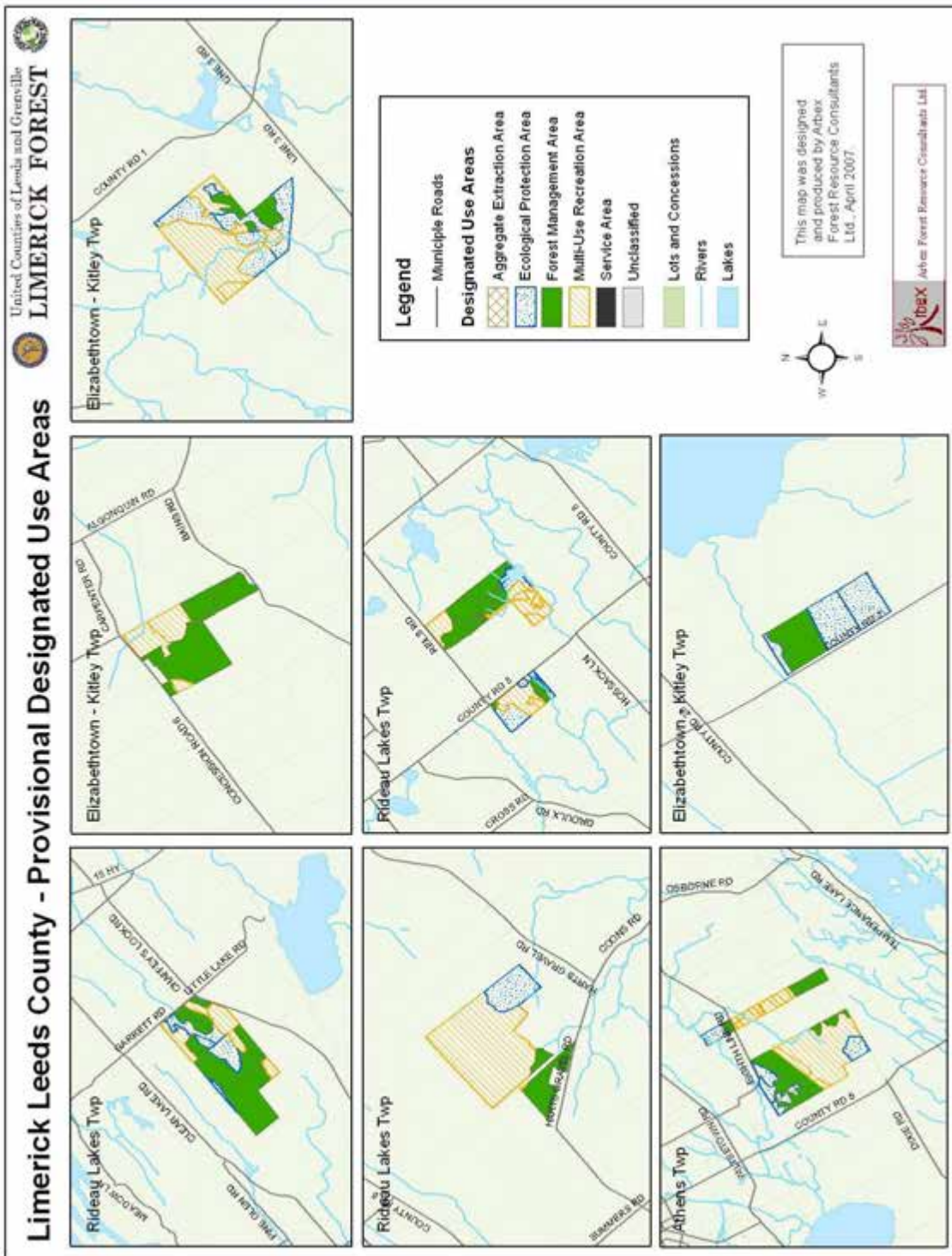


Figure 8. Designated Use Areas in Leeds County

2.3. Administration

Limerick Forest is administered by the United Counties of Leeds and Grenville through its Public Works Committee. Two forestry staff personnel (Forest Manager and Forest Technician) are responsible for the day-to-day management of the Forest and liaison between the Limerick Forest Advisory Committee (LFAC), government agencies, other stakeholders and the UCLG. Additional information on the administration of the Forest is provided in Section 11.

2.3.1. OFFICIAL PLANS

The Planning Act requires that each municipality develop an Official Plan to guide municipal development. All municipal plans must have regard for the Provincial Policy Statement.

An Official Plan for UCLG has not been prepared, but 14 Official Plans have been prepared for municipalities within the Counties. Implementation of the Official Plan policies is directed by zoning by-laws in each municipality.

Most Official Plans affecting Limerick Forest apply an open space designation to lands within the Forest, although some portions of the Forest are designated as rural. Open space definitions within the individual official plans do not always include forestry as a permitted use. This circumstance requires that permitted usages in individual compartments be ascertained through consultation with appropriate authorities and/or researching the applicable Official Plan and zoning by-law³.

2.3.2. LIMERICK FOREST LONG RANGE PLAN

The LFLRP establishes a vision, goal, objectives strategies and activity parameters for Limerick Forest. It also provides designated use zones and associated policy statements for the general management of the zones. The vision of the LFLRP is as follows:

“A century from now Limerick Forest will be an outstanding example of community cooperation in the sustainable management of its natural resources. Limerick Forest will be providing a wide variety of community goods and services including jobs and revenue, varied recreational opportunities, the protection of areas of significant biodiversity, the protection of soil and water resources, and the provision of structured educational opportunities.”

The LFLRP is given force through a by-law # 01-47. Changes to the plan must be approved by Counties Council in consultation with LFAC.

³ Source: Limerick Forest Long Range Plan.

2.3.3. THE LIMERICK FOREST ADVISORY COMMITTEE (LFAC)

To facilitate the management of Limerick Forest the UCLG established an advisory committee; the Limerick Forest Advisory Committee (LFAC) to advise County Council regarding management Limerick Forest. LFAC reports to the UCLG through its Public Works Committee. The Committee structure consists of five sub-committees; Administration, Ecology, Education and Communications, Forest Resources and Recreation. The Terms of Reference for LFAC (Appendix D) describes the subcommittee mandates as follows:

Administration: To establish rules and regulations for the use of the resources in Limerick Forest.

Forest Resources: To manage the resources of Limerick Forest on a sustainable basis for a wide variety of goods and services.

Recreation: To provide for a wide variety of quality recreational opportunities in a safe environment.

Ecology: To promote the scientific understanding of biodiversity and to protect the ecological features and values of Limerick Forest.

Education and Communications: To provide outdoor education opportunities and to foster a strong understanding of sustainable resource management.

Each sub-committee has an elected chair. The sub-committee chairs are members of the LFAC Chairs Committee which acts as the linkage between LFAC and the UCLG. A Communications Working Group is responsible for informing the public of LFAC activities. Additional information on the roles and responsibilities of LFAC are provided in Section 11.

2.4. Forest Management History

Limerick Forest was established as an Agreement Forest in April 1940 which created a partnership between the UCLG and the then Department of Lands and Forests⁴. Under the Agreement, Limerick Forest was leased by the Counties to the Department of Lands and Forests for forest management purposes (e.g. production of commercial wood products and environmental services such as the provision of recreation, watershed and ground water protection etc.). The original lease was renewed in 1960 and 1976. Over this period the DLF and later the OMNR prepared a twenty-year forest management plan to ensure the sustainable management of the natural resources of the Forest. This FMP was

⁴ The Department of Lands and Forests became the Ontario Ministry of Natural Resources in 1973

prepared by Alf Van Dyke R.P.F. (OMNR Area Forester – Dundas/Grenville) and covered the period of 1992-1997. A five year operation plan (1992-1997) was also prepared.

In 1995, the OMNR essentially ended its operational involvement in Limerick Forest and initiated a process to terminate the Agreement Forest Program. The United Counties assumed management of Limerick Forest in 2001 when OMNR forgave outstanding debts associated with its management of the Forest.

The “Limerick Forest Long Range Plan (LFLRP)” was drafted by LFAC and John Ambrose under the direction of UCLG Forest Manager Ed Reynolds in 2003. As noted, this plan established long term goals and five broad objectives for the sustainable management of the Forest. The development of the LFLRP enabled the initiation of some limited forest management interventions within the Forest. A Draft Forest Management (2004-2024) Plan and Operation Plan (2004-2009) was prepared by Peter Neave (UCLG Forest Technician) in March 2005.

3.0. BIOPHYSICAL CONTEXT

3.1. Climate

The climate of the UCLG is characterized by relatively cold winters with moderate snowfall and warm summers. Climatic statistics for the UCLG are summarized in Table 6.

Table 6. Climatic Statistics (Environment Canada Climate Normals 1971-2000)

Statistic	Measurement
Mean Annual Temperature	5.9 C
Mean January Temperature	-10.3 C
Mean July Temperature	20.4 C
Mean Annual Precipitation	961.7 mm
Mean Annual Rainfall	763.3 mm
Mean Annual Snowfall	199.2 cm

3.2. Hydrology

Most of Limerick Forest is located in the headwaters of the South Nation and Rideau River watersheds. A few of the most westerly situated compartments are located in the Cataraqui Watershed.

Individual wetlands and wetland complexes are a predominant feature within Limerick Forest as a result of its relatively flat topography and shallow soil depths to bedrock.

The Forest is believed to be an important aquifer recharge area. Its vegetation and system of wetlands provide important ecological functions by maintaining groundwater levels, controlling surface runoff and maintaining surface water quality.

3.3. Physiography and Soils

Limerick Forest properties are situated mainly in two physiographic regions; the Smith Falls Limestone Plain, and the Edwardsburgh Sand Plain. In general, soils

have a low capability for agricultural production and have moderate to good capabilities for the production of commercial timber crops. Table 7 presents the approximate distribution of soil series in Limerick Forest.

Table 7. Approximate Percentage Distribution of Soil Series in Limerick Forest

Soil Series or Type	% Distribution
Peat and Muck	30
Farmington Loam	30
Granby Sand or Sandy Loam	15
Rubicon Sand	10
Upland Sand	10
Other	5

Source: Limerick Forest Long Range Plan.

The Smith Falls Limestone Plain is typified by a thin veneer of loamy soil (Farmington loam) over limestone. The plain is the largest and most continuous tract of shallow soil over limestone in Southern Ontario.

Flat topography and shallow depth to bedrock impedes drainage which results in the presence of numerous wetlands. Soil depth ranges from 0 - 45 cm, although some pockets of deeper soil do occur. Soils can be excessively stony, and tend to be excessively wet in the spring and drought prone during the summer months. Approximately 75% of the Limerick Forest compartments are situated on this SFLP.

The Edwardsburgh Sand Plain soils are predominately deep sands with low agricultural capability due to nutrient deficiencies. Soils are typically acid. Occasional ridges or hummocks of till or gravel occur. Topography is relatively flat and varies from 90 - 120 metres above sea level. Where soils are shallow wetlands are common. Three soil series based on differences in drainage are defined:

- Upland Sand – Deep well drained fine to medium sand.
- Rubicon Sand – Imperfectly drained, fine to medium red sand, generally close to the water table.
- Granby Sand – Poorly drained grey sands, with high water table and limited productivity.

Approximately 25% of the Limerick Forest compartments occur on the Edwardsburgh Sand Plan.

As previously noted, the predominant feature of the Limerick Forest landscape is its large bogs and wetlands which occur on both the limestone plain and sand plain landforms. Soils associated with the wetlands and bogs are peat or muck. Peat soils are highly acidic and exhibit low capability for tree growth. Muck soils are well decomposed and may support forest cover tolerant of high water tables.

3.4. Life Science Features Description

3.4.1. ECOLOGICAL LAND CLASSIFICATION

The goal of the provincial Ecological Land Classification (ELC) program is to establish a comprehensive and consistent province-wide approach for ecosystem description, inventory and interpretation. The ELC is to provide community descriptions and sampling methodologies for identifying and mapping valuable natural heritage features and areas, with the objective of assisting municipalities in meeting their obligations under Policy 2.3 in the Provincial Policy Statement (1997). The ELC will also provide a basis for on-going research by providing an objective stratification and sampling of ecological conditions for activities such as growth and yield studies, forest management, wildlife habitat analysis, long term ecological research and land use planning.

LFAC initially requested that this forest management plan be prepared based on ELC classifications. This work could not be undertaken within the available budget as forest-wide ELC information does not exist. Available information was limited to work undertaken during the LFAC Ecology Subcommittee "Proposed Old Growth Reserves Project" (2003) during which 78 sites were ELC sampled and classified.

To meet the LFAC objective to the extent possible and to assist the management planning process a first approximation of ELC community series for LF was derived on the basis of the 1992 Forest Resource Inventory (FRI) data (Table 8). ELC maps are provided in Appendix E.

Community series were distinguished based on the type of vegetation cover or the plant form that characterizes the community (e.g. whether the community has open, shrub or treed vegetation cover as well as whether the plant form is deciduous, coniferous or mixed). This information may be used to assist in the design and stratification of future ELC sampling initiatives and operational and annual planning requirements that require an extensive description of forest ecosystems or ecotypes.

Table 8. Limerick Forest's Community Series.

ELC	South Tract	North Tract	North Augusta	Cranberry Lake	Grenville	Leeds	Other Leeds	Total
CUM				4.5				4.5
CUP	416.7	334.2	263.0	384.0	208.4	140.0	8.1	1,754.4
CUS	8.9	25.0	1.7	41.0	22.4	26.9		125.9
FOC	103.0	127.8	230.8	242.2	46.5	23.4	3.3	777.0
FOD	323.8	87.1	153.3	321.4	63.3	301.1		1,250.0
FOM	49.3		27.5			17.1		93.9
SWC	11.5							11.5
SWD	15.7	4.5	14.0					34.2
Un classified	542.9	543.9	171.3	268.2	83.0	115.2	6.4	1,730.3
Total Area:	1,471.8	1,122.5	861.6	1,261.3	423.6	623.7	17.8	5,782.3

** Not all stands are classified for ELC due to missing data.

CUM = Cultural Meadow

CUS = Cultural Savannah

FOD = Deciduous Forest

SWC = Coniferous Swamp

UCL = Unclassified

CUP = Cultural Plantation

FOC = Coniferous Forest

FOM = Mixed Forest

SWD = Deciduous Swamp

3.5. Historic Forest Condition

Much of the original deciduous forest which dominated the landscape of eastern Ontario no longer exists due to land clearing arising from urban and agricultural development, logging and to a lesser extent natural disturbance events.

Historic survey records provide some insight as to the species composition of the original forests; hemlock pine associations were most common on till and rock regions, sugar maple-elm associates were most frequent on clay plains and areas of limestone plain were largely dominated by associations of sugar maple and beech. Hemlock was the dominant species growing in association with sugar maple, white pine and spruce on sand soils. Wetland and lowland forests were typically comprised of cedar, ash and tamarack. The early forests are believed to have contained a large component of standing dead and moribund trees and significant amounts of coarse woody debris (typically > 20 mg/ha) could be found on the forest floor. Dominant tree species likely obtained diameters of 50 cm or less with the largest attaining diameters of 1.5 m. (EOMF, 1993).

The Limerick Forest South area was settled in the late 1840's mostly by Irish immigrants from the potato famine. The settlers removed vast tracts of forest for both agricultural production and the production of potash. These practices served to further diminish the predominately shallow soils of nutrients. Over time, the declining productivity of the soil resulted in the abandonment of significant areas of cleared land. Soils cleared of tree cover were subjected to wind and rain erosion which further reduced the capacity of the land for agricultural production. With land taxes due, many of the impoverished cleared areas were abandoned and ultimately reverted to County ownership. The Reforestation Act (1921) enabled municipalities to enter agreements with the province for the reforestation/rehabilitation of cleared and abandoned lands. The UCLG signed such an agreement in 1940 which enabled the reforestation of Limerick Forest to extensive plantations of red pine, jack pine, white pine, scots pine and spruce in 1942 and between 1950-53 and provided the DLF with a mandate to manage the Forest on the Counties behalf. The Agreement was renewed in 1961 and 1976.

3.6. Current Timber Resource Description

The area of forested land in Limerick Forest is 4,241 ha (Table 9). Approximately 50 percent of the forested area is classified as production forest (2,129.1 ha). Production forest is land capable of growing commercial timber crops and may include areas classified as not-satisfactorily regenerated or barren and scattered (i.e. stand stocking is less than 25%). A significant proportion (56%) of the productive forest land of Limerick Forest consists of conifer plantations. Approximately, 22 % of the production forest area is classified as protection forest (~16% of the total Forest). Protection forest includes forest growing on environmentally sensitive areas which may be utilized for the production of commercial timber crops. The protection forest designation usually is a result of shallow soils or the presence of high water table. Much of the protection forest occurs on the Smith Falls Limestone Plain.

Non-Productive land comprises 1,517 ha of Limerick Forest. Areas classified as Protection Forest Reserve (areas of protection forest which are excluded from commercial timber production) and Ecological Reserve occupy 1,924 hectares.

Table 9. Limerick Forest All Land Classification (Hectares)

Land Classification	Area (Ha)	Percent Distribution
Unclassified Land (e.g. gravel pits/hydro lines, infrastructure)	24.0	0.4
Wetlands and Swamps	1517.0	26.2
Production Forest ⁵	2,129.1	36.8
Non-Production Forest Land (Ecological Reserve, Protection Forest Reserve)	1,924.6	33.3
Barren + Scattered	187.6	3.2
Total:	5,782.3	100.0

The estimated gross total volume of timber is 467,248 m³ (all land classifications). The volume estimate is based on the electronic update of the 1992 FMP Forest inventory Ledger and stand updates based on data collected by the UCLG in ice storm damage surveys. 250,993 m³ is present in plantations and 215,028 m³ is within natural forest. The gross total volume of protection forest is 128,073 m³. Table 10 presents the estimated gross total volume of the production forest working group.

Table 10. Estimated Gross Total Volume by Working Group for the Production Forest.

Working Group	Area (Ha)	GTV (m³)
Hard Maple	223.1	30,571
Soft Maple	127.6	22,711.3
Poplar	69.2	9,970.5
Other Hardwoods	58.7	7,367.4
Cedar	434.3	62,543.4
Jack Pine	257.3	20,065.6
Red Pine	418.9	108,244.3
White Pine	192.8	38,713.3
White Spruce	312.0	35,451.0
Other Conifers	35.2	3,645.1
Total:	2,129.1	339,282.8

⁵ Production Forest is forest land that is available for commercial forest production. This area includes Protection Forest on which harvesting is modified for environmental considerations.

Tables 11 and 12 present the gross total volume by working group by forest tract. The South and North tracts are the most productive forest areas largely as a result of soil and drainage conditions.

Table 11. Area (Ha) and GTV (m³) of Conifer Working Groups by Tract (All Land Classifications)

LOCATION	Area & GTV (m ³)	Pj	Pr	Pw	Sw	Ce	Oc	Total
South Tract	Area (Ha)	1.8	292.6	42.3	70.6	138.2	18.0	563.5
	GTV (m ³)	178.4	76,490	9,685.9	12,008.5	19,266.4	2,573.6	119,506.1
North Tract	Area (Ha)	48.0	101.9	111.7	45.7	135.0	36.5	478.8
	GTV (m ³)	5,026.3	28,596.4	22,304.9	4,867.6	21,572.9	4,135.7	86,503.8
North Augusta	Area (Ha)	88.5	71.0	42.3	79.8	196.6	18.7	496.9
	GTV (m ³)	5,180.1	14,107.9	9,272.0	6,862.2	24,315.1	2,376.3	62,113.6
Cranberry Lake	Area (Ha)	209.2	10.4	5.1	126.2	259.2	41.0	651.1
	GTV (m ³)	6,290.2	1,990.2	0.0	7,734.0	15,829.0	0.0	31,843.4
Grenville	Area (Ha)	99.9	40.7	2.5	86.4	37.7	8.5	275.7
	GTV (m ³)	2,276.5	6,299.7	0.0	5,727.5	3,813.3	115.2	18,232.2
Leeds	Area (Ha)	38.4	26.1	46.7	25.8	47.5	1.3	185.8
	GTV (m ³)	2,141.4	6,495.4	5,078.6	4,386.8	2,940.1	432.9	21,475.2
Other Leeds	Area (Ha)	2.7	2.2	1.2	3.3			9.4
	GTV (m ³)	168.0	180.4	152.4	266.4			767.2
Total Area:		488.5	544.9	251.8	437.8	814.2	124.0	2,661.2
Total GTV:		21,260.9	134,160	46,493.8	41,853.0	87,736.8	9,633.7	341,138.1

Table 12. Area (Ha) and GTV (m³) for Hardwood Working Groups by Tract (All Land Classifications)

LOCATION	Area & GTV (m ³)	Mh	Ms	Po	Oh	Total
South Tract	Area (Ha)	31.9	175.2	60.9	97.4	365.4
	GTV (m ³)	5,842.8	23,227.4	8,354.0	7,501.6	44,926.0
North Tract	Area (Ha)	48.2	17.4	18.3	15.9	99.8
	GTV (m ³)	7,876.2	2,924.5	164.0	1,032.6	11,997.3
North Augusta	Area (Ha)	37.5	79.8	52.9	23.2	193.4
	GTV (m ³)	5,615.1	15,572.1	2,217.4	541.1	23,945.7
Cranberry Lake	Area (Ha)	84.1	107.0	52.8	93.6	337.5
	GTV (m ³)	5,194.3	2,437.4	1,349.0	5,250.9	14,231.5
Grenville	Area (Ha)	14.2	12.8	31.4	6.5	64.9
	GTV (m ³)	954.4	3,360.0	821.1	1,087.0	6,222.5
Leeds	Area (Ha)	209.1	82.9	2.4	28.3	322.7
	GTV (m ³)	18,354.8	3,387.6	0.0	3,044.7	23,487.1
Other Leeds	Area (Ha)				2.0	2.0
	GTV (m ³)				0.0	0.0
Total Area:		425.0	475.1	218.7	266.9	1,385.7
Total GTV:		43,837.6	50,909.0	12,905.6	18,457.9	126,110.1.1

Tables 13 and 14 summarize the average volume per hectare and mean annual increment by production forest working group and age class. The productivity of the conifer plantations is considerably higher than that of the natural hardwood forest. The low productivity of the hardwood groups is largely attributed to poor site conditions on the Smith Falls Limestone Plain.

Table 13. Production Forest Average Volume/Ha (m³) by Working Group and Age Class

Working Group	0 -20	21-40	41-60	61-80	81-100	100+
Red Pine		220.1	256.5	281.1		
White Pine		49.8	227.0	284.3		
White Spruce		82.8	116.8	208.3	99.0	
Jack Pine		30.4	60.2	100.0		
Cedar	7.5	30.5	107.5	137.7	193.3	
Other Conifer		37.5	87.7	177		383.0
Hard Maple		54.0	79.7	131.7	182.3	
Soft Maple		31.4	58.7	128.1	126.3	212.1
Poplar		32.5	61.1	133.0	111.9	
Other Hardwood		39.7	64.2	99.7	56.8	

Table 14. Production Forest - Mean Annual Increment (m³/ha/yr) by Working Group and Age Class

Working Group	0 -20	21-40	41-60	61-80	81-100	100+
Red Pine		6.8	6.1	5.6		
White Pine		3.1	5.7	6.1		
White Spruce		3.1	3.3	7.8		
Jack Pine		2.9	2.8	2.5		
Cedar		3.2	3.6	3.2	2.5	
Other Conifer		4.3	5.1	4.1		
Hard Maple		3.0	3.0	2.4	2.5	
Soft Maple		2.4	3.0	3.1		
Poplar		3.0	3.7	3.4		
Other Hardwood			2.6	2.4	1.3	

3.6.1. AGE CLASS DISTRIBUTION

An age class area imbalance exists in Limerick Forest, reflecting both past harvest and land clearing practices and initiatives to re-establish forests on denuded lands in the 1940's and early 1950s (Tables 15 & 16 and Figures 9 and 10). Appendix F provides maps of the age class distribution within individual forest tracts and charts of individual working group age class distributions.

A significant portion of the total forest area is within the 41-60 age class. Age class area imbalances also occur in the 10-60 age classes in all forest types. This circumstance will pose problems with respect to the supply of habitat and the regulation of timber harvests and timber sales revenues over time.

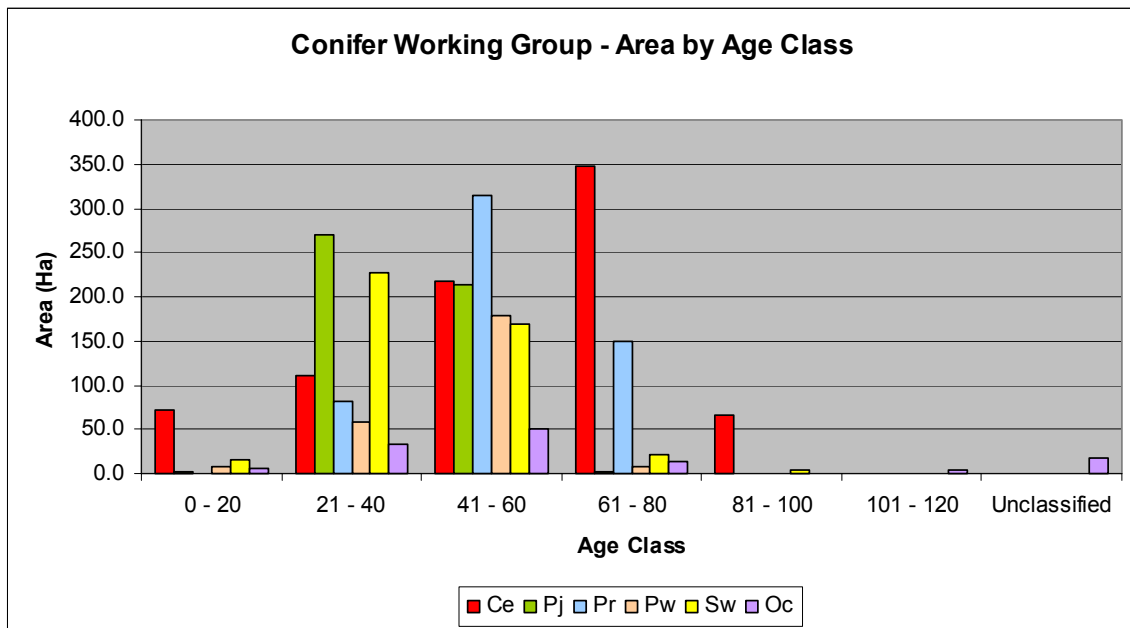


Figure 9. Age Class Distribution of Conifer Working Groups

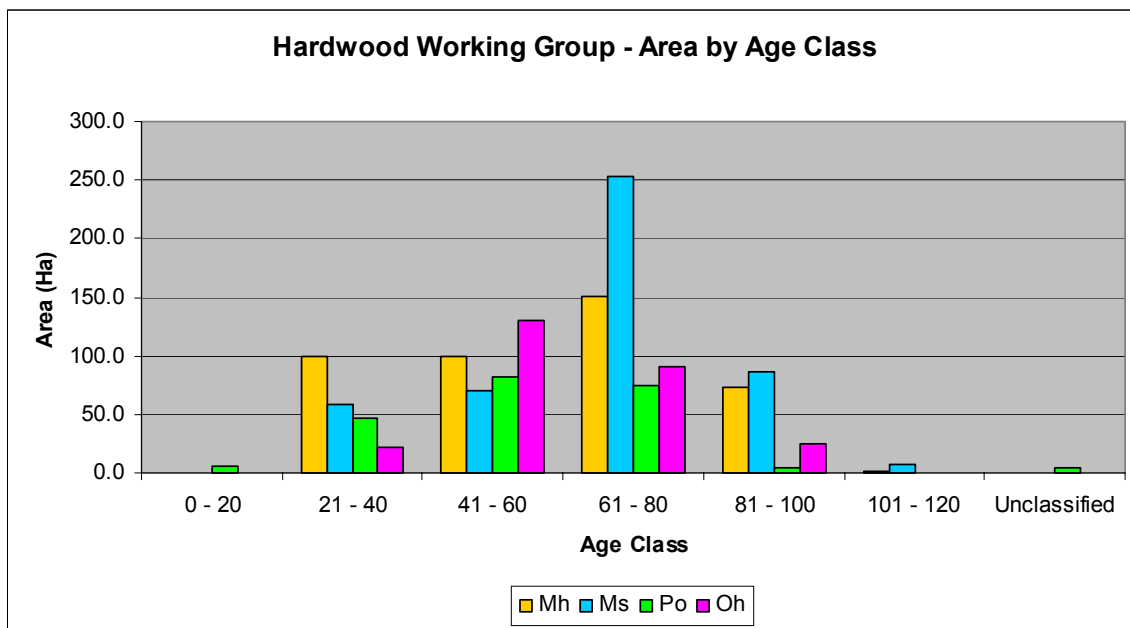


Figure 10. Age Class Distribution of the Hardwood Working Groups

Table 15. Age Class Distribution (Ha) of Conifer Working Groups (All Land Classifications)

Age Class	Jack Pine	Red Pine	White Pine	White Spruce	Cedar	Other Conifer	Total
0-20	2.2	0.5	8.0	16.5	72.6	6.7	106.5
21-40	270.2	81.1	57.7	227.1	111.1	32.1	779.3
41-60	213.3	314.7	178.5	168.4	217.2	49.7	1,141.8
61-80	2.8	148.6	7.6	21.9	347.9	14.3	543.1
81-100	0.0	0.0	0.0	3.9	65.4	0.0	69.3
101-120	0.0	0.0	0.0	0.0	0.0	4.6	4.6
UCL						16.6	
Total:	488.5	544.9	251.8	437.8	814.2	124	2,661.2

Table 16. Age Class Distribution (Ha) of Hardwood Working Groups (All Land Classifications)

Age Class	Hard Maple	Soft Maple	Poplar	Other Hardwood	Total
0-20	0.0	0.0	5.9	0.0	5.9
21-40	99.2	58.4	47.1	22.1	226.8
41-60	100.1	70.4	82.1	129.9	382.5
61-80	151.2	253.3	74.3	90.5	569.3
81-100	72.6	85.9	4.9	24.4	187.8
101-120	1.9	7.1	0.0	0.0	9.0
UCL			4.4		
Total:	425.0	475.1	218.7	266.9	1,385.7

The age class area distribution of the production forest is shown in tables 17 and 18 and Figures 11 and 12.

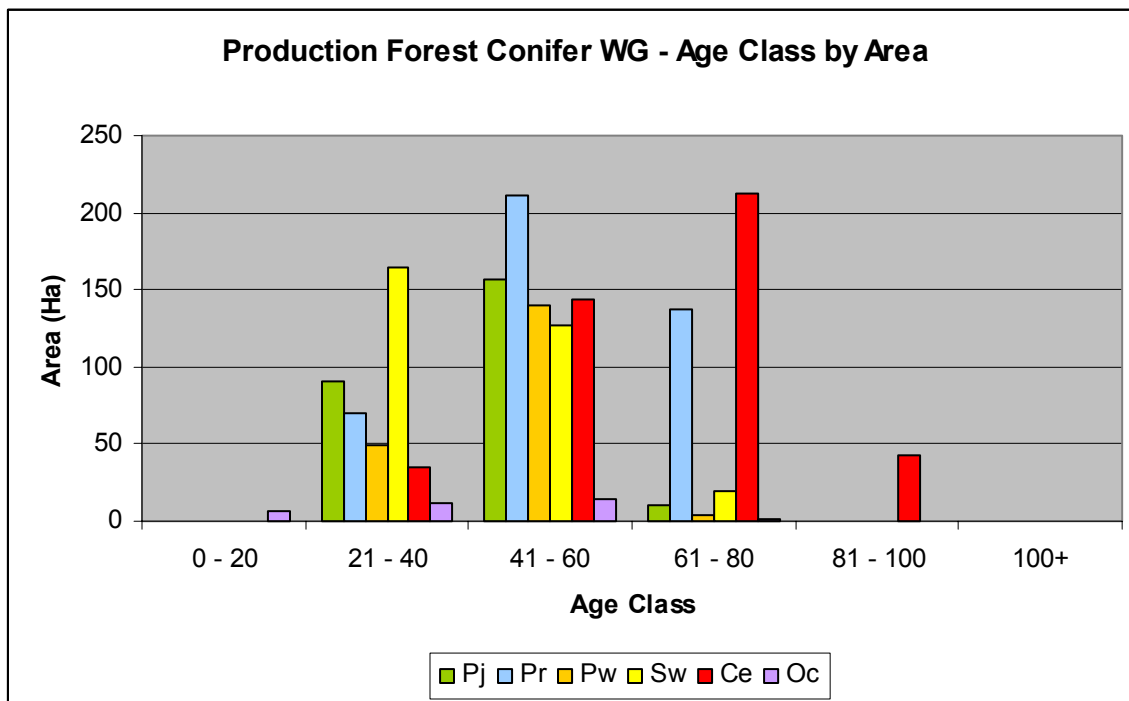


Figure 11. Production Forest Age Class Distribution of Conifer Working Groups

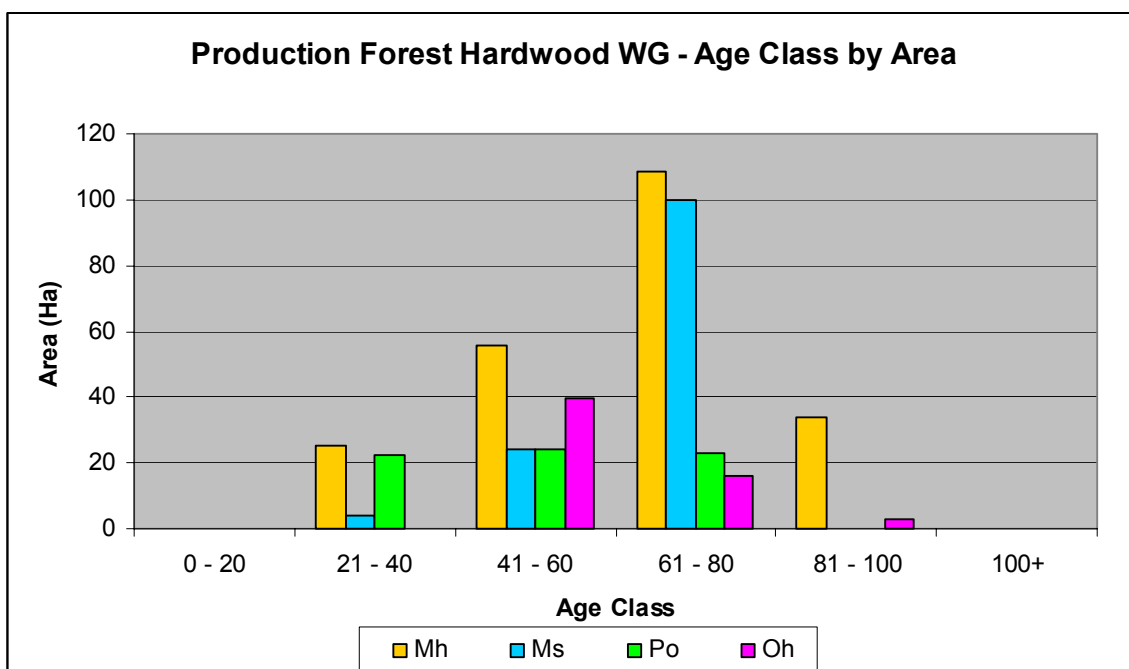


Figure 12. Production Forest Age Class Distribution (Ha) of Hardwood Working Groups

Table 17. Production Forest Age Class Distribution (Ha) of Conifer Working Groups

Age Class	Jack Pine	Red Pine	White Pine	White Spruce	Cedar	Other Conifer	Total
0-20	0	0	0	0	0	6.7	6.7
21-40	90.5	69.5	49.2	164.6	35.2	12.2	421.2
41-60	157.0	211.5	139.5	137.6	143.8	4.3	793.7
61-80	9.8	137.9	4.1	19.9	212.1	1.9	385.7
81-100	0	0	0	0	43.2	0	43.2
101-120	0	0	0	0	0	0	0
Total:	257.3	418.9	192.8	322.1	434.3	25.1	1,650.5

Table 18. Production Forest Age Class Distribution (Ha) of Hardwood Working Groups

Age Class	Hard Maple	Soft Maple	Poplar	Other Hardwoods	Total
0-20	0	0	0	0	0
21-40	25.4	3.8	22.2	0	51.4
41-60	55.5	24.0	24.3	39.9	143.7
61-80	108.4	99.8	22.7	15.9	246.8
81-100	33.8	0	0	2.9	36.7
101-120	0	0	0	0	0
Total:	223.1	127.6	69.2	58.7	478.6

3.6.2. PRODUCTION FOREST SITE CLASS DISTRIBUTION

Table 19 indicates that Limerick Forest soils have a relatively good potential for the production of timber crops. Product sizes and values at various ages are largely controlled by site quality and stand density. Fifty percent of the production forest area is classified as site class 1. Approximately, equivalent areas of production forest occupy site class 2 and 3 land. It is noteworthy that much of the protection forest reserve occupies site class 3 lands where the low timber production potential is related to shallow and/or imperfectly drained soils.

Table 19. Production Forest Site Class Distribution by Working Group (Hectares)

Working Group	Site Class 1a	Site Class 1	Site Class 2	Site Class 3	Total (Ha)
Jack Pine		45	40.6	171.7	257.3
Red Pine		322.3	46.8	23.4	392.5
White Pine		151.8	41.0		192.8
White Spruce	174.2	95.0	8.0		277.2
Cedar	73.4	221.4	80.4	56.3	431.5
Other Conifer	9.6	6.9			16.5
Total Softwood	257.2	842.4	216.8	251.4	1,567.8
Hard Maple		70.5	66.4	67.0	203.9
Soft Maple		65.4	55.0	7.2	127.6
Poplar		9.6	2.0	41.3	52.9
Other Hardwood		29.9	13.6	12.3	55.8
Total Hardwood	0.0	175.4	137.0	127.8	440.2
Total:	257.2	1,017.8	353.8	379.2	2,008.0

* Site Class information missing for some stands in the database.

3.6.3. PRODUCTION FOREST STOCKING LEVEL DISTRIBUTION

Growth rates achieved by any given forest stand is largely determined by the innate productive capacity of the site (i.e. site class) and the amount and composition of the growing stock present in the stand. Trees will grow faster with increased amounts of growing space, therefore the control of stand density at stand establishment and subsequently by thinning and other silvicultural practices is an important aspect of timber management.

Height growth is relatively unaffected by stand density while diameter growth has been shown to increase with decreasing stand density. However, for any given age there is a lower limit of stand density below which no further increase in diameter growth will result from continued density reductions. Factors such as competition from other vegetation in low density stands may also affect diameter growth. The range of stand stocking levels for production forest stands by

working group and age class is shown in Table 20. In general, conifer plantations are well stocked. Instances of low stocking mainly reflect tree mortality for the 1998 ice storm. Hardwood stands can be characterized as low to moderately well-stocked. Low stocking within hardwood stands is attributed to past logging, the 1998 ice storm and site conditions.

Table 20. Percent Stocking Distribution by Working Group (Production Forest) (Hectares)

WG	B&S	30	40	50	60	70	80	90	100	>100
Pj	1.2	41.1	51.8	47.5	27.9	46.5	3.2	0.0	0.0	23.3
Pr	4.0	0.0	2.1	10.1	24.2	70.9	68.6	59.5	57	90.1
Pw	5.1	0.0	0.0	8.6	14.3	10.1	31.8	44.7	13.9	62.4
Sw	28.9	6.4	9.1	40.5	45.0	46.4	14.2	42.4	4.6	43.2
Ce	69.8	4.3	11.8	68.1	18.4	112.5	45.9	21.9	15.5	114.8
Oc	1.2	7.6	0.0	7.5	8.7	8.2	12.5	0.0	0.0	0.0
Total	110.2	59.4	74.8	182.3	138.5	294.6	176.2	168.5	91.0	333.8
Mh	73.8	0.0	0.0	8.0	6.2	28.8	27.3	22.8	8.2	85.0
Ms	0	2.7	0.0	13.3	12.4	0.0	15.1	20.9	0.0	63.2
Po	3.6	0.0	0.0	1.3	0.0	16.2	29.3	0.0	0.0	2.8
Oh	0	0.0	4.9	19.3	10.1	2.0	0.0	0.0	1.7	19.5
Total	77.4	2.7	4.9	41.9	28.7	47.0	71.7	43.7	9.9	170.5
Total (All):	187.6	62.1	79.7	224.2	167.2	341.6	247.9	212.2	100.9	504.3

3.7. Description of Production Forest Working Groups

3.7.1. CONIFER WORKING GROUPS

Approximately forty-eight percent of the production forest landbase is comprised of plantations of jack pine, red pine, white spruce and white pine (Jack Pine 15%, Red Pine 14%, White Spruce 13% and White Pine 5%). Many of these plantations were established during the 1940s to reclaim abandoned agricultural fields or cleared forested areas.

Jack Pine Working Group (includes Scots Pine)

Jack pine (*Pinus banksiana*) and Scots pine plantations were established to protect and rehabilitate shallow drought prone sites in an effort to create

conditions where natural regeneration of native species could occur. Some of the plantation sites are infilling with cedars and hardwoods, but many have significant areas of invasive species (i.e. European Buckthorn, Prickly Ash) established in the understory.

The plantations can be characterized as being of generally poor quality with variable stocking. The plantations are typically less than 60 years of age and relatively uniformly distributed amongst the LF tracts.

The estimated gross total volume of the jack pine working group is 24,806 m³. The average volume per hectare is 57 m³.

Red Pine Working Group

Red pine (*Pinus resinosa*) plantations within Limerick Forest are typically of high quality and have been thinned in the past for the commercial forest products and the future production of high value timber products. Red pine was primarily established on the more productive sites on the Edwardsburgh Sand Plain. Most of the red plantations are typically older than 40 years, and are primarily located in Limerick South and North Forest tracts. Twenty-one percent of the red pine plantation area is classified as protection forest due to shallow soil conditions.

The estimated gross total volume of the red pine working group is 134,160 m³. The average volume per hectare is 254 m³.

White Pine Working Group

White pine (*Pinus strobus*) was typically planted in pure plantations or in association with other species such as white spruce and red pine. White pine dominated plantations occupy 252 ha, of which 225 ha are single species plantations. Plantations are situated mainly in the North Tract (98 ha) but also occur in the South Tract (38 ha), North Augusta (36 ha) and in Leeds County (46 ha). Single plantations are located in Grenville County and the Cranberry Lake Area. Fifty-five hectares of white pine working group plantations are classified as protection forest. In general, most of the pine plantations are of poor quality due to past weevil and blister rust damage.

The estimated gross total volume of the white pine working group is 46,494 m³. The average volume per hectare is 193 m³.

White Spruce Working Group

Plantations of white spruce (*Picea glauca*) were established on wetter sites within Limerick Forest. Spruce working group plantations occupy an area of 400

hectares. The plantations are distributed throughout Limerick Forest with the largest concentrations of plantation occurring in the North Tract (42 ha) and the South Tract (64 ha). Nineteen percent of spruce working group plantations are classified as protection forest due to shallow soil or imperfect drainage conditions.

In the past, spruce working group plantations were not actively managed and now as a result of the lack of management exhibit high densities. The estimated gross total volume of spruce working group stands is 41,853 m³. The average volume per hectare is 107 m³.

Other Conifer Working Group

The Other conifer working group consists of plantations of tamarack, European and Japanese larch. These plantations occupy 77 ha. The estimated gross total volume of the other conifer working group is 6,122 m³. The average volume per hectare is 105 m³.

3.7.2. HARDWOOD WORKING GROUPS

1,385.7 hectares of the Forest are classified as hardwood working group stands (poplar, hard maple, soft maple and other hardwoods). Production forest stands occupy 471 hectares. The estimated gross total volume of hardwoods in the production forest is 126,110 m³.

Hard Maple Working Group

Distributed throughout Limerick Forest, the hard maple working group is the dominant hardwood forest cover type (425 ha). Two hundred and fourteen hectares are classified as production forest containing an estimated gross total volume of 43,838 m³. The average volume per hectare is 115 m³/ha.

Soft Maple Working Group

Situated primarily on imperfectly drained soils, the soft maple working group occupies 475 ha (128 ha is classified as production forest). The estimated gross total volume of the working group is 50,909 m³. The average volume per hectare is 114 m³/ha.

Poplar Working Group

The poplar working group occupies a relatively small proportion of Limerick Forest (219 ha). Production forest stands occupy 69 ha (Hybrid poplar plantations were established on 14.4 ha) and protection forest stands occur on 38 ha.

Poplar working group stands can be characterized as being of poor quality. The estimated gross total volume of the working group is 12,906 m³. The average volume per hectare is 80 m³/ha.

Other Hardwood Working Group

Other hardwood working group stands are typically comprised of associations of various mixtures of birch, soft maple, ash and other intolerant hardwoods mixed with minor amounts of balsam fir, cedar or white spruce. This working group occupies 267 ha. Of this area, 60 hectares are classified as production forest.

The estimated gross total volume of the working group is 18,458 m³. The average volume per hectare is 72 m³/ha.

3.8. Wildlife Resources

To date, an intensive wildlife inventory and/or a habitat inventory has not been completed for Limerick Forest. Undoubtedly, the Forest offers good terrestrial and wetland habitats for a variety of eastern Ontario mammals, reptiles, amphibians and bird species due to its mosaic of habitats (e.g. wetlands, open meadows and forests) and its diversity of forest cover types and wetland complexes. However, the current skewed age class structure towards younger (21-40 age class) to mid-rotation age classes (41-80 age class) implies that habitat requirements for species dependent on older forest are not present.

Lists of wildlife species occurrences within the Forest have been compiled in conjunction with federal and provincial initiatives (i.e. Ontario Breeding Bird Atlas) and other inventories and evaluations (e.g. wetland evaluations). Several species at risk are believed to possibly occur in the Forest (Table 21). Wolford Bog, the Kemptville Creek Complex and the Charleville Creek Wetland Complex are all recognized as a locally significant winter deer yarding areas. Additionally the Wolford Bog is a significant waterfowl staging area.

The OMNR Natural Resource Values Information System (NRVIS) for the Kemptville District contains limited information with respect to Limerick Forest's wildlife values. The currency of the information (typically 1980s vintage) within the NRVIS system is questionable and values maps have not been updated on a regular schedule.

Table 21. Species at Risk Which May Occur in Limerick Forest

Species	Category	Designator
Least Bittern	Vulnerable ⁶	COSEWIC COSSARO
Black Tern	Vulnerable	COSSARO
Spotted Turtle	Special Concern Vulnerable	COSEWIC COSSARO
Blandings Turtle	Local Concern	
Western Chorus Frog	Local Concern	
Eastern Prairie White-fringed Orchid	Endangered ⁷	COSEWIC
Southern Flying Squirrel	Special Concern	COSEWIC
Red Shouldered Hawk	Special Concern Vulnerable	COSEWIC COSSARO
Cerulean Warbler	Special Concern Vulnerable	COSEWIC COSSARO
Red-headed Woodpecker	Special Concern Vulnerable	COSEWIC COSSARO
American Ginseng	Endangered	COSEWIC
Monarch Butterfly	Special Concern	COSEWIC

Source: Limerick Forest Long Range Plan

COSEWIC – The Committee on the Status of Endangered Wildlife In Canada

COSSARO – The Committee on the Status of Species at Risk In Ontario

3.9. Areas of Natural and Scientific Interest (ANSI)

An ANSI is an area of land and/or water containing natural landscapes or features that have been identified as having life science or earth science values related to protection, scientific study or education. In regard to ANSIs the Ontario Policy Statement states that “...*development and site alteration shall not be permitted unless it has been demonstrated that there will be no negative impacts on the natural features or their ecological functions*”. Development and/or other land use activities on lands adjacent to ANSIs must also meet this same criteria.

⁶ Vulnerable – Any native species that, on the best available evidence, is at species of special concern (in Ontario), but is not a threatened or endangered species. COSEWIC has replaced the category of “vulnerable” with “Special Concern”.

⁷ Endangered – Any native species that, on the basis of the best available scientific evidence, is at risk of extinction or extirpation throughout all or a significant portion of its (Ontario) range.

Three wetlands within Limerick Forest have been designated as ANSIs; Groveton Bog, Merrickville Bog and the Cranberry Lake Swamp. Appendix G presents the Natural Heritage Information Centre Reports associated with each site. A brief synopsis of these reports is presented below.

Groveton Bog

The Groveton Bog⁸ constitutes the least disturbed core portion of a huge domed peatland on a large Sand Plain outwash deposit (1,200 ha). Large, essentially linear sand-based ridges occur within the bog which support mature upland forest types (e.g. red maple, eastern hemlock and white pine). Deciduous thicket swamp constitutes a significant portion of the bog. The vast size of the essentially core wetland complex, complete with potentially very significant upland forests on higher “islands” and the presence of a number of significant plant species offers a high level of significance to the site. The site appears to contain peatland values, particularly the mixed swamp habitat, unsurpassed by other known sites in Site District 6E-12 (Brunton, 1992).

Merrickville Bog

The Merrickville Bog⁹ is a large and diverse wetland (2,000 ha) with extensive open and treed domed bog communities. The site is situated on an organic (peat and muck) landform. The bog is the most extensive bog area in the Site District (6E-11). In addition to the bog communities there is a range of most other wetland types, including mixed and coniferous swamp.

Cranberry Lake Swamp

The Cranberry Lake Swamp (2,000 ha) is a lacustrine and palustrine wetland community that occurs on organic (peat and muck). Approximately 20% falls within Limerick Forest. The most significant feature of the site is the extensive deciduous swamp associated with the shallow Cranberry Lake. A large colony (perhaps the largest in eastern Ontario) of provincially rare Southern Arrowwood (*Viburnum recognitum*) occurs within the deciduous swamp. Other wetland communities such as mixed swamp and open and treed bog, and palustrine bog are also present and provide a range of microhabitats.

⁸ Groveton Bog is also known as the Limerick Forest Wetland

⁹ Merrickville Bog is also known as Hanlan's Marsh.

3.10. Wetlands

Limerick Forest contains 1,536 ha of wetland¹⁰ (e.g. marshes, swamps, bogs and fens) and 13 ha of open water. Wooded swamps are the predominant wetland feature of Limerick Forest although all types of wetlands are present as individual wetlands or as wetland complexes. Ten wetlands associated with Limerick Forest were evaluated by the Ontario Ministry of Natural Resources to determine their ecological significance according to biological, social, hydrological and special features components. Seven were designated as Provincially Significant Wetlands (Table 22) and three of the complexes were designated as Areas of Natural and Scientific Interest (ANSI)¹¹. All wetlands were classified as locally significant. Provincially Significant Wetlands are protected by a Provincial Policy Statement which provides guidelines for protection. Locally significant wetlands are not protected under the policy statement.

Table 22. Provincially Significant Wetlands associated with Limerick Forest

Wetland	Area and Significance	Description
Limerick Forest Wetland	2,575 ha, Groveton Bog ANSI <u>Provincially Significant Animals:</u> Black Tern (<i>Chidonias niger</i>) Nesting <u>Provincially Significant Plant Species:</u> Southern Arrow-wood (<i>Viburnum recognitum</i>) <u>Locally Significant Plant Species:</u> Stout Woodreed (<i>Cinna arundinacea</i>)	Comprised of three wetland types (7% bog, 92% swamp and 1% marsh).

¹⁰ Means lands that are seasonally or permanently covered by shallow water, as well as lands where the water table is close to or at the surface. The four major types of wetlands are swamps, marshes, bogs and fens.

¹¹ Means areas of land and water containing natural landscapes or features that have been identified as having life science or earth science values related to protection, scientific study or education.

	<p>Northern Fly-honeysuckle (<i>Lonicera villosa</i>)</p> <p>Tall Cinquefoil (<i>Potentilla arguta</i>)</p> <p>Narrow-leaved Vervain (<i>Verbena simplex</i>)</p>	
Wolford Bog-Pt 1	<p>1,975 ha, Cranberry Lake ANSI</p> <p><u>Provincially Significant Animals:</u></p> <p>Black Tern (<i>Chidonias niger</i>) Nesting</p> <p><u>Provincially Significant Plant Species:</u></p> <p>Southern Arrow-wood (<i>Viburnum recognitum</i>)</p> <p><u>Locally Significant Plant Species:</u></p> <p>Illinois Pondweed (<i>Potamogeton illinoensis</i>) American Bladdernut (<i>Staphylea trifoliata</i>) Swamp Rose (<i>Rosa palustris</i>)</p> <p><u>Other Species of Interest:</u></p> <p>Osprey (<i>Pandion haliaetus</i>) Common Loon (<i>Gavia immer</i>) American Bittern (<i>Botaurus lentiginosus</i>) Blue-winged Teal (<i>Anas discors</i>) Mallard (<i>Anas platyrhynchos</i>)</p> <p>Regionally significant waterfowl staging area</p>	Comprised of three wetland types (11% bog, 70% swamp and 19% marsh).

	Regionally significant for winter deer cover.	
Wolford Bog-Pt 3	<p>1,547 ha, Merrickville Bog ANSI</p> <p><u>Provincially Significant Animals:</u></p> <p>None recorded</p> <p><u>Provincially Significant Plant Species:</u></p> <p>Southern Arrow-wood (<i>Viburnum recognitum</i>)</p> <p><u>Other Species of Interest:</u></p> <p>Pied-billed grebe (<i>Podilymbus podiceps</i>) Pitcher Plant (<i>Sarracenia purpurea</i>) Sundew (<i>Drosera sp.</i>)</p> <p>Regionally significant for winter deer cover.</p>	Comprised of three wetland types (26% bog, 72% swamp, and 2% marsh).
Wolford Bog-Pt 4	<p>413 ha</p> <p><u>Provincially Significant Animals:</u></p> <p>None recorded</p> <p><u>Provincially Significant Plant Species:</u></p> <p>Southern Arrow-wood (<i>Viburnum recognitum</i>)</p> <p><u>Other Species of Interest:</u></p> <p>Marsh Wren (<i>Cisstothorus palustris</i>)</p>	Comprised of two wetland types (95% swamp and 5% marsh).

	<p>River Otter (<i>Lutra canadensis</i>)</p> <p>Regionally significant for winter deer cover.</p>	
Charleville Creek Wetland Complex	<p>1,545 ha</p> <p><u>Provincially Significant Animals:</u></p> <p>Cooper's Hawk (<i>Accipiter cooperii</i>)</p> <p><u>Provincially Significant Plant Species:</u></p> <p>Southern Arrow-wood (<i>Viburnum recognitum</i>) Small Beggarticks (<i>Bidens discoidea</i>) Sedge (<i>Carex cryptolepis</i>)</p> <p><u>Regionally Significant Plant Species:</u></p> <p>Clearweed (<i>Pilea Fontana</i>) Beggarticks (<i>Bidens triparatita</i>)</p> <p><u>Locally Significant Plant Species:</u></p> <p>Sedge (<i>Carex lasiocarpa</i>) Hooded Ladies'-tresses (<i>Spiranthes romanzoffiana</i>)</p> <p>Regionally significant for winter deer cover.</p>	<p>Comprised of five individual wetlands and two wetland types (99.5% swamp and 0.5% marsh).</p>
Cooligan Marshes Wetland Complex	<p>852 ha</p>	<p>Comprised of six individual wetlands and two wetland types (78% swamp and 22% marsh).</p>

Kemptville Creek Part 2 Complex	<p>328 ha provincially significant marsh and swamp.</p> <p><u>Provincially Significant Animals:</u> Black Tern (<i>Chidonias niger</i>)</p> <p><u>Regionally Significant Animals</u> Merlin (<i>Falco cyaneus</i>)</p> <p><u>Other Species of Interest:</u></p> <p>River Otter (<i>Lutra Canadensis</i>) Northern Harrier (<i>Circus cyaneus</i>)</p> <p>Regionally significant for winter deer cover.</p>	Two wetland types are present (42% swamp, 58% marsh).
---------------------------------	--	---

Other non-provincially significant wetlands associated with Limerick Forest are described in Table 23.

Table 23. Non-provincially Significant Wetlands associated with Limerick Forest

Wetland	Area (Ha)	Description
Wolford Bog Part 5	242	Comprised of two wetland types (93% - swamp and 7% marsh).
Indian Creek Wetland	565	Comprised of two wetland types (92% swamp and 8% marsh).
Hutton Creek Wetland	772	Comprised of five individual wetlands and two wetland types (86% swamp and 14% marsh).

4.0. THE SOCIO-ECONOMIC CONTEXT FOR FOREST MANAGEMENT

4.1. Population Demographics of the United Counties

The United Counties of Leeds and Grenville cover a land area of approximately 3,351 square kilometres. The County is situated between Kingston to the west, Cornwall to the east and Ottawa to the North. The United Counties is comprised of ten municipalities (Athens, Augusta, Edwardsburgh/Cardinal, Elizabethtown/Kitley, Front of Yonge, Leeds and the Thousand Islands, Merrickville-Wolford, North Grenville, Rideau Lakes and Westport). Three separated municipalities are also situated within the County, Gananoque, the City of Brockville and Prescott.

In 2001, the population of the United Counties was 96,606. Between 1996 and 2001 population growth was 0.3%. Statistics Canada data indicates that the median age of the population was 41 in 2000, and the average annual household income was \$29,045.00.

Sixty-five percent of the population is rural and five percent is farm rural¹². Most residences in the UCLG are within a half hour commute of the larger tracts of Limerick Forest.

4.2. The Forest Industry in Eastern Ontario

The forest industry is not a significant employer in eastern Ontario. Employment in forest related industries represents less than 1% of the total employment in eastern Ontario.¹³

In 2002-2003 the raw wood inputs to mills in southern Ontario from the Kemptville OMNR District was 538,992 m³ (520,082 m³ hardwood, 18,909 m³ conifer). Sawlogs (hardwood and softwood) were primarily accessed from private landholdings. Approximately 63% of the pulpwood and wood chips supplying eastern Ontario mills were sourced from outside of the province. Table 24 presents the volume of wood by product type and source utilized by eastern Ontario mills in 2003-2004.

¹² Limerick Forest Long Range Plan

¹³ For the province as a whole forest industry related employment was approximately 1.4%

Table 24. Volume in m³ of Wood Fibre Purchased by Eastern Ontario Mills (2003-2004)

Product Type	Private Land (m³)	Crown Land (m³)	Out of Province (m³)	Total (m³)
Hardwood Sawlogs	54,036	836	31,236	86,108
Softwood Sawlogs	9,794	1,359	0	11,153
Total Sawlogs:	63,830	2,195	31,236	97,261
Hardwood Pulp	45,097	22,524	113,985	181,606
Hardwood Chips	3,407	0	317,057	320,464
Totals:	112,334	24,719	462,278	599,331
Percent:	19	4	77	100

Source: State of Eastern Ontario's Forests Report

The majority of hardwood sawlogs purchased are hard maple (25,903 m³/yr) and mixed hardwoods (23,615 m³/yr). The softwood sawlog market is dominated by cedar (7,785 m³/yr) with lesser amounts of red and white pine (2,866 m³/yr) purchased.

The Ontario Ministry of Natural Resources – Forest Resource Processing Facilities (Mills) list of the active mills in the Kemptville District (April 1st, 2006) indicates that no sawmills with a production capacity greater than 50,000 m³/year are located within the District (Table 25). Three large mills are situated within the Pembroke District and these mills have historically purchased wood from the Kemptville District (Table 26).

Table 25. OMNR – Forest Resource Processing Facilities (Mills) List of the Active Mills in the Kemptville District (April 1, 2006)

Sawmill Type	Mill Name	Location	OMNR District
Medium Sawmill (<50,000 m³/yr)			
	Dalkeith Lumber Inc.	Dalkeith	Kemptville
	Albert Larocque Lumber Ltd.	Hawkesbury	Kemptville
	M.J. Umpherson Lumber Co. Ltd.	Lanark	Kemptville
	Byway Lumber Ltd.	Perth	Kemptville
	Paul D. MacDonald	Smith Falls	Kemptville

Small Sawmill (<5,000 m³/yr)			
	Lanark Cedar	Carleton Place	Kemptville
	Lindsay Duncan	MacDonald Corners	Kemptville
	Barr Lumber Ltd.	Pakenham	Kemptville
	Lloyd R. McVeigh Lumber Ltd.	Perth	Kemptville

Table 26. Large Capacity Sawmills in the OMNR Pembroke District.

Sawmill Type	Mill Name	Location	OMNR District
Large Sawmill (> 50,000 m³/yr)			
	Lavern Heideman & Sons Ltd.	Eganville	Pembroke
	Ben Hokum & Son Ltd.	Killaloe	Pembroke
	Dament & Charles Lumber Manufacturing Ltd.	Pembroke	Pembroke

Many of the traditional markets for forest products and/or species no longer exist or have become limited as a result of the recent downturn in the forest sector. Markets are available in the Pembroke District for conifer plantation thinnings and other specialty products (i.e. utility poles).

4.3. Limerick Forest Wood Sales Revenue

The sale of wood products constitutes the largest source of revenue derived from the exploitation of the natural resources of Limerick Forest. Wood sales revenue contributes to the UCLG general revenue account and is significant for the maintenance of management and operations in Limerick Forest. During the period of 2002-2007 (winter) tendered wood sales for conifer plantation thinnings yielded a gross revenue of \$208,032.80. Of this amount, \$161,070.50 was received for the sale of sawlogs. Polewood sales fetched \$46,962.30.

In the short to mid-term, the market for conifer plantation thinnings from Limerick Forest is expected to remain strong due to declining supplies in Quebec associated with recent reductions to the provincial annual allowable cut. The market for hardwoods is weak and markets for low quality hardwood material are expected to remain poor over the management plan period. Continuing markets

for hardwood sawlogs are anticipated, although the sawmilling sector has not been immune to the downturn affecting the forestry sector as a whole. Another effect of the downturn is that fewer logging contractors are operating in the region. This factor could negatively affect the availability of woods labour for harvesting and forest management operations and may further depress prices offered (i.e. buyers market).

A general decline in wood sales revenue is anticipated over the management plan period. This decline is premised on the following factors:

- Less productive compartments are scheduled for harvest during the management plan period as a result of lower site productivities and past thinning schedules.
- The general poor economic outlook for the provincial forestry sector over the short to mid-term.
- Predicted shortages of woods labour and equipment associated with the decline of the forest industry.
- The current age class area imbalance within LF plantations which will result in diminishing areas being available for thinning in future management periods¹⁴.

The magnitude of the wood sales revenue decline may be partially tempered by higher prices fetched for the sale of larger size material (i.e. conifer sawlogs, utility poles) scheduled for harvest late in the management period and increases in the prices paid for hardwood fuelwood in association with rising home energy costs. The implementation of planned stand improvement operations within hardwood stands will in the future enable the harvest of more valuable hardwood material (i.e. sawlogs and veneer).

4.4. Recreation and Tourism

In 1996, Canadians spent \$ 11 billion dollars on nature related activities (Harshaw et al. 2007). Direct recreation expenditures varied by activity. Indirect contributions related to recreation include tax revenues and individual incomes and jobs. Accounting for the economic value of non-commercial outdoor recreation is difficult as it is not typically a market-traded good or service. Further, recreational use can be expected to fluctuate in response to population changes (i.e. age mobility), in the activity choices available to people (i.e. as new

¹⁴ The age class gap resulting from the lack of area in the 0-20 age class will significantly impact future revenue from the Forest unless management actions are implemented to regulate the Forest. The forest management requirement to normalize the age class structure is discussed further in Section 8.

activities emerge and the popularity of existing activities may wane) and in access to recreational opportunities (Harshaw et al. 2007).

Limerick Forest is a “multi-use” forest that provides for a wide variety of outdoor recreational opportunities primarily, but not exclusively associated with, the Forest’s many trails and access roads. Uses are both diverse and dynamic and include hiking, bird watching, hunting, horseback riding, cross-country skiing, geocaching and motorized trail sports (i.e. snowmobiling, dirt biking, ATVs, etc.).

It is reasonable to anticipate that the recreational use of the Forest will continue to increase with population growth and the increased awareness of the recreational opportunities afforded by the Forest. Quantified data on recreational user days by activity is limited, and no studies have been undertaken to ascertain the economic value of the various recreational activities on the local or regional economy. User day estimates are provided by the Recreation Sub-committee membership and surveys and workshops conducted by LFAC (Table 27). A Tourism and Recreational Development Study for Limerick Forest (Willis, 2006) indicated that motorized trail riding and other recreational activities are increasing within Limerick Forest. The study further indicated that most recreational activity is presently confined to the South Tract.

Table 27. Estimated Annual User Visits – Limerick South Tract (2003)

Activity	Annual # of Estimated Visits
Snowmobiling	3,000
Motorcycling	1,400
All Terrain Vehicles	1,400
Mountain Bikes	600
Horseback Riding	520
Hunting	590
Hiking	1,400
Other	2,000
Geocaching**	378***
Total Visits:	10,190

* LFAC Recreation Sub-Committee

** Source: Ontario Geocaching Association Website.

*** Total Logged Visits

Fees are not currently charged for recreational use (e.g. trail fees) and monitoring of recreational activities is not formally conducted by county staff.

The potential of Limerick Forest as an outdoor tourism destination has not been fully investigated. Additional study and data collection (i.e. recreational use

information) are prerequisite to the development of a viable tourism development strategy and marketing plan(s) for the Forest. The determination of the economic and social costs and benefits associated with promotion of recreational use of the Forest should ideally be undertaken within the context of broader tourism development initiative to promote the UCLG as a tourism destination.

4.5. Wildlife & Other Non-timber Resources

Information on the economic value and public use of Limerick Forest's non-timber resources is not available. Activities such as berry-picking and the collection of mushrooms do occur primarily for domestic consumption.

Statistics related to the harvest of wildlife resources have not been compiled for Limerick Forest. Typically hunting information (i.e. number of hunters, hunting effort) is compiled at the OMNR Wildlife Management Unit (WMU) level. Limerick Forest is situated in WMU 66A and WMU 67. Based on WMU hunting statistics the LFLRP estimated that approximately 590-635 hunting visits occur annually within the Forest. Deer and upland game species are the principle species hunted.

Low prices offered and higher operating costs (e.g. fuel) has resulted in a significant decline in the number of persons trapping. Trapping is principally undertaken to supplement income and/or as outdoor hobby. The LFLRP indicates that only one individual is actively trapping in Limerick Forest. This individual's trapline is situated entirely within the South Tract.

4.6. Aggregate Extraction

The OMNR regulates aggregate resources through licenses and wayside permits. Municipalities develop and protect aggregate resources through Official plans. In 2000, there were 113 licensed pits and quarries in the UCLG. Annual aggregate extraction rates approximate 2.4 million tones per year. Sand and gravel deposits are limited in the UCLG with an estimated available supply of 109.6 million cubic metres being available. Limestone bedrock is quarried at 13 sites in the UCLG. These sites are licensed to extract 4.46 million tones annually.

While numerous sand dunes and sand plains are present in Limerick Forest South, these sites contain only limited amounts of "high quality" material. Table 28 lists the locations for sand and gravel reserves in Limerick Forest.

Table 28. Sand and Gravel Reserves in Limerick Forest

Name	Township	Concession	Lot Number	Limerick Forest Compartment Number
Shanty Knoll Quarry	Augusta	VIII	1 & 2	76, 78, & 80
	Edwardsburgh	VIII and IX	37	53, East end of 50,51 & 52

The Shanty Knoll Quarry (aka Limerick Forest Pit) is the largest active pit in Limerick Forest (7.8 ha). The pit situated on the main road north of Roebuck in Limerick Forest South. The pit is currently leased to the Township of Augusta through a 1997 lease agreement (expiry in 2012) which provides for the annual extraction of 25,000 tonnes. Annual revenue to the UCLG under the lease arrangement is \$12,500.00.

5.0. MANAGEMENT PLAN OBJECTIVES

5.1. The Limerick Forest Long Range Plan (LFLRP) Vision, Objectives and Strategies for Objective Achievement

In September of 2003 the UCLG Forest Manager in collaboration with the LFAC prepared a long range plan for Limerick Forest which established the vision, goal, objectives, strategies and activity parameters for Limerick Forest. The vision of the LFRFP is as follows:

“A century from now Limerick Forest will be an outstanding example of community cooperation in the sustainable management of its natural resources. Limerick Forest will be providing a wide variety of community goods and services including jobs and revenue, varied recreational opportunities, the protection of areas of significant biodiversity, the protection of soil and water resources, and the provision of structured educational opportunities.”

The plan provided area use designations as well as general policy statements for the management of designated areas. These goals and objectives provide the overall direction and context for forest management during the 2007-2027 planning period. The goal of the plan is:

“To manage Limerick Forest on a sustainable basis for a wide variety of goods and services.”

Table 29 provides a summary of the LFLRP objectives and strategies for the management of Limerick Forest’s natural resources.

Table 29. LFLRP Objectives and Strategies for Objective Achievement

LFLRP Objective	Strategies for Objective Achievement
1) <i>To ensure that Limerick Forest continues to provide a source of economic activity for local people.</i>	1) Continue to harvest timber products on a sustainable basis. 2) Continue to harvest fur on a sustainable basis. 3) Continue to extract aggregate when and where appropriate. 4) Develop additional and sustainable economic activities.

<p>2) <i>Manage Limerick Forest effectively in order to maximize benefits to the United Counties.</i></p>	<ol style="list-style-type: none"> 1) Generate revenue from various resource harvesting activities including timber and fur harvesting and aggregate mining. 2) Generate revenue through user fees and licences for various recreational activities. 3) Generate revenue from other sources including sale of surplus buildings. 4) Dispose of surplus land and acquire additional strategic lands. 5) Establish a Limerick Forest Management Trust Fund. 6) Establish a “Friends of Limerick Forest”. 7) Prepare an effective forest protection plan (fire, insects, disease, and invading species).
<p>3) <i>Provide a wide range of quality recreational opportunities in a safe environment.</i></p>	<ol style="list-style-type: none"> 1) Identify and design a recreational trail system that will meet the needs of all current and potential users. 2) Identify other (non-trail) type recreational opportunities (e.g. tobogganing, wildlife viewing, picnicking, and camping). 3) Prepare a code of conduct for trail and other recreational users. 4) Continue to provide traditional recreational past practices such as hunting.
<p>4) <i>Protect the ecological features and values of Limerick Forest</i></p>	<ol style="list-style-type: none"> 1) Identify and describe Limerick Forest ecosystems and their functions. 2) Identify the challenges and opportunities to cooperate with traditional users. 3) Identify areas for research and study. 4) Identify and describe requirements for protection (e.g. removal of alien

	species) including exclusion from other uses.
5) <i>Provide outdoor educational opportunities and foster a strong understanding of sustainable resource management.</i>	<ol style="list-style-type: none"> 1) Determine the level of demand for an outdoor education centre and outdoor education program to be established in Limerick Forest. 2) Based on the outcome (1); plan and develop an outdoor education program including infrastructure requirements. 3) Explore opportunities through stakeholder groups to make use of existing facilities / resources. 4) Explore adult education opportunities.

5.2. 2007 – 2027 Forest Management Plan Goal and Objectives

The goal of this Forest Management Plan is:

“To enhance the economic and social welfare of the residents of the UCLG through the improvement, sustainable use, development and protection of Limerick Forest’s timber, wildlife, non-timber and recreational resources.”

This goal is to be achieved through the implementation of adaptive, ecologically sound management principles and strategies. Objectives are developed in a forest management plan for benefits or outcomes which can be achieved by managing forest cover. The plan objectives should be visualized as dynamic statements, which may require modification or revision as new information becomes available, or should societal values change over time.

Forest management plan objectives for the management of environmental, recreation, and timber values are outlined in the sections below. These objectives recognize the importance of all uses of the Forest and impose a responsibility on the Forest Manager and LFAC to co-ordinate alternative land uses within the context of sustainable forest management.

5.2.1. OBJECTIVES FOR ENVIRONMENTAL MANAGEMENT

Sustainable forest management requires the development and implementation of management strategies which maintain or enhance biodiversity and provide for

multiple social, economic and environmental benefits to society. In the past decade, there has been a shift from the traditional preoccupation of forest managers to manage forest land for a sustained yield of timber supply to the management of forests for the perseverance of forest ecosystems. This management philosophy seeks to sustain diversity and productivity and prescribe management practices which best suit the characteristics of the land and the specific purposes for which the land is being managed. Although Limerick Forest is currently not FSC certified, it is the intent of the UCLG to follow the FSC Great Lakes St. Lawrence Standard and the Silvicultural Guide to Managing Southern Ontario Forests as closely as possible in to help ensure that LF is managed in responsible and sustainable manner.

Limerick Forest provides a variety of ecological functions and benefits ranging from the provision of wildlife habitat to the cycling of nutrients and water. The LFLRP seeks to *“Protect the ecological features and values of Limerick Forest”*.

The following objectives for forest management have been identified to support the LFLRP direction:

1. To conserve and enhance biological diversity of Limerick Forest.
2. To maintain and enhance the wildlife habitats by the application of appropriate forest management.
3. To ensure no loss of threatened, endangered, rare or vulnerable species habitat (plant or wildlife) as a result of forest management activities.
4. To ensure forest management interventions minimize adverse effects on soils, water, vegetation fish and wildlife and other identified values.
5. To maintain wildlife populations at levels which provide for species continuance and provide opportunities for wildlife harvesting, aesthetic appreciation, and education and scientific investigation.
6. To minimize environmental damage to the natural resources of Limerick Forest and prevent personal injury or loss of life and which may arise from natural disturbance events such as wildfire, or from human activities.

Strategies for objective achievement are detailed in Section 6.

5.2.2. OBJECTIVES OF RECREATION MANAGEMENT

Outdoor recreation management is primarily concerned with people management: the management of their expectations and the management of the impacts that recreationalists have on one and other and the landscape in which they pursue their activities (Harshaw et al. 2007). Outdoor recreation management is a social endeavour that attempts to balance the needs and

desires of recreationalists with the capacities of the natural environment on which they depend as well as other recreationalists and land uses (Harshaw, 2005).

Zones of multi and single recreational use have been identified in the LFLRP and general management policy statements are provided. Within the context of this forest management plan, the provision of a wide range of quality recreational opportunities will be accomplished through the attainment of the following objectives;

1. To maintain a diversity of forest cover types and stand structures to provide for a diversity of recreational uses.
2. To ensure that timber management activities (e.g. harvest, renewal, and maintenance) are undertaken in a manner, which eliminates or minimizes conflicts with other users of the forest.
3. To ensure that recreational uses do not degrade or adversely affect the forest, its access roads and trails or other values.
4. To promote the use of Limerick Forest as a public resource for forestry and natural environment education.
5. To provide a safe environment for the public use of Limerick Forest.
6. To solicit external financial and human resources support for the development and/or improvement of recreation opportunities in Limerick Forest.
7. To collect data and information on the outdoor recreational use of Limerick Forest for incorporation into the forest management and land-use planning process and to support future UCLG tourism development initiatives.

Strategies for objective achievement are outlined in Section 7.

5.2.3. OBJECTIVES FOR TIMBER MANAGEMENT

The LFLRP recognizes the contribution of forest harvesting to the local and regional economy and advocates a policy of continued harvesting of forest products on a sustainable basis. This policy is to be achieved within the context of the multi-use of Limerick Forest by the attainment of the following objectives;

1. To manage the timber resource of Limerick Forest on the basis of sustained yield and in a manner consistent with sound forestry and environmental practices.
2. To manage the timber resources of Limerick Forest for the benefit of the people of the UCLG with due consideration of all forest users and resource values.

3. To conserve and enhance biological diversity of Limerick Forest through the application of timely and appropriate silviculture practices.
4. To ensure no loss of threatened, endangered, rare or vulnerable species habitat (plant or wildlife) as a result of forest management activities.
5. To ensure forest management interventions minimize adverse effects on soils, water, vegetation fish and wildlife and other identified values.
6. To promote the growth of high quality timber products through the application of timely and appropriate silvicultural practices.
7. To protect the timber resource from damaging agents such as fire, insects and disease.

Strategies for objective achievement are detailed in Sections 8 of this document.

5.3. Resource Management Issues

The following issues related to forest management in Limerick Forest were identified during the management planning process. Strategies to address these issues are provided.

5.3.1. THE INTEGRATION OF TIMBER MANAGEMENT STRATEGIES WITH OTHER RESOURCE USERS

Perhaps the most significant challenge to resource management in Limerick Forest is the requirement to ensure that the Forest provides a balance of uses, goods and services for the benefit of the people of the United Counties of Leeds and Grenville (UCLG). Limerick Forest has historically supported multiple uses. Public demands for the provision of economic benefits, recreational uses and environmental services from the Forest can reasonably be expected to increase over the management planning period. Some concern persists amongst some members of LFAC and other stakeholders as to the long-term sustainability of forestry operations and the viability and compatibility of other resource activities with commercial timber production activities.

Strategies:

- Harvest, renewal, and maintenance activities will be undertaken in a manner, which eliminates or minimizes conflicts with other users of the forest.

- An Area of Concern Management¹⁵ process will be implemented through the early identification of sensitive sites and values, the development and implementation of appropriate management prescriptions, and the monitoring of prescriptions for compliance and unintended effects. The application of specific or generic AOC prescriptions will be applied to any additional concerns identified during the life of this plan.
- Timber effects monitoring and adaptive management strategies will be implemented on an as required basis as information on impacts of forest management becomes available.
- The forest management plan conforms to the land use designations and general management policies of the LFLRP.

5.3.2. ANSI AND PSW BOUNDARIES

The Ontario Ministry of Natural Resources is responsible for maintenance and updating of natural resource values information in the Ontario through its Natural Resource Values Information System (NRVIS). In the 1980's Limerick's ANSI and PSW boundaries were approximated and digitized for input into the NRVIS system. During the planning process it became apparent that these boundaries incorporate areas of plantation and other forest stands which were likely not intended to be included within the designations.

Current provincial regulations limit or restrict activities which may occur within ANSI and PSW designations. Development activities are restricted within areas designated as areas of scientific interest. The policy for protection of provincially significant wetlands does not address forestry activities specifically, so in instances where commercial forest stands are within the digitized wetland boundaries forest management in accordance with environmentally sound practice (e.g. winter logging) is permissible. It is recommended that a process to correct the boundaries be initiated and the following strategy implemented.

Strategy:

- It is recommended that the Forest Manager officially inform the OMNR Kemptville District of the boundary issues to: 1) notify OMNR of any planned or past forest management activities within the current boundaries and 2) request that boundaries be re-delineated in the next update of NRVIS.

¹⁵ An AOC is an area adjacent to a site of identified value that may be affected by some or all aspects of planned forest management or recreational activities. The AOC management process prescribes strategies and/or guidelines for the maintenance or protection of the identified values.

5.3.3. INVASIVE SPECIES

The LFLRP identifies buckthorn, garlic mustard and dog strangling vine as potential threats to Limerick Forest's natural communities. Buckthorn is perhaps the most pervasive invasive plant species in Limerick Forest, with plantation areas being most heavily invaded. Invasive species do not currently exist at levels which completely preclude native species and as such no active management activities have yet to be implemented for their control or eradication. The 2005 FMP did recommend that experimental treatments to control buckthorn be considered in 10 forest compartments. This work was not undertaken.

Strategy:

- The abundance of invasive species will be monitored in conjunction with other forest management activities, and practical and effective control measures implemented as warranted.

5.3.4. LOW QUALITY OF GROWING STOCK

Many of the natural forest stands and plantations of Limerick Forest are of poor quality for commercial timber operations. Advanced regeneration may be limited or inhibited by invasive species or suppressed. The poor quality of the resource is associated with uncertain markets for lower quality timber.

Strategies:

- Silvicultural operations will target the improvement of growing stock within designated stands through the removal of trees of limited potential and the improvement of growing conditions (spacing) around better quality stems.
- All silvicultural prescriptions are to be prepared and certified by a Registered Professional Forester (R.P.F.) in good standing with the Ontario Professional Foresters Association.
- For partial cutting harvest systems "certified tree markers" will be utilized to implement the marking prescription.
- It is recommended that external financial and human resource support be solicited to support forest management in stands that under current conditions are uneconomic to manage. This strategy could entail the acceptance of reduced stumpage payments for stand improvement operations.

5.3.5. AGE CLASS DISTRIBUTION

As noted, an age class area imbalance exists in Limerick Forest, reflecting both past harvest and land clearing practices and initiatives to re-establish forests on denuded lands in the 1940's and early 1950s. A significant portion of the total forest area is within the 41-60 age class. Age class area imbalances also occur in the 10-40 and 61-80 age classes and in all forest types. This circumstance will pose problems with respect to the supply of habitat and the regulation of timber harvests over the long term.

The current age class structure will not sustain an even flow of timber sales revenue; revenues will fluctuate over time for areas managed under even-age management strategies. The continued application of the "harvest the oldest timber first" rule will result in the periodic harvest increasing with aging of the forest and then decreasing as a result of the lack of area currently in the younger age classes. After a full rotation (60-90 years) the forest will be "regulated" (assuming markets are available for the rotation period).

It is possible to smooth volume flows during regulation¹⁶ by distributing the cut more evenly amongst age classes where tree size and volumes permit. Scheduling harvests within a broader range age classes will accelerate the recruitment of area into the younger age classes, alleviate wide differences in volume flows and may serve to meet wildlife and recreation objectives. Cutting may target the removal of entire stands or portions of stands (clearcutting, patch cutting or shelterwood harvests). Harvest strategies which retain portions of the stand (i.e. patch cuts or 2-cut shelterwood harvests) will extend the time period required to balance the age class distribution. The time lag in "regulating" the forest may be counter-balanced by the attainment of other forest management objectives (i.e. wildlife, recreation and social) associated with the maintenance of mature forest cover.

A financial investment in forest renewal and maintenance activities will be necessary to ensure that all harvested areas are renewed to pine working group stands. The effective application of a strategy to broaden the range of age classes harvested is contingent upon the collection of updated forest inventory information and the requirement to balance the need for forest regulation with other objectives.

¹⁶ Regulation is the organization of a forest for a sustained and approximately even harvest. A fully regulated forest is considered a valuable concept in forest management. An essential requirement of a fully regulated forest are that age and size classes are represented in such proportion and be consistently growing at such rates that an approximately equal or periodic yield of products of desired size and quality may be obtained (Davis, 1966).

Strategy:

- The planned annual allowable harvest will in the long term regulate the age class structure of the forest of Limerick Forest.
- It is recommended that the age class area imbalance associated with Limerick Forests plantations will be addressed through accelerated harvesting and/or liquidation of selected red pine and white pine working group stands (or portions of stands where feasible and where markets permit). Financial investments in planting and tending will be required to ensure the prompt renewal of these sites to pine species. This approach will dampen the projected impact of declining yields and revenues over future management terms. The success of this strategy is contingent upon the verification of plantation inventory data and the requirement to balance the need for forest regulation with other objectives.

5.3.6. FOREST RESOURCE INVENTORY AND VALUES DATA

LF records and data were in extremely poor condition for the preparation of this management plan. Information on some forest stands was incomplete, inaccurate or missing. Problems existed with the GIS digital database as data layers were often incomplete, inaccurate or poorly projected. Not all data issues could be addressed during FMP preparation due to budget restrictions.

LFAC had requested that the development of this management plan be based on the Southern Ontario Ecological Land Classification (ELC). Forest-wide ELC information does not exist. Data is currently only available for the limited number of compartments which have been surveyed in conjunction with work to identify areas of “proposed old growth reserve”.

Natural resource and cultural heritage values information for Limerick Forest was also non-existent (e.g. First Nation Values information had not been collected or documented in past management plans) or had not been maintained or updated since the 1980’s when the NRVIS data base was established (i.e. stick nest information).

Strategies:

- The Forest Manager is obligated to ensure that funding and human resources are made available on an annual basis for data collection, management and maintenance.
- Accurate and concise records (e.g. cutting records, silvicultural records and annual cost summaries) of all activities are to be maintained to ensure the continuity of the planned management.

- In the absence of specific values information provincial forest management guidelines and current wildlife habitat guidelines will be used to guide timber management planning.
- ELC classification field work will be scheduled as a component of the annual work schedule where funding levels permit.
- The Forest Manager will initiate and foster communications with local and regional First Nations to ascertain if sites of current use and/or special cultural, ecological, economic or spiritual significance to First Nation communities are situated in Limerick Forest. The results of these consultations will be incorporated in annual operating plans to ensure heritage/cultural values protection pending the completion of the five-year revision of the management plan.

5.3.7. AVAILABILITY OF MARKETS FOR TRADITIONAL FOREST PRODUCTS

Many of the traditional markets for forest products and/or species no longer exist in eastern Ontario or have become limited as a result of the downturn in the forest sector. Markets for conifer plantation thinnings and other specialty products currently exist, mainly in the Pembroke District of the OMNR and western Quebec.

Wood sale revenues derived from plantation thinnings are expected to decline over the management period as plantations with lower unit volumes and lower wood product quality are scheduled for treatment. Historically, wood sales have been concentrated within confined geographic areas and targeted within the highest yielding stands. In order to modulate the economic effects of fluctuating wood revenues the Forest Manager should consider a more balanced distribution of harvest sites and areas in operational planning. While initial revenues will likely be lower than realized under the current scheduling strategy, the overall fluctuations in future sales revenues will be lower. Several decision support tools (i.e. linear programming techniques (optimization or goal programming)) are available to assist in the analysis of the various harvest scheduling options.

Due to the closure of the Domtar Mill in Cornwall, the market for hardwood forest pulp is weak, and is expected to remain poor over the short to mid-term. The Domtar closure has also served to depress prices offered for low quality hardwoods (i.e. fuelwood) in regional wood sales. The general downturn in the forest sector has also resulted in fewer logging contractors operating in the region. This circumstance may negatively affect the availability of woods labour for tendered sales, and could act to further depress prices offered (i.e. buyers market).

Strategies:

- The UCLG Forest Manager will monitor and maintain a database of regional tendered wood sale prices.
- It is recommended that the Forest Manager consider the use of linear programming techniques to develop thinning and harvest schedules in five year operational planning.

5.3.8. HISTORIC RECREATIONAL TRAIL USE PATTERNS

Historic recreational use patterns may pose challenges for the development and implementation of objectives and strategies for recreational land uses.

The use of trails by motorized and non-motorized vehicles (e.g. all terrain vehicles, dirt bikes and mountain bikes) is most prevalent in Limerick South. As a result of use pressures, the quality of some of the trails in the tract has deteriorated.

Strategies:

- A trail density model to quantify and qualify recreational trail densities within Limerick Forest tracts will be developed in conjunction with the preparation of this FMP. The model will provide guidance with respect to strategic planning for future recreational trail development.
- Trail conditions will be monitored and reported on annually. In instances of trail quality deterioration trails will be repaired and/or seasonal/permanent use restrictions (voluntary/mechanical) implemented as required.

5.3.9. NUTRIENT MANAGEMENT

In response to concerns about nutrient loss arising from forest management operations, and a concern that nutrient levels within Limerick Forest have declined significantly since pre-settlement times LFAC endorsed a nutrient management policy for inclusion in the forest management plan with the objective of “retention and accretion of mineral nutrients in the forest ecosystem with a goal of achieving pre-settlement nutrient levels”.

The full implementation of this policy imposes a requirement on the UCLG and LFAC to commit time, human and financial resources to a multi-year program of research and field experimentation. The associated environmental and economic implications of policy implementation must also be fully understood.

Strategies:

- The Forest Manager, in collaboration with LFAC, will design and implement a nutrient management program to guide forest management activities in Limerick Forest.
- Silvicultural strategies that minimize potential nutrient losses arising from silvicultural operations (e.g. retention of logging slash and residues on poor sites, restriction of full tree harvesting systems on poor sites) will be implemented during the management period.

5.3.10. THE IDENTIFICATION AND MANAGEMENT OF “PROPOSED OLD GROWTH FOREST RESERVES”

The LFAC Ecology Sub-Committee proposed that 387 ha (10% of the total forested area) be designated as “proposed old growth reserve” based on the definition of old growth in Limerick Forest as “*A natural forest stand which is at least 80 years old, containing trees at least 120 years old with undisturbed ground vegetation.*” At the time of the preparation of this FMP the old growth policy had not been endorsed for consideration by the UCLG due to ongoing discussion and debate as to; 1) the requirement for the adoption of strategy in LF, 2) the suitability of LF stands as proposed old growth reserves in the context of the local and regional forest landscape, 3) the candidate site selection criterion and amount of area proposed, and 4) the implications of arising from the adoption of an “old growth” policy on other forest stakeholders (e.g. commercial forestry interests and recreationalists).

Strategies:

To foster further understanding with respect to the requirement for and implications of the draft “proposed old growth reserve policy” the following strategies will be implemented during the first five-year period of the FMP;

- 1) The Forest Manager and LFAC will review the updated forest inventory ledger for possible inclusions and/or removals to the 2007 candidate stand list as the initial inventory on which stand selection was based has been modified during the forest management planning process. Field work to assess the suitability of selected stands to meet old growth management objectives (stand structures, species composition, etc.) will be undertaken on an as-required basis.
- 2) The Forest Manager and Ecology Sub-Committee Chair will report to the UCLG and LFAC on the stand and forest level implications of policy implementation (i.e. economic, social and environmental) to foster understanding and improved decision-making.

- 3) The selected stands will be classified as “ecological reserve” in the forest inventory ledger.

5.3.11. ZONING AND MUNICIPAL OFFICIAL PLANS

The Limerick Forest Long Range Plan (LFLRP) indicated that Official Plans (14) within the UCLG complicate use zoning within Limerick Forest as the plans are not uniform in their approach to zoning designations and definitions.

Strategy:

- The Forest Manager will conduct necessary research to determine if planned resource management strategies, objectives, and activities are compatible with the Official Plan and zoning by-laws of each affected municipality during annual operations planning and scheduling.

5.3.12. LACK OF QUANTITATIVE DATA ON RECREATIONAL USE & TOURISM POTENTIAL

Sustainable forest management requires an understanding of the full spectrum of resource use activities so that the impacts and contributions of these activities can be gauged and addressed in the forest management planning process (Harshaw et al. 2006). Quantified data on recreational user days by activity in Limerick Forest is limited. No studies or surveys have been undertaken to ascertain the economic value of the various recreational activities on the local or regional economy, or to determine the potential of Limerick Forest as an outdoor recreation tourism destination.

Strategy:

- Data and information on the outdoor recreational use of Limerick Forest will be collected during the first five year operating period. This information will be used in forest management and land-use planning and in support of future UCLG tourism development initiatives.

6.0. MANAGEMENT OF THE NATURAL ENVIRONMENT

Limerick Forest provides a variety of ecological functions and benefits ranging from the provision of wildlife habitat to the cycling of nutrients and water. The LFLRP seeks to “*Protect the ecological features and values of Limerick Forest*”.

Four objectives are identified in the LFLRP for the attainment of this objective:

- 1) Identify and describe Limerick Forest ecosystems and their functions.
- 2) Identify the challenges and opportunities to cooperate with traditional users.
- 3) Identify areas for research and study.
- 4) Identify and describe requirements for protection (e.g. removal of alien species) including exclusion from other uses.

This forest management plan identifies the following objectives in support of the LFLRP direction. These objectives are as follows:

1. To conserve and enhance biological diversity of Limerick Forest.
2. To maintain and/or enhance wildlife habitats by the application of appropriate forest management.
3. To ensure no loss of threatened, endangered, rare or vulnerable species habitat (plant or wildlife) as a result of forest management activities.
4. To ensure forest management interventions minimize adverse effects on soils, water, vegetation fish and wildlife and other identified values.
5. To maintain wildlife populations at levels which provide for species continuance and provide opportunities for wildlife harvesting, aesthetic appreciation, and education and scientific investigations.
6. To minimize environmental damage to the natural resources of Limerick Forest and prevent personal injury or loss of life and which may arise from natural disturbance events such as wildfire or from human activities.

The following strategies will be implemented to maintain or enhance the environmental integrity of Limerick Forest during the twenty-year management period:

- Areas of productive forest land classified as Protection Forest Reserve or Ecological Reserve will be exempt from forest management activities.

- The Forest Manager will, in collaboration with LFAC and interested members of the public, develop/adopt a code of best practice for forest and wildlife management.
- Timber and non-timber forest values will be protected and enhanced through appropriate and timely management practices.
- There will be no loss of threatened, endangered, rare or vulnerable species habitat (plant or wildlife).
- Candidate areas of “Proposed Old Growth Reserves” will be retained in Limerick Forest.
- Specific management targets for restoring uncommon vegetation types (within the context of historic distributions in eastern Ontario and regional forest landscape) will be established in stand level management prescriptions.
- Invasive exotic species will be monitored in conjunction with normal forest management activities and practical control measures implemented as required.
- All wildfires will be actively suppressed and management actions to reduce fire risk will be undertaken on an as needed basis.
- Insect and disease outbreaks will be controlled as required. Integrated pest management approaches will be utilized where practical.
- Roads, water crossings and access trails will be constructed and maintained to minimize impacts to the forest site and other values (i.e. natural heritage values, water courses etc.) in accordance with local best management practices and provincial guidelines.
- Site inspections will be completed for all areas designated as eligible for harvest to determine the presence of natural or heritage values and the protection of identified values as required through the application of area of concern prescriptions. In the absence of specific values information provincial forest management guidelines and current wildlife habitat guidelines will be used to guide timber management planning.
- Forest management operations will be limited to times of the year when the soil is frozen on susceptible sites.
- Signs will be posted restricting motorized trail use when soils are excessively wet. Physical barriers will be used in instances where requests for voluntary compliance do not prove adequate.
- Logging slash and debris will be retained on nutrient poor sites. Full tree logging systems will not be used in lower site class stands.
- The Area of Concern digital layer for natural and cultural heritage values will be maintained and updated (as appropriate) in the LF database.

- Habitat features desirable to wildlife will be preserved where feasible and appropriate.
- Forest operations will be conducted in a manner consistent with prescribed wildlife management objectives, provincial wildlife management guidelines and the protection of rare, threatened or venerable species and their habitat.
- Wildlife habitat improvement programs and initiatives (i.e. water impoundment projects) with community groups and partner organizations will be fostered and promoted.

6.1. Area of Concern Management Guidelines

An area of concern (AOC) is an area adjacent to a site of identified value that may be affected by some or all aspects of planned forest management activities. Areas of Concern include wildlife habitats, fragile soils and riparian ecosystems.

The following sections outline management strategies and guidelines for the maintenance and protection of Limerick Forest's natural and cultural heritage values. Appendix H provides a summary of the AOC management guidelines and prescriptions to be implemented during the management period. These guidelines are in accordance with existing provincial management guidelines and local best management practices. AOC management practices will be updated and revised as new provincial guidelines become available during the management period.

An area of concern data layer has been constructed in the LF GIS as a component of the management planning process. The maintenance and updating of this digital layer will be an annual requirement for effective forest management. Figures 13 – 18 illustrate the identified areas of concern by forest tract.

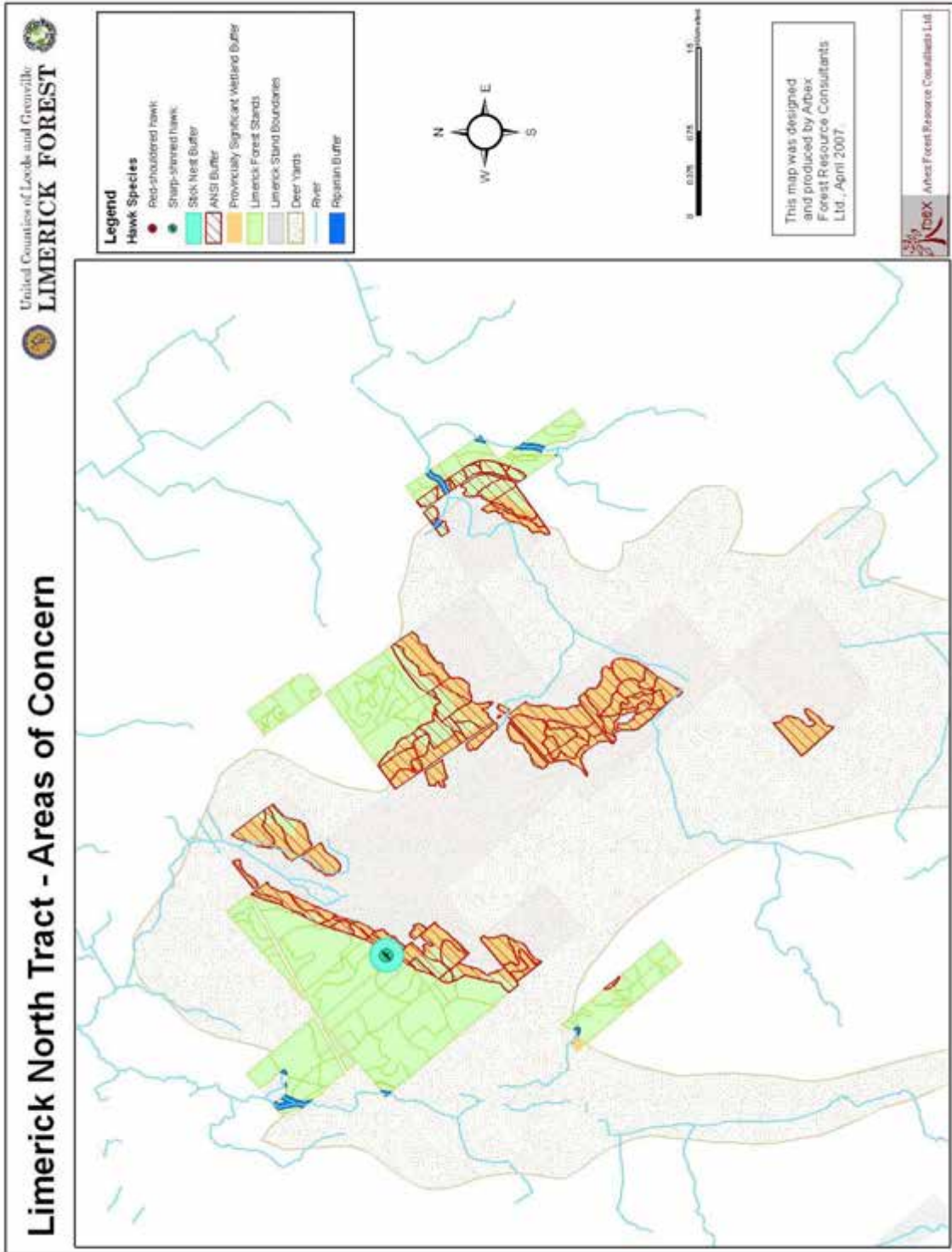


Figure 13. Areas of Concern in Limerick North Tract

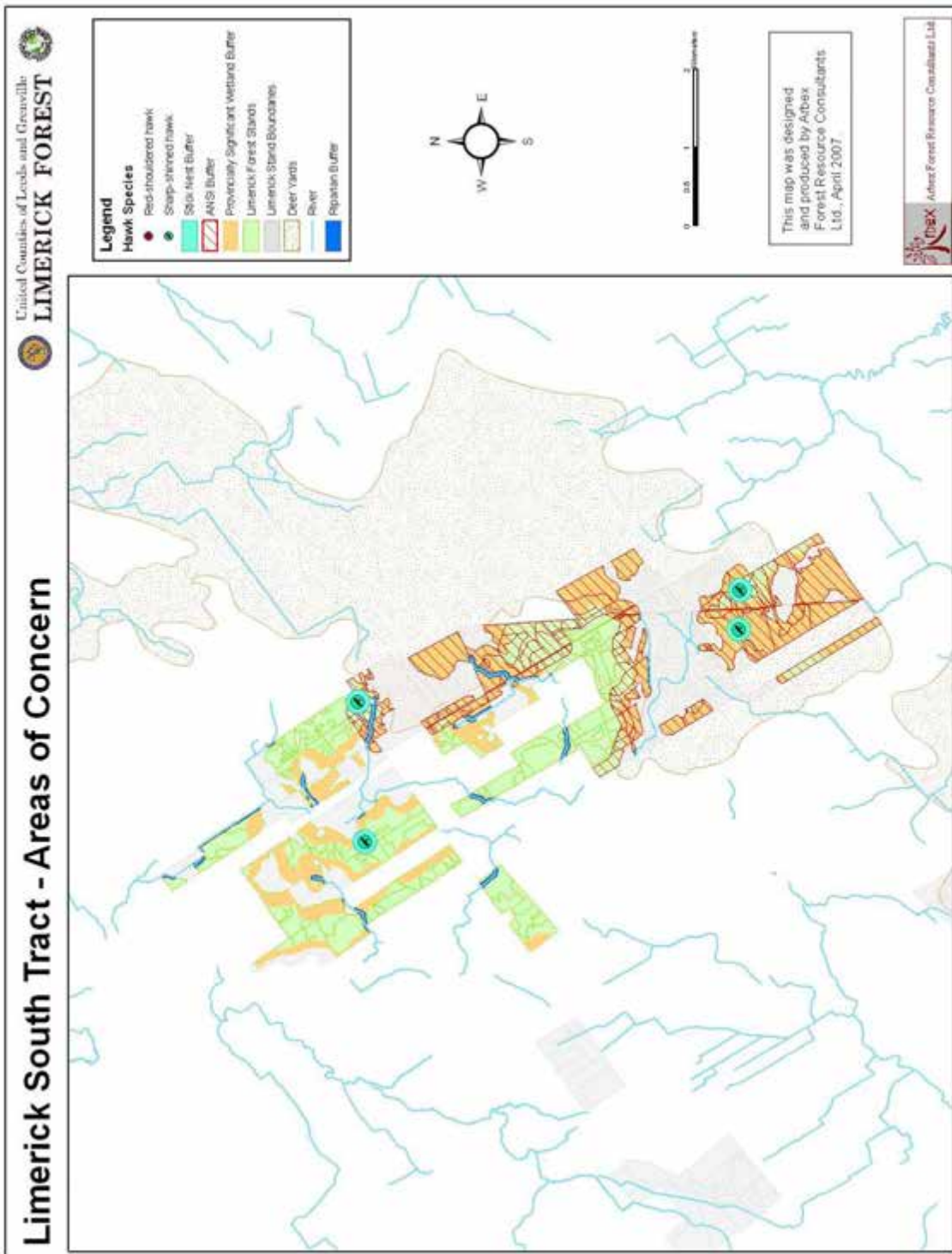


Figure 14. Areas of Concern in Limerick South Tract

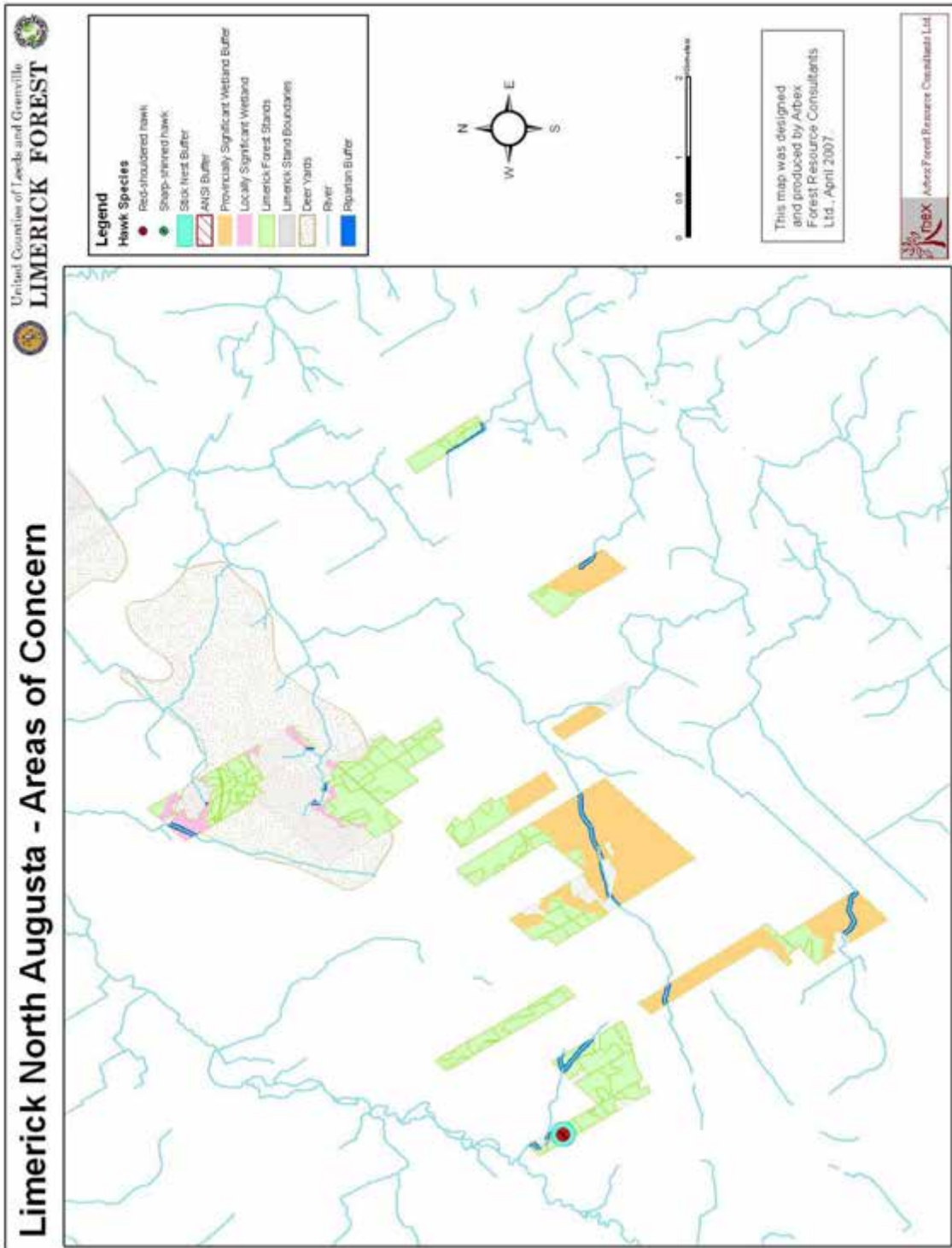


Figure 15. Areas of Concern in Limerick North Augusta

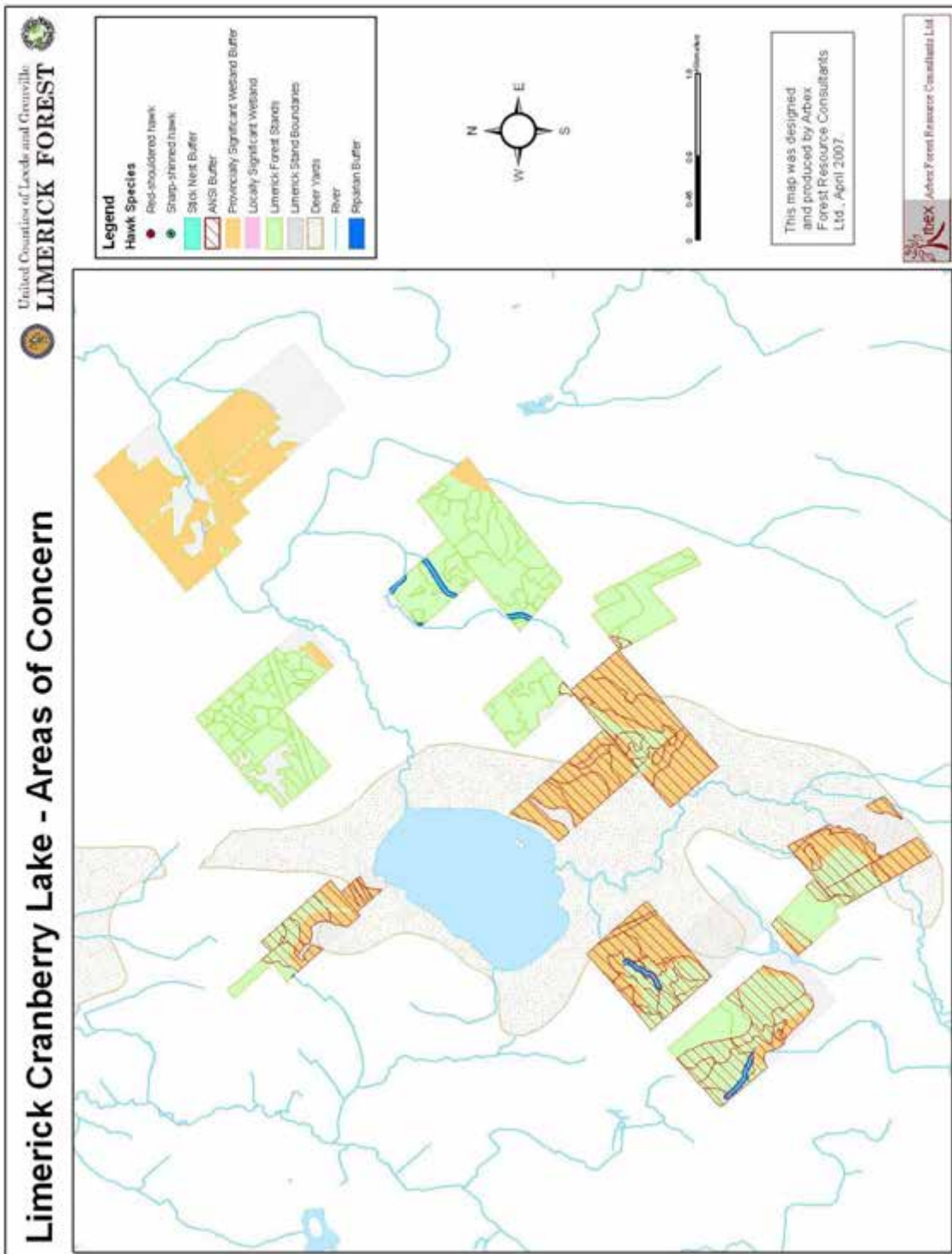


Figure 16. Areas of Concern in Limerick Cranberry Lake

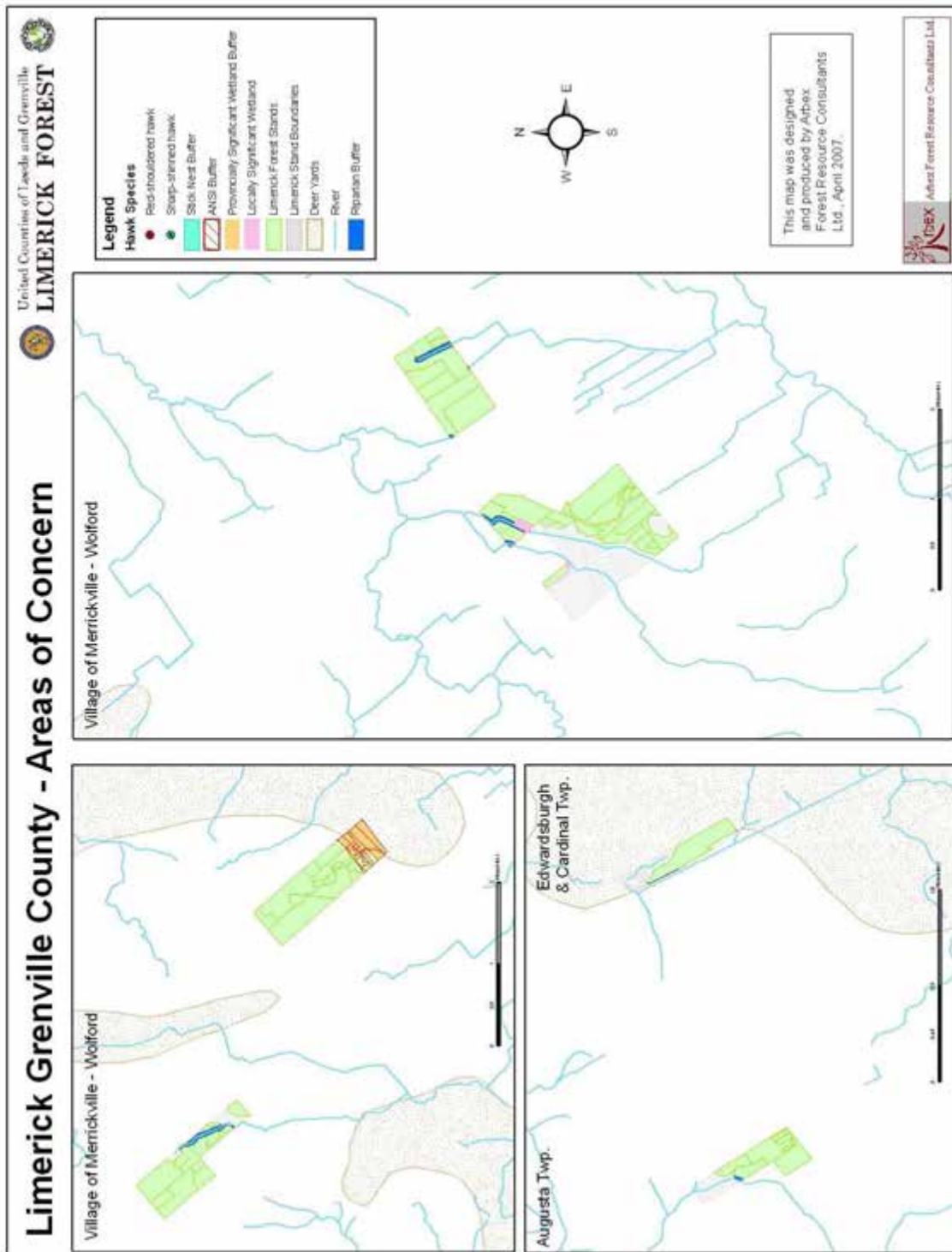


Figure 17. Areas of Concern in Limerick Grenville County



Figure 18. Areas of Concern in Limerick Leeds County

6.1.1. AREAS OF NATURAL AND SCIENTIFIC INTEREST (ANSI)¹⁷

The Ontario Policy Statement states that “...*development and site alteration shall not be permitted unless it has been demonstrated that there will be no negative impacts on the natural features or their ecological functions*”. Development and/or other land use activities on lands adjacent to ANSIs must also meet the same criteria. Three wetlands within Limerick Forest have been designated as provincially significant ANSIs; Groveton Bog, Merrickville Bog and Cranberry Lake Swamp.

Forest management activities and/or motorized recreational use will be prohibited or restricted within ANSI areas on the basis of a site evaluation. This use strategy recognizes the historic use of the areas by local people and an issue associated with the approximation of digitized ANSI boundaries (see paragraphs below). Forest management operations in plantation and/or natural forest areas that are not prone to environmental degradation during normal operations will be permitted under special management conditions (i.e. specific site guidelines developed during the preparation of stand prescriptions). Continued use of the existing roads and/or recreation trails will also be permitted. These uses will be discontinued in the event of environmental deterioration arising from the use. Other passive recreational activities will be permitted provided that such uses do not degrade site quality or values.

A 120 m reserve (Modified Management Area (MMA)) will be established adjacent to the ANSI areas. Harvest operations will be permitted in these zones but operations will be modified to accommodate site environmental concerns (i.e. limiting of harvest on wet soils to times when the ground is frozen) or to retain habitat features (i.e. clumps of cedar).

A requirement currently exists to verify and re-map ANSI boundaries within the Limerick Forest as boundaries (ANSI and provincially significant wetland boundaries (PSW)) were approximated during the development of the OMNR Natural Resource Values Information System (NRVIS). A review of maps, satellite imagery and aerial photos indicates that in some instances ANSI boundaries extend beyond wetland boundaries (i.e. high water level) and into productive forest areas (i.e. plantations). Since Provincial regulations limit or restrict activities which may occur within ANSI and PSW designations, the UCLG should formally notify the Ontario Ministry of Natural Resources Kemptville District Office of the ANSI boundary delineation issue and endeavor to ensure that the boundaries are corrected in the provincial and UCLG digital databases.

¹⁷ Means areas of land and water containing natural landscapes or features that have been identified as having life science or earth science values related to protection, scientific study or education.

6.1.2. WETLANDS

Ten wetlands associated with Limerick Forest were evaluated by the Ontario Ministry of Natural Resources to determine their ecological significance according to biological, social, hydrological and special features components. Seven were designated as Provincially Significant Wetlands (Table 22) and three of the complexes were designated as ANSIs. All wetlands were classified as locally significant. Provincially Significant Wetlands are protected by a Provincial Policy Statement which provides guidelines for protection. Locally significant wetlands are not protected under the Policy Statement. Forest management activities and recreational use strategies are as proposed in Section 6.1.1. Continued use of the existing roads and/or recreation trails is permitted. These uses will be discontinued in the event of environmental deterioration arising from the use. Other passive recreational activities will be permitted provided that such uses do not degrade site quality or values.

All provincially significant wetlands in Limerick Forest and the adjacent lands within 120 metres of the wetland are protected¹⁸. The 120 metre zone is considered a modified management area where harvesting is permitted in accordance to guidelines (See Appendix H).

Non-provincially significant wetlands that do not support forest stands will be protected by a 15 m modified harvest zone. Equipment will not be permitted within the zone unless the soil is frozen.

6.1.3. RIPARIAN ZONE MANAGEMENT

Stream banks and the areas adjacent to Limericks wetlands, swamps and bogs constitute important wildlife habitats. Forestry and recreational development in or adjacent to these areas which may result in the deterioration and/or physical alteration of the riparian zone are discouraged.

Timber management activities in riparian ecosystems will maintain and enhance the riparian zone's ability to achieve the stated objectives, and must be conducted in a manner which minimizes ground disturbance.

Large-sized, standing and downed dead and dying trees are important habitat components for many wildlife species. Effort will be made to maintain these features in riparian buffer zones where their availability may be limited in adjacent stands. The retention of snags in riparian areas will supplement the

¹⁸ The Provincial Policy Statement, Section 2.3, states that natural heritage features and areas will be protected from incompatible development. Development and site alterations on significant wetlands and adjacent lands will only be permitted if it has been demonstrated that there will be no negative impacts on the natural features or the ecological functions for which the area is identified.

number of snags available for cavity dependent species and will preserve potential nest sites for raptors. The retention of large trees near streams and wetland areas will also function to provide a short and long-term supply of fine and coarse woody debris to the water. The application of this strategy will not affect buffer zone widths beyond its influence on buffer stability.

Streams and creeks will be protected in accordance with the OMNR *Timber Management Guidelines for the Protection of Fish Habitat*. These guidelines recommend reserve sizes which are slope dependent ranging from 30 m to 90 m.

Wetlands that support forest stands (generally cedar, green and black ash) will be protected through the application of the appropriate silvicultural ground rules for each species and site condition. Non-provincially significant wetlands that do not support forest stands will be protected by a 15 m modified harvest zone. Equipment will not be permitted within the zone unless the soil is frozen.

Harvest operations in the vicinity of vernal pools (surface area > 200 m²) seepages and intermittent streams will retain crown closure (50-75%) and be conducted in a manner which ensures that felled material is not deposited in the pool. Harvesting is not to be permitted near the edge of vernal pools.

The application of these riparian management strategies will satisfy the following goals: (1) the maintenance of aquatic integrity; (2) the maintenance of riparian ecological diversity; (3) the maintenance of landscape connectivity; (4) the protection of recreation resources; and (5) the assurance of wood production on a sustainable basis in a manner compatible with the management of other resources and values.

6.1.4. MANAGEMENT OF CULTURAL AREAS OF CONCERN

First Nation cultural and traditional values are often identified within the context of forest management plan development as areas requiring special protection and/or management considerations. Identified areas (e.g. medicinal plant gathering sites, traditional hunting areas) are typically set aside and protected from forest operations and detrimental recreational use through policies such as harvest/recreational use exclusion and/or the establishment of modified use or harvest strategies. First Nations values information had not been documented in past plans for Limerick Forest.

For crown lands, the Native Values Collection process is the responsibility of the Ministry of Natural Resources and the Class Environmental Assessment for Timber Management requires that Native values identified in the forest management planning process be protected (Condition 57). While no similar obligation exists for forest management on private lands, the Forest Stewardship Council Certification Standard for the Great Lakes St. Lawrence Region

addresses the legal and customary rights of indigenous peoples related to the use and management of forest lands in Principal 3. The First Nation communities that are believed to have possible traditional land use or current use interests in Limerick Forest are the Mohawks of Akwesasne and the Algonquins of Golden Lake. During the preparation of this FMP, the UCLG Forest Manager contacted these communities in order to ascertain if native cultural values were present in Limerick Forest. No areas of cultural significance were identified.

In future forest management planning, the communities will be invited to provide input and comment to forest management and operating plans by telephone, mail-out notice or other appropriate means. Separate consultations with respect to forest management in Limerick Forest will be undertaken upon written request to the UCLG Forest Manager.

6.1.5. UNCOMMON VEGETATION

Uncommon or rare vegetation types are characterized by their species composition and structure. They typically occupy a limited number of sites, covering small areas. They are naturally infrequent due to rare arrangement of ecological conditions, which result in their establishment, or they may have become rare as a result of human activities. The integration of management on a landscape scale implies an integration of biodiversity maintenance objectives with harvesting. Reserves are a necessary part of such an integrated landscape. As such, stands dominated by regionally uncommon vegetation should be maintained as permanent forest reserve (Ecological Reserve) over the twenty year management period and be excluded from harvest. Three stands have been designated; two stands dominated by hemlock (*Tsuga canadensis*) (Compartments 85d and 169f) and a stand dominated by black cherry (*Prunus serotinas*) (Compartment 138d). Field reconnaissance is required to ascertain the stand species composition and confirm the “Ecological Reserve” status.

Individual trees of uncommon species will be retained during harvest operations where individual tree condition and silvicultural objectives permit. The maintenance and renewal of these species will be addressed in the stand marking prescriptions prepared during annual planning.

6.1.6. SOIL PROTECTION

Wide scale problems of soil erosion and/or compaction or rutting currently do not occur in Limerick Forest. The degree of compaction related to forestry activities and/or motorized recreation is related to a number of factors including the presence and amount of soil organic material, the nature of ground vegetation and root network, soil texture and soil moisture, machinery type and the number of machine passes over a given area.

The objective in implementing the management plan will be to minimize impacts on soil arising from forestry operations and recreational activities. Strategies to minimize soil compaction and rutting will include:

1. Limiting forest operations on susceptible sites (i.e. organic soils, poor drainage) to times of the year when the soil is frozen.
2. Selection of harvesting equipment and methods to reduce ground-bearing pressure.
3. Skid trail layout which confines skidding operations to set network of trails and minimizes the distances traversed.
4. Restrictions on motorized recreational trail use when soils are excessively wet and/or designating trail seasonal use.

Table 30 provides guidelines related to soil compaction in partial cutting harvest operations in the Great Lakes St. Lawrence Region which have been developed by the Algonquin Forestry Authority. It is recommended that these standards be adopted for operations in Limerick Forest. When compaction on a skid trail exceeds the guideline, the trail will be closed until rehabilitation takes place or weather conditions allow the continued use of the trail without further compaction. No new trails will be created to compensate for damaged trails that exceed the guideline.

Table 30. Site Impact Guidelines¹⁹

Skid Trail Category	Maximum Distance of Compaction per Skid Trail	Maximum Distance of Compaction Per Landing	Operational Status
Minor – 15 cm or less compaction	Can be maintained over the length of the trail.	Can be maintained over the entire system of main skid trails.	None
Moderate – 16 cm to 30 cm of compaction	Can be maintained over the length of the trail.	Can be maintained over the entire system of main skid trails.	None
Major – 31 cm to 60 cm of compaction	120 m	480 m	If the maximum distance is greater than 120 m cease operations on an

¹⁹ Source: A Silvicultural Guide for the Tolerant Hardwood Forest in Ontario (1998).

			<p>individual trail. This may include up to 30 m of extreme compaction for an individual trail.</p> <p>If maximum distance is greater than 480 m, cease operations on the landing. This may include up to 120 m of extreme compaction for a landing.</p>
Extreme – compaction greater than 61 cm.	30 m	120 m	<p>If the maximum distance is greater than 30 m, cease operations on an individual trail.</p> <p>If maximum distance is greater than 120 m, cease operations on the landing.</p>

Soil erosion will be minimized by good planning and layout of trails. Water bars will be used to minimize erosion during operations as required.

6.2. Site Nutrient Management

Nutrients enter forest ecosystems primarily through rainfall and the decomposition of soil and rock and leave the forest by leaching, harvesting and some volatilization. Differences in a regional basis are marked due to differences in climate and geologic history. The topic of nutrient cycling in ecosystems is broad and complex and complicated by our imperfect knowledge of nutrient fixation rates, weathering and mineralization of organic matter in forest ecosystems, and tree species nutritional needs. Our current understanding of nutrient cycling in forested ecosystems and the silvicultural and management implications of nutrient cycling suggests that;

- The ecological consequences of timber removals vary for different nutrients according to species, stand density, stand age and site quality as these parameters determine the relative proportions of stem biomass and consequently, the difference in nutrient withdrawals between harvesting techniques.
- Our current knowledge of nutrient fixation rates, weathering and mineralization of organic matter in forest ecosystems, as well as species nutritional needs is fragmentary, making conclusions as to the effect of harvesting on nutrient removals rudimentary (Alban et al., 1978).
- Full-tree harvesting puts more stress on the nutrient pools and the structure and functioning of cycling pathways in forest ecosystems, however, the overall ecological significance, duration and long-term implications of these stresses is less clear.
- Mixedwood site types typically demonstrate shorter nutrient replacement times and are likely less vulnerable to nutrient depletions.
- Harvesting impacts on nutrient pools appear to be greatest on soils that are poorly drained or shallow. Evidence suggests that complete tree removal on such sites can be expected to diminish available forms of nutrients and extend nutrient replacement times.
- It is generally not known if nutrient depletion arising from the removal of forest trees is critical, or is instead balanced by the influx of new nutrients from bedrock weathering or atmospheric deposition. Research to date indicates that the number of years needed to replace nutrient removals by annual inputs from precipitation and weathering is usually less than the harvest cycle for conventional harvests. Inputs from weathering however are expected to be slight in soils which are poorly drained or shallow over bedrock where water residence time may be short. Repeated harvests at time periods shorter than those required to regain pre-cut nutrient levels on these sites can amplify ecosystem deterioration.
- In general conifer species better exploit soils with poor structures and nutrients in mineralized forms than hardwood species due to the large size of conifer fine roots.

Timber harvesting operations and site preparation can reduce nutrients by causing them to be leached, volatilized in the case of fire, or taken from the site during harvest. The following strategies will be implemented to reduce nutrient losses in Limerick Forest:

- Environmentally sensitive sites (i.e. shallow and/or wet soils) identified in the forest inventory are removed from the productive forest land base and excluded from the calculation of the allowable cut since harvesting on

these sites appears to diminish available forms of nutrients and extend nutrient replacement times.

- The retention of logging slash and residues on poor sites (site class 3 stands) is recommended. This debris will act as a nutrient sink from which nutrients gradually become available to the system through the process of decomposition.
- The use of full tree harvest systems will be limited (where economically feasible) to site class 1 and 2 stands.
- Site preparation techniques that mix organic materials with surface mineral soil will be favoured over treatments that remove slash and humus.
- Harvest operations will retain stand vertical structure where possible and appropriate.

6.3. The LFAC Nutrient Management Policy

Nutrient management in Limerick Forest has been a topic of considerable discussion amongst the members of LFAC. In response to concerns about nutrient loss arising from forest management operations, and a concern that nutrient levels within Limerick Forest have declined significantly since pre-settlement times the LFAC Chairs Committee endorsed a nutrient management policy for inclusion in this forest management plan with the objective of “retention and accretion of mineral nutrients in the forest ecosystem with a goal of achieving pre-settlement nutrient levels”. The policy is as follows:

“Recognizing that this nutrient management policy is an innovation in Ontario Forestry, an on-going analysis shall be undertaken to track the financial, environmental and regulatory impacts and implications of the following practices:

- Balance nutrient outflow (from harvest) with nutrient inflow.
- Gradually increase the nutrient inflow and retention to promote a healthy successional forest.
- Study the nutrient status of Limerick Forest on an ongoing basis and to utilize the accumulated information as a model to guide future forest management decisions.

While it is beyond the scope of this management plan to provide details on the design and delivery of the proposed nutrient management program the following is intended to offer some guidance with respect to broader issues which may be encountered and warrant consideration.

- Undoubtedly, the full scale implementation of this policy imposes a requirement on the UCLG and LFAC to commit time, human and financial resources to a multi-year program of research and field experimentation. The associated environmental and economic implications of policy implementation must also be fully understood by all parties. For example, existing environmental regulations and guidelines with respect to the use of inorganic and organic fertilizers must be respected. Budgets must be allocated for trial plot establishment and maintenance (re-measurement) and the cost of removing areas of productive forest from the eligible harvest area must be also evaluated, recognizing that future harvests of trial plots may yield greater economic returns than those that would have been otherwise realized as a result of increases in product value arising from increased tree diameters.
- Field trials should be designed and delivered in a manner which will enable the analysis, evaluation, interpretation and comparison of any observed results. Stand conditions must also be carefully considered in the selection of areas for trial treatments. For example, nitrogen fertilization increases needle biomass and fertilized trees with small diameters are prone to breakage (due to increased crown weight) in areas of heavy wet snow.
- Environmental, economic and social benefits arising from the nutrient management policy should be documented to guide future forest management activities in the forest.
- Initial efforts related to the implementation of the policy should focus on the collection and characterization of baseline data (i.e. current nutrient status of species/stands and the characterization of the pre-settlement nutrient status of eastern Ontario forests), and the gathering of information related to field trial design methodologies, soil nutrient monitoring techniques (e.g. foliar analysis) etc. With respect to the delivery of the field component of the policy (i.e. site selection, establishment of field trials etc.) factors such as duration of trees growth response, the efficiency with which added nutrients are held by the forest ecosystem will require that field trial areas within productive forest stands be removed from the eligible harvest area for at least a cutting cycle. The low level of forest management activity occurring in Limerick Forest will also limit the number of sites on which the response of thinned stands to nutrient applications can be calibrated.

6.4. Management of “Proposed Old Growth Reserves”

The Ontario Government has not yet developed a definition of old growth forest specific to Great Lakes St. Lawrence Forest or defined a provincial policy for the

conservation and management of old growth forests in Southern Ontario. The OMNR general definition for old growth is as follows:

“Old growth ecosystems are characterized by the presence of old trees and their associated plants, animals and ecological processes. They show little or no evidence of human disturbance” (OMNR 1994).

Work is on-going in the province to provide estimates of old growth age-of-onset and duration by ELC ecosites or ecozone and forest tree species (Table 31).²⁰

Table 31. Old Growth Age-of-Onset and Duration For Forest Ecosites in Ecoregions 6E and 7E.

Ecosites	General Species Associations	Common Soil and Site Description	Old Growth Age-of-Onset	Old Growth Forest Stand Duration
FOC1	White Pine, Red Pine, Jack Pine	Dry to fresh, shallow over bedrock, sandy to course loamy soils	Pw - 120	Pw – 450+
FOC2	White Cedar, Red Cedar	Dry to fresh, shallow over bedrock, sandy to course loamy soils	Cr – 110 Ce - 110	Ce – 1000+ Cr – 500+
FOC3 FOC4	White Cedar Hemlock	Fresh to moist, sandy to fine loamy soils	Ce – 110 He - 140	Ce – 1000+ He – 600+
FOM1 FOM2 FOD1	Oak-Pine; Oak- Hardwood	Dry to fresh, shallow over bedrock, sandy to course loamy soils	Or – 120 Ow – 120 Ob - 120	Or – 200+ Ow -200+ Ob – 300+
FOD4-6	Tolerant-Mid- Tolerant Hardwoods	Dry to moist, wide range of soil textures	Mh -120 Be-120 Bd -120	Mh – 200+ Be – 300+ Bd – 200+

²⁰ Age-of-Onset and Duration is not provided for Poplar species.

FOM3-7	Tolerant Hardwood- Conifer Mixedwood	Dry to moist, wide range of soil textures	Mh – 120 He - 140	Mh – 200+ He – 600+
FOD7-9	Lowland- Transitional Deciduous	Fresh to moist, sandy to clayey soils often adjacent to riparian areas	Ash - 120	Ash – 200+
SWD1-7 SWM1-6	Lowland Hardwoods and mixedwood (forested wetlands)	Moist mineral, peaty phase to wet organic soils	Bur Oak – 120 Ms – 120 Ash - 120	Bur Oak – 200+ Ms – 200+ Ash – 200+
BOT1, FET1 SWC1-4	Lowland Conifers (forested wetlands)	Moist mineral, peaty phase to wet organic soils	Insufficient data	Insufficient data

Source: Old Growth Forest Definitions for Ontario (OMNR 2003).

As can be seen from Table 31, tree ages between 100 and 400 years are typically required before stands transition to the old growth stage. The following structural characteristics are commonly associated with old growth:

- A reverse J-shaped diameter distribution.
- A variety of tree species and other vegetation.
- Many large old trees, often at wide spacing.
- A relatively continuous vertical distribution of foliage.
- Standing dead trees (snags).
- Large logs on the ground.
- A relatively steady-state equilibrium volume where growth equals mortality.
- A relatively steady state nutrient condition where a large amount of internal recycling occurs.
- Specific composition of the forest community described through the occurrence of changing abundance of certain associated species (e.g. lichens).

The Forest Stewardship Council's standards for 'Well Managed Forests in the Central and Southern Great Lakes-St. Lawrence Forests of Ontario' defines old growth as follows "*Old growth forest ecosystems are characterized by the presence of old trees and their associated plants, animals, and ecological processes. They show little or no evidence of human disturbance*". The criterion in the GLSL standard with respect to late seral stage, old growth or mature forests requires that "*Remnant pockets of "untouched" mature natural forest that display no known signs of past logging activity or other human disturbance should be retained*" and specifically with respect to white pine that "*Old growth white pine stands (>120 years) are not cut where they represent less than 10% of the white pine working group in the area covered by the management plan.*" The standard also requires that special attention (as described in Criterion 6.3) be given to ensure the protection and retention of "*old growth of many of the commercially targeted species in the GLSL forests*".

Oliver and Larson indicate that "The distinction between old growth and multi-cohort stands can be arbitrary" and that "true old growth stands have probably never been common because major disturbances occur quite frequently in most areas compared to the life spans of trees. Trees become more predisposed to disturbances as they grow larger, and so stands of progressive older larger trees are increasingly rare". Further, the development of old growth through the biological process of stands growing for very long time periods in the absence of external disturbances does not necessarily lead to the popular conception of old growth stand structures of large, majestic trees. The development of old growth may not contain large or majestic trees if the species involved are short-lived and do not grow large. Poor sites will decrease the time before overstorey trees senesce and the transition old growth stage is reached.

Uneven-age management strategies which retain stand structures and diameter distributions within the stand, and the relatively long time horizons for fire and catastrophic wind throw disturbance regimes within deciduous and mixed forest types may reduce the requirement for conservation strategies to be implemented for late seral stage management. It must also be recognized that it is also impossible to retain current old growth stands permanently. All stands are subject to disturbances as there is a natural disturbance cycle typical of each stand type and location.

The LFAC Ecology Sub-Committee proposed that 387 ha (10% of the total forested area) be designated as "Proposed Old Growth Reserves" based on the definition of old growth in Limerick Forest as "*A natural forest stand which is at least 80 years old, containing trees at least 120 years old with undisturbed ground vegetation.*" At the time of the preparation of this FMP the old growth policy had not been endorsed by LFAC for consideration by the UCLG due to ongoing discussion and debate as to; 1) the requirement for the adoption of strategy in LF, 2) the suitability of LF stands as proposed old growth reserves in

the context of the local and regional forest landscape, 3) the candidate site selection criterion and amount of area proposed, and 4) the implications of arising from the adoption of an “old growth” policy on other forest stakeholders (e.g. commercial forestry interests and recreationalists).

During 2002, 2003 and 2005, 637 hectares were inventoried to verify forest inventory data, assess the suitability of the stand to meet old growth management objectives (stand structures, species composition, etc.), and evaluate the potential of the stand to maintain structures for periods beyond the economic rotation. Table 32 presents a listing of the candidate “Proposed Old Growth Reserves” stands. These areas have been designated as “Ecological Reserve” in the forest inventory and were excluded from the allowable cut calculation. This status removes the areas from active forest management for the twenty-year planning horizon.

Table 32. PROPOSED OLD Growth Reserve Stand List

Working Group	Tract	Stand Id.	Age Class	Area	GTV (m³)	% of Working Group Area
Hard Maple						
MH	L. North	11b	61 - 80	13.0	1,857.6	0.3
	L. South	53b	81 - 100	10.1	1,903.5	0.2
	Grenville	96c	61 - 80	2.8	379.6	< 0.1
	Cranberry Lake	144f	101 - 120	1.9	0	< 0.1
	L. South	145f	61 - 80	6.1	1,204.9	0.1
	L. South	40b	61 - 80	1.4	249.5	< 0.1
	L. South	55b	61 - 80	8.4	1,525.7	0.2
	Leeds	89a	61 - 80	5.2	0	< 0.1
Sub-total:				48.9	7,120.7	
White Cedar						
CE	Cranberry Lake	168e	81 – 100	6.5	1,080.3	0.7
	L. South	51b	61 – 80	11.6	1,484.8	1.4
	L. South	53a	61 – 80	11.5	1,987.8	1.4
	L. North	10d	81 – 100	3.6	1,227.2	0.4
	Cranberry Lake	160b	61 – 80	5.8	1,173.9	0.7

	L. North	170b	61 – 80	11.9	0	1.5
	L. North	19e	81 - 100	1.7	121.2	0.2
	L. North	20e	41 - 60	2.6	422.4	0.3
	L. North	26b	81 - 100	6.1	1,018.7	0.7
	L. South	51c	81 - 100	3.1	887.5	0.4
HE	Leeds	169f	61 - 80	1.3	432.9	22
	North Augusta	85d	101 - 120	4.6	1,761.7	78
Sub-total:				70.3	11,598.5	
Soft Maple						
MS	L. South	75b	61 – 80	16.7	3,342.4	3.5
	L. South	80b	81 – 100	29.5	4,598.3	6.2
	Leeds	91e	61 – 80	8.4	1,061.4	1.8
	Leeds	119g	61 – 80	8.7	1,690.3	1.8
	North Augusta	120g	81 – 100	14.0	3,717.9	2.9
	Cranberry Lake	126f	61 – 80	5.6	0	1.2
	L. South	135e	81 – 100	2.9	0	0.6
	L. South	145b	61 – 80	7.3	1,122.8	1.5
	L. South	145c	81 – 100	6.1	632.5	1.3
	L. South	145e	81 – 100	17.3	168.5	3.6
	Cranberry Lake	156b	61 - 80	10.1	0	2.1
	L. South	171a	81 – 100	2.4	657.9	0.5
	L. South	171d	81 – 100	9.6	0	2.0
	L. North	33d	101 - 120	4.0	741.3	0.8
	L. South	79c	61 – 80	14.7	2,236.6	3.1
	Leeds	89c	61 - 80	3.1	0	0.6
Sub-total:				160.4	19,969.8	33.8
Poplar						
PO	Grenville	106h	81 – 100	2.5	559.3	1.1
	L. South	136c	61 – 80	1.8	307.2	0.8
	L. North	20i	41 – 60	6.7	0	3.0
	Leeds	89b	81 - 100	2.4	0	1.0

Sub-total:				13.4	866.5	5.9
Other Hardwoods						
AB	L. South	139a	61 - 80	14.8	1,023.5	7.2
	Cranberry Lake	149g	61 - 80	6.9	1,142.6	3.3
	Cranberry Lake	156a	61 - 80	2.7	0	1.3
	L. South	35a	61 - 80	3.9	1,032.0	1.9
	L. South	48b	61 - 80	15.7	0	7.6
Sub-total:				44.0	3,198.1	21.3
BW	L. South	145d	81 - 100	4.4	785.2	38.6
Sub-total:				4.4	785.2	38.6
OH	L. North	10f	61 - 80	3.2	216.2	13.4
	L. South	136e	61 - 80	11.6	978.5	48.7
	Cranberry Lake	152f	61 - 80	8.0	1,062.1	33.6
Sub-total:				22.8	2,256.8	95.7
White Spruce						
SW	Cranberry Lake	164c	21 - 40	2.9	263.7	0.6
	Cranberry Lake	164f	81 - 100	3.9	386.3	0.9
Sub-total:				6.8	650.0	1.5
Other Conifers						
BF	Cranberry Lake	152e	41 - 60	3.3	0	100
				3.3	0	100
Wetland	L. South	55a		20.7	0	1.2
Sub-total:				20.7	0	1.2
Total:				395.0	46,445.6	

Appendix I provides maps depicting the location of the selected Proposed Old Growth Reserves stands.

The Ecology Sub-Committee proposed the following management policies and procedures for the management of these stands;

- All designated old growth stands be exempt from silvicultural activities permanently, with the exception of emergency measures (i.e. insect disease or fire control) or special situations (e.g. wind throw salvage).
- Safety measures (i.e. felling of dangerous trees along trails) be permitted.
- No new trails or developments would be permitted in Old Growth, unless directly related to the old growth itself (i.e. trail to an old growth stand).
- Proposed activities within old growth stands would be subject to the LFAC environmental assessment procedure.
- Existing activities and facilities in old growth stands are to be monitored and modified if necessary.

At the time of the preparation of this FMP the old growth policy had not been endorsed for consideration by the UCLG due to ongoing discussion and debate as to; 1) the requirement for the adoption of strategy in LF, 2) the suitability of LF stands as proposed old growth reserves in the context of the local and regional forest landscape, 3) the candidate site selection criterion and amount of area proposed, and 4) the implications of arising from the adoption of an “old growth” policy on other forest stakeholders (e.g. commercial forestry interests and recreationalists).

Clearly, additional time and effort is warranted to build consensus on the issue of old growth management in Limerick Forest. It is also apparent from Table 32 that for most of the candidate sites the age of old growth on-set is decades away. The following activities are recommended for implementation during the first five-year term of the FMP.

- 1) The Ecology Sub-committee should review the forest inventory ledger for possible removals or inclusions to the 2007 candidate area list given that the forest inventory information was updated and/or revised for the preparation of the FMP. It is advisable that some younger age forest types be included in the candidate stand pool.
- 2) The methodology used for the selection of proposed old growth reserves should be reviewed/revisited in the context of other regional and/or provincial initiatives to identify old growth or potential old growth areas to
 - 1) approximate the natural age class distribution of eastern Ontario forests
 - 2) assess the suitability of the stand to meet old growth management

- objectives (stand structures, species composition, etc.), and 3) to evaluate the potential of selected stands to maintain structures for periods beyond the economic rotation.
- 3) Candidate stands for retention and recruitment should ideally occur in protected locations, where the potential of fire or other natural disturbance is reduced. Riparian buffer zones, ANSIs or other reserves are ideal areas for these stands.
 - 4) Pending the outcome of the review of stands, selected stands will be classified as “ecological reserve” in the forest inventory ledger.

6.5. Guidelines for Site Protection During Forest Management Operations

Under some site conditions, the use of certain practices or equipment during timber management operations has a greater potential to cause negative or undesirable environmental impacts such as compaction, rutting, loss of nutrient capital, disruption of lateral water flow, loss of surface organic matter and erosion. The magnitude and duration of these impacts will vary with the nature and timing of the activity, site conditions, and the cumulative effects of adjacent land uses. The following sections outline management standards and practices to be adopted in Limerick Forest to mitigate unwanted negative impacts arising from forest management operations.

6.5.1. LOGGING DAMAGE

Operator training, good judgment, and care in the conduct of harvesting, and other forestry activities will mitigate negative site impacts of planned operations. Typically, logging damage to the stems and roots of residual trees increases with the size of the skidding equipment and the length of the load.

Table 33 presents stand level damage standards for partial harvesting systems in hardwood forests to be adopted for operations in Limerick Forest.

Table 33. Stand Level Damage Standards for Partial Harvesting Systems

Damage Type	Standard
Damage to Residual Stems	After harvesting 85% of the residual basal area (10+ cm) should be free of major damage and 90% of the residual acceptable growing stock should be free of major damage. Incidence of damage should not be concentrated in any one size class.
Damage to Regeneration	Minimum stocking and density regeneration standards as detailed in the silvicultural ground rules must be maintained following release operations (i.e. removal cuts in shelterwood harvest systems).
Skid Trail Coverage	A minimum of 70% of the ground area in uniform shelterwood areas and 80% in selection cut areas is to be skid trail free.

Source: A Silvicultural Guide for the Tolerant Hardwood Forest in Ontario (1998)

6.5.2. LOSSES OF PRODUCTIVE FOREST LAND

Landings, skid trails, and slash piles diminish productive forest area. Area losses will be minimized through the application of management practices, which maximize skid trails, minimize the area designated to landing areas, and reduce slash pile areas by burning or scattering.

6.5.3. LOGGING SLASH

Logging slash should be lopped so that it lies near to the ground and, if possible, spread evenly over the cut area. These practices serve to speed up decomposition, reduce soil nutrient losses and enhance the survival of tree seedlings by protecting them against extremes in temperature and moisture.

6.5.4. SKID TRAIL LAYOUT

Skid trail layout and location must be addressed within the context of annual cut plans to minimize site damage. Effort should be made to both minimize distances traversed and the number of trails required. Standards for skid trail coverage are provided in Table 33. The existing extensive network of roads and trails within Limerick Forest should minimize the number of new trails that need to be developed.

6.5.5. ROAD LOCATION & WATER CROSSINGS

All road and water crossings must conform to current provincial regulations. The development of a GIS-based water crossings inventory is recommended during

the first five year operating period. Monitoring of water crossings to mitigate the likelihood of washouts should be undertaken between periods of active road use.

6.6. Wildlife Management

The application of silviculture within a forest stand will affect the diversity and stability of the forest ecosystem, and therefore directly influence the ability of a forest stand to support and/or maintain wildlife populations. Forestry operations have both beneficial and detrimental impacts on habitat quality and quantity depending on the habitat, and/or the food and shelter requirements of the species affected. It must also be recognized that harvest impacts vary both spatially and temporally over the landscape. Throughout the timber rotation, both timber and wildlife objectives may be realized to the mutual satisfaction of all resource users.

Silvicultural systems (shelterwood or clear cutting) that yield sapling size stems of intolerant species are preferred in terms of upland game or ungulate production provided adequate areas of winter cover are maintained. Selection cutting systems generally produce more limited wildlife habitat as a balanced diameter distribution and relatively even regeneration to shade tolerant species is maintained. Although the dietary diversity available to herbivores is diminished with the perpetuation of the climax forest, selection cutting is considered beneficial to other wildlife species such as terrestrial furbearers and non-game birds. The maintenance of cull timber in selection harvest systems for nesting, denning or perching sites is also desirable.

The detrimental impacts of harvesting may include fragmentation of the forest which results in a reduction in food, cover and/or nesting/denning sites, increased erosion and soil compaction, ecosystem simplification, etc.

The habitat diversity of a forest can be measured both horizontally (i.e. the spatial pattern of habitats over an area) and vertically (i.e. the number of vertical strata in the forest). The diversity of the forest, with respect to a particular species, depends upon the scale at which it is viewed by that species (Hunter, 1990). Different animal species have different requirements for habitat diversity; some can live in a variety of habitats, some require a diverse habitat, some require a uniform habitat. For species with small home ranges, a mature forest with many gaps may represent a spatially diverse habitat. Diversity of species with larger home ranges however, may be a mosaic of stands of varying ages and species composition (Hunter, 1990). The forest that results from timber harvesting will not be the same as the forest that existed prior to harvest; there will be a change in density and species composition after harvesting. It is generally not possible to accommodate the needs of all wildlife species in an area following a disturbance due to the habitat requirements of each species.

Wildlife species can for the most part adapt to disturbances created by timber management activities provided that the pattern of harvesting mimics natural events as much as possible (Arnup et al. 1988, Thompson and Welsh, 1993). In the years immediately following traditional clear cutting vertical habitat diversity is almost non-existent, as the overstorey is completely removed. The reduction of vertical diversity is not as significant in silvicultural systems which retain standing timber (i.e. selection, shelterwood systems).

Horizontal habitat diversity will vary as a function of the size and arrangement of cuts. As a general rule, timber management that creates forest fragments smaller than a species home range will result in a reduction in abundance of that species (Boyle, 1991). Several authors now advocate using a range of harvest patterns, including large clear cuts to create landscape-level diversity. Patch cuts or small clear cuts can be used to create a mosaic of stands of different ages and species composition creating mid-scale diversity.

Shelterwood harvesting generally produces more vertical diversity through the retention of standing trees until the final cut. The retention of trees suitable for cavity nesting birds and other animals will provide in-stand structural diversity. The horizontal diversity of habitats in shelterwood harvest areas is dependent on the size and arrangement of cut and uncut areas.

Selection cutting creates discontinuities in tree size (or groups of trees) and thus ensures that there will be trees of many different ages in a stand. Both group and individual tree selection cause fine scale disturbance, so stand level vertical structure is usually high edge and fragmentation effects are often low, and stand heterogeneity is high relative to clear cut or patch cut stands. Single tree selection allows for the greatest vertical diversity as it provides more canopy layers than other harvesting systems. Group selection lessens the continuity of vertical habitat, but increases the horizontal diversity; there is more understorey vegetation, fewer openings and plant growth is more clumped. An even distribution of low understorey vegetation results from individual tree selection which should generally support low but constant populations of terrestrial wildlife.

6.6.1. WILDLIFE MANAGEMENT OBJECTIVE

The wildlife management objective for Limerick Forest is

“To maintain wildlife populations at levels which provide for species continuance and provide opportunities for wildlife harvesting, aesthetic appreciation (e.g. bird watching), and education and scientific investigation”.

6.6.2. WILDLIFE MANAGEMENT STRATEGIES

This objective will be achieved through the attainment of the following strategies:

- A diversity of forest cover types and stand structures will be maintained to provide a diversity of wildlife habitats.
- The mandatory application of provincial guidelines for wildlife management (where appropriate) in forest management planning and operations.
- There will be no loss of threatened, endangered, rare or vulnerable species habitat (plant or wildlife).
- Habitat features desirable to wildlife will be preserved where feasible and appropriate.
- Forest operations will be conducted in a manner consistent with prescribed wildlife management objectives, provincial wildlife management guidelines and the protection of rare, threatened or vulnerable species and their habitat.
- A values layer which contains information on wildlife values will be maintained in the LF database.
- Wildlife habitat improvement programs and initiatives (i.e. water impoundment projects) with community groups and partner organizations will be fostered and promoted.

6.7. Wildlife Management Guidelines

The protection of wildlife values will be addressed during forest management planning and operations by the mandatory application of forest management guides (where appropriate) developed by the OMNR. Forest management activities will be conducted in a manner consistent with planned silvicultural, area of concern, and wildlife management objectives and strategies.

The effectiveness of the provincial guide strategies and other silvicultural strategies in achieving wildlife habitat management objectives will be monitored by UCLG staff in conjunction with the delivery of regular management activities in the Forest. The sections below present guidelines to be adopted during annual tree marking operations in Limerick Forest.

6.8. Stick Nest Management Guidelines

Stick nests located in Limerick Forest will be protected according to the prescriptions provided below. These prescriptions have been developed for species known or believed to breed in Limerick Forest.

All stick nest trees will be marked with a blue dot during tree marking operations and their location recorded in a global positioning system (GPS) for input into the LF GIS database. Value maps must be updated to record the location of the nest, its status (i.e. inactive or active) and species. When there is doubt regarding nest identification the OMNR Area Biologist or a suitably qualified LFAC volunteer should be consulted to inspect and identify the nest.

6.8.1. COOPER'S HAWK NESTS

Management of Cooper's Hawk nest sites will maintain forest cover around the nest site. This will be achieved by the establishment of a 150-metre reserve around the nest site coupled with an additional 150-metre modified harvest area. A crown closure of at least 70% must be maintained in the modified area and no logging activity is to occur between March 1st and July 1st. Satellite nests and known nests that have been inactive for more than 5 years will be protected with a 20 metre reserve. Any trail or road construction in the AOC must be kept to a minimum.

6.8.2. GOSHAWK NESTS

Management of Goshawk Hawk nest sites will maintain forest cover around the nest site. This will be achieved by the establishment of a 50-metre reserve around the nest site coupled with an additional 100-metre modified harvest area. A crown closure of at least 70% must be maintained in the modified area and no logging activity is to occur between March 1st and July 31st. Satellite nests and known nests that have been inactive for more than 5 years will be protected with a 20 metre reserve. Any trail or road construction in the AOC must be kept to a minimum.

6.8.3. OSPREY NESTS

Management of Osprey nest sites will be achieved through the maintenance of a 150-metre reserve and 150-metre modified harvest area around the nest. Selection or shelterwood systems with a timing restriction of no operations between March 1st and July 31st would be permitted. At least three super canopy trees must be maintained in the modified harvest. A 50-metre reserve will be established around old nests for a period of at least 5 years.

6.8.4. HERON ROOKERIES

Management of heron rookery sites will be accomplished by the maintenance of a 150-metre reserve around the heronry and the establishment of an additional 150-metre modified harvest area. No harvesting is permitted in the modified buffer area between April 1st and August 15th. The maintenance of vegetation in the area immediately around the heronry should reduce disturbance to, and predation of the colony. Adjacent tree cover may also provide additional potential nesting sites and some protection from adverse weather.

In instances where the rookery is more than 150 metres from the treed edge, a 30-metre reserve from the shoreline will be maintained. No trails, roads or landings will be allowed in the reserve. Activity in the modified area is to be minimized.

6.8.5. BROAD-WINGED / RED-SHOULDERED/ SHARP SHINNED HAWK NESTS

Management of nest sites will be accomplished through the maintenance of forest cover around the nest site during breeding season. A 150-metre modified harvest area will be established around active nests between March 1st and July 31st. Selection and/or shelterwood harvesting will be permitted during the non-breeding season. Trees adjacent to the nest will not be candidates for harvest in order to maintain canopy closure.

6.9. Maintenance of Cavity Trees and Snags

Cavity trees and snags are important as perching, foraging, nesting, roosting and denning sites for many species of wildlife. A minimum of 6-12 cavity/snag trees (or potential cavity/snag trees) will be retained per hectare (ideally trees should be larger than 25 cm dbh). Standing dead trees should be retained on site wherever possible provided they do not pose a safety risk. The general low quality of hardwood trees within Limerick Forest, poor markets for low quality hardwood material and the use of harvest systems which retain residual trees can be expected to facilitate the achievement of cavity and snag tree retention targets for the planning period.

6.10. Maintenance of Mast Producing Trees

Oaks, black cherry, basswood, butternut and ironwood are all important mast producing trees in Limerick Forest. Efforts to maintain or enhance the mast potential within stands will be achieved by retaining a minimum of 8 mast producing trees per hectare (where available). Larger trees (> 25 cm dbh) with

large vigorous crowns will be preferred leave trees. When marking stands, the retention priority for mast trees will be as follows; hickories, butternut, oaks, beech black cherry, basswood and ironwood.

6.11. Retention of Conifer Trees within Hardwood Stands

Approximately 10% of the wildlife that inhabit tolerant hardwood forest stands use conifer trees as cover (OMNR, 1998). Where feasible individual conifer trees or pockets of conifer will be retained and perpetuated in forest management.

The following guidelines will apply:

- In instances where there are fewer than 10 large conifers/ha ($< 2 \text{ m}^2/\text{ha}$) manage the stand to retain a minimum of 5 conifers per hectare.
- In instances where there are more than 10 large conifers/ha ($>2 \text{ m}^2/\text{ha}$) manage the stand to retain a minimum of 10 conifer trees/ha.
- Retention strategies should favour larger diameter stems over smaller diameter trees and favour long lived species (e.g. hemlock, spruce, pine) over balsam fir.
- Retain clumps of trees where possible.

6.12. Deer Wintering Areas

Wolford Bog, the Kemptville Creek Complex and the Charlieville Creek Wetland Complex are all recognized as a locally significant winter deer yarding areas. These areas are excluded from timber management operations and a modified management area has been established at the wetland boundaries. Pockets of conifer and/or cedar within and/or adjacent to these areas will be retained during stand marking operations. Additionally, the silvicultural management guidelines for the cedar working group stands advocate winter harvesting to provide browse (logging residues) for yarding deer and the provision of continuous cover within stands for wildlife.

7.0. RECREATION & TOURISM MANAGEMENT

Limerick Forest is a multiple use forest with a long history of recreational use by the citizens of the UCLG. Public demands for the provision of recreational opportunities in Limerick Forest can reasonably be expected to increase over the management period with increased population growth in the United Counties and increased awareness of the Forest as a recreational area.

Recreation management issues are typically related to trail deterioration arising from overuse and/or inappropriate trail use and the desire of some hikers and other recreationalists to restrict motorized access either seasonally or permanently within some compartments. Past forest management plans did not prescribe land use designations for recreational use.

The LFLRP does provide management direction for recreational use through the designation of multi and single recreation use DUAs, the prescription of compatible secondary uses and general policies for recreation within all DUAs. The Long Range Plan approves recreational use within all DUAs with the exception of motorized recreation within ecological protection areas. Specific recreational activities may be restricted or limited in Limerick Forest in instances where public safety and well-being is a concern.

Recreational activities occurring in Forest are varied and include;

- Motorized trail use (i.e. dirt bike & ATV riding).
- Non-motorized trail use (hiking, horseback riding, X-country skiing, snowshoeing, mountain biking).
- Geocaching.
- Bird watching, nature photography and observation.
- Hunting.

Such passive uses of Limerick Forest are entirely appropriate and should be promoted. Most activities are compatible and/or accommodated (i.e. shared non-motorized and motorized trail use).

Seasonal restrictions (e.g. no motorized vehicle use on trails during the spring thaw, no permanent tree stands for deer hunting) are posted on signs at the trailheads, in parking and staging areas and on occasion in local media. Compliance is voluntary and access roads and trails are not regularly monitored for incidences of non-compliance with the posted directives. The Forest Manager and members of the Recreation subcommittee are of the opinion that additional measures to control recreation use and access by physical barricades (such as gates, ditches, berms and rock piles) are not currently warranted.

7.1. Recreation & Tourism Management Objectives and Strategies

LFAC has recognized the growing significance of recreational use in Limerick Forest and the importance of establishing recreational use policies within the broader context of a forest management policy framework for Limerick Forest. The provision of a range of quality recreational and outdoor educational opportunities is a significant element of the LFLRP and its third objective relates specifically to recreation:

“Provide a wide range of quality recreational opportunities in a safe environment”.

The LFLRP proposes the following strategies for objective achievement:

1. Identify and design a recreational trail system that will meet the needs of all current and potential users.
2. Identify other (non-trail) type recreational opportunities (e.g. tobogganing, wildlife viewing, picnicking, camping).
3. Prepare a code of conduct for trail and other recreational users.
4. Continue to provide traditional recreational past practices such as hunting.

Zones of multi and single recreational use have been identified in the LFLRP and general management policy statements are provided. Within the context of this forest management plan the provision of a wide range of quality recreational opportunities will be accomplished through the attainment of the following objectives;

1. To maintain a diversity of forest cover types and stand structures to provide for a diversity of recreational uses.
2. To ensure that timber management activities (e.g. harvest, renewal, and maintenance) are undertaken in a manner, which eliminates or minimizes conflicts with other users of the forest.
3. To ensure that recreational uses do not degrade or adversely affect the forest, its access roads and trails or other values.
4. To promote the use of Limerick Forest as a public resource for forestry and natural environment education.
5. To provide a safe environment for the public use of Limerick Forest.
6. To maintain the road and trail network of Limerick Forest in sufficient condition for recreation use.

7. To collect data and information on the outdoor recreational use of Limerick Forest for incorporation into the forest management and land-use planning process and to support future UCLG tourism development initiatives.

The following strategies will be adopted during the management plan period to maintain and enhance recreational opportunities in Limerick Forest.

- Develop a trail density model to quantify and qualify recreational trail densities within Limerick Forest tracts to provide guidance with respect to strategic planning for future recreational trail development.
- Annual monitoring and reporting on trail conditions will be undertaken. Road and trail maintenance work will be undertaken as financial and human resources permit. Maintenance requirements associated with public safety issues and environmental protection will be acted upon on a priority basis.
- Seasonal/permanent use restrictions (voluntary/mechanical) will be implemented on designated trail systems on an as required basis.
- Annual public relations programs (signage, brochures, media campaigns) will be implemented to encourage the appropriate public use of Limerick Forest, promote safety, and reduce incidences of vandalism and illegal dumping.
- Trail additions or relocations will be based on site assessments of the potential impacts on other values of Limerick Forest. All new trails or trail segments will be constructed to standards appropriate to the trail type.
- Trail locations (including additions and relocations) will be maintained in the GIS.
- Sports hunting will be permitted in accordance with annual hunting regulations.
- It is recommended that the UCLG seek legal advice and develop a policy with respect to UCLG 3rd party liability which may arise from the public use of UCLG properties or facilities.
- Partnerships with local community and/or provincial interests, and research that contributes to environmental and recreation management will be encouraged to assist in the achievement of plan objectives.
- Data on recreational use and preferences will be collected to assist in the development of recreation, forest management and tourism development strategies.

7.2. Recreational Trail Use and Management Guidelines

Most recreational use of Limerick Forest can be associated with its network of access roads and trails. Recreational trail use may be either motorized or non-motorized (hiking, horseback riding, mountain biking etc.). The use of trails and roads by all terrain vehicles (ATVs) is the most popular recreational trail use. Motorized use of the trails is regulated by provincial regulation (i.e. Highway Traffic Act, Motorized Snow Vehicle Act, Off Road Vehicle Act). Use is restricted to existing trails, the maximum allowable speed is 50 km/hr, and motorcycles and off-road vehicles must comply with the noise limits and standards set by the Canadian Motorcycle Association.

Initially the road and trail network was developed to support forest management activities (e.g. planting, stand maintenance, forest protection and harvesting), however, more recently, trail development has been related to the provision and/or improvement of recreational opportunities. Table 34 provides a listing of the approximately 180 km of mapped roads and trails within LF by tract.²¹

Table 34. Existing Trail Designations and Distances by Tract

Limerick Forest Tract	Trail Designation	Distance (km)
Limerick South Tract	Forest Road	40.5
	Trail	40.5
Limerick North Tract	Forest Road	29.9
	Trail	2.2
Limerick North Augusta Area	Forest Road	11.0
	Trail	8.5
Limerick Cranberry Lake	Forest Road	18.5
	Trail	7.5
Leeds County	Forest Road	3.6
	Trail	6.0
Grenville County	Forest Road	10.5
	Trail	1.1
Total:		179.8

Source: GIS Digital Database

Trail systems currently within the GIS database are shown in Figures 19-24.

²¹ For the purposes of this FMP, a forest road is a road capable of being driven by a 4 wheeled motorized vehicle. A trail is typically a less than 1m wide.

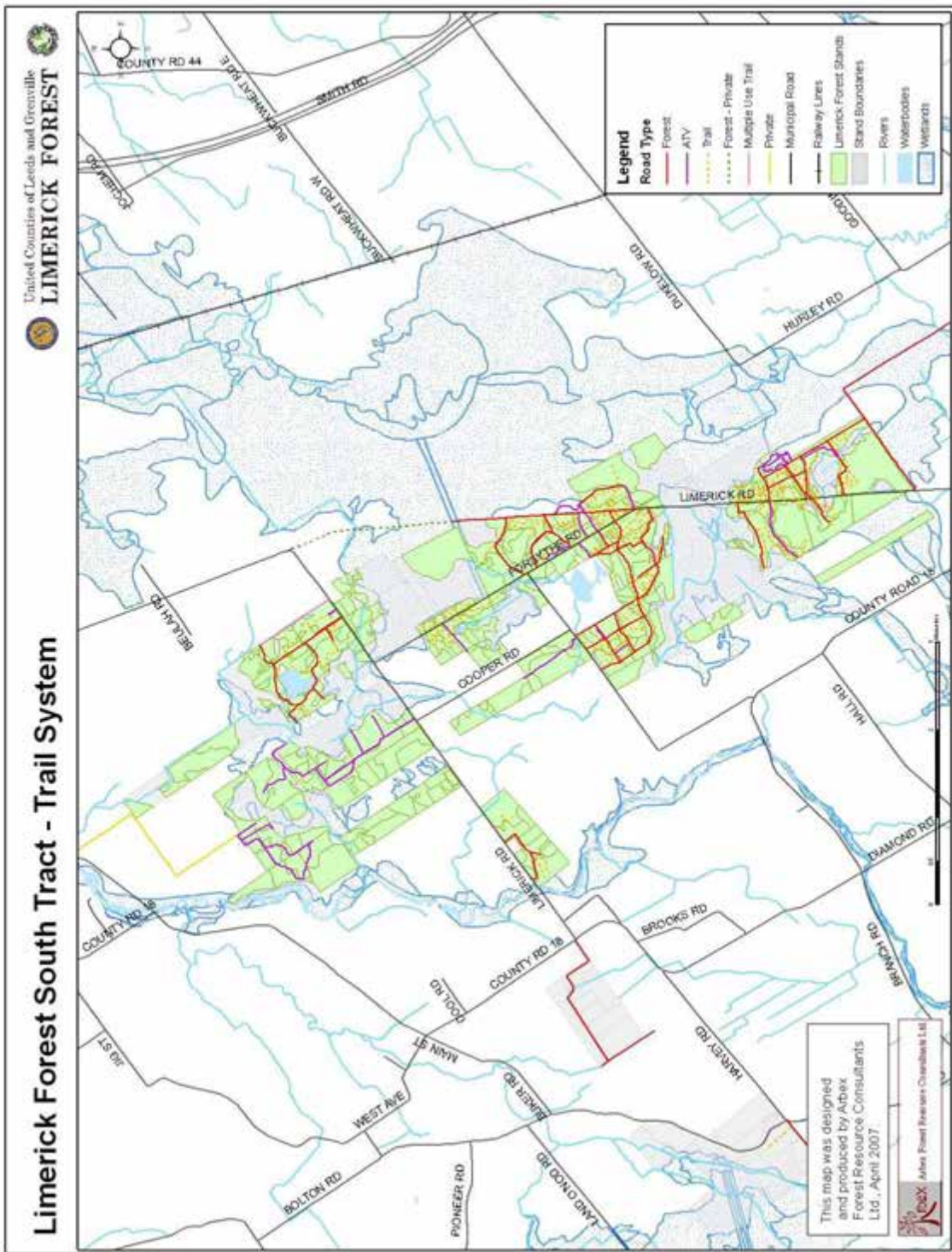


Figure 20. Limerick South Tract Trail System

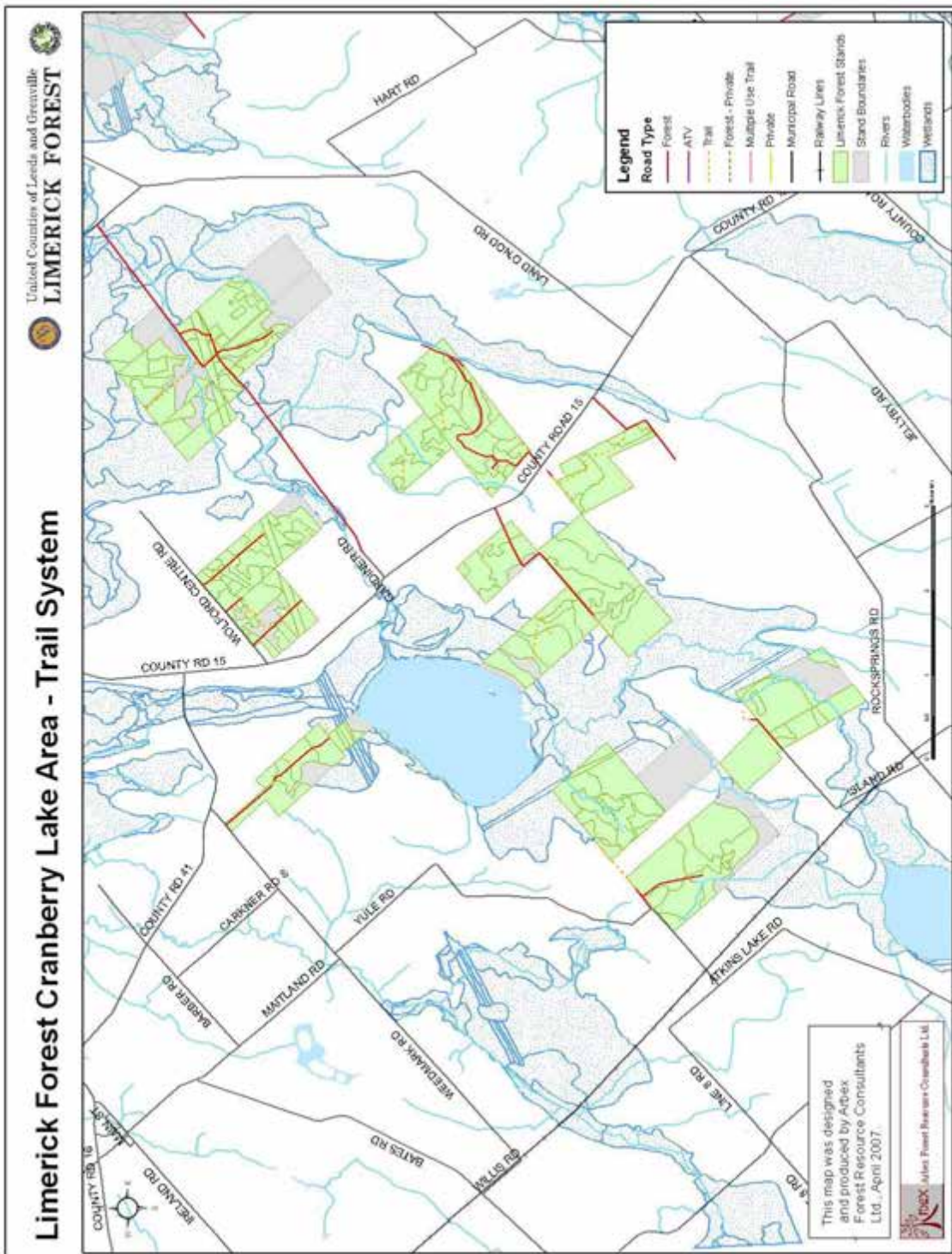


Figure 22. Limerick Cranberry Lake Trail System

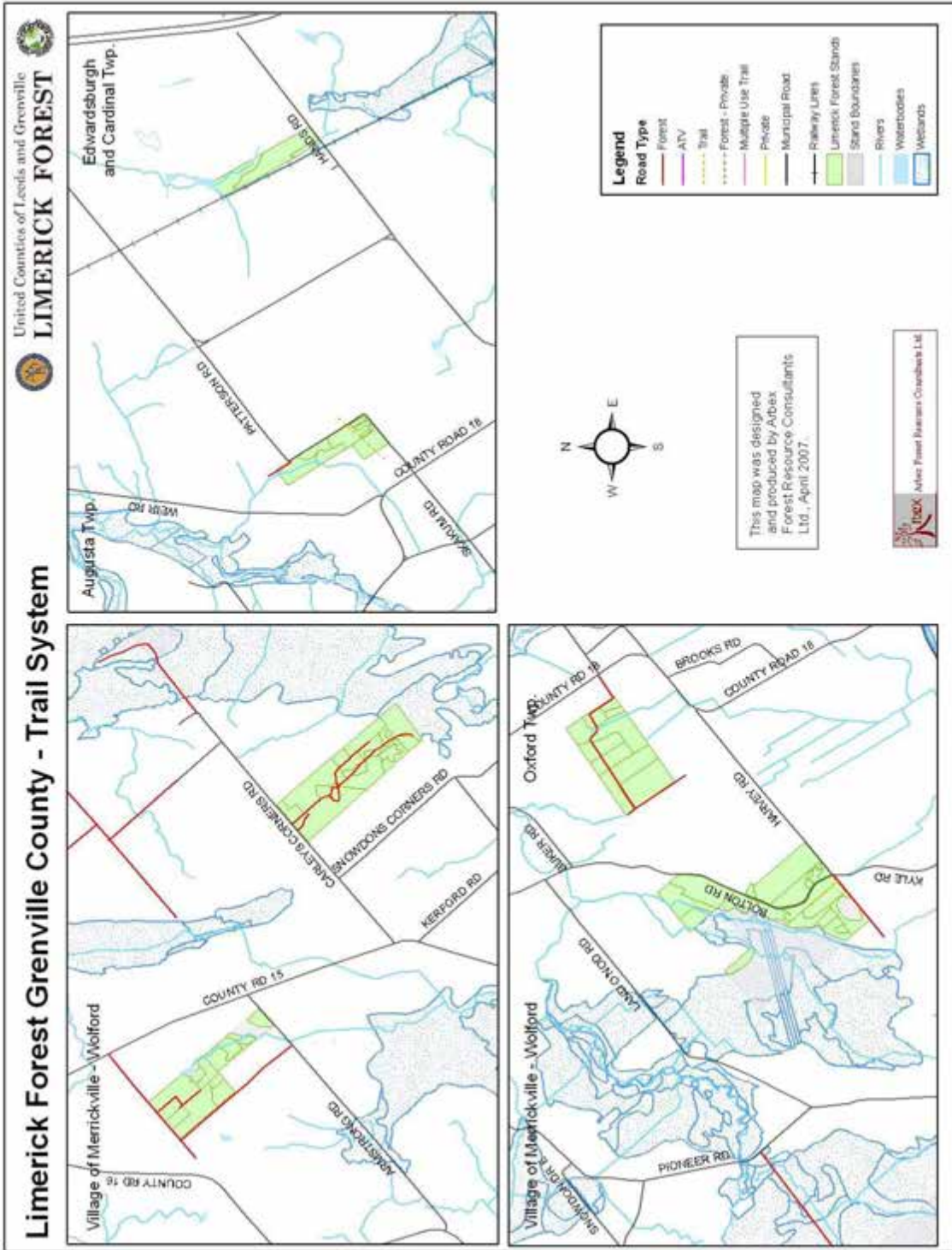


Figure 23. Limerick Grenville County Trail System

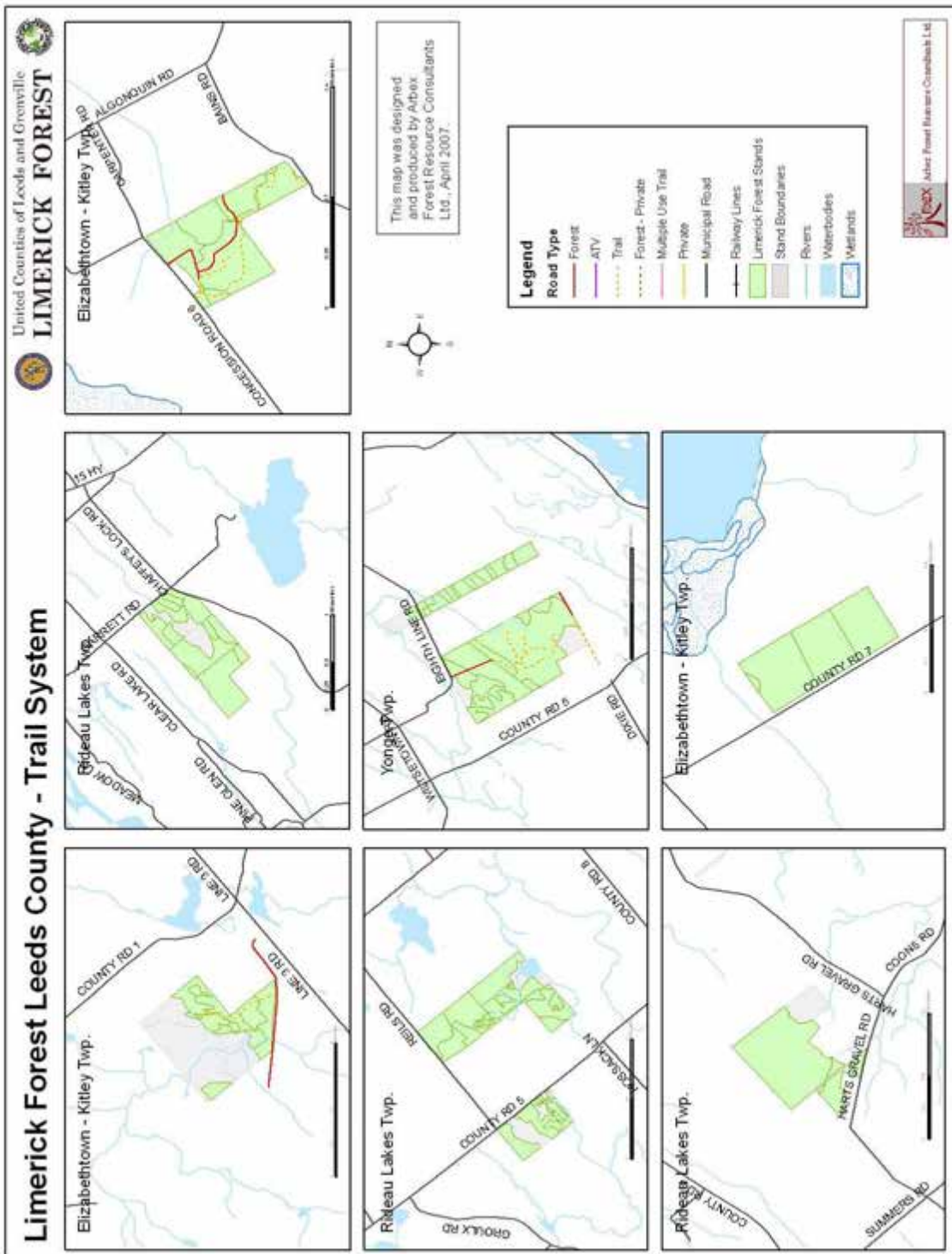


Figure 24. Limerick Leeds County Trail System

Approximately 30 kilometers of snowmobile trail is maintained in Limerick Forest (Table 35)²². These trails are signed, and maintained and groomed to four metres wide by the Leeds and Grenville Snowmobile Association (LGSA). Other roads and trails may be used by snowmobiles but they are not actively maintained as part of the LGSA trail network.

Table 35. Managed Snowmobile Trails within Limerick Forest

Limerick Forest Tract	Trail Tier	Trail Identifier	Length (km)
Limerick South Tract	Provincial Trail	E113	6.2
	Regional Trail	2 LGSA	7.2
	Local Trail	G 50	0.8
	Local Trail	K 39	1.9
Limerick North Tract	Regional Trail	1 LGSA	1.5
	Local Trail	K 38	8.2
North Augusta	Local Trail	G 50	3.8
	Local Trail	G 51	0.9
Total:			30.5

Source: LFLRP (Snowmobile Leeds and Grenville Counties Map 2001-2002)

The road, trail and snowmobile trail network is most extensively developed within Limerick South and Limerick North. Most recreational use occurs in Limerick South tract due to the tract's comparatively extensive trail network. Other contributing factors for the Tract's popularity with recreationalists may be its location relative to population centres, its good accessibility, its existing infrastructure (i.e. graveled parking area) and the existing reputation of South Tract as a quality recreation destination.

Responsibility for trail development and maintenance resides with the UCLG. The LFAC Recreation Sub-committee assists the Forest Manager in this responsibility through trail monitoring and reporting on trail conditions and the development of proposals for inclusion in annual plans for trail development, maintenance or upgrade work. Members of the Sub-committee, the general public and Human Resources Canada work crews undertake trail work with financial, human resource and equipment support provided by the UCLG as resources permit.

²² Source LFLRP (2001 Data)

7.2.1. ROAD AND TRAIL MANAGEMENT

As a result of use pressures, the trail quality in some sections of Limerick Forest's trail network (particularly in Limerick South) has degraded over time. During the management period annual monitoring and reporting on trail conditions will be undertaken by UCLG forestry staff in conjunction with normal operations in Limerick Forest. This monitoring function will be augmented by reporting from the general public and members of the Recreation Sub-committee. Additional partnerships with local community and/or provincial interests, that contribute to environmental and recreation management will be encouraged to assist in the achievement plan objectives. Annual public relations programs (signage, brochures, and media campaigns) will also be implemented to encourage the appropriate public use of Limerick Forest, promote safety, and reduce incidences of vandalism and illegal dumping. It is also recommended that the Forest Manager ensure that the UCLG is included as an additional insured on commercial general liability insurance policies maintained by organizations/user groups which frequent Limerick Forest.

All road and trail maintenance requirements associated with public safety issues and environmental protection will be acted upon on a priority basis. Additional road and trail maintenance work will be identified in annual plans and undertaken as financial and human resources permit.

An inventory of all water crossings (i.e. culverts) will be completed during the first five year operating period for incorporation in the GIS database. This inventory is to include information on the location and condition (i.e. maintenance requirements) of all water crossings in the Forest. Beavers and beaver impoundments will be removed where flooding threatens recreation or access roads and trails. Culverts will be monitored for beaver activity (blockages) and appropriate mitigation measures (i.e. installation of gates, "beaver bafflers") implemented as required.

Timber management activities (e.g. harvest, renewal, and maintenance) will be conducted in a manner, which eliminates or minimizes conflicts with other users of the forest and maintains the integrity of the trail and road network. AOC planning in operating and annual plans will assign the appropriate modifications to normal operations to protect recreation/wildlife values. The following strategies will be adopted:

- Application of timely and appropriate silvicultural strategies to ensure the maintenance of a diversity of forest cover types and stand structures to provide for a diversity of recreational uses.

- Mapped trails and roads will be cleared of logging slash, debris and high risk trees (i.e. leaning, damaged trees) arising from forest management activities.
- Existing roads and trails will be maintained to the same standards as encountered prior to the commencement of operations. Logging contractors will be required to repair to original condition damage to roads, trails, fences, culverts and other improvements.
- Public safety is a major concern when logging and trail use occur simultaneously. Harvest prescriptions for logging operations in the vicinity of high use trails or roads will include reserves and/or modified harvesting conditions. Signs must be posted along the trails to advise the public that forest management activities are in progress.
- Forest management activities will be conducted in a manner consistent with FMP Area of Concern strategies and emerging policies related to source water protection.
- Forest management activities will be monitored to identify situations where activities need to be modified or restricted to maintain forest health and amenities.

Wide scale problems of soil erosion and/or compaction or rutting currently do not occur in Limerick Forest. The degree of compaction related to motorized recreation is related to a number of factors including the presence and amount of soil organic material, the nature of ground vegetation and root network, soil texture and soil moisture, machinery type and the number of machine passes over a given area. In order to maintain the quality of the recreational experience on Limerick's road and trail network seasonal/permanent use restrictions (voluntary/physical) will be implemented on designated trail systems or sections of trail on an as required basis. The Recreation Sub-committee will be advised of all proposed use restrictions and invited to provide comment and input with respect to any proposed restrictions or mitigation measures. The general public will be informed of trail closures through local media and the posting of signs at affected trailheads and staging areas.

LFAC opinion surveys of off-road motorized recreation enthusiasts²³ indicate a desire for more trails in Limerick Forest. Recreational trail planning will be undertaken in conjunction with the preparation of five year and annual operating plans. Effective planning will require data and information on current and projected trail use, and outdoor recreationalists' characteristics and preferences etc. User surveys combined with information from other sources (i.e. municipal tourism officers etc.) may be used to inform the recreation planning process. New trail locations will consider the LFLRP DUA designations and final trail

²³Dirt Bike and ATV riders

additions or relocations will be based on site assessments of the potential impacts on other values of Limerick Forest. A prototype trail density model has been developed in conjunction with the development of this management plan to provide guidance with respect to strategic planning for future recreational trail development (Appendix J). All new trails or trail segments will be constructed to standards appropriate to the trail type. The construction of two new parking areas is proposed in the first five year operation period to accommodate vehicle parking in Limerick South (Cooper Rd) and Limerick North (budgets permitting). Annual planning will address other site locations and physical site improvements required.

Locations of new trail and/or sections of trail on which maintenance has been performed will be recorded in a global positioning system and the information uploaded into the Access Data Layer of the LF GIS. This process will facilitate the preparation of accurate trail maps for public display and/or use and assist the Forest Manager in access planning for recreation, forestry operations etc. Access record maintenance will also assist in the identification of areas prone to rutting etc. which may require seasonal closures, access restrictions or relocation.

7.2.2. GUIDELINES FOR OTHER RECREATIONAL ACTIVITIES

As public land, Limerick Forest is available to all individuals for recreational use. Most individual recreational pursuits (i.e. hiking, jogging, X-country skiing, geocaching, nature viewing, etc.) are compatible and road and trail networks are shared largely without incident.

Since most recreational use is compatible with planned forest management objectives special restrictions or regulations are typically not warranted. Noted exceptions include a restriction on the use of motorized vehicles on the hiking trails to the north of the Chalet in Limerick South, and a prohibition on overnight camping²⁴. Recreational use will also be restricted in instances where it poses a public safety issue or when necessary for environmental protection. Public notices advising of use restrictions will be posted.

County policy requires the issuance of special use permits to groups or individuals (i.e. Scouts, Militia training) that wish to hold organized outdoor events in Limerick Forest. Sanctioned uses must be compatible with the LFLRP DUA designations and permits will specify terms and conditions of for use, location and duration of the activity etc. Fees were not collected for special use permits in the past, however nominal rental fees were charged for the use of the Chalet. The implementation of a policy for the collection of fees for special use permits and the continued charge of rent for use of Limerick Forest facilities is at the discretion of the UCLG.

²⁴ Camping is restricted to scout and youth groups and by permit only.

Sport hunting is a traditional activity in Limerick Forest and will be permitted in accordance with annual provincial hunting regulations and other directives issued by the Forest Manager on behalf of the UCLG (i.e. no permanent tree stands, no over night camping). Written permission is not required to hunt in Limerick Forest and exclusive rights to an area are not granted.

7.2.3. GUIDELINES FOR OUTDOOR EDUCATION

The mandate of the LFAC Education/Communications Sub-committee is to provide outdoor education opportunities and foster a strong understanding of sustainable resource management. Activities supported by the sub-committee include an “Open Doors” program (field observation program guided by local naturalists), an “Envirothon “(a forestry and soil science educational program for local schools) the publication of newsletters and the maintenance of the LFAC website (www.limerickforest.ca).

In addition to LFAC sponsored events and activities, Limerick Forest has in the past been used as an outdoor education laboratory by local schools, universities, NGOs (i.e. Eastern Ontario Model Forest) and government agencies (i.e. Natural Resources Canada, OMNR). LFAC and the UCLG Forest Manager should continue efforts to promote the Forest as a site for ecosystem research (i.e. wetlands and Great Lake St-Lawrence terrestrial ecosystems) and/or as a demonstration area to communicate research results and applications to practicing resource managers and students.

Several government agencies and universities/schools have established permanent sample plots within the forest to monitor forest health and growth and yield. The Forest Manager must approve all proposed permanent sample plot locations, designs and sampling strategies/methodologies. Plot locations are to be recorded in the LF GIS database for future reference and to ensure that sample site integrity is maintained and research objectives are not compromised by incompatible forest uses. Researchers using Limerick Forest are encouraged to share research results, findings and data with the Forest Manager.

Although current use of Limerick Forest as an outdoor education resource has declined from historic levels, interest remains in continuing outdoor education programs in the Forest. Current and past outdoor education activities and programs have centered in the Limerick South Tract primarily due to its proximity to local schools and its site amenities (i.e. Chalet, graveled parking, and accessibility). Continued use of the Forest for outdoor education will be continued and fostered. Partnerships with local community and/or provincial interests, and research that contribute to recreation management will also be encouraged.

7.3. Recreation User Fees and Liability Insurance

The socio-economic value of Limerick Forest as a recreation site has never been quantified. Traditionally, the public has been able to access and use the Forest at no charge. Workshops and surveys conducted by LFAC confirm the public preference for the maintenance of this no fee for use policy. However, the subject of user fees as a potential revenue source for management and operation of the Forest has been discussed amongst LFAC and UCLG for several years. Fee for use policies, charges, collection methods, monitoring and enforcement approaches on public land (Conservation Areas, Municipal Parks, and Provincial Parks) vary across the province. Mechanisms for the collection of fees include the placement of protected collection boxes in parking lots for daily use passes, and the sale of permits and/or trail passes (seasonal or annual) via mail, the internet or retail outlets, toll booths etc. The lack of quantitative data on volume and value of recreation use in Limerick Forest precludes a recommendation on the adoption of a user fee policy or approach in this management plan. Should the UCLG wish to consider the adoption of fee for use policy a cost benefit analysis of current practices is warranted to determine the cost/benefit of such a policy. Further a business case should be prepared to select the most appropriate model for implementation.

Safe public use of the Forest is a UCLG priority. Recreational use is restricted in instances where it poses a public safety issue and public notices advising of use restrictions are posted. As the owner of the Forest the UCLG post signs advising that use of the Forest is “At Own Risk” to protect against legal liability for injuries or damages associated with the public use of the Forest. A recommendation with respect to public liability insurance is provided in section 7.3. In response to a hunting fatality, managers at the Simcoe County Forest enacted a policy that requires all persons hunting in that forest to be members of the Ontario Federation of Anglers and Hunters²⁵ as this organization provides additional public liability insurance for its membership. The UCLG should consider the implementation of a similar policy with respect to 3rd party liability issues associated with all public use of County properties or facilities. Should the UCLG adopt a similar policy direction, the Forest Manager should consult with Simcoe County Forest Staff for guidance with respect to the implementation and enforcement of the policy.

²⁵ OFAH members in association with their membership and existing personal liability insurance coverage have an additional \$ 2 million in public liability insurance when they are engaged in OFAH related activities such as hunting, fishing, skeet, trap or target shooting, archery, camping in connection with an OFAH activity, conservation work and non-commercial trapping.

8.0. TIMBER MANAGEMENT

Integrated resource management in Limerick Forest will, for the most part, be achieved by the management or manipulation of forest cover, principally through the application of silvicultural strategies for forest harvest, renewal and tending.

Only lands classified as production forest (i.e. production, protection forest, and barren and scattered) will be eligible for forest management activities (2,311 ha) during the twenty year management term. These areas constitute approximately 40 % of the forested area of Limerick Forest. Protection forest reserve and ecological reserve lands will be excluded from active forest management²⁶. The status of barren and scattered areas (188 ha) as productive or Non-Production forest lands will be determined during the first five year management term.

8.1. Past Timber Management Activities (2001-2007)

The United Counties are in a fortunate position in that, past expenditures and investments incurred by the Ontario Ministry of Natural Resources for timber management (approximately \$1.68 million) were forgiven when management authority for the Forest was transferred back to the Counties in 2001. The revenues generated from the sale of forest products are the most significant source of resource revenue derived from Limerick Forest²⁷.

Reinvestment in the timber resource will be required during the twenty year management period, for stand improvement, renewal (i.e. management of plantations on higher site classes) and maintenance, if commercial timber production objectives are to be achieved.

Timber management activities conducted within Limerick Forest between 2001 & 2007 are summarized in Table 36. Much of the forest management effort focused on the inventory, and marking of plantation stands for subsequent thinning operations. A limited tree plant and subsequent re-fill plant was undertaken in 2001 (approximately 9,600 trees) and 2002 (approximately 4,000 trees). Forest inventory work was also completed on approximately 600 ha in conjunction with the “identification of potential old growth forest” project.

²⁶ Forest management interventions within Non-Production forest lands (i.e. protection forest reserve and ecological reserve areas) will be restricted to interventions for insect or disease control, forest access or the salvage of dead or moribund timber resulting from natural or man-caused disturbance events (i.e. wind throw, fire etc.)

²⁷ The financial contribution of wood sales to the Counties was approximately \$ 208,000.00 between January 1st, 2002 and March 31st, 2007. Sale of aggregate over the same period yielded approximately \$ 65,000.00. Rental fees are collected for the rental of the Limerick Work Station compound. No fees are currently charged for recreational use of the Forest.

Table 36. Forest Management Activities 2001 - 2007

Activity	Year	Area (Ha)	Volume (m³)
Tree Planting	2001	17.5	
	2002	11.1	
Total:		28.6	
Thinning	2002	49.7	4,211
	2003	50.2	632
	2005	59.8	1,421
	2007 (fall)	43.7	2,050*
	2007 (spring)	57.1	1,538
	Total:		260.5
Forest Inventory	2001-2002	1,632	
	2002-2003	600	
	2003-2004	51 parcels	

Source: UCLG Database/LRFP

* Estimate

8.2. Timber Management Objectives and Strategies

The Limerick Forest Long Range Plan (LFLRP) sets the overarching policy for resource management within Limerick Forest and provides overall direction and context for forest management planning. The goal of the LFLRP is to manage the Forest on a sustainable basis for a wide variety of goods and services. Objectives associated with the plan seek to;

- 1) Ensure that LF continues to provide a source of economic activity.
- 2) Ensure management maximizes benefits to the UCLG.
- 3) Ensure that a range of quality recreational opportunities are provided.
- 4) Ensure that ecological features and values are protected.
- 5) Ensure that outdoor educational opportunities are provided.

The LFLRP recognizes the contribution of forest harvesting to the local and regional economy and advocates a policy of continued harvesting of forest products on a sustainable basis. This policy is to be achieved within the context of the multi-use of Limerick Forest. Therefore, the continued development and implementation of viable and sustainable forestry operations will be based on the following forest management goal.

“To enhance the economic and social welfare of the residents of the UCLG through the improvement, sustainable use, development and protection of Limerick Forest’s timber, wildlife, non-timber and recreational resources.

This broad goal may be realized through the attainment of the following objectives;

1. To manage the forest ecosystems of Limerick Forest on the basis of sustained yield and in a manner consistent with sound environmental practices.
2. To manage the natural resources of Limerick Forest for the benefit of the people of the UCLG with due consideration of all forest users and resource values.
3. To conserve and enhance biological diversity of Limerick Forest.
4. To ensure no loss of threatened, endangered, rare or vulnerable species habitat (plant or wildlife) as a result of forest management activities.
5. To ensure forest management interventions minimize adverse effects on soils, water, vegetation fish and wildlife and other identified values.
6. To promote the growth of high quality timber products through the application of timely and appropriate silvicultural practices.
7. To control damaging agents such as fire, insects and disease.

The following strategies for timber management will be implemented during the twenty-year management period.

- It is recommended that this FMP be formally revised in 2012, 2017 and 2022. Five year operation plans will be prepared to schedule planned activities for each operating term (2007, 2012, 2017 and 2022).
- All stand silvicultural prescriptions for operations in Limerick Forest are to be prepared and certified by a Registered Professional Forester (R.P.F.) in good standing with the Ontario Professional Foresters Association. Prescriptions are to recognize integrated resource management values.

- All tree marking activities will be carried out by “certified tree markers” in accordance with “approved marking prescriptions” prior to active operations. Property boundaries will be verified prior to the commencement of forest management activities.
- Post harvest surveys will be conducted for each harvested stand to verify residual stand structure as per the approved marking prescription and assess contractor performance (i.e. residual stand damage, compliance with AOC boundaries etc.).
- The calculated AAC is considered as the maximum allowable depletion for the maintenance of sustainable harvest yield for the five year period 2007-2012. The annual allowable cut calculation will be re-calculated in conjunction with the preparation of five year operating plans 2012, 2017, and 2022.
- All areas designated as eligible for harvest will be inspected prior to operations to determine the presence of natural or heritage values. Appropriate measures will be implemented to protect identified values.
- Wood products will be directed towards the highest and best end use where feasible and appropriate.
- Silvicultural operations will target the improvement of growing stock within designated stands through the removal of trees of limited potential and the improvement of growing conditions (spacing) around better quality stems.
- It is recommended that external financial and human resource support be solicited to support forest management in stands that under current conditions are uneconomic to manage. This strategy could entail the acceptance of reduced stumpage payments for stand improvement operations.
- Public tendered sale of wood products will be promoted. All timber sold will be marked and tallied for diameter and product. Wood sale contracts will detail species volumes and prices, operational, safety, regulatory and other requirements as determined by the UCLG. It is recommended that wood sale contracts be subject to a minimum 10% performance holdback to offset costs or charges associated with non-compliance to contracted terms and conditions and/or penalties or remedial actions related to environmental or site damage arising from harvest/hauling operations.
- It is recommended that the upgrading and updating of the forest inventory database be given a high priority in annual plans for the first five year management term.
- Management of Limerick Forest plantations will continue to be based on the application of area wide density management diagrams augmented by the local experience and professional judgment of UCLG forestry staff.

- Uneven-age management strategies will be based on a 20 year cutting cycle²⁸.
- Site Class 1 conifer plantations located on production forest land will be intensively managed for timber production (approximately 569 ha).
- Conversion of conifer plantations situated on less productive sites to tolerant or mid-tolerant species will be encouraged over time through natural succession and/or artificial regeneration.
- It is recommended that the age class area imbalance associated with site class 1 plantations will be addressed through accelerated harvesting and/or liquidation of selected stands (where feasible and where markets permit) and prompt renewal of these sites to the species. This strategy will dampen the projected impact of declining yields and revenues over future management terms.
- Roads, water crossings and access trails will be constructed and maintained to minimize impacts to the forest site and other values (i.e. natural heritage values, water courses etc.) in accordance with local best management practices and provincial and appropriate approvals and permits.
- Invasive exotic species will be monitored in conjunction with normal forest management activities and practical control measures implemented as required.
- All wildfires will be suppressed and management actions to reduce fire risk will be implemented on an as needed basis. It is recommended that a fire management plan be prepared and fire services agreements with the municipalities be formalized.
- Control of insect and disease outbreaks will be implemented on an as required.
- Silviculture will be conducted in accordance with the appropriate OMNR Guidelines (e.g. A Silvicultural Guide to Managing Southern Ontario Forests).

8.3. Forest Management Systems

To achieve management objectives, silvicultural techniques will necessarily vary with the nature and condition of the forest stand. Stands of inferior quality will be subject to improvement treatments to remove cull, high risk, less desirable species and poor quality growing stock where markets for funding permit.

²⁸ This cycle may be extended on sites with low productivity to 25-30 years.

In general, even-age and uneven-age (all-age) silvicultural systems or adaptations thereof will be utilized in conjunction with the management of the forest working groups in Limerick Forest.

8.3.1. EVEN-AGE SILVICULTURE

Even-age practices may be applied for both tolerant and intolerant tree species (conifer and hardwood). Reproduction methods include uniform or group shelterwood, artificial reforestation, and clear-cutting systems.

The concept of rotation age (the age at which the stand is cut) is applied to stands managed under clear-cutting or shelterwood harvesting systems. Rotation ages are determined on the basis of economic criterion (tree size and mill requirements), silvicultural guidelines for vegetation units, biological and regulatory concerns, and biodiversity and wildlife management considerations.

Even age management strategies are appropriate for plantation management and the management of the following working groups; cedar, poplar and soft maple.

8.3.2. UNEVEN OR ALL-AGE SILVICULTURE

An uneven-age stand is one whose trees originated at different times so that the stand tends to include trees all ages and sizes. The age-size distribution is seldom perfect. There maybe two, three, or more, age groups intermixed in various ways. The distinguishing feature of such stands is that they have no identifiable beginning point or ending point in time.

Under selection systems, trees are removed singly or in small groups first through improvement cuttings, and ultimately in true selection cuts. The aim of this system is to maintain a balanced diameter distribution within the stand from which sustained cuttings can be made over time. Achievement of this goal requires control over both diameter distribution and residual stocking. Well-structured, uneven-age stands typically exhibit an inverse J-shaped curve. The J-curve represents a geometric series of decreasing tree diameters in successive diameter classes. To ensure a good progression of growing trees a quotient between numbers of trees growing in successive diameter classes is calculated ('q' method). This technique requires examining the following three parameters:

- a) residual stocking levels;
- b) maximum size tree to be left after each cut; and
- c) the level of "q" to be used.

Where age class distributions permit, uneven-age management strategies will be applied to hard maple and other hardwood working group stands.

Three main harvesting methods are applied in uneven-age management:

1. Selection Cutting
2. Shelterwood Cutting
3. Patch or Group Selection

The choice of harvesting method depends on species objectives and stand conditions as determined during operational inventories.

8.3.2.1. Selection Cutting

Selection cutting is the preferred system where the trees to be retained as growing stock are capable of producing high quality products (i.e. sawlogs, veneer). The system provides maximum flexibility in choosing trees to harvest and retain, but does not provide much of an opportunity to manipulate understory development. As such, selection cutting should only be applied in satisfactorily-stocked stands of desirable species and form.

Single tree selection consists of removing individual trees that are usually isolated from one and another. The system is applicable to areas where timber harvesting is restricted, where aesthetic considerations are important, or in areas where site protection is necessary. The basic objective is to control the development of the stand so that all diameter classes are represented. Regeneration can be stimulated under selection harvesting if the cutting removes trees either singly or in groups (not more than 1 hectare in size).

Re-establishment of tolerant species poses no problems provided a residual crown density of 65% is maintained. Typically, winter harvesting is recommended to minimize damage to advance regeneration or sensitive sites.

8.3.2.2. Shelterwood Cutting

Uniform shelterwood harvesting may be adopted in instances where regeneration of desirable species is present under a mature overstory, when site protection is considered necessary, or when there is a requirement to improve the regeneration levels for desired species in the stand. Shelterwood cutting (uniform) is recommended for areas where aesthetics or site protection considerations warrant leaving trees on the site until regeneration is established. The stand is typically removed in two cuttings. This system provides a partial canopy that encourages regeneration of desirable tolerant species, stimulates

early seedling growth to shorten the regeneration period, and restricts the intensity of competition from grasses and herbaceous plants.

The first cut removes inferior quality trees, or undesirable species leaving better stems as the seed crop (at least 10 trees/hectare). Residual trees should be vigorous, wind firm, regularly spaced, and capable of good increment growth. All cankered stems should be removed in this felling. Marking should be based on percent crown cover, rather than stand basal area.

The second cut is a release cut, which removes the overstory and releases regeneration. Cutting should take place when the growth of terminal shoots of the regeneration begin to show signs of decline, or the shoots begin to lean to the side. A 20-year period between cuts has been selected as a general guide for the management of Limerick Forest stands. Regeneration must be at least 1 metre in height before the overstory is removed. Overstory removal should take place in the winter to reduce damage to regeneration, and avoid risks of sapstreak disease resulting from root injury. Log forwarding is preferred to ground skidding. However, deep snow can minimize skidding damage to advance regeneration.

8.3.2.3. Patch Cutting

Patch selection cutting provides the best opportunity for the regeneration of a high component of intermediate and intolerant tree species. Patch harvesting is recommended only for use when a low value stand is underlain by an undesirable or sparse understory. The system will only be utilized on sites where the removal of groups of trees will not adversely affect soil, and drainage conditions. Species composition in the cut patch will largely be determined by the advance regeneration present and factors such as soil moisture and the species composition of the parent stand.

8.4. Management Guidelines for Limerick Forest Working Groups

Timber management involves the application of a series of integrated treatments. These treatments typically include a combination of timber harvesting, site preparation, regeneration and tending operations. The types of treatments applied to a site depend on many factors such as soil type, topography, climate, forest structure, wildlife habitat requirements, economics, and tree growth characteristics. Timber management guidelines specific to the productive forest working groups are provided in sections below.

8.4.1. HARD MAPLE WORKING GROUP

The hard maple working group occupies 149 ha of production forest in Limerick Forest and 74 of the protection forest area. Protection forest stands typically occur on shallow soils over limestone. The hard maple stands of LF can be characterized as being between adequate and overstocked; with a stocking range between 50% and 150%.

Management Objectives

1. The hard maple working group will be managed on a 110 year rotation using uneven-age management for the production of quality wood products (i.e. sawlogs and veneer) where site conditions and tree quality permits.
2. Where stand conditions are not conducive for the initiation of uneven-age management the working group will be managed on an even-age basis for the production of fuelwood, pulp and the incidental production of sawlogs. Rotation periods of 100-120 years will be adopted depending on site.
3. The area of hard maple working group will be expanded by encouraging the natural regeneration of hard maple within protection forest and protection forest reserve plantations (e.g. jack pine and scots pine)²⁹.

Harvest

Where commercial timber production is an objective harvesting will be by selection cutting, shelterwood cutting or patch selection cutting systems utilizing a twenty-year cutting cycle.

Selection Cuts

The selection cutting will be applied in site class 2 or better stands. The following criteria will be adopted to identify hard maple working group stands to be managed by selection cutting:

- 1) The stand must have the potential to produce quality hardwoods in a period not greater than 40 years, with a minimum of 1,500 fbm during the cutting cycle.
- 2) The stand must have a minimum of 7 m²/ha of good quality tolerant species in the 25 cm or better diameter class.

²⁹ This can be achieved by retaining hard maple trees as seed sources adjacent to protection forest boundaries.

- 3) The total basal area of the stand must not exceed 27-32 m²/ha prior to cutting.

Site class 1 stands will be managed for sawlog and/or veneer production. Sawlog quality trees will be managed on a financial rotation (90-120 years depending on site). Veneer quality stems will be selected at maturity and permitted to grow for a second cutting cycle. As a result of the predominance of poor quality trees the first cut in many stands will in essence be an improvement cut. The next cut in the cycle will more closely resemble classical selection cutting.

Regeneration can be stimulated under the selection system if cutting is done either singly or in groups of not more than 0.1 hectares (1/3 acre) in size. Provided a residual crown density of approximately 65% is maintained, the re-establishment of hard maple does not present a problem.

Shelterwood Cuts

Shelterwood cuts should not be applied in maple stands younger than 40 years or in stands having an average diameter breast height (dbh) of less than 20 cm.

A residual crown density of 65% should be maintained after the cut to promote recruitment of hard maple. Hard maple will regenerate satisfactorily under a stand with 14 m² basal area.

Patch or Group Selection Cuts

Patch harvesting will only be utilized in instances where a low value stand is underlain by an undesirable or sparse understorey and when harvesting will not adversely affect soil, and/or drainage conditions.

Renewal

The species will be renewed by natural regeneration as reproduction of the species poses no special management problems.

8.4.2. THE POPLAR WORKING GROUP

Poplar working stands are a minor component of Limerick Forest. In general, trees are of poor quality.

Management Objectives

1. In instances where commercial timber production objectives are secondary to other objectives such as wildlife production or recreation, stands will either be removed from production and maintained as reserves or managed by modified harvests.
2. Site class 1 and 2 poplar working group stands will be managed on a 50 year rotation. The rotation may be extended to provide for the production of veneer where tree quality permits.
3. Site class 3 stands will be managed on a pathological rotation to salvage merchantable volume where markets permit as stands on these sites typically begin to decline prior to reaching rotation age.
4. On poorer site indexes where poplar grows in association with conifers and birch the management goal is to maintain or increase the more commercially valuable softwood component.

Thinning

Thinnings for fibre production are not recommended.

Harvest

Poplar stands will be managed by the clear cutting system where the management objective is the reproduction of either pure or working group stands of poplar. In instances where the management goal is to increase the softwood component of the stand several cutting strategies are applicable. Group selection or shelterwood systems will encourage conifer regeneration and will be applied in poplar dominated mixedwood stands where the conifer component is >30%. In stands where the softwood component is less than 30 percent, patch cuts or clear cuts will be applied to promote aspen suckering and ensure the maintenance of the working group. Conifer species can be expected to seed into the stand and occupy understorey positions as the poplar matures.

Underplanting and release treatments may also be utilized to increase the conifer component of poplar working group stands. Conifer species can be successfully underplanted (depending upon site, drainage, and basal area of the stand overstorey) or planted within openings created by cutting. The selection of sites to underplant should be made with consideration of the eventual removal of the overstorey.

Renewal

The reproduction of poplar on good sites poses no special management problems. The species sprouts prolifically from root suckers and will seed into areas opened up by disturbance.

8.4.3. SOFT MAPLE WORKING GROUP

The soft maple working group is situated primarily on imperfectly drained soils. The working group occupies 127 ha of productive forest, of which 59 ha is classified as protection forest reserve due to the presence of high water tables. Stands are typically of poor quality as a result of the prevailing site conditions (i.e. low productivity, imperfect drainage).

Management Objective

1. Production forest stands will be managed on a 60-80 year rotation (dependent on site conditions) for pulp, fuelwood and sawlogs.
2. Flooded stands and stands identified as prone to seasonal flooding will be excluded from harvesting to protect site integrity.

Harvest

The working group will be managed under both even-age and uneven-age management strategies with the choice of management system being dependent upon prevailing site conditions and stand attributes (i.e. stem quality, stocking, vigour etc.)

Single tree selection or group tree selection will be implemented on higher site classes where tree quality permits or site protection is a priority. Strip cutting or patch cutting will be adopted in instances where poorer quality stems predominate (i.e. pulpwood or fuelwood cuts).

Renewal

The species will be renewed by natural regeneration.

8.4.4. OTHER HARDWOOD WORKING GROUP

Other hardwood working group stands are typically comprised of associations of various mixtures of birch, soft maple, ash and other intolerant hardwoods mixed with minor amounts of balsam fir, cedar or white spruce. The working group occupies 51 ha of production forest area

Management Objectives

1. The Other Hardwood working group will be managed primarily for pulpwood/fuelwood although the production of sawlogs may be a by-product of management.
2. Oak stands will be primarily managed for sawlog and/or veneer production where timber quality warrants.

Harvest

The working group will be managed under both even-age and uneven-age management strategies with the choice of management system being dependent upon prevailing site conditions and stand attributes (i.e. stem quality, stocking, vigour etc.).

Single tree selection or group tree selection will be implemented on higher site classes where tree quality permits or site protection is a priority. Strip cutting or patch cutting will be adopted in instances where poorer quality stems predominate (i.e. pulpwood or fuelwood cuts).

Renewal

Regeneration of the other hardwood working group can be achieved by shelterwood or selection cutting. The method adopted will be determined by an inspection of the stand.

No known silvicultural method will maintain or increase the amount of oak in a stand. Stands with a high component of oak will be harvested by selection cutting only.

8.4.5. CEDAR WORKING GROUP

The cedar working group is composed mainly of natural stands. In the past, some areas were underplanted to cedar. Most cedar working group stands are in the 41 to 80 age classes. The majority of cedar stands are classified as protection forest due to shallow soils, imperfect drainage and/or their proximity to wetlands.

Management Objectives

1. The cedar working group will primarily be managed for the provision of continuous cover for wildlife (i.e. cover and browse).

2. Timber production will be a secondary management objective with production stands managed on a 60-80 year rotation (depending on site conditions) for the production of small sawlogs and posts.

Harvest

Cedar working group stands will be managed under a patch clearcutting strategy as this system provides for a commercial harvest of both poles and sawlogs where tree quality permits and maintains and often enhances the browse and shelter requirements for white-tailed deer. Although cut designs may be variable the size of the cuts should not exceed 0.08 ha (1/5 acre). Progressive cuts should be oriented into the direction of the prevailing wind to assist in seed dissemination.

The timing of the cut is not critical from the standpoint of seed supply. Harvests may be scheduled to coincide with optimum market conditions for commercial harvests or during periods of “population stress” in a wildlife management context. Winter harvesting is recommended as site protection is maximized by the presence of snow cover, and logging residues will provide browse for yarding deer.

Renewal

Site preparation is usually not warranted as in most stands advanced regeneration is typically present, adequate viable seed is accumulated in the duff layer, and the residual patches of timber will act as a seed source. A five year regeneration period will be allotted. Cut patches failing to meet stocking requirements (1,235 stems/ha) will be either artificially regenerated to the working group or converted to an appropriate species as determined by site inspection.

In areas where artificial renewal strategies are implemented the use of bareroot planting stock is recommended. Planting spacing will be determined by the management objective (i.e. variable spacings for wildlife habitat) and soil and site conditions.

8.5. Plantation Management

The management strategies for Limerick Forest’s conifer plantations are presented in the sections below. Conifer plantations occupy 48% of the total forest area occupying 747 ha of the production forest and 462 of protection forest. Most plantations in Limerick Forest were established after 1940, with the majority of the tree planting effort occurring in the years prior to 1972 (planting of

approximately 7.6 million trees). Approximately 1.2 million trees were planted in LF between 1972 and 2006.

To date most forest management activities that have occurred within Limerick Forest have been related to the management of plantation areas. Thinning in pure plantations has been directed by the use of density management diagrams. This method to determine thinning prescriptions and schedules has proven to be effective and is recommended for continued use during the management period. Professional judgment, experience and local knowledge should also guide thinning management decisions.

Site Class 1 conifer plantations located on production forest land will be intensively managed for timber production (approximately 569 ha). This strategy will require that the UCLG to allocate funding for forest renewal and maintenance. Financial requirements and the schedule for renewal and other silvicultural operations will be addressed in the five year operating plans.

Conversion of conifer plantations situated on less productive sites to tolerant or mid-tolerant species will be encouraged over time through natural succession and/or artificial regeneration.

8.5.1. RED PINE WORKING GROUP

Red pine plantations occupy 333 ha of the production forest area and 86 ha of protection forest. Most plantations are within the 41 - 60 age class with the balance of the working group within the 21 - 40 and 61 - 80 age classes. Red pine is presently one of the most productive species growing in Limerick Forest. Plantations are generally well stocked and have received one thinning. Examples of poor or patchy stocking do exist where red pine was established on the limestone plain in Limerick North, where pine was established on poorly drained soils and as a result of the damage from the 1998 ice storm.

Management Objectives

- High quality stands of red pine (site class 1 & 2) will be managed for the production of quality sawlogs, utility poles and building logs on rotation of 80-100 years.
- The red pine working group will be maintained on site class 1 sites. Site class 2 sites will be permitted to revert to tolerant and mid-tolerant species over time through natural ingress of hardwoods and other conifer species or the planting of appropriate species.
- Site Class 3 red pine plantations will be managed on an-open ended rotation based on stand vigour with the primary objective of management being the protection of the site. The long term objective for these stands

is the attainment of a natural forest condition from the ingress of hardwoods and other conifer species. The production of wood products is incidental to this objective.

- To dampen the projected impact of declining product and revenue yields associated with the age class area imbalance in site class 1 plantations, it is recommended that select stands be liquidated³⁰ or subjected to accelerated harvest schedules (where feasible and where markets permit) and renewed promptly to pine. The successful application of this strategy is contingent upon the collection of accurate stand inventory information for all red pine working group plantations.

Thinning

Periodic thinning of red pine plantations is recommended to target diameter growth on the best trees available, maintain uniform growth rates, remove diseased and damaged stems, shorten rotation periods and increase stand yields.

It is recommended that stand density management diagrams (DMD) continue to be used as a decision support tool for the development of area wide thinning prescriptions. Local knowledge, professional judgment and experience should also guide thinning management decisions. The following general guidelines are provided to inform plantation management decisions:

- For first thinnings a target residual basal area of 23 m²/ha should be maintained. In older unthinned plantations, it may be necessary to achieve the basal area target in two thinnings in order that the stand is not opened up excessively and becomes more prone to wind or ice damage.
- For second and subsequent thinnings selection cutting will be undertaken with the objective of releasing the best quality trees (dominant and co-dominant). Timing of the cuts will be every 7-10 years depending on site. In second thinnings a residual basal area of 25m²/ha should be maintained. Subsequent thinnings should retain a basal area of 28m²/ha.
- All tree marking for thinning operations is to be conducted by certified tree markers.

³⁰ Cutting strategies other than traditional clear cuts such as patch cuts or 2-cut shelterwood harvesting may be adopted. Patch and shelterwood techniques retain a portion of the stand and will extend the time period required to balance the age class distribution ("regulate the forest"). This time lag may be acceptable as other objectives (e.g. wildlife, recreation) associated with the retention of standing timber on the site may have a higher priority.

- Residual trees should have a live crown ration of 30% or greater in order to achieve the maximum growth response from thinning, be free of defect, be of average or greater stand diameter and occupy overstorey crown positions.
- Red pine plantations classified as protection forest may be thinned to promote ingress of regeneration or to capture volume on declining trees. These thinnings should not remove more than 20% of the stand in a single cut.

Harvest

Harvest cuts will be conducted in accordance with the OMNR silvicultural guidelines for red pine management. Typically a three-cut uniform shelterwood system will be adopted in instances where advance regeneration of desired species is present. Timing of the final cuts may be delayed in areas where aesthetics are important.

Clearcut strategies are applicable on sites scheduled for artificial renewal (planting) of the working group.

Renewal

Red pine will be renewed by artificial regeneration on sites scheduled for maintenance of the working group (i.e. site class 1). A planting spacing of 2.7 x 2.7 m is recommended. It is anticipated that this wider spacing will enable better diameter growth and eliminate the need for pre-commercial thinnings. Planted stands should be fully stocked and plantation survival must be monitored to ensure adequate stocking to red pine.

Site class 2 and 3 stands will be managed to promote ecological complexity through the natural encroachment and eventual conversion to tolerant and mid-tolerant hardwood species. Some under planting of hardwoods may be used to supplement natural regeneration.

8.5.2. WHITE PINE WORKING GROUP

White pine plantations occupy 137 ha of the production forest area and 56 ha of protection forest. Most plantations are within the 41 - 60 age class with the balance of the working group within the 21 - 40 and 61 - 80 age classes. Plantations are generally of poor quality due to past heavy damage by the white pine weevil and damage from white pine blister rust. In mixed plantations with white spruce, the pine now occupies the dominant crown position, but the trees are heavy limbed.

Management Objectives

- To manage higher quality plantations (i.e. plantations with 100+ quality trees per hectare) on an 80-100 year rotation for the production of sawlogs.
- Plantations with less than 100 good quality stems per hectare will be managed on an open-ended rotation and harvested for maximum economic return.
- Site Class 3 white pine plantations will be managed on an open-ended rotation based on stand vigour with the primary objective of management being the protection of the site and the long term objective of attaining a natural forest condition from the ingress of hardwoods and other conifer species. The production of wood products is incidental to this objective.
- To expand the area of white pine working group where appropriate through underplanting and stand conversion.
- Site Class 1 white pine plantations will be maintained as white pine working group stands.

Thinning

The objective of thinning is to release crop trees for diameter growth and the production of 150-250 crop trees at rotation age (actual crop tree density will be a function of site and stand conditions). Crop trees should be released on two-sides. Subsequent thinnings should occur at intervals between 7 and 10 years dependent upon site conditions and available markets.

Harvest

Strip or uniform shelterwood systems are recommended in order to promote the natural regeneration of white pine. For plantations, the strip shelterwood harvesting is recommended. Strips should be evenly spaced and not more than 30 metres wide. Harvesting of the leave strips should be delayed until cut strips are adequately stocked to white pine or other desired species. Infill planting will be undertaken as required to maintain adequate stocking levels.

Renewal

Artificial renewal of white pine will be undertaken in in-fill underplanting or to establish the species on cutovers. Spacing should be at 1.8 x 1.8 m. Large bareroot stock is preferred, as larger stock will have a competitive advantage on most sites. White pine performs well on a variety of soils and drainage conditions (imperfectly to well-drained soils). Site preparation may be required to improve drainage conditions on imperfectly drained soils however in most instances logging activities should provide adequate mineral soil exposure.

Manual or chemical tending should be considered in instances where the pine is being out-competed on fertile sites.

Corrective clipping within young plantations is recommended in instances where white pine weevil damage is significant.

8.5.3. JACK PINE (INCLUDES SCOTS PINE) WORKING GROUP

Plantations of jack pine and scots pine occupy 10 ha of production forest land and 248 ha of protection forest reserve lands. Most plantations are within the 41 - 60 age class with the balance of the working group within the 21 - 40 and 61 - 80 age classes.

The majority of Limerick Forest's jack pine plantations were established on the shallow land of the Smith Falls Limestone Plain for the purpose of site rehabilitation or site protection. Most plantations are of poor quality and exhibit low stocking levels as a result of shallow soil depth, poor drainage and/or mortality and mechanical damage resulting from the 1998 ice storm and windthrow.

Scots pine plantations are a minor component of the standing forest inventory in Limerick Forest. Plantations are typically low stocked with poor quality trees. In most plantations the scots pine has acted as a nurse crop for a developing understory of hardwood species. All plantations will be managed for site protection and rehabilitation in accordance with the working group management objectives outlined below.

Management Objective

- To manage existing plantations for site protection where soils are depleted or shallow.
- To manage jack pine working group plantations on production forest land on a 50 year rotation for the production of pulp and/or small sawlogs.
- To decrease the area of the working group over time through the natural ingress of native species such as cedar and tolerant hardwoods where seed sources are available.

Thinning

Jack Pine working group stands will not be thinned for volume production or to increase wood product size.

Harvest

Jack pine working group stands will only be harvested (clearcut or patch cutting) when harvesting is economically viable and stands are adequately stocked to regeneration of desired species (i.e. tolerant hardwoods, white pine, cedar). As a general guideline, cutting should not occur until the advance regeneration has attained free-to-grow status. Shelterwood cutting is appropriate in instances where the establishment of invasive species is a management consideration.

Renewal

Limerick Forest will not be renewed to jack pine or scots pine; rather plantations will be permitted to revert to tolerant or mid-tolerant native species. Artificial renewal of sites will be undertaken where seed sources are not available or poor site conditions result in sparse natural regeneration of desired species.

Many of the jack pine working group stands are poorly stocked and invasive species have become established. In order to ensure that the renewed stand is adequately stocked to desired species it may be necessary to site prepare the stand by chemical or mechanical means to eliminate the invasive species and artificially renew the site. Treated areas will be monitored for the re-establishment of invasive species and follow-up treatments (chemical or mechanical) implemented on an as required basis.

8.5.4. WHITE SPRUCE WORKING GROUP

The white spruce working group (includes Norway spruce) occupies 322 ha within Limerick Forest. 243 ha are classified as production forest with 79 ha classified as protection forest reserve. Most plantations are within the 21 - 40 age class with the balance of the working group within the 41 - 60 and 61 - 80 age classes. Spruce plantations are typically well-stocked. To date most plantation areas have not been actively managed. Plantations of Norway spruce (13.3 ha) have been included in the working group.

Management Objectives

- Stands will be managed on a 40-80 year rotation (depending on site productivity and commercial wood product objectives) where the working group occurs on production forest land.
- Commercial wood production will be a secondary objective for stands growing on lands classified as protection forest. These stands will be managed primarily for site protection or wildlife management objectives.
- Site class 1 plantations will be maintained in the spruce working group.

Thinning

Intermediate thinnings to capture wood volume that would otherwise be lost to natural mortality will be undertaken where markets exist for pulp or small to medium sized sawlogs. Generally, these thinnings are conducted when the plantation is between 25-30 years old. When plantations are adequately stocked, row thinning removing every third row with light selective thinning within residual rows is recommended. Selection thinning may be adopted in plantations with lower stocking levels. A residual basal area of between 26-28 m²/ha must be retained. Subsequent selective thinnings will be conducted on a 10-15 year cycle (where markets permit). A residual basal area of 28m²/ha following thinning is recommended.

Harvest

Site class 1 white spruce stands will be maintained as white spruce working group by clearcutting, site preparation and planting.

Lower quality site classes will be permitted to revert to tolerant or mid-tolerant species (i.e. soft maple, ash cedar). The final harvest method will be a clearcut.

Where advanced regeneration is present traditional clearcutting will be utilized. Harvesting in winter is recommended to protect advance regeneration. When sites are not adequately stocked to desirable advance regeneration (but an adequate seed source is available) strip cutting will be the preferred method of harvest. Strips should not be more than 40 m wide and oriented at right angles to the prevailing wind.

Renewal

Site class 1 stands will be maintained as white spruce working group by planting. In instances where logging did not provide adequate expose of mineral soil, mechanical site preparation is recommended. The choice of equipment will be based on factors such as site conditions (i.e. soil types, drainage conditions etc.), machine availability and cost etc.

8.5.5. OTHER PLANTATIONS

Plantations of red oak (1.2 ha) European larch (6.9 ha), Japanese larch (7.2) and hybrid poplar (4.3) have all been established within Limerick Forest. These plantations typically are well stocked and with exception of the red oak plantation, less than 40 years old.

The red oak plantation will be managed by crop tree thinning. This approach will focus growth on the trees with the highest potential to increase in quality and

value. Thinning should not reduce crown closure to less than 70% and in general should not create canopy gaps larger than 1.5 m wide on three or four sides of selected crop trees.

Plantations of other species occupying production forest areas will be managed by even-age management harvest systems on a pathological rotation (dependent upon available markets). The conversion of these plantations to other species by natural ingress will be encouraged. Artificial renewal to appropriate species will be undertaken in instances where advance regeneration is inadequate to achieve desired stocking targets.

8.6. Determination of the Annual Allowable Cut

8.6.1. FOREST INVENTORY

Past forest inventory work was undertaken intermittently with sampling dependent on management requirements and available funding. The most recent forest inventories investigated the effects of the 1998 Ice Storm, assisted in the designation of “proposed old growth” reserves, and provided stand attribute data for the preparation of wood sale tenders (plantations). In general, forest sampling was not intensive, and little or no information is available with respect to sampling intensities, sample confidence intervals etc.

For the preparation of this management plan, LF forest inventory records and data were in an extremely poor condition for management planning. Information on some forest stands was incomplete, inaccurate or missing. Not all attribute data fields had been updated to reflect changes in age, height and volume which have occurred with the aging of the Forest or silvicultural activities (i.e. volume adjustments for thinned stands) which have occurred since 1992.

Forest data was recorded in an Excel spreadsheet. The geographic Information system (GIS) information available consisted of a “shapefile” of compartment boundaries with no attribute data attached. The compartment data was often incomplete, inaccurate and/or poorly digitized. Sub-compartment data was not available. Legacy and projection issues contained in the UCLG digital layer resulted in discrepancies between areas generated in the GIS and hardcopy documents provided by the County. To correlate compartment and sub-compartment area information with the LFLRP and other existing documents, compartment area information was based on the “Limerick Forest Compartment and Area” ledger and manually input into the area fields of the new GIS shapefile.

The available budget for forest management planning restricted the number of data issues which could be addressed during FMP preparation and the amount of field work which could be undertaken to support planning. Issues and problems with the forest inventory remain. It is critically important for the sustainable management of Limerick Forest that forest inventory and values information be updated and maintained.

Information management work completed during the preparation of this plan included the development of a functional GIS dataset for the Forest and the electronic updating of the LF database based on information in the 1992 inventory ledger, field work and silvicultural records. The forest inventory ledger³¹ must be considered as a work in progress and the UCLG Forest Manager should provide an annual budget to improve data quality and accuracy over the first five year management term. Initial inventory work should determine the status of lands classified as barren and scattered, inventory scheduled harvest stands to determine product yields and stands for which data was lacking, and confirm the “protection forest reserve and ecological reserve” designation in select stands (Table 37).

It is also critically important that all future silvicultural activities be recorded in the forest management database and that the forest inventory ledger be continuously updated to reflect volume reductions arising from harvest or thinning operations, stand growth and/or new information (i.e. cruise volumes, establishment of AOC reserves etc.).

Table 37. Listing of Stands Requiring Assessment 2007-2011

Compartment Number	Classification	Working Group / Status	Area
111c	Protection	Planted White Spruce	7.1
113b	Protection	Planted White Spruce	4.8
116b	Protection	Planted White Spruce	4.3
116c	Protection	Planted White Spruce	2.9
117c	Protection	Planted Red Pine	2.6
117e	Protection	Planted White Spruce	2.0
118b	Protection	Planted White Spruce	3.3
123c	Protection	Planted White Spruce	1.3
126d	Protection	Planted White Spruce	4.0
127e	Protection	Planted White Spruce	1.7
127g	Protection	Planted White Spruce	3.5
143g	Protection	Planted White Spruce	1.0

³¹ The Forest Inventory Ledger is as a supplementary document to the FMP.

15i	Protection	Planted White Spruce	1.6
97d	Protection	Natural Hard Maple	4.7
117b	Production	Planted Red Pine	3.3
129e	Production	Planted White Pine	2.5
135b	Production	Planted Red Pine	7.5
144d	Production	Planted White Spruce	12.6
151c	Production	Planted Other Conifer	1.9
168g	Production	Planted Other Conifer	6.7
172c	Production	Planted White Pine	4.5
66a	Production	Planted Red Pine	7.4
88i	Production	Planted White Spruce	1.2
1d	B & S	Planted Scots Pine	1.2
14d	B & S	Red Pine	2.4
19c	B & S	White Pine	4.0
33a	B & S	Cedar	0.7
41a	B & S	Poplar	2.0
45c	B & S	White Spruce	1.7
57d	B & S	White Spruce	1.4
57f	B & S	White Spruce	1.7
62d	B & S	Red Pine	0.5
67c	B & S	Cedar	1.8
96a	B & S	White Spruce	1.9
98b	B & S	Cedar	2.4
102a	B & S	Planted Red Pine	1.1
106g	B & S	Poplar	1.6
134a	B & S	White Spruce	16.5
135c	B & S	White Spruce	2.1
147b	B & S	White Pine	1.1
147f	B & S	Cedar	2.4
148e	B & S	Jack Pine	1.2
148i	B & S	Cedar	3.1
148m	B & S	Cedar	1.3
148n	B & S	Cedar	7.5
148r	B & S	Cedar	2.3
148t	B & S	Cedar	1.3

148u	B & S	Cedar	6.5
148v	B & S	Cedar	2.0
148w	B & S	Cedar	4.2
152g	B & S	Cedar	3.7
154c	B & S	Cedar	1.7
154f	B & S	Planted White Spruce	3.6
168b	B & S	Cedar	3.4
169e	B & S	Cedar	16.0
173b	B & S	Cedar	2.1
174b	B & S	Cedar	7.4
174g	B & S	Hard Maple	73.8
175a	B & S	Cedar	1.9
175b	B & S	Cedar	1.6
85d	Ecological Reserve	Other Conifer (Hemlock)	4.6
169f	Ecological Reserve	Other Conifer (Hemlock)	1.3
138d	Ecological Reserve	Other Hardwood (Black Cherry)	1.7

To enable the development of this management plan and the determination of the long term sustainable yield, stand attribute information (i.e. height, age, stocking) was updated from field records and/or with the use of Normal Yield Tables for Ontario. Each compartment classified as production forest was assigned a gross total volume and gross merchantable volume on the basis of estimated site class (based on height and age relationship) and updated stand age. Estimates of stocking for the volume estimate were derived by comparing the recorded “actual basal area” to the yield table “normal basal area”.

8.6.2. DERIVATION OF THE LONG TERM SUSTAINABLE YIELD (ANNUAL ALLOWABLE CUT)

Two techniques were utilized to calculate the annual allowable cut for production forest land — area control and volume control on the basis of Limerick Forest’s ten broad working groups (Appendix K). The resultant calculations were then averaged to provide the maximum recommended harvest levels for the first five-year period (Table 38).

Derivation of the AAC requires that lands dedicated to uses that exclude forest operations be removed from the calculation. Areas identified within the forest

inventory ledger as Protection Forest Reserve (PFR) and Ecological Reserve (ER) were therefore excluded from the calculation.

Table 38. Estimated Maximum Annual Allowable and Periodic Harvest by Working Group (2006-2011).

Working Group	AAC (m³)	Period AAC (m³)
Jack Pine	460	2,300
Red Pine	2,089	10,445
White Pine	1,348	6,740
White Spruce	1,489	7,445
Cedar	1,738	8,690
Other Conifer	219	1,095
Softwood Total:	7,343	36,715
Hard Maple	674	3,370
Soft Maple	769	3,845
Poplar	278	1,390
Other Hardwood	308	1,540
Hardwood Total:	2,029	10,145
Total:	9,372	46,860

The calculated AAC should be considered as a reasonable guideline for the maintenance of sustainable harvest yields for the five year period 2007-2012. It is recommended that the annual allowable cut calculation be re-calculated in conjunction with the planned formal plan revisions in 2012, 2017, and 2022 to permit adjustments to the allowable cut which may be required by changing social, economic or resource conditions or new forest resource inventory information.³² Irregularities in annual forest yields may be smoothed by adjustments in the cutting cycle over the five year operating period.

Volume estimates used in the calculation(s) were derived from information provided by UCLG, and OMNR Normal Yield Tables (Metric) for Major Forest Species of Ontario (OMNR, 1981). As noted above, forest inventory information for some compartments was suspect or wanting, and in general the forest inventory ledger had not been properly maintained in the past.

³² For example, adjustments to the AAC can be expected in response to the identification of additional areas of ecological reserve, protection forest reserve and/or in response to natural disturbance events (i.e. wind throw, insect infestations) and local market conditions.

8.7. Utilization Standards

The following utilization standards have been supplied as guidelines to be applied during harvesting operations.

Sawlogs

Sawlogs must have a minimum 25 cm diameter at the smallest end. Log lengths are 2.4 m, 3 m, 4.3 m or 4.9 m.

Veneer Logs

Normally, trees with diameters less than 41 cm are not marketed for veneer. Log lengths are similar to those prescribed for sawlogs.

Poles

Red pine poles are marketed according to size, straightness and number of knots. Size classes are determined by length and top and groundline diameters. The minimum standard length is 6.1 m.

Pulpwood

Pulpwood trees must have a minimum 10 cm diameter breast height (dbh) and minimum top diameter of 9 cm.

Logging Slash

Logging slash resulting from harvesting operations represents valuable forest biomass and should where economically feasible be utilized for fuelwood or pulpwood.

Unmerchantable slash will be left on site in accordance with the LFAC Nutrient Management Policy. In this instance, it is recommended that it be distributed over the cutover and lopped so it that it lies near the ground.

8.8. Identification of Eligible Harvest Areas

To successfully implement the plan eligible for harvest, renewal and tending operations must be identified and subsequently selected for operations in the context of the preparation of the five year operating plans. Actual five year harvest levels must conform to the calculated periodic harvest level.

Table 39 provides a preliminary listing of stands which meet eligibility requirements for harvest during the twenty year planning period based on current inventory data. Multiple listings indicate successive thinning regimes in the compartment. In operational planning the primary consideration for the selection of stands is volume per hectare, although it is noted that actual tree quality and volume per hectare will vary according to site and stand conditions encountered in the field. Actual stand selections will be undertaken during operational planning following site inspections.

Five year operational planning and annual work schedules will consider the most appropriate balance of harvesting, renewal and tending with due consideration of available markets, operating budgets and labour availability.

The following criteria were applied to identify stands as potentially eligible for harvest during the twenty year management period.

Uneven-Age Management Stands

- 1) Stands had to be mature.
- 2) Stand had to be capable of yielding a minimum removal yield of 100 m³ per hectare of desired species.
- 3) Stand stocking had to be 70% or better.
- 4) Stands had to have a minimum stand basal area of 28 m²/ha.

Even-Age Management Stands

1. Stands had to be mature (minimum age 26 years for red pine and 40 yrs for white pine).
2. Stands had to be capable of yielding a minimum removal volume of 100 m³ per hectare of desired species.
3. Stand stocking had to be 70% or better.
4. For white pine and red pine plantations a minimum stand basal area of 40 m²/ha for first commercial thinnings was assumed. Subsequent thinnings were assumed to occur at 10-15 year intervals (dependent on site). A residual basal area of approximately 25 m²/ha was to be maintained after the second thinning. Subsequent thinnings retain a basal area of 28 m²/ha.
5. For the white spruce working group, an initial row thinning removing a third of the volume was assumed to occur between 25-30 years. Subsequent selective thinnings were scheduled on the basis of a 10-15 year cycle. A residual basal area of 28m²/ha was to be maintained following treatment.

It is recommended that operational surveys to identify timber supply, site conditions, including ecosites and specific operational prescriptions at the stand level be carried out over each five year operational term. Hardwood stands should be surveyed with a specific focus on the basal area of acceptable and unacceptable growing stock for the identification of products and application of an appropriate silvicultural system.

Table 39. Potential Eligible Harvest Stands by Operating Period for the Twenty year Management Period.

Working Group	2007- 2012
White Spruce	106c, 106f, 114a, 119d,121d, 129b, 132b, 133f, 136a, 138c, 140d,142a,146a,148s, 44c, 44f, 56d, 58b, 60c, 61b, 63d, 83c, 86b, 96e, 99c
	2012 - 2017
	120a, 122h, 23g, 24a, 85c, 88b, 90f
	2017 - 2022
	109c, 119a, 146c, 146f, 56h, 65a, 70a
	2022 - 2027
106c, 106f, 114a, 119d,121d, 129b, 132b, 133f, 136a, 138c, 140d,142a,146a,148s, 44c, 44f, 56d, 58b, 60c, 61b, 63b, 63d, 83c, 64b, 83c, 86b, 96e, 99c, 26a	
Red Pine	2007- 2012
	25f, 2a, 3b, 5a, 6a, 6d, 85c, 106d, 110a, 138b, 140c, 155a, 3d, 44b, 63c, 11f, 25c, 25h, 27b
	2012 - 2017
	119b, 148g, 3e, 4b, 89e, 95c10b, 116a, 119f, 120b, 121c, 123b. 13a, 146b, 146i, 148o, 148q, 14c, 15b, 24b, 37c, 38b, 40a, 42a, 43a, 44d, 44g, 53c, 54b, 57g, 63h, 63i, 66c, 67b, 68a, 68b, 68c, 69b, 69c, 69d, 70b, 71a, 84a, 84c, 85a, 86e, 90g, 95b, 05e, 96f, 108a, 36d, 39a, 60a, 60b, 61a, 62c, 132a, 49b, 49c, 49d, 51e, 52c, 56a, 56b, 56e, 56f, 57e, 58c, 59a, 135a, 46a, 64a, 65c, 67a
	2017 - 2022
	106d, 110a, 138b, 140e, 155a, 3d, 44b, 63c, 85c, 11f, 25c, 25h, 27b,25f, 2a, 3b, 5a, 6a, 6d
2022 - 2027	

	119b, 148g, 3c, 4b, 89c,85c, 10b, 116a, 119f, 120b, 121c, 123b, 13a, 146b, 146i, 148o, 148q, 14c, 15b, 24b, 37c, 38b, 40a, 42a, 43a, 44d, 44g, 53c, 54b, 57g, 63h, 63i, 66c, 67b, 68a, 68b, 68c, 69b, 69c, 69d, 70b, 71a, 84a, 84c, 85a, 86e, 90g, 95b, 95e, 96f, 108a, 36d, 39a, 60a, 60b,61a, 62c, 132a, 49b, 49c, 49d, 51e, 52c, 56a, 56b, 56e, 56f, 57e, 58c, 59a, 135a, 46a, 64a, 65c, 67a
White Pine	2007-2012
	120c, 59b, 78d, 86c, 25e, 25g, 27a, 46b, 62b, 1h, 1i, 6e, 9a, 1k, 5b
	2012 - 2017
	10a, 14e, 169h, 174e, 22d, 24h, 42d, 52d, 52e, 54a, 6b, 83b, 84b, 62b, 46b, 15c, 1f, 1g
	2017 - 2022
	15a, 15d, 57a, 80c, 120c, 59b, 78d, 86c, 25e, 25g, 27a, 1h, 1i, 6e, 9a, 1k, 5b
	2022 - 2027
39d, 82b, 82c, 10a, 14c, 169h, 174e, 22d, 42d, 52d, 52c, 54a, 6b, 83b, 84b, 62b, 46b,122g, 1c, 15c,1f, 1g	
Cedar	2007-2012
	100h, 109e, 114d, 118a, 119e, 124e, 126a, 126b, 127d, 127f, 133c, 140i, 143b, 151b, 154b, 161a, 164a, 165b, 166c, 168a, 169g, 171e, 2b, 2g, 2i, 30c, 32c, 38a, 3a, 54c, 6c, 98d, 102c, 103a, 103b, 104c, 105b, 112a, 24g, 44c, 46d, 50b, 56g, 62a, 63e, 70e, 83a, 85b, 87a
	2012 - 2017
	113a, 120e, 127h, 1l, 115c, 116d, 162a, 171j, 40g, 62e
	2017 - 2022
	147g, 42b, 96b, 104d, 105a,
	2022 - 2027
	119c, 33b, 3c, 50a
Hardwoods	2007-2012
	102b, 118d, 129f, 54d, 70d, 87b, 92a, 65d, 167b
	2012 - 2017

	91b, 174c, 63g, 112b, 125h, 171c, 127c, 165c
	2017 - 2022
	1a, 125a, 35b
	2022 - 2027
	24d, 104b, 142c, 125c, 157b, 164d

8.9. Roads Management

Roads will be managed to provide and maintain access to the resources of Limerick Forest for recreation, forest protection and forest management. Annual plans will detail road construction or maintenance requirements for annual forest operations and other forest uses. Roads will be constructed and maintained in accordance with the *Environmental Guidelines for Access Roads and Water Crossings* (OMNR, 1999). No new road construction requirements were identified for the twenty-year management period.

8.10. Timing of Harvest Operations

LFAC has established a policy that the normal harvesting season in Limerick is to occur between September 1st and March 31st. It is recommended that this policy be reviewed to enable harvesting to occur throughout the year (where appropriate and markets permit) since seasonal restrictions may limit opportunities to market wood products.

The area of concern management process, strict adherence by operators to the various provincial guidelines, and the monitoring of operations for compliance with stand prescriptions etc. will minimize the potential of negative site impacts arising from operations.

9.0. RESOURCE PROTECTION

9.1. Fire Protection

The objective for fire management in Limerick Forest is to:

Prevent personal injury or loss of life and minimize damage to the resources of Limerick Forest or adjacent properties which may result from wildfire.

Strategies for objective achievement will include:

- 1) The active suppression of all wildfires.
- 2) The implementation of management actions such as hazard reduction on an as need basis.
- 3) Prevention and detection programs delivered by Municipal Fire Services.

Species composition, canopy cover, ecological moisture regime and exposure all influence the moisture characteristics of a given fuel complex and hence fire behaviour. Live deciduous leaves are less flammable than conifer needles due to differences in the moisture content, surface area-to-volume ratio and chemical composition. The flammability of mixedwood forests varies with the proportion of conifer species present, whether or not there is a deciduous overstorey, and whether or not grasses, herbaceous plants and shrubs in the understorey have flushed. In general, the flammability rating for the deciduous forest types of Limerick Forest is low. Fires in deciduous forest types are rare and relatively easily controlled. Fire risk is greatest in hardwood forests during the spring and fall. Crown fires are typically not expected.

Conifer forest types are typically more flammable than hardwood forest types. The flammability of conifer stands is influenced by a number of factors including stand age (younger stands being more prone to damaging fires than older stands) understorey composition, and other biotic factors such as fuel moisture content, relative humidity, temperature etc. Deciduous stands in close proximity to plantations and the many access roads within Limerick Forest may serve as firebreaks in the event of a fire slowing the rate of spread and intensity of a wildfire. The risk of crown fire is low in mature pine because of the height of the living branches from the forest floor, the thick bark of the species, and a relative lack of ladder fuels.

Fire suppression responsibility for Limerick Forest resides with the various Township Fire Services. As the landowner, the UCLG is responsible for ensuring

access and has prevention responsibility. Annual work schedules prepared by the Forest Manager typically include clearing and brushing work to ensure access along major roads within compartments. A formal fire plan was to be prepared in 2005 in consultation with Township authorities; however, this plan was not completed. It is recommended that this work be scheduled for completion within the first five year operating period.

Silvicultural interventions to reduce fire threats or risks within forest stands typically involve;

- 1) Prescribed burning to remove surface fuels and kill smaller live stems.
- 2) Thinning to reduce stand density to minimize crown torching and therefore the risk of a crown fires.
- 3) Combinations of prescribed burning and thinning.

Prescribed burning is not recommended as a management strategy for forest fuel load reduction in Limerick Forest. The current thinning regimes implemented by the UCLG in plantations and access road maintenance and brushing are appropriate fire management tools. The potential fire threat arising from the presence of logging slash within thinned or harvested sites will require an on-site assessment. Possible slash management options to reduce fire risk include the dispersal of slash over the logged area, lopping and piling and burning.

9.2. Protection from Insects and Disease

The Canadian Forest Service and OMNR monitor forest health conditions and provide annual reports on the status of forest health. Preparedness planning for outbreaks, regular monitoring for developing problems, and management practices that promote forest health reduce the risk of large-scale problems associated with insects and disease are best management practices for the prevention of insect and disease infestations.

Control of forest insects/diseases should be accomplished through an integrated pest management approach to ensure biologically effective, environmentally acceptable and economically efficient pest management. Concerns for the environment and long-term biological effectiveness dictate that chemical pesticides should not be depended upon as a long-term exclusive tactic. Rather chemical control measures should be utilized only when other methods cannot achieve satisfactory control, and as part of a more comprehensive integrated pest management program. Prevention through encouragement and maintenance of mixed stands of good vigour is a first line of defense in forest pest management.

Indirect approaches for forest protection against insects typically include stand manipulations, silvicultural techniques and other practices that lead to an overall increase in tree health. These approaches may include species selection (i.e. choosing the appropriate tree species for a given forest area), forest density control (to increase tree growth and health) and silvicultural practices that modify species composition or remove susceptible forest stands.

Direct actions will be taken when insect populations reach epidemic levels. Population control methods include insect trapping, mechanical treatments, harvesting of infested trees, the use of biological control agents or the application of insecticides.

The Status of Important Insect Pests in Ontario 2005 (Evans et al. 2005) lists the following major forest insects as significant in the Kemptville District; Spruce Budworm (*Choristoneura fumiferana*), Birch Skeletonizer (*Bucculatrix canadensisella*), Larch Caseborer (*Coleophora laricella*), Eastern Larch Beetle (*Dendroctenous simplex*), and the White Pine Weevil (*Pissoides strobi*).

The Emerald Ash Borer, Asian Long Horned Beetle, and the European Wood Wasp are invasive exotic pests which could potentially cause significant damage in the future. The European Wood Wasp (*Sirex noctilio*) is an invasive species recognized as a “very high risk” for plantations of pine in North America (Evans et al). A reproducing population of the wasp has been reported in New York State in close proximity to the Canadian border (approximately 100 km south of Kingston). A survey in the summer of 2005 indicated the presence of the wasp at four locations in Ontario (three collections in the south half of Prince Edward County and a fourth on Highway 416 north of Prescott).

Diseased trees exist in all healthy forests where they provide wildlife and ecological functions. The degree of damage caused by diseases is typically extremely variable, with the level of damage being related to host tree vigour and environmental conditions.

Timber losses to disease in Limerick Forest have been, to date, relatively minor with no major outbreaks reported in past management plans or silvicultural records. The maintenance of a diverse and healthy forest is the best preventative measure against widespread outbreaks of disease. Management options for the control of forest pathogens will be based on an assessment of the extent of and potential damage caused, environmental conditions and resources available for effective control. Silvicultural options (e.g. sanitation cutting, thinning etc.) are preferred but chemical control may be warranted in some instances. Specialists from the Canadian Forest Service and OMNR will be able to offer advice with respect to treatment strategies and options.

Monitoring of disease status will be undertaken during regular forest management activities. It is recommended that staff monitor stands for the status of *Fomes Annosus* root rot in all conifer stands and White Pine Blister Rust. Stands of red pine should also be monitored for Limestone Chlorosis (a decline in red pine planted on calcareous soils). Stands currently planted to red pine but unsuitable for red pine growth will be monitored for decline and regenerated to a more suitable species.

Table 40 lists diseases that have caused damage within Limerick Forest in the past and suggests possible control measures. Control methods adopted will be at the discretion of the UCLG Forest Manager and depend on the value(s) being threatened, the severity of the problem and the resources available for effective control.

Table 40. Some Common Diseases of Limerick Forest

Common Name	Control Methods
Nectria Canker	Remove cankered trees in thinnings and stand improvement operations.
Eutypella Canker	Remove cankered trees in thinnings and stand improvement operations.
Hypoxylon Canker	Minimize loss by maintaining dense stands and closed canopy. If stand is scheduled to be thinned remove all infected stems otherwise no treatment is warranted.
White Pine Blister rust	Prune limbs infected with potentially lethal cankers (10-46 cm). Select against trees with lethal cankers during thinning operations.
Annosus root rot	Schedule early harvest in severely affected stands.
Armillariella root rot	Maintain stand vigour. In high value stands remove infected stumps and roots.
Galls	None available.
Birch Dieback	None available.
Butternut Canker	None available.

9.3. Ice Storm Damage Management

The 1998 ice storm damaged many stands in Limerick Forest. In general, within the Kemptville District, damage to hardwoods was variable and patchy dependent on site conditions (i.e. tree health, stand density etc.) and species.

For conifer working groups, plantations of red pine, jack pine and scots pine sustained the most damage. Limited salvage operations were conducted in the winter of 1998-1999 to remove damaged trees and salvage merchantable volumes in compartments where damage was significant and operations were economically viable. Records of the volumes removed in the salvage were not maintained. White pine was planted in stand openings within the salvage logged sites.

In affected stands ice damage reduced stand densities and increased down fuel loads (toppling of trees), and lowered tree quality and vigour (i.e. broken tops, stripped branches). Many of the other sites opened up by the ice storm have propagated to buckthorn and raspberries, and control of these species may be warranted if regeneration becomes suppressed or killed.

Stands damaged by the storm will be monitored during forest management activities for signs of decline (as tree wounds where tops were broken off or branches sheared may also serve as infection courts for disease) and appropriate management interventions (i.e. sanitation cutting, renewal etc.) implemented.

9.4. Management of Invasive Plant Species

The LFLRP identifies buckthorn, garlic mustard and strangling dogvine as potential threats to Limerick Forest's natural communities. Buckthorn is perhaps the most pervasive invasive plant species in Limerick Forest, with plantation areas being most heavily invaded. The success of the species in becoming established occupying sites is attributed to species characteristics such as;

- Frequent and abundant seed crops.
- Ease of seed dispersal by birds and small mammals.
- Rapid and vigorous germination of seeds.
- High tolerance of shade and ability to aggressively capitalize on canopy openings.
- Plants vigorously sprout from the stump if the top is damaged.
- Seeds may accumulate in the soil beneath existing plants for 3.5 years.

- Plants take advantage of early and late portions of the growing season by leafing out earlier and retaining leaves longer than most native species.
- Tolerance of wet sites.

The 2005 FMP recommended that experimental trial for the control of buckthorn be initiated in 10 compartments to assess costs and the effectiveness of various control measures. These experimental trials were not undertaken.

Invasive species do not currently exist at levels which completely preclude native species and as such no active management activities have been implemented for their control or eradication. The abundance of invasive species will be continue to monitored in conjunction with other forest management activities, and practical and effective control measures implemented.

For areas where infestations are light and seed sources scarce, herbicide or mechanical treatments (i.e. uprooting, cutting) are appropriate but time consuming and costly. Methods to control buckthorn on larger areas include 1) light burning, 2) foliar application of herbicides, or 3) mowing and chopping with follow-up treatment of either the stumps or sprouts with herbicide (Miller, 2005). Research indicates that herbicide control techniques are more cost effective and efficient in controlling buckthorn than mechanical techniques (i.e. uprooting, cutting) and therefore herbicide treatment is recommended for Limerick Forest. Herbicide applications should be carefully targeted to avoid undesired effects as no methods are selective enough to eliminate only buckthorn when applied broadly (Miller, 2005). Since buckthorn seed remain viable for a number of years, follow-up surveillance and re-treatment of sites may be required.

9.5. Management of Nuisance Animals

While it is recognized that beaver impoundments are considered necessary to achieve waterfowl and other furbearer production objectives and beaver impoundments are required to create local biological diversity, nuisance beaver problems will be dealt with on a case-by-case basis. Beavers and beaver impoundments will be removed where flooding threatens private land, high value timber, wetlands (where specialized habitats are threatened by raised water tables) or recreation or access roads and trails. Culverts will be monitored for beaver activity (blockages) and appropriate mitigation measures (i.e. installation of gates, “beaver bafflers) implemented as required.

Porcupine feeding can cause extensive damage to plantations. Animals will be removed from locations were damage is deemed to be significant and/or control to minimize economic loss of timber is warranted. Sanitation thinnings are recommended in areas where damage is deemed excessive.

9.6. Protection from Illegal Cutting and Dumping of Garbage

With the exception of occasional illegal fuelwood cutting, the illegal cutting of wood generally does not occur within Limerick Forest. The scale of this illegal cutting is relatively insignificant. UCLG Forestry Staff, members of LFAC and members of the general public monitor the forest for illegal activities on an as encountered basis.

The illegal dumping of garbage by the public on access roads and trails is also considered to be a minor problem. Annual public relations programs will be implemented to encourage the appropriate use of Limerick Forest and discourage vandalism and illegal dumping.

10.0. MONITORING AND ASSESSMENT

Forest management plans are monitored to ensure compliance with the forest management plan, to determine the effectiveness of planned silviculture, to ensure that forest operations have complied with prescriptions for operations and operational restrictions, to discover problems (i.e. insect infestations, illegal dumping etc.) and to document observations of the effects of forest management and other forest uses on forest cover types and forest values.

Indicators of Forest Sustainability

Indicators are the tools for assessing the outcome of management decisions, and a guide for adaptive, knowledge-based management. Periodic assessments (five year intervals) will be made in order to determine whether Limerick Forest is being managed sustainably and whether other management objectives are being achieved. Previous LF management plans did not provide for the assessment of the indicators of sustainability. This forest management plan therefore, will provide the base information and data required to monitor assess and report on progress towards forest sustainability over successive planning periods.

The assessment will include a comparison of the achievement of planned vs. actual targets, an assessment of the status of sustainability indicators and the rationale for any significant deviations from planned targets. The Forest Management Planning Manual for Crown Lands in Ontario identifies five criteria for use in the determination of forest sustainability at the management unit level³³; biodiversity, forest condition and ecosystem productivity, soil and water quality and the provision of multiple benefits to society. It is recommended that the Forest Manager, in collaboration with LFAC, develop a comprehensive suite of forest sustainability indicators appropriate to the resource attributes and uses of Limerick Forest (e.g. stability of forest cover types, recreational use trends, public satisfaction with forest management, value of wood products harvested etc.) during the first operating period.

Forest Operations Inspection

All forest operations will be inspected for compliance with contract specifications. The frequency of inspections will depend on the complexity of the operation, the

³³ Six criteria are commonly used in the determination of forest sustainability: Biodiversity; Forest Condition and Ecosystem Productivity; Soil and Water Quality; Global Ecological Cycles; Multiple Benefits to Society; and Accepting Society's Responsibility for Sustainable Development. The *Crown Forest Sustainability Act (CFSA)* requires a determination of forest sustainability at the management unit level. With the exception of Global Ecological Cycles, these criteria are relevant to the management unit level.

values to protect and contractor performance in previous contracts. Prior to the commencement of silvicultural contracts it is recommended that the UCLG Forest Manager meet with contractor's staff in the field to discuss site specific conditions and the importance of compliance with the silvicultural prescription.

Field Inspections should occur at least on a monthly basis with a final inspection at the end of operations prior to the departure of the contractor. During site inspections it is important to record any undesirable conditions in areas of operations that appear to be related to forest management activities (e.g. washouts, blow downs).

The minimization of damage in selection harvesting operations will be important in order to maintain suitable levels of acceptable growing stock over the cutting cycle. Logging damage surveys will be carried out to ensure minimum standards as described in Section 6.5.1. Tree marking will be monitored prior to harvesting, to ensure that minimum standards are achieved prior to harvesting.

It is recommended that operational surveys to identify timber supply, site conditions, including ecosites and specific operational prescriptions at the stand level be carried out over the five year operational term. Hardwood stands should be surveyed with a specific focus on the basal area of acceptable and unacceptable growing stock for the identification of products and application of an appropriate silvicultural system.

Regeneration

Survival assessments will be conducted in the first, second, fifth, tenth and fifteenth year following tree planting. Remedial actions will be prescribed in the event of stocking shortfalls. Surveys of natural regeneration will be conducted on a seven year interval following cutting.

Permanent Sample Plots

Permanent sample plots (PSP) have been established within Limerick Forest to monitor timber growth and yield, harvesting effects on regeneration, ground vegetation and invasive species establishment and growth. Most plots are established according to Ecological Monitoring and Assessment Network (EMAN) protocols and established in conjunction with the delivery of projects to 1) monitor effects of thinning in red pine plantations, 2) assist in the identification of proposed old growth reserves and 3) monitor terrestrial ecosystems. Table 41 provides the location of the EMAN plots (Figure 25).

Table 41. Forest Compartments with EMAN Plots

Plot Description	Compartment
Ecological Monitoring and Assessment Network (EMAN) ³⁴	61a, 61b, 39a, 74a,76b, 78b, 174e, 51b, 53b,75b, 85d, 119g

Forest operations will be restricted or modified in the vicinity of the plots in order that site integrity may be maintained. The locations of past growth and yield plots established in LF could not be determined at the time of management plan preparation.

Findings and knowledge derived from the PSP activities will be utilized to improve forest management planning (i.e. use of growth and yield information in allowable cut calculations) and to guide the development of management prescriptions and/or strategies.

Forest Health Monitoring

Forestry Canada and the OMNR monitor forest health conditions and are required to report annually on the status of forest health. Monitoring for insects and disease will be undertaken by County staff during regular forest management activities.

LFAC Environmental Assessment Policy

Every project, unless otherwise exempted in the Management Plan, is subject to an environmental review by the Chairperson’s Committee of the Limerick Forest Advisory Committee (LFAC).

This review process is outlined in Schedule “A” of the LFAC Terms of Reference (Appendix D). There is no single best methodology for conducting an environmental assessment. An environmental assessment should consider the scope and nature of likely environmental effects, the significance of any adverse effects and the need for mitigation to reduce or eliminate adverse identified effects. The LFAC policy addresses these general requirements and is flexible, practical (in that it does not necessarily require specialist skills or a substantial commitment of resources and time), and transparent.

³⁴ The Ecological Monitoring and Assessment Network (EMAN) is made up of linked organizations and individuals involved in ecological monitoring in Canada to better detect, describe, and report on ecosystem changes (www.eman-rese.ca)

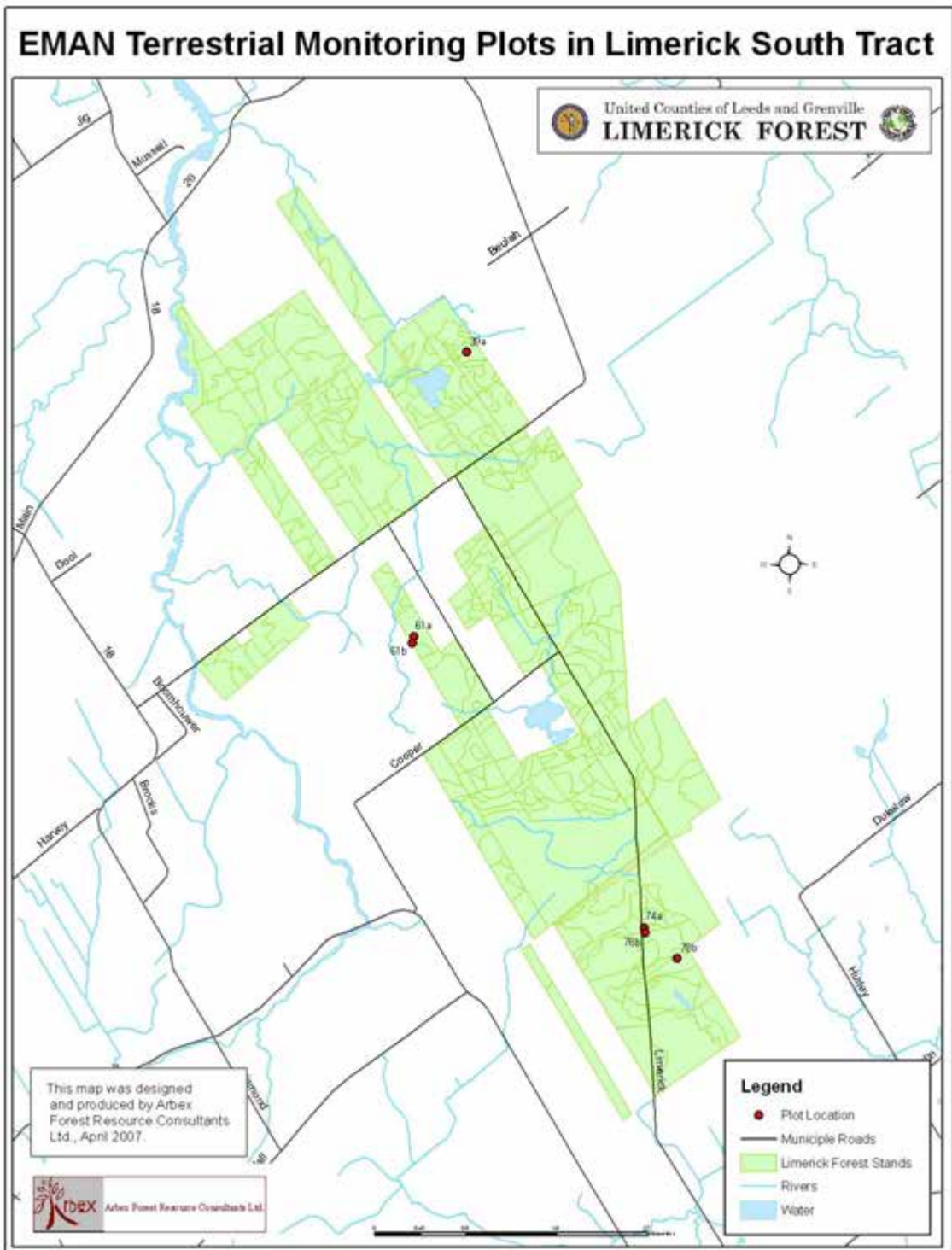


Figure 25. EMAN Plot Locations in Limerick South Tract

11.0. FOREST MANAGEMENT PLAN ADMINISTRATION

11.1. Administration

While the overarching land use plan for Limerick Forest is the Long Range Management Plan, direction for the management of the forest is set by the UCLG Council. The Limerick Forest Manager is responsible for the all aspects of the management of Limerick Forest on behalf of the UCLG.

The Council is assisted in this task by the Limerick Forest Advisory Committee (LFAC) which provides management advice and public comment. The committee consists of volunteer members of the public who are dedicated to the sustainable development of the Limerick Forest and interested in being involved in the management of Limerick Forest. The mandate, structure and operating procedures of LFAC are guided by a Terms of Reference approved by County Council. LFAC reports to the UCLG through its Public Works Committee. The Committee structure consists of five sub-committees; Administration, Ecology, Education and Communications, Forest Resources and Recreation.

The Terms of Reference for LFAC describes the subcommittee mandates as follows:

Administration: To establish rules and regulations for the use of the resources in Limerick Forest.

Forest Resources: To manage the resources of Limerick Forest on a sustainable basis for a wide variety of goods and services.

Recreation: To provide for a wide variety of quality recreational opportunities in a safe environment.

Ecology: To promote the scientific understanding of biodiversity and to protect the ecological features and values of Limerick Forest.

Education and Communications: To provide outdoor education opportunities and to foster a strong understanding of sustainable resource management.

Each subcommittee has an elected chair. The sub-committee chairs are members of the LFAC Chairs subcommittee which acts as the linkage between LFAC and the UCLG. A Communications Working Group is responsible for informing the public of LFAC activities. Subcommittees propose and approve

work projects for annual implementation and perform other duties (e.g. environmental assessments, project management) on an as required basis.

UCLG Forest Manager and Forest Technician

A Forest Manager is employed by the UCLG to supervise the day to day forest management operations of Limerick Forest and to liaise with LFAC, the general public, municipal governments and government and non-government agencies. The manager is responsible for the planning, development and implementation of Limerick Forest activities and operations. Areas of specific responsibility include the production of annual reports, five year operating plans, wood sales tenders and operations budgets. The Forest Manager is assisted in his duties by a staff Forest Technician. The technician performs manual labour and silvicultural services (i.e. tree marking, forest inventory, silvicultural assessments).

11.2. Management Plan Period

This management plan spans the twenty-year period between 2007-2027. Management activities are to be based on four five year operating periods to maintain maximum flexibility and to allow for either periodic or intermittent revisions should resource condition or social/economic conditions change over the planning period. Formal revisions to this plan should be undertaken in 2012, 2017 and 2022. The public will be invited to review and comment on the management plan revisions by notices placed in local media and scheduled information sessions/open houses. The plan documents will be available for public review during regular office hours at the UCLG office in Brockville.

Five year operating plans will be developed to guide on-the-ground forest management activities. For timber management the operating plans will select areas for harvest, renewal and/or maintenance, provide specific AOC prescriptions to protect specific values and detail access requirements for operations as required. Recreational trail management activities (i.e. location of new trails and trail upgrading and maintenance activities) and infrastructure development or improvements will also be detailed. Estimates of costs and revenues associated with management activities proposed for the five year term will be provided. Public notice of the plan will be provided prior to final plan approval and the commencement of management activities or projects. To facilitate the public review of the five year operating plans the plan will be made available for public inspection during regular office hours at the UCLG office in Brockville.

Annual work plans will be prepared which will detail planned annual management activities and projects to be undertaken and provide a time schedule for the activities. The period of annual plans is April 1st to March 31st. Cost estimates

and anticipated revenues will be provided. Public notice of the plan will be provided prior to final plan approval and the commencement of management activities or projects. To facilitate the public review, the annual plan (including maps) will be available for public inspection during regular office hours at the UCLG office in Brockville.

11.3. Record Keeping

Accurate and concise records of all activities must be maintained to ensure the continuity of the planned management. Cutting records, silvicultural records and annual cost summaries for physical improvements, administration and maintenance must be strictly maintained. Although some records and maps for silvicultural operations, wood sales etc. have been kept, the lack of a formal system of record keeping made it difficult to consolidate background information to create an accurate picture of past activities in Limerick Forest. This kind of information is fundamental for the development of management prescriptions and strategies for the next management period that both build upon and are consistent with past efforts.

A formalized system of record keeping needs to be implemented by the UCLG to facilitate the tracking of all activities, values, costs and revenues associated with the management of Limerick Forest. The use of the geographic information system (GIS) will further enhance record keeping by providing a means to store, update and link stand data and historical/treatment information with spatial datasets and permit the forest manager to conduct data queries, produce maps and perform data analysis functions. It is recommended that the Forest Manager and the Limerick Forest Technician receive GIS training to ensure that record management functions are properly implemented and maintained.

A considerable amount of field observation data collected by members of the public and LFAC volunteers exists, as does information and reports compiled by past LFAC activities and projects. It is recommended that an archive of this material be maintained by the Forest Manager. Where appropriate, effort should be made to geo-reference data (natural history and other data) to facilitate its incorporation into the Limerick Forest GIS database.

11.4. Land Acquisitions and Disposal

No land acquisitions or dispositions are anticipated during the twenty year planning horizon, although opportunities may arise where crown or private land may be acquired in order to consolidate forest compartments or expand tracts for timber management, recreation or conservation purposes. The UCLG does not currently have a policy in situ for the sale or purchase of tracts of forest land. It is

recommended that such a policy be developed and approved in the first five year operating term.

12.0. RECOMMENDATIONS

Recommendations contained in this forest management plan for consideration by the UCLG, the Forest Manager and LFAC are summarized below. It is recommended that these recommendations be implemented during the first five year management term.

Administrative

It is recommended that:

1. The Forest Manager officially inform the OMNR Kemptville District of the ANSI and PSW boundary issues to: 1) notify OMNR of any planned or past forest management activities within the current boundaries and 2) request that boundaries be re-delineated in the next update of NRVIS.
2. This forest management plan and the annual allowable cut calculation are revised in 2012, 2017 and 2022.
3. The Limerick Forest Inventory Database and associated GIS digital layers (i.e. Area of Concern, Roads layer etc.) be maintained and updated on a regular basis. Significant effort must be made in the first operating period to improve Limerick Forest's forest resource and values inventory information if Limerick Forest is to be managed on a sustainable basis.
4. The Forest Manager and Resource Technician receive training in GIS systems management and use.
5. Annual public relations programs (e.g. signage, brochures, media campaigns) to encourage the appropriate public use of Limerick Forest, promote public safety and reduce incidences of vandalism and illegal dumping be instituted.
6. The Forest Manager promote partnerships with local community and/or provincial interests and research that contribute to the environmental and recreation management of Limerick Forest.
7. The UCLG develop a land acquisition/disposal policy to facilitate the sale or purchase of tracts of forest land in the first five year operating term.
8. It is recommended that the UCLG seek legal advice and develop a policy with respect to UCLG 3rd party liability which may arise from the public use of UCLG properties or facilities.

9. It is recommended that an archive of field observations, reports and other data related to Limerick Forest be maintained by the Forest Manager. Where appropriate, effort should be made to geo-reference data collected (where appropriate) to facilitate its incorporation into the Limerick Forest GIS database.

Forest Management

It is recommended that:

1. The goal, objectives and management strategies detailed within this Forest Management Plan be adhered to.
2. All stand silvicultural prescriptions for operations be prepared by a Registered Professional Forester in good standing with the Ontario Professional Foresters Association.
3. All tree marking activities be conducted by “certified tree markers”.
4. The management of Limerick Forest Plantations continue to be based on the application of density management diagrams supplemented by local knowledge and experience.
5. The Forest Manager adopt the use of linear programming techniques to develop thinning and harvest schedules in five year operational planning.
6. The age class area imbalance associated with Limerick Forests plantations be addressed through accelerated harvesting and/or liquidation of selected red pine and white pine working group stands (where feasible and where markets permit) and prompt renewal of these sites to pine species.
7. External financial and human resource support be solicited to support forest management in stands that under current conditions are uneconomic to manage.
8. Wood sale contracts be subject to a minimum 10% performance holdback to offset costs or charges associated with non-compliance to contracted terms and conditions and/or penalties or remedial actions related to environmental or site damage arising from harvest/hauling operations.
9. A Fire Management Plan for Limerick Forest be prepared in the first five year operating period.
10. Operational surveys to identify timber supply, site conditions, including ecosites and specific operational prescriptions at the stand level be carried out over each five year operational term.

11. The Forest Manager, in collaboration with LFAC, develop a comprehensive suite of forest sustainability indicators appropriate to the resource attributes and uses of Limerick Forest (e.g. stability of forest cover types, recreational use trends, public satisfaction with forest management, value of wood products harvested etc.) during the first operating period.
12. LFAC should review the policy which restricts harvesting operations to between October 1st and March 31st.

BIBLIOGRAPHY

- Archibald, D., Wiltshire, W., Morris, D., Batchelor, B. Forest Management Guidelines for the Protection of the Physical Environment. OMNR Queen's Printer for Ontario. 1997.
- Clutter, J., Forston J., Pienaar, L., Brister, G. and Bailey, R. Timber Management a Quantitative Approach. John Wiley and Sons Inc. Toronto, 1983.
- Copestake, M. Information Report No. 100 Eastern Ontario Wood Flow and Wood Supply Study. EOMF. 2005.
- Copestake M., Rowsell, M. State of Eastern Ontario's Forests: Flow of Wood Products. EOMF, 2005.
- Davies L. & Johnston. K. Forest Management (Third Edition). McGraw-Hill Inc. Toronto 1996.
- Evans, H. Hopkin, A., Scarr, T. Status of Important Forest Pests in Ontario in 2005. Natural Resources Canada and OMNR Forest Management Branch.
- Evers, Ron and J. Henry. Limerick Forest Management Plan Monkey Survey. (June 2006).
- Forest Stewardship Council. FSC Policy and Standards Unit Advice Note. Interpretation of FSC Criterion 10.9. December 2002.
- Forest Stewardship Council. FSC Principles and Criteria for Forest Stewardship. FSC-STD-01-001. April 2004.
- Forest Stewardship Council. Standards for Well Managed Forests in the Great Lakes St. Lawrence Forests of Ontario and Quebec.
- Harshaw, H., Sheppard, S., Kozak, R. Outdoor Recreation and Forest Management: A plea for empirical data. Forestry Chronicle Volume 82. No.2. 2007.
- Heritage Quest Inc. Stage 2 Archaeological Assessment Shanty Knoll Quarry Lots 2/3, Concession 8 Township of North Augusta Grenville County. 2001
- Hunter, M.J. Wildlife, Forests and Forestry. Principles of Managing Forests for Biological Diversity. Prentice-Hall, Inc. Toronto. 1990.
- Keddy, C. Information Report No. 1. Forest History of Eastern Ontario. EOMF. 1994.

Leuschner, W.A. Introduction to Forest Resource Management. John Wiley and Sons Inc. Toronto. 1984.

Neave, Peter. Draft 2 Forest Management Plan for Leeds and Grenville Counties Limerick Forest April 2004 – March 31, 2024 and Five Year Operation Plan April 2004-March 2009. (March 17, 2005).

United Counties of Leeds and Grenville. Limerick Forest Long Range Management Plan. (September 2003)

Government of Ontario. Provincial Policy Statement 2005. Queen's Printer for Ontario. 2005.

OMNR 1993. Forest Management Plan for Leeds and Grenville Counties Agreement Forest (Limerick Forest) April 1992-March 2012. (March, 1993).

OMNR. 1998 A Silvicultural Guide for Tolerant Hardwood Forest in Ontario. OMNR Queen's Printer for Ontario.

OMNR 1998. A Silvicultural Guide for the Great Lakes-St. Lawrence Conifer Forest in Ontario. OMNR Queen's Printer for Ontario.

OMNR 2000. A Silvicultural Guide to Managing Southern Ontario Forests. OMNR Queen's Printer for Ontario. .

OMNR. April 2001. Forest Information Manual. OMNR Queen's Printer for Ontario.

OMNR. Ecological Land Classification for Southern Ontario, First Approximation and its Application, SCSS Field Guide FG-02. 1998.

OMNR 2007. Ontario Forest Resources Inventory Calibration Plot Specifications.

OMNR. Managing Red Pine Plantations. Queen's Printer for Ontario. 1986.

OMNR June 2004. Forest Management Planning Manual for Ontario's Crown Forests. OMNR. Queen's Printer for Ontario.

OMNR. Growth and Yield Responses of Red Pine Plantations to Thinning. Technical Note #06. 2000.

OMNR. Red Pine and White Pine Site Index Curves and Tables for the South Central Region. Technical Note #02. 1996.

OMNR. Extension Notes – Restoring Old-Growth Features to Managed Forests in Southern Ontario. Queen’s Printer for Ontario. 1996.

OMNR. Extension Notes – Old Growth Forests in Southern Ontario. Queen’s Printer for Ontario. 1996.

OMNR. Extension Notes – Managing Red Pine Plantations. Queen’s Printer for Ontario. 1999.

OMNR. Normal Yield Tables (Metric) for Major Forest Species of Ontario. 1981.

Oliver C., Larson B. Forest Stand Dynamics. McGraw Hill Inc. Toronto 1990.

United Counties of Leeds and Grenville. Limerick Forest Annual Activity Plan 2005.

United Counties of Leeds and Grenville. Limerick Forest Annual Activity Plan 2004.

United Counties of Leeds and Grenville. 2005 Annual Report.

United Counties of Leeds and Grenville. Limerick Forest 2003 Annual Report.

United Counties of Leeds and Grenville. Limerick Forest 2002 Annual Report.

United Counties of Leeds and Grenville. Limerick Forest Annual Activity Plan Report 2004.

United Counties of Leeds and Grenville. Limerick Forest Annual Activity Plan for the Period: January 1, 2003 to December 31, 2003.

USDA A Managers Handbook for Northern Hardwoods in the North Central States.

General Technical Report NC-39. 1977.

USDA. A Managers Handbook for Red Pine in the North Central States.

General Technical Report NC-33. 1977.

USDA. A Revised Managers Handbook for Red Pine in the North Central Region. USDA Forest Service and University of Minnesota. 2005.

USDA. A Managers Handbook for Aspen in the North Central States. General Technical Report NC-36. 1997.

Van Dyke, A. Forest Management Plan for Leeds and Grenville Counties Agreement Forest (Limerick Forest) For the Period April 1, 1992 to March 31, 2012. and Forest Operating Plan for the Period April 1, 1992 to March 31, 1997. OMNR 1993.

Wenger, K.E. Forestry Handbook Second Edition. Society of American Foresters John Wiley and Sons. Toronto 1984.

Willis, Sue. Limerick Forest Advisory Committee Membership Survey Results. (January 2006).

Willis, Sue. The History of the Limerick Forest Advisory Committee (LFAC). The Spirit of a Community Forest. (March 2006).

Willis, Sue. Retaining and Recruiting Volunteers. A Report Prepared for the Limerick Forest Advisory Committee (March 2006).

Willis, Sue. Tourism and Recreational Development Study for Limerick Forest. (August 2006).

APPENDICES

APPENDIX A
List of Acronyms

List of Acronyms

AAC	Annual Allowable Cut
Ab	Black Ash
Aw	White Ash
Aka	Also Known As
ANSI	Area of Natural and Scientific Interest
AOC	Area of Concern
ATV	All-Terrain Vehicle
Bd	Basswood
Be	American Beech
Bf	Balsam Fir
B+S	Barren and Scattered
Bw	White Birch
Cb	Black Cherry
Ce	Eastern White Cedar
CM	Centimetre
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
COSSARD	Committee on the Status of Species at Risk in Ontario
Cr	Eastern Red Cedar
DBH	Diameter at Breast Height
DUA	Designated Use Area
ELC	Ecological Land Classification
EMAN	Ecological Monitoring and Assessment Network
ER	Ecological Reserve
FBM	Foot Board Measure
FMP	Forest Management Plan
FOC	Coniferous Forest
FOD	Deciduous Forest
FOM	Mixed wood Forest
FRI	Forest Resource Inventory
GA	Actual Growing Stock
GIS	Geographic Information System
GN	Normal Growing Stock
GPS	Global Positioning System
GTV	Gross Total Volume
Ha	Hectare
He	Hemlock
IA	Annual Increment
LF	Limerick Forest
LFAC	Limerick Forest Advisory Committee
LGSA	Leeds and Grenville Snowmobile Association
LRP	Long Range Plan
LFLRP	Limerick Forest Long Range Plan

LTSY	Long Term Sustainable Yield
M	Metre
M ²	Square Metre
M ² /ha	Square metre per hectare
M ³	Cubic Metre
M ³ /ha/yr	Cubic metre per hectare per year
M ³ /yr	Cubic metre per year
Mh	Hard Maple
MMA	Modified Management Area
Ms	Soft Maple
NRVIS	Natural Resource and Values Information System
Ob	Bur Oak
Oc	Other Conifers
OFAH	Ontario Federation of Anglers and Hunters
Oh	Other Hardwoods
Or	Red Oak
Ow	White Oak
OMNR	Ontario Ministry of Natural Resources
PFR	Protection Forest Reserve
Pj	Jack Pine
Po	Poplar
Pr	Red Pine
Ps	Scots Pine
PSP	Permanent Sample Plot
PSW	Provincially Significant Wetland
Pw	Eastern White Pine
R	Rotation Age
Sw	White Spruce
UCLG	United Counties of Leeds and Grenville
WG	Working Group
WMU	Wildlife Management Unit

APPENDIX B

List of Forest Compartments

LOCATION	COMP	KEY	AREA	WG	SPECIES_CO		
Limerick North Tract	Lim 1	1a	3	Mh	Mh70Bd20Hb5Ob2		
		1b	3.8	Sw	Sw5Pw3Pr1Ce1		
		1d	1.2	Pj	Ps5Sw3Cb1Ce1		
		1e	1.5	Pw	Pw5Pj4Sw1		
		1f	1.2	Pw	Pw70Sw30		
		1g	3.1	Pw	Pw6Sw4		
		1h	4	Pw	Pw9Sw1		
		1i	1.7	Pw	Pw8Sw2		
		1k	12.6	Pw	Pw5Sw4Ce1		
		1l	5.4	Ce	Ce95Bw3Pw1		
			Lim 1 Total:		37.5		
	Lim 2	2a	5.1	Pr	Pr9Pw1		
		2b	7.7	Ce	Ce10		
		2c	2.8	Pj	Pj10		
		2d	2.6	Pj	Pj4Pr3Ce3		
		2e	2.4	Sw	Sw10		
		2g	2.9	Ce	Ce65Mh23Bn4Pw4Bd2		
		2h	1.3	Pj	Pj8Ps1Oh1		
		2i	1.1	Ce	Ce10		
			Lim 2 Total:		25.9		
			Lim 3	3a	21.6	Ce	Ce93Mh2AgFbBwCbMrSw5
3b	2.5			Pr	Pr8Oh2		
3c	2.6			Ce	Ce10		
3d	3.4			Pr	Pr10		
3e	1.5			Pr	Pr60Sw30Ps10		
	Lim 3 Total:		31.6				
	Lim 4	4a	3.2	Pj	Ps10		
		4b	13.3	Pr	Pr8Pw2		
		4c	7.8	Pj	Pj10		

LOCATION	COMP	KEY	AREA	WG	SPECIES_CO
	Lim 4 Total:		24.3		
	Lim 5	5a	9.1	Pr	Pr10
		5b	4.2	Pw	Pw6Sw4
		5c	8.6	Pw	Pw5Pr4Pj1
		5d	6.5	Pw	Pw5Pr3Sw2
		5e	6.4	Pr	Pr8Ps2
	Lim 5 Total:		34.8		
	Lim 6	6a	6.7	Pr	Pr10
		6b	13.9	Pw	Pw7Sw2Ce1
		6c	5.1	Ce	Ce10
		6d	12.5	Pr	Pr9Pw1
		6e	6.3	Pw	Pw8Sw2
	Lim 6 Total:		44.5		
	Lim 7	7a	3.6	Ce	Ce7Oh2Bw1
	Lim 7 Total:		3.6		
	Lim 8	8a	3.1	Sw	Sw6Ce4
	Lim 8 Total:		3.1		
	Lim 9	9a	1	Pw	Pw5Sw4Pr1
		9b	2.2	Ce	Po5Ce5
		9d	1.2	Ce	Ce10
	Lim 9 Total:		4.4		
	Lim 10	10a	3.8	Pw	Pw7Sw3
		10b	2.4	Pr	Pr9Pw1
		10d	3.6	Ce	Ce40Mr14Ag14Ab12Fb12By4Mh2
		10f	3.2	Oh	Bd51Mh40Be3Hb3
	Lim 10 Total:		13		
	Lim 11	11a	2.6	Pj	Pj9Pr1
		11b	13	Mh	Mh48Pw30Hb5Id5At2Sw2Fb2Bd1Bw1Ew1
		11d	7	Pw	Mh5Pw4OH1
		11f	1.4	Pr	Pr10
	Lim 11 Total:		24		

LOCATION	COMP	KEY	AREA	WG	SPECIES_CO
Lim 13		13a	2.3	Pr	Pr7Sw2Ce1
		13b	5.9	Ce	(blank)
		13c	3.2	Ce	Ce10
	Lim 13 Total:		11.4		
Lim 14		14b	10.3	Ms	Mr64Ag8Be8Mh5Bd5Bw2Ce2Cb2
		14c	1	Pr	Pr10
		14d	2.4	Pr	Pr10
		14e	1.1	Pw	Pw9Pr1
	Lim 14 Total:		14.8		
Lim 15		15a	0.8	Pw	Pw9Sw1
		15b	1.7	Pr	Pr8Pw2
		15c	1.6	Pw	Pw7Sw3
		15d	4.2	Pw	Pw7Sw3
		15f	0.4	Ce	Ce10
		15g	2.1	Ce	Ce7Pw3
		15h	2.2	Ce	Ce9Sw1
		15i	1.6	Sw	Sw6Pw4Ce1
	Lim 15 Total:		14.6		
Lim 16		16b	1.4	Pw	Pw6Sw3Ce1
	Lim 16 Total:		1.4		
Lim 17		17a	6.2	Sw	Sw5Pw4Bw1
	Lim 17 Total:		6.2		
Lim 18		18a	6.1	Mh	Mh57Hb13Ag7Bn7Ew5Pw5Bd2
		18b	1.3	Pr	Pr8Bw2
		18c	2.7	Pr	Pr8Bw2
		18d	2.3	Sw	Sw7Pw3
		18e	9.1	Ce	Ce94At4Ag1
	Lim 18 Total:		21.5		
Lim 19		19b	4.5	Oh	Bw5Po2Oh3
		19c	4	Pw	Pw8Pr2
		19e	1.7	Ce	Ce70A113At13Cb2

LOCATION	COMP	KEY	AREA	WG	SPECIES_CO
	Lim 19 Total:		10.2		
	Lim 20	20a	2.1	Oh	Ag40Cw28Pb16At8Ab4Cb4
		20b	6.7	Po	Po
		20c	2.2	Pw	Pw5Sw3Pr1Po1
		20d	3	Pr	Pr9Sw1
		20e	2.6	Ce	Ce10
		20f	1.7	Mh	Mh54Bd13Bw9Sw9Ag4
		20g	2	Oh	Ag25Bd18Cb18ld18Mh6Al6At6
		20h	3.2	Sw	Sw10
		20i	6.7	Po	Po10
	Lim 20 Total:		30.2		
	Lim 22	22a	14.6	Ce	Ce7Bw2Mh1
		22b	5.2	Sw	Sw6Pw4
		22d	2.8	Pw	Pw7Pr2Sw1
	Lim 22 Total:		22.6		
	Lim 23	23a	2.9	Pj	Ps10
		23b	0.8	Sw	Sw5Pj4OH1
		23c	1.8	Ce	Ce8Po2
		23d	0.9	Sw	Sw5Pj4OH1
		23e	4.8	Sw	Sw5Pj4OH1
		23f	4.4	Mh	Mh54Or30Hb6Bd4Cb2He2
		23g	0.6	Sw	Sn5Pj4OH1
	Lim 23 Total:		16.2		
	Lim 24	24a	3.1	Sw	Sn10
		24b	4.9	Pr	Pr9Pw1
		24c	10.5	Pj	Pj10
		24d	4.4	Mh	Mh35Ce30Hb10Cb10Aw5Bd5ld5
		24e	1.2	Oh	Or10
		24f	2.3	Mh	Mh40Cb35Bd10Hb10Ew5
		24g	6.9	Ce	Ce55Bw13Ew13At10Pb7
		24h	2.4	Pw	Pw10

LOCATION	COMP	KEY	AREA	WG	SPECIES_CO
	Lim 24 Total:		35.7		
	Lim 25	25a	3.7	Sw	Sw9Po1
		25b	8.3	Pr	Pr4Ms2Po2Ce2
		25c	4.8	Pr	Pr10
		25d	11.8	Pj	Pj6Ps4
		25e	4.8	Pw	Pw4Pr3Sw3
		25f	2.1	Pr	Pr7Pj3
		25g	2.8	Pw	Pw7Or3
		25h	1.6	Pr	Pr6Pw4
	Lim 25 Total:		39.9		
	Lim 26	26a	7.4	Sw	Sn6Sw2Bw1Ce1
		26b	6.1	Ce	Ce74Sw15At3Ew3Bw1
	Lim 26 Total:		13.5		
	Lim 27	27a	1.3	Pw	Pw 8Pr2
		27b	1.5	Pr	Pr10
		27c	9.6	Mh	Mh36Ce26Ab14Bw6Bd4Ag1Bn1Ew1Ab1At1
		27d	3.7	Mh	Mh76Ag12Hb8Pw4
		27e	5.6	Oc	Ta7Sw3
		27f	0.8	Pj	Ps10
		27g	1.2	Pw	Pw 6Sw4
	Lim 27 Total:		23.7		
	Lim 30	30a	3.6	Sw	Sw9Ce1
		30b	1.1	Ce	Ce9Bw1
		30c	1.6	Ce	Ce10
		30d	2.4	Po	Po4Ce3Ab2Ew1
		30e	0.7	Sw	Sw10
		30f	1	Pj	Pj10
		30g	4.2	Pj	Pj10
		30h	1.5	Pj	Pj Ps
		30i	2.5	Pw	Pw Ps Pj
		30j	3.2	Pw	Pw Ps

LOCATION	COMP	KEY	AREA	WG	SPECIES_CO
		30k	2.9	Oh	Ab7Ce1Po1Sw1
	Lim 30 Total:		24.7		
	Lim 31	31a	1.6	Sw	Sw9Pw1
		31b	1.2	Sw	Sw9Pw1
		31d	3.8	Pj	Ps10
		31e	3.8	Pj	Ps10
	Lim 31 Total:		10.4		
	Lim 32	32b	3.1	Ms	Ms9Ab1
		32c	1.4	Ce	Ce6Ps4
		32d	4.7	Pj	Ps10
	Lim 32 Total:		9.2		
	Lim 33	33a	0.7	Ce	Ce10
		33b	4.7	Ce	Ce6Sw3Ag1
		33c	0.6	Po	Po6Ce3Ab1
		33d	4	Ms	Ms6Ab4
		33f	1.9	Po	Po Pj
		33g	1.9	Pj	Pj10
	Lim 33 Total:		13.8		
	Lim 170	170b	11.9	Ce	CePoBw
	Lim 170 Total:		11.9		
Limerick North Tract Total:			578.6		
Limerick South Tract	Lim 34	34a	8.9	Oh	Ab5Po2Bw1Ew1Ms1
	Lim 34 Total:		8.9		
	Lim 35	35a	3.9	Oh	Ab3Ce3Po2Ew1Ms1
		35b	11.6	Po	Po4Ce3Ab2Bw1
	Lim 35 Total:		15.5		
	Lim 36	36b	7.4	Oh	Ag5Ew3Bd1Oh1
		36c	3.8	Ms	Mr70Cb30
		36d	2.1	Pr	Pr10
	Lim 36 Total:		13.3		

LOCATION	COMP	KEY	AREA	WG	SPECIES_CO
	Lim 37	37b	2	Po	At30Bw30Bd20Ew20
		37c	1.3	Pr	Pr10
		37d	2.9	Ms	Mr65Bd13Ab8Ag4Cb4Id4
		37e	2.5	Pj	Ps7Ms3
	Lim 37 Total:		8.7		
	Lim 38	38a	5.2	Ce	Ce38Pb23Ag14Bw5Ew5Oth15
		38b	6	Pr	Pr9Bw1
		38c	2.1	Mh	Mr30Bd30Ag11Cb11Oth18
		38e	3.8	Ms	Mr20Pb16Ag16At13Bw10Al10Bd6Ew3Sw3
	Lim 38 Total:		17.1		
	Lim 39	39a	6.2	Pr	Pr10
		39c	2.7	Oh	Ag90Ew10
		39d	2	Pw	Pw6Ce4
	Lim 39 Total:		10.9		
	Lim 40	40a	5.8	Pr	Pr9Po1
		40b	1.4	Mh	Mh59Bd22Cb9Bw4Mr4
		40d	6.1	Oh	Ag40Mr25Bw18Cb3Ew3Pb3At3Wi3
		40e	2.6	Oh	Ag40Mr25Bw18Cb3Ew3Pb3At3Wi3
		40f	1.7	Oh	Ag40Mr25Bw18Cb3Ew3Pb3At3Wi3
		40g	2.2	Ce	Ce86Bw6Pw4At2
		Lim 40 Total:		19.8	
	Lim 41	41a	2	Po	(blank)
	Lim 41 Total:		2		
	Lim 42	42a	6.7	Pr	Pr9Ce1
		42b	2.8	Ce	Ce44Pw41Pb8Oth7
		42d	1.4	Pw	Pw8Po2
		42e	2.4	Mh	Mr30Bd30Ag11Cb11Oth18
	Lim 42 Total:		13.3		
	Lim 43	43a	9.8	Pr	Pr10
		43b	1.8	Oh	Ag57Ew28Pb14
	Lim 43 Total:		11.6		

LOCATION	COMP	KEY	AREA	WG	SPECIES_CO
	Lim 44	44b	6.5	Pr	Pr80Pw20
		44c	3.1	Ce	Ce70At16Ag8OH4
		44d	2.9	Pr	Pr7 Sw3
		44e	3	Sw	Sw10
		44f	1.6	Sw	Sw9OH1
		44g	1.3	Pr	Pr10
Lim 44 Total:			18.4		
	Lim 45	45c	1.7	Sw	(blank)
Lim 45 Total:			1.7		
	Lim 46	46a	20.4	Pr	Pr9Pw1
		46b	1.6	Pw	Pw10
		46c	2	Pj	Ps10
		46d	1.2	Ce	Ce65Ta13Ps8Pr8Or4
Lim 46 Total:			25.2		
	Lim 47	47a	1.8	Pr	Pr10
		47b	4.3	Ce	Ce90Sw6Bw3
		47c	4.3	Pr	Pr9Sw1
		47d	2.2	Ce	Ce68Sw15Bw10Pb2Fb2
Lim 47 Total:			12.6		
	Lim 48	48b	15.7	Oh	Ab4Ms3Bw1Ce1Pw1
Lim 48 Total:			15.7		
	Lim 49	49a	0.8	Ce	Ce75At10Sw10Bw5
		49b	1.6	Pr	Pr10
		49c	2.6	Pr	Pr10
		49d	2.3	Pr	Pr10
Lim 49 Total:			7.3		
	Lim 50	50a	7.1	Ce	Ce47Ag25Ab22Oth4
		50b	7.4	Ce	Ce52Mr25Bw5Sw5Cb5Oth8
		50c	4.9	Ms	Ms59Pw31Ce4Fb4
Lim 50 Total:			19.4		
	Lim 51	51a	2.5	Pr	Pr10

LOCATION	COMP	KEY	AREA	WG	SPECIES_CO
		51b	11.6	Ce	Ce4Po1Ms1Mh1Pw1Ab1OH1
		51c	3.1	Ce	Ce38Mr25Bw11Sw8Fb5Pw5Oth8
		51d	7.8	Pr	Pr10
		51e	3.3	Pr	Pr10
	Lim 51 Total:		28.3		
	Lim 52	52a	5.2	Pr	Pr10
		52b	2.1	Pr	Pr7Po3
		52c	3.2	Pr	Pr10
		52d	0.3	Pw	Pw7Sw3
		52e	0.3	Pw	Pw5Sw4Pj1
	Lim 52 Total:		11.1		
	Lim 53	53a	11.5	Ce	Ce38Fb15Pw12By12Mr7Ab5Oth11
		53b	10.1	Mh	Mh55Aw23Bd8Oth14
		53c	2.5	Pr	Pr8Pw2
	Lim 53 Total:		24.1		
	Lim 54	54a	1.1	Pw	Pw6Pr4
		54b	12.4	Pr	Pr10
		54c	3.1	Ce	Ce82Ta10Mr3At1Bw1
		54d	1.2	Po	At45Ce30Mr9Sw9Bw3Ta3
	Lim 54 Total:		17.8		
	Lim 55	55b	8.4	Mh	Mh10
	Lim 55 Total:		8.4		
	Lim 56	56a	1.8	Pr	Pr10
		56b	1.5	Pr	Pr10
		56d	2.7	Sw	Sw5Pw5
		56e	1.2	Pr	Pr9Ta1
		56f	3.1	Pr	Pr10
		56g	4.3	Ce	Ce52At17Bw13Al5Bg3Pr3Sw1
		56h	1.4	Sw	Sw10
	Lim 56 Total:		16		
	Lim 57	57a	3.4	Pw	Pw8Sw4

LOCATION	COMP	KEY	AREA	WG	SPECIES_CO
		57d	1.4	Sw	Sw
		57e	1.3	Pr	Pr6Sw2Pw2
		57f	1.7	Sw	Sw
		57g	3	Pr	Pr10
	Lim 57 Total:		10.8		
	Lim 58	58b	1.5	Sw	Sw4Pr3Ps2Pw1
		58c	3.6	Pr	Pr10
	Lim 58 Total:		5.1		
	Lim 59	59a	2.4	Pr	Pr10
		59b	1.6	Pw	Pw7Po3
		59c	2.2	Pr	Pr5Sw4Ce1
	Lim 59 Total:		6.2		
	Lim 60	60a	1.8	Pr	Pr10
		60b	0.9	Pr	Pr7Sw1Pw1Po1
		60c	7	Sw	Sw7Po2Pr1
	Lim 60 Total:		9.7		
	Lim 61	61a	6.4	Pr	Pr10
		61b	1.7	Sw	Sw6Bw2Po2
	Lim 61 Total:		8.1		
	Lim 62	62a	14.8	Ce	Ce56Sw24Pb16Pr2Mr1
		62b	2.7	Pw	Pw7Sw3
		62c	7.5	Pr	Pr10
		62d	0.5	Pr	Pr10
		62e	1.4	Ce	Ce6Sw4
	Lim 62 Total:		26.9		
	Lim 63	63b	2.2	Sw	Sn100
		63c	1.5	Pr	Pr8Pw2
		63d	6.1	Sw	Sw6Pw2Ta2
		63e	0.8	Ce	Ce82Sw11Bw5
		63g	2	Po	Po4Ps2Ce2Ta2
		63h	0.4	Pr	Pr10

LOCATION	COMP	KEY	AREA	WG	SPECIES_CO
		63i	3.4	Pr	Pr10
	Lim 63 Total:		16.4		
	Lim 64	64a	8	Pr	Pr10
		64b	1.8	Sw	Sw7Po2Ce1
	Lim 64 Total:		9.8		
	Lim 65	65a	2.8	Sw	Sw5Pr4Ps1
		65c	7.8	Pr	Pr9P01
		65d	1.6	Po	Po8Ps2
		65e	1	Pr	Pr Pw
	Lim 65 Total:		13.2		
	Lim 66	66a	7.4	Pr	Pr10
		66b	1.3	Pj	Ps10
		66c	1	Pr	Pr10
	Lim 66 Total:		9.7		
	Lim 67	67a	6.2	Pr	Pr10
		67b	2.1	Pr	Pr5Pj5
		67c	1.8	Ce	CePo
	Lim 67 Total:		10.1		
	Lim 68	68a	2.4	Pr	Pr10
		68b	3.9	Pr	Pr9Po1
		68c	1.2	Pr	Pr5Pj3Po2
		68d	1.8	Pj	Pj4 Ce2Po2Ps1Bw1
		68e	1.6	Pj	Ps10
	Lim 68 Total:		10.9		
	Lim 69	69a	1.2	Pj	Ps9Pr1
		69b	4	Pr	Pr9Po1
		69c	4.2	Pr	Pr7Po3
		69d	3.7	Pr	Pr10
		69e	2.2	Ce	Ce82Ta10Mr3At1Bw1
	Lim 69 Total:		15.3		
	Lim 70	70a	3.1	Sw	Sw70Pw30

LOCATION	COMP	KEY	AREA	WG	SPECIES_CO
		70b	5.1	Pr	Pr9Po1
		70d	4.1	Po	Po5Ce1Bw1At1Pb1Oh1
		70e	3.8	Ce	Cw30Bw20Ta15Pb15Cb10Sw5Pw5
	Lim 70 Total:		16.1		
	Lim 71	71a	5.2	Pr	Pr10
		71b	9.8	Ce	Ce9OH1
		71d	2.3	Ce	Ce9Pj1
	Lim 71 Total:		17.3		
	Lim 72	72a	4.1	Pj	Ps7Po3
		72b	0.9	Oh	Ce8Oh2
	Lim 72 Total:		5		
	Lim 74	74a	1.6	Pr	Pr10
		74b	2.5	Pr	Pr8Pw2
		74c	3.5	Pw	Pw67Ce10Mr7Pr7Oth9
		74d	1.4	Ms	Mr85Pw7Bw3Ag3
		74e	2.5	Ms	Ms4Pw2Mh2Sw1OH1
	Lim 74 Total:		11.5		
	Lim 75	75a	5.5	Pr	Pr9Pw1
		75b	16.7	Ms	Mr53Pw12Al12Sw4Ce4Oth15
		75c	2	Pw	Pw5Sw5
	Lim 75 Total:		24.2		
	Lim 76	76a	1.4	Mh	Mr51Pw20Hb17Bd10
		76b	9.6	Pr	Pr10
		76c	5.1	Po	Mr54Mh15Cb9Ew6Bd6Aw6Oth4
	Lim 76 Total:		16.1		
	Lim 77	77a	17.7	Ms	Mr6He2Oh2
		77b	5.1	Pr	Pr10
	Lim 77 Total:		22.8		
	Lim 78	78b	5.6	Pr	Pr10
		78c	4.2	Sw	Sw8Pr1Pw1
		78d	4.2	Pw	Pr7Pw3

LOCATION	COMP	KEY	AREA	WG	SPECIES_CO
	Lim 78 Total:		14		
	Lim 79	79b	3.3	Pr	Pr9Po1
		79c	14.7	Ms	Ag38Mr23Ab18Ew7Oth14
		79d	3.8	Pw	Pw6Sw4
	Lim 79 Total:		21.8		
	Lim 80	80b	29.5	Ms	Ce3Mr2Bw2He1Oc1Oh1
		80c	5.3	Pw	Pw6Sw4
	Lim 80 Total:		34.8		
	Lim 81	81a	12.1	Oh	Ag4Ab2Mr1At1Oh2
	Lim 81 Total:		12.1		
	Lim 104	104b	6.8	Po	At5Mr2Al2Ag1
		104c	3.6	Ce	Ce93Mr2Ag2Bw2
		104d	6.2	Ce	Ce45Pb30Bw12Ag9Ew3
	Lim 104 Total:		16.6		
	Lim 105	105a	2.6	Ce	Pb38Ce33At16Bw11
		105b	10.4	Ce	Ce68Bw19At8Ag1Pb1
		105c	6.1	Ms	Mr44Ag33Ab5Fb5Ew5Pb5
	Lim 105 Total:		19.1		
	Lim 108	108a	9.7	Pr	Pr10
		108e	5.2	Pw	Pw9Sb1
		108f	5.3	Ms	Ms6Bw2Sw1Oh1
	Lim 108 Total:		20.2		
	Lim 132	132a	2.6	Pr	Pr10
		132b	2.8	Sw	Sw9OH1
		132c	2.3	Ce	Ce50La40Oh10
		132d	1.7	Pr	Pr10
	Lim 132 Total:		9.4		
	Lim 135	135a	8	Pr	Pr7Ps3
		135b	7.5	Pr	Pr10
		135c	2.1	Sw	(blank)
		135d	2.2	Po	P04C32Ab2Bw1Bd1

LOCATION	COMP	KEY	AREA	WG	SPECIES_CO
		135e	2.9	Ms	Ms Oh
		135g	4.6	Ms	Ms8Ab2
	Lim 135 Total:		27.3		
	Lim 136	136a	2.8	Sw	Sw10
		136c	1.8	Po	Po8Bw1Ow1
		136d	2.7	Ms	Ms7Ab3
		136e	11.6	Oh	Oh7Ab2Ms1
		136f	7	Po	Po Oh
	Lim 136 Total:		25.9		
	Lim 139	139a	14.8	Oh	Ab6Bw2Oh2
	Lim 139 Total:		14.8		
	Lim 145	145b	7.3	Ms	Ms3Bw3Bd2Ab1Ow1
		145c	6.1	Ms	Ms3Ab3Ce2Bw1By1
		145d	4.4	Oh	Bw3Ab3Ms2Ce1Oh1
		145e	17.4	Ms	Ms10
		145f	6.1	Mh	Mh6Ms2Ab1Oh1
	Lim 145 Total:		41.3		
	Lim 146	146a	12.5	Sw	Sw10
		146b	2.4	Pr	Pr10
		146c	1.8	Ms	Mr72Ag22Ab5
		146d	3.9	Sw	Sw10
		146e	1.6	Sw	Sw10
		146f	1	Sw	Sw10
		146g	1.8	Oc	Lj10
		146h	5.9	Po	Ag60Mr16Ew12Pb8Bw4
		146i	1.2	Pr	Pr10
		146j	5.9	Ms	Mr63Ce16Ag13Bw6
	Lim 146 Total:		38		
	Lim 171	171a	2.4	Ms	Ms9By1
		171b	2.8	Oh	Ab
		171c	5.2	Ms	Ms4Bw3Ab1Bd1Ce1

LOCATION	COMP	KEY	AREA	WG	SPECIES_CO
		171d	9.6	Ms	Ms Ab
		171e	5.3	Ce	Ce5Bw2Po2Ab1
		171f	1.7	Po	Po6Bw3Ab1
		171g	4.4	Po	Po6Ew3 OH1
		171h	2.7	Pw	Pw10
		171i	3.5	Oc	Lj100
		171j	1	Ce	Ce43Ag33At13Bw6Ew3
		171k	1.2	Pw	Pw10
		171l	1.5	Po	Phy10
	Lim 171 Total:		41.3		
Limerick South Tract Total:			928.9		
Lim. North Augusta A	Lim 82	82a	10.1	Ce	Ce5Ab5
		82b	11.2	Pw	Pw3Sw3Pr2Pj1Ce1
		82c	6.1	Pw	Sw6Pw3Po1
		82d	2.8	Ce	Ce8Pw2
		Lim 82 Total:		30.2	
	Lim 83	83a	7.8	Ce	Ce82At8By3Bg1Bn1Mr1
		83b	14	Pw	Pw7Sw2Ag1
		83c	1.4	Sw	Ce5Sw4Pw1
	Lim 83 Total:		23.2		
	Lim 84	84a	1.8	Pr	Pr10
		84b	0.6	Pw	Pw10
		84c	4.5	Pr	Pr10
	Lim 84 Total:		6.9		
	Lim 85	85a	2	Pr	Pr10
		85b	4.5	Ce	Ce90Mr6Oh3
		85c	1.5	Pr	Pr10
		85d	4.6	Oc	He59Mh16By10Ce8Be2Mr2
		85e	1.6	Sw	Sw10
	Lim 85 Total:		14.2		

LOCATION	COMP	KEY	AREA	WG	SPECIES_CO
	Lim 86	86a	2	Oh	Ag40At33Ew26
		86b	1.3	Sw	Sw10
		86c	1.4	Pw	Pw10
		86d	4.4	Sw	Sw10
		86e	5.9	Pr	Pr10
	Lim 86 Total:		15		
	Lim 87	87a	3.5	Ce	Ce47Mr23At8Bw6Ew6Fb2Cb2Sw2
		87b	15.1	Ms	Mr2Ab1Bd1Ag1Bw1By1At1Mh1Oh1
	Lim 87 Total:		18.6		
	Lim 100	100a	3.9	Sw	Sw10
		100b	2.5	Sw	Sw10
		100c	3.4	Pj	Pj10
		100d	3.4	Pw	Pw Sw
		100e	5.8	Pr	Pr10
		100f	3.4	Pj	Pj10
		100h	4.4	Ce	Ce10
	Lim 100 Total:		26.8		
	Lim 101	101a	18.9	Pj	Pj8Ce2
		101b	3.1	Oh	Aw40Hb40Id20
		101c	1.8	Sw	Sw10
		101d	3	Pr	Pr10
		101e	3.5	Pj	Pj10
		101f	3.7	Po	Po10
	Lim 101 Total:		34		
	Lim 102	102a	1.1	Pr	(blank)
		102b	11.6	Ms	Ms6Mh2Aw1Oh1
		102c	3.2	Ce	Ce10
		102d	2.7	Pj	Pj6Ps4
	Lim 102 Total:		18.6		
	Lim 103	103a	5.9	Ce	Ce10
		103b	11	Ce	Ce8Bw1Po1

LOCATION	COMP	KEY	AREA	WG	SPECIES_CO
		103c	1.3	Pr	Pr10
		103d	2	Pj	Pj6Ps4
	Lim 103 Total:		20.2		
	Lim 111	111a	3.6	Ce	Ce10
		111b	27.8	Ce	Ce10
		111c	7.1	Sw	Sw8Ce2
		111d	3.2	Mh	Mh6ld2Bd2Hb1Or1
	Lim 111 Total:		41.7		
	Lim 112	112a	6.6	Ce	Ce6Po4
		112b	18.5	Ms	Ms8 Ab2
	Lim 112 Total:		25.1		
	Lim 113	113a	3.9	Ce	Ce10
		113b	4.8	Sw	Sw10
		113d	7.4	Ms	Ms3Ce3Bw2Po2
		113e	1.7	Sw	Sw10
	Lim 113 Total:		17.8		
	Lim 114	114a	4.1	Sw	Sw10
		114c	2.1	Pj	Ps Ce
		114d	3.4	Ce	Ce3Bw3Ms2Po1
		114f	2.3	Ce	Ce10
		114g	2.7	Ce	Ce10
	Lim 114 Total:		14.6		
	Lim 115	115b	10.2	Ce	Ce5Bw3Po1Ab1
		115c	3.4	Ce	Ce2Bw2Po2Ab2Bd2
	Lim 115 Total:		13.6		
	Lim 116	116a	4.6	Pr	Pr10
		116b	4.3	Sw	Sw10
		116c	2.9	Sw	Sw8Ce2
		116d	5.2	Ce	Ce8Po2
	Lim 116 Total:		17		
	Lim 117	117a	3.9	Pj	Pj10

LOCATION	COMP	KEY	AREA	WG	SPECIES_CO
		117b	3.3	Pr	Pr10
		117c	2.6	Pr	Pr10
		117d	2.1	Pr	Pr6Pj4
		117e	2	Sw	Sw8Ce2
	Lim 117 Total:		13.9		
	Lim 118	118a	28.4	Ce	Ce5Bw2Ms1Po1By1
		118b	3.3	Sw	Sw8Ce1Po1
		118d	6.5	Mh	Be3Mh3Ms3Po1
	Lim 118 Total:		38.2		
	Lim 120	120a	17.4	Sw	Sw10
		120b	5.2	Pr	Pr10
		120c	5.6	Pw	Pw92Mr4Ce3
		120e	5.2	Ce	Ce68Ab7Mr7Bw3Cb3Ew3Fb1At1
		120f	2	Ms	MsAb
		120g	14	Ms	Mr61Ab35Ew2
	Lim 120 Total:		49.4		
	Lim 123	123a	2.2	Mh	Hb4Mh3Id3
		123b	2.7	Pr	Pr10
		123c	1.3	Sw	Sw4Po3
		123e	0.7	Po	Po
		123f	2.3	Mh	Sw4Hb3Mh2OH1
		123g	1.8	Mh	Mh5Hb3Ag2
		123h	22.1	Pj	Pj10
	Lim 123 Total:		33.1		
	Lim 124	124a	6.4	Ce	Ce8OH1OC1
	Lim 124 Total:		6.4		
	Lim 125	125a	1.1	Mh	Mh6lw2Or1Cb1
		125b	7.8	Pj	Pj10
		125c	13.7	Mh	Mh46Aw28Or8Hb8OH
		125d	3	Ce	Ce10
		125e	2.6	Ce	PoCe

LOCATION	COMP	KEY	AREA	WG	SPECIES_CO
		125f	2.1	Sw	Ce7Sw3
		125g	1	Oh	Bg
		125h	3.8	Mh	Mh5lw2Ce2Or1
	Lim 125 Total:		35.1		
	Lim 138	138a	2.5	Oh	Bw
		138b	4.4	Pr	Pr10
		138c	2.6	Sw	Sw10
		138d	1.7	Oh	Cb5Aw2Bw2Po1
	Lim 138 Total:		11.2		
	Lim 140	140a	6.9	Oc	Le9Sw1
		140b	12.9	Oh	Po30Ew30Aw30Ms10
		140d	2.4	Sw	Sw10
		140e	7.1	Pr	Pr10
		140f	4.7	Pj	Pj10
		140g	2.9	Mh	Mh46Bd31Hb8Mr8Aw7
		140h	5.1	Pj	Ps10
		140i	11.7	Ce	Ce5Po2Oh1Bw1Ms1
		140j	6.6	Pj	Pj10
		140l	4	Ms	Ms6Po3Bf1
	Lim 140 Total:		64.3		
	Lim 142	142a	3.3	Sw	Sw10
		142b	3.1	Po	Po6Bw3Ce1
		142c	9.4	Po	Po5Ce4Ag1
		142d	4.4	Po	Po Ce
	Lim 142 Total:		20.2		
	Lim 154	154a	7.2	Ms	Ms7Bw2Po1
		154b	5.2	Ce	Ce7Po3
		154c	1.7	Ce	(blank)
		154d	7.1	Ce	Ce9Ab1
		154e	9.5	Pj	Pj10
		154f	3.6	Sw	Sw10

LOCATION	COMP	KEY	AREA	WG	SPECIES_CO
	Lim 154 Total:		34.3		
	Lim 155	155a	6.3	Pr	Pr9Sw1
	Lim 155 Total:		6.3		
	Lim 165	165a	5.8	Pr	Pr10
		165b	3	Ce	Ce10
		165c	4.1	Po	Po7Ce3
		165d	27.5	Po	Po3Ab3Ce3Ms1
	Lim 165 Total:		40.4		
North Augusta Total:			690.3		
Cranberry Lake	Lim 107	107a	3.3	Sw	Sw10
		107b	10.1	Pj	Pj10
		107c	2.5	Pr	Pr5Po3Ta2
		107d	13.6	Ms	Ms Ab
	Lim 107 Total:		29.5		
	Lim 126	126a	6.1	Ce	Ce10
		126b	8.5	Ce	Ce9Po1
		126c	3	Pj	Pj10
		126d	4	Sw	Sw10
		126f	5.6	Ms	Ms Ab
	Lim 126 Total:		27.2		
	Lim 127	127a	26.3	Sw	Sw10
		127b	3.3	Oh	Ab Ms
		127c	3.3	Po	P06Ab4
		127d	0.6	Ce	Ce10
		127e	1.7	Sw	HyPo6Sw4
		127f	2.4	Ce	Ce10
		127g	3.5	Sw	Sw10
		127h	1.8	Ce	Ce10
		127i	2.5	Oc	Ta10
	Lim 127 Total:		45.4		

LOCATION	COMP	KEY	AREA	WG	SPECIES_CO
	Lim 130	130a	4.1	Sw	Sw10
		130b	20.6	Pj	Pj10
		130c	1.8	Pj	Pj10
	Lim 130 Total:		26.5		
	Lim 137	137a	24.7	Pj	Pj10
	Lim 137 Total:		24.7		
	Lim 141	141a	29.4	Pj	Pj10
		141b	3.7	Oc	TaCe
		141c	15	Oh	(blank)
		141d	3.4	Ce	CeSw
		141e	11.4	Po	Po6Ab2Sw1Ew1
		141f	25.5	Pj	Pj10
		141g	8.9	Mh	Mh Oh
	Lim 141 Total:		97.3		
	Lim 143	143a	7	Ms	(blank)
		143b	8	Ce	Ce10
		143d	2.9	Ce	Ce Pj
		143e	1.8	Ms	Ms
		143f	2	Ce	Ce5Pj5
		143g	1	Sw	Sw6Ce4
			Lim 143 Total:		22.7
	Lim 144	144a	1.6	Ce	Ce50Pj51
		144b	0.8	Ce	Ce10
		144d	12.6	Sw	Sw8Ce1OH1
		144e	7.3	Ce	CePoAb
		144f	1.9	Mh	Mh Ce
	Lim 144 Total:		24.2		
	Lim 147	147a	2.3	Pj	Pj10
		147b	1.1	Pw	(blank)
		147d	4.3	Po	Phy4Sw2Pw2Ce2
		147e	12.3	Sw	Pr3Ce3Pj2OH2

LOCATION	COMP	KEY	AREA	WG	SPECIES_CO
		147f	2.4	Ce	(blank)
		147g	3.3	Ce	Ce10
		147h	4.5	Ce	Ce53At38Ew7
		147i	1.9	Pr	Pr6Pj4
		147j	8.2	Oc	Ta60Phy40
	Lim 147 Total:		40.3		
	Lim 148	148a	4	Pw	Pw HyP
		148b	3.3	Po	HyP
		148c	1.4	Pj	Pj10
		148d	1	Ce	Ce10
		148e	1.2	Pj	Pj9Ce1
		148f	0.8	Sw	(blank)
		148g	1.8	Pr	Pr10
		148h	1.3	Sw	Sw5Pj4Ce1
		148i	3.1	Ce	(blank)
		148j	1.3	Po	At53Ce23Cb15Bw7
		148k	2.3	Pj	Pj10
		148l	6.1	Pj	Pj10
		148m	1.3	Ce	(blank)
		148n	7.5	Ce	(blank)
		148o	3	Pr	Pr10
		148p	6.4	Sw	Sw10
		148q	1.2	Pr	Pr10
		148r	2.3	Ce	(blank)
		148s	3.3	Sw	Sw10
		148t	1.3	Ce	(blank)
		148u	6.5	Ce	Ce At Bt Ew
		148v	2	Ce	(blank)
		148w	4.2	Ce	(blank)
	Lim 148 Total:		66.6		
	Lim 149	149a	16.4	Pj	Pj10

LOCATION	COMP	KEY	AREA	WG	SPECIES_CO
		149b	13.9	Sw	Sw10
		149c	14.1	Ms	Ms5Ab2Ce1Po1Sw1
		149d	4.3	Ce	(blank)
		149e	18.1	Oh	(blank)
		149f	7	Mh	Mh Oh
		149g	6.9	Oh	Ab4Po3Aw1Ms1Bn1
	Lim 149 Total:		80.7		
	Lim 152	152b	16.6	Oc	Sb10
		152c	19.1	Ms	Ms Ab
		152d	12.2	Ms	Ms Ab
		152e	3.3	Oc	Bf
		152f	8	Oh	Bd4Mh2Ce2Bf1Po1
		152g	3.7	Ce	(blank)
	Lim 152 Total:		62.9		
	Lim 156	156a	2.7	Oh	Ab Ms
		156b	10.1	Ms	Ms Ab
	Lim 156 Total:		12.8		
	Lim 157	157a	1.5	Ce	Ce95OH5
		157b	10.2	Mh	Mh72Bd12Be3ld3Aw1Bw1Bn1Hb1
		157c	2.2	Ce	Ce10
		157d	8.9	Mh	Mh33Hb18Aw14Bd14Or7ld7Ob3
		157e	12.2	Pj	Pj10
		157g	6.1	Sw	Sw10
	Lim 157 Total:		41.1		
	Lim 158	158a	16.3	Pj	Pj8Ps2
		158b	4.9	Po	P04Bw3Ce1Sw1Oh1
		158c	25.3	Oh	Ab4Ce3Po1Bw1Bf1
		158d	14.2	Po	(blank)
	Lim 158 Total:		60.7		
	Lim 159	159a	7.3	Po	Po Ce Oh
		159b	2.3	Sw	Sw10

LOCATION	COMP	KEY	AREA	WG	SPECIES_CO
		159c	24.6	Ce	(blank)
	Lim 159 Total:		34.2		
	Lim 160	160a	11.6	Ms	Ms Ab
		160b	5.8	Ce	Ce5Ms3Ab1Sw1
	Lim 160 Total:		17.4		
	Lim 161	161a	8.1	Ce	Ce6Mh2Sw1Bw1
		161c	3.5	Ms	Ms8Ab2
	Lim 161 Total:		11.6		
	Lim 162	162a	16.5	Sw	Sw10
		162b	3.7	Ce	Ce68Bd10Pb10Sw4At4Bw2
		162c	7.6	Ce	Ce68Bd10Pb10Sw4At4Bw2
		162d	10.5	Ce	Ce64Fb8Mr6Sw6Pb5Pw2Al2Bd1At1Ag1
		162f	10.4	Mh	Mh51Id20Al5Hb5Cw3Bd3Ag3Be1Bn1Ew1
	Lim 162 Total:		48.7		
	Lim 163	163a	5.5	Ms	Ms Ab
	Lim 163 Total:		5.5		
	Lim 164	164a	10.7	Ce	Ce6Pw2Oh1Sw1
		164b	12.7	Mh	Mh3Ow3Pw2Ce1lw1
		164c	2.9	Sw	Sw4Pw3Ow2Mh1
		164d	2.9	Ms	Ms7Ab3
		164e	25.6	Ce	Ce10
		164f	3.9	Sw	Sw4Oh4Ce1Po1
	Lim 164 Total:		58.7		
	Lim 166	166a	13.2	Ce	Ce10
		166b	1.4	Pj	Pj10
		166c	26.2	Ce	Ce3Po3Sw2Bf1Aw1
		166d	5	Pj	Pj10
		166e	4.5	Ce	Ce4Sw3Po3
	Lim 166 Total:		50.3		
	Lim 168	168a	7	Ce	Ce4Sw2Ow2Pw1lw1

LOCATION	COMP	KEY	AREA	WG	SPECIES_CO
		168b	3.4	Ce	(blank)
		168c	5.6	Pj	Pj10
		168d	2.8	Po	Po Ce Sw
		168e	6.5	Ce	Ce4Sw3Pw1Po1Bw1
		168f	1.1	Mh	Mh4Po3Bd1Ow1Bw1
		168g	6.7	Oc	Ta10
		168h	2.2	Pj	Pj Ce
		168i	21.7	Pj	Pj10
	Lim 168 Total:		57		
	Lim 173	173a	19.5	Mh	Mh Oh
		173b	2.1	Ce	(blank)
		173c	14.3	Oh	Ab Bf
		173d	3.5	Mh	Mh
		173e	3.2	Ce	Ce Oh
	Lim 173 Total:		42.6		
Cranberry Lake Total:			988.6		
Grenville	Lim 93	93a	3.5	Pj	Pj10
		93b	2.5	Ce	Ce70Sw10Pj10OH10
		93c	16.8	Pj	Pj10
	Lim 93 Total:		22.8		
	Lim 94	94a	19.5	Pj	Pj10
	Lim 94 Total:		19.5		
	Lim 95	95a	2.3	Pj	Pj5Ce4Pr1
		95b	2.5	Pr	Pr10
		95c	7.3	Pr	Pr5Pj5
		95d	1.8	Sw	Sw10
		95e	3	Pr	Pr10
		95f	11	Po	PoCeAbBw
	Lim 95 Total:		27.9		
	Lim 96	96a	1.9	Sw	Sw100

LOCATION	COMP	KEY	AREA	WG	SPECIES_CO
		96b	9.3	Ce	Ce5Bw2Mh1Po1Aw1
		96c	2.8	Mh	Mh9Oh1
		96d	3.4	Pj	Ps5Pj5
		96e	3.6	Sw	Sw10
		96f	1.3	Pr	Pr10
	Lim 96 Total:		22.3		
	Lim 97	97a	12.7	Pj	Pj10
		97c	1.7	Pj	Pj Pr
		97d	4.5	Mh	Mh Oh
	Lim 97 Total:		18.9		
	Lim 98	98a	12.5	Pj	Pj10
		98b	2.4	Ce	(blank)
		98c	1.8	Mh	Mh3Bd3lw2Oh1Ce1
		98d	5.2	Ce	Ce10
	Lim 98 Total:		21.9		
	Lim 99	99a	5.1	Mh	Mh5Aw2lw2Hi1
		99b	3.2	Pj	Ps10
		99c	2.4	Ce	Ce70Sw30
		99e	3.1	Sw	Sw10
	Lim 99 Total:		13.8		
	Lim 106	106a	16.1	Pj	Pj Sw
		106b	15.6	Pr	Pr5Sw5
		106c	7.7	Sw	Sw10
		106d	7.4	Pr	Pr10
		106e	16.3	Po	Po4Ms3Aw3
		106f	3.6	Sw	Sw10
		106g	1.6	Po	(blank)
		106h	2.5	Po	Po4Ce3Bw2Sw1
	Lim 106 Total:		70.8		
	Lim 109	109b	3.4	Ce	Ce10
		109c	19.7	Sw	Ce7Sw3

LOCATION	COMP	KEY	AREA	WG	SPECIES_CO
		109d	14.8	Pj	Pj5Ce5
		109e	2.2	Ce	Ce7Pj3
	Lim 109 Total:		40.1		
	Lim 110	110a	3.6	Pr	Pr10
		110b	1.8	Sw	Sw10
		110c	3.6	Ce	Ce10
	Lim 110 Total:		9		
	Lim 129	129b	2.8	Sw	Sw10
		129c	3.3	Oh	Ab5Po5
		129d	5.9	Sw	SwSr
		129e	2.5	Pw	Pw10
		129f	3.2	Oh	Aw50Fb25Ew25
	Lim 129 Total:		17.7		
	Lim 134	134a	16.5	Sw	(blank)
		134b	7.8	Sw	Sw10
	Lim 134 Total:		24.3		
	Lim 151	151b	6.7	Ce	Ce8Bw1Po1
		151c	1.9	Oc	Lj10
		151d	6.6	Sw	Sw Pw
		151e	3.6	Sw	Sw Lj Ta
	Lim 151 Total:		18.8		
	Lim 167	167b	12.8	Ms	Mr86Ab14
	Lim 167 Total:		12.8		
Grenville Total:			340.6		
Leeds	Lim 89	89a	5.2	Mh	Mh He Oh
		89b	2.4	Po	Po
		89c	3.1	Ms	Ms Oh
		89d	1.3	Sw	Sw8Po1Pw1
		89e	2.4	Pr	Pr10
		89f	1.5	Oh	Aw10
		89g	1.3	Pw	Pw5Sw5

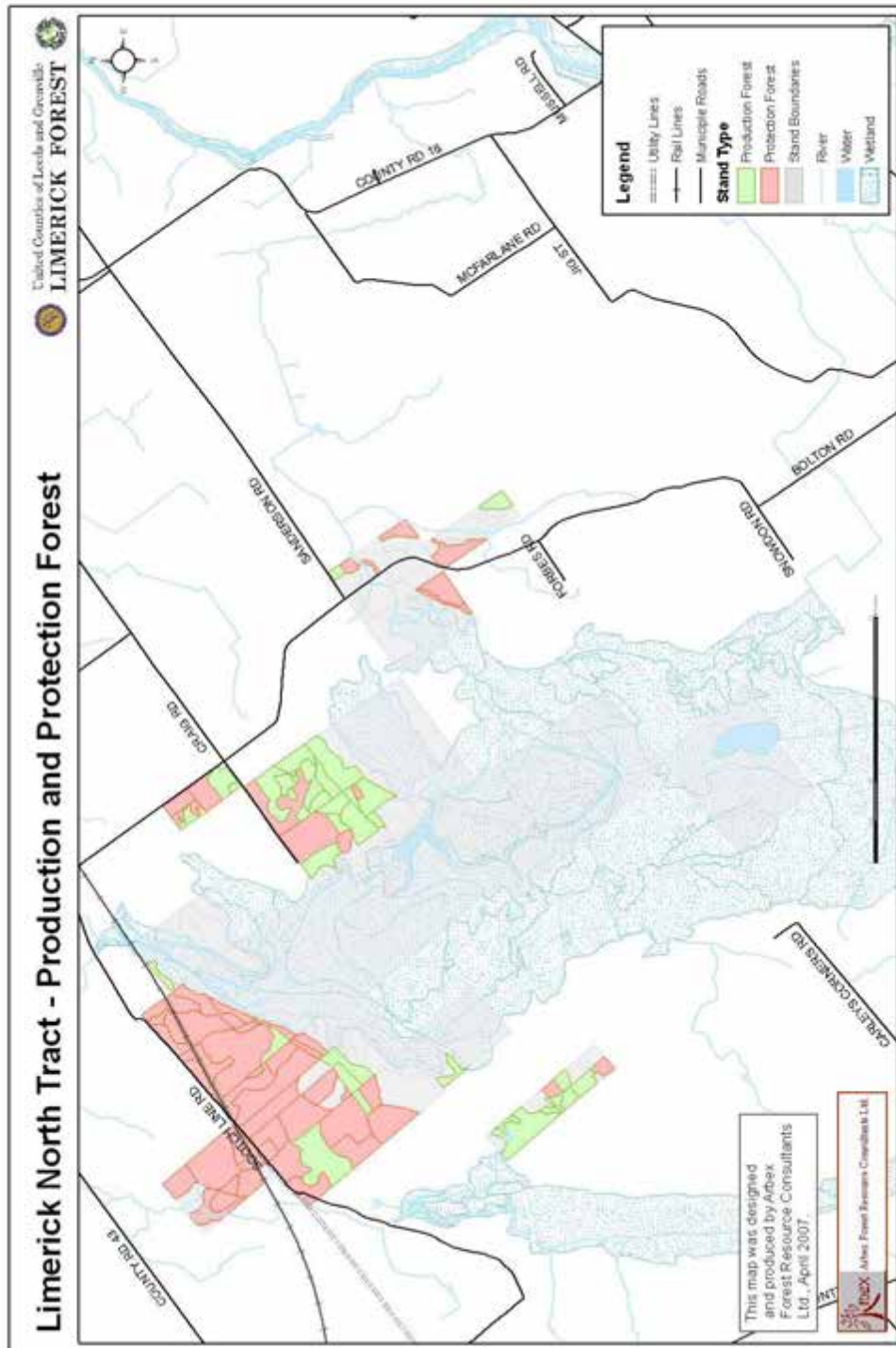
LOCATION	COMP	KEY	AREA	WG	SPECIES_CO
		89h	3	Oh	Aw10
	Lim 89 Total:		20.2		
	Lim 90	90a	4	Pr	Pr8Pw2
		90b	2.4	Mh	Mh Pw Po
		90e	5	Ms	Mr44Pw33Or11Cb6Aw6
		90f	3.6	Sw	Sw100
		90g	2.8	Pr	Pr10
		90h	1.4	Sw	Sw10
	Lim 90 Total:		19.2		
	Lim 91	91a	0.3	Ms	(blank)
		91b	12.9	Mh	Aw58Mh42Or8
		91d	1.5	Pw	Pw
		91e	8.4	Ms	Mr38Pw24Bw12Aw12Ow12
	Lim 91 Total:		23.1		
	Lim 92	92a	18.8	Mh	Pw29Aw26Mh16Or16Mr10
		92c	1.7	Ms	Ms2Aw2Or2Mh2Hi2
	Lim 92 Total:		20.5		
	Lim 119	119a	5.9	Sw	Sw4Ce2Ps1Ta1Po1Ag1
		119b	4	Pr	Pr9P01
		119c	1.6	Ce	Ce8Cb1By1
		119d	5.5	Sw	Sw10
		119e	7	Ce	Ce6Bw2Ms2
		119f	7.4	Pr	Pr9Po1
		119g	8.7	Ms	Mh34Ce13Bd12He8Aw8Be5By3Pw3Mr1Se1Bn1C
	Lim 119 Total:		40.1		
	Lim 121	121a	25.9	Mh	Mh65Hb21Ob4Cb2Bd1Ew1ld1Or1
		121b	12.4	Pj	Pj10
		121c	5.5	Pr	Pr10
		121d	1.8	Sw	Sw10
	Lim 121 Total:		45.6		
	Lim 122	122a	3.3	Mh	Mh36Cb26Hb15Ob10Aw5ld5

LOCATION	COMP	KEY	AREA	WG	SPECIES_CO
		122b	14.7	Pj	Pj10
		122c	4.7	Mh	Mh36Cb26Hb15Ob10Aw5Id5
		122d	5.5	Pj	Pj10
		122f	8.4	Mh	Mh6Hb3Or1
		122g	2.7	Pw	Pw6Sw4
		122h	1.3	Sw	Sw10
	Lim 122 Total:		40.6		
	Lim 133	133a	8.6	Mh	Mh6Ew1Aw1Hb1Or1
		133c	9.3	Ce	Ce5Bw3Ms2
		133e	5.8	Pj	Pj10
		133f	5	Sw	Sw10
		133g	1.1	Ms	Mr62Pw12Ce12Id12
	Lim 133 Total:		29.8		
	Lim 153	153a	21.1	Mh	Mh30Ce18Hb15Ag15Or9Ob3Id3Aw1Bn1
	Lim 153 Total:		21.1		
	Lim 169	169a	6.3	Mh	Mh4Bw3Po2Ew1
		169d	2.8	Mh	Mh4lw3Hi2Ew1
		169e	16	Ce	(blank)
		169f	1.3	Oc	He4Bw3Ce2Mh1
		169g	2.7	Ce	Ce5Mh3OH2
		169h	9.3	Pw	Pw10
	Lim 169 Total:		38.4		
	Lim 172	172a	54.6	Ms	Mr88Pw12
		172c	4.5	Pw	Pw10
	Lim 172 Total:		59.1		
	Lim 174	174b	7.4	Ce	(blank)
		174c	15.1	Oh	Ab5Po3Ew1Ow
		174d	8.7	Oh	Aw
		174e	27.4	Pw	Pw10
		174f	9	Mh	Mh3Bd3Ag2Or1Ew1
		174g	73.8	Mh	Mh10

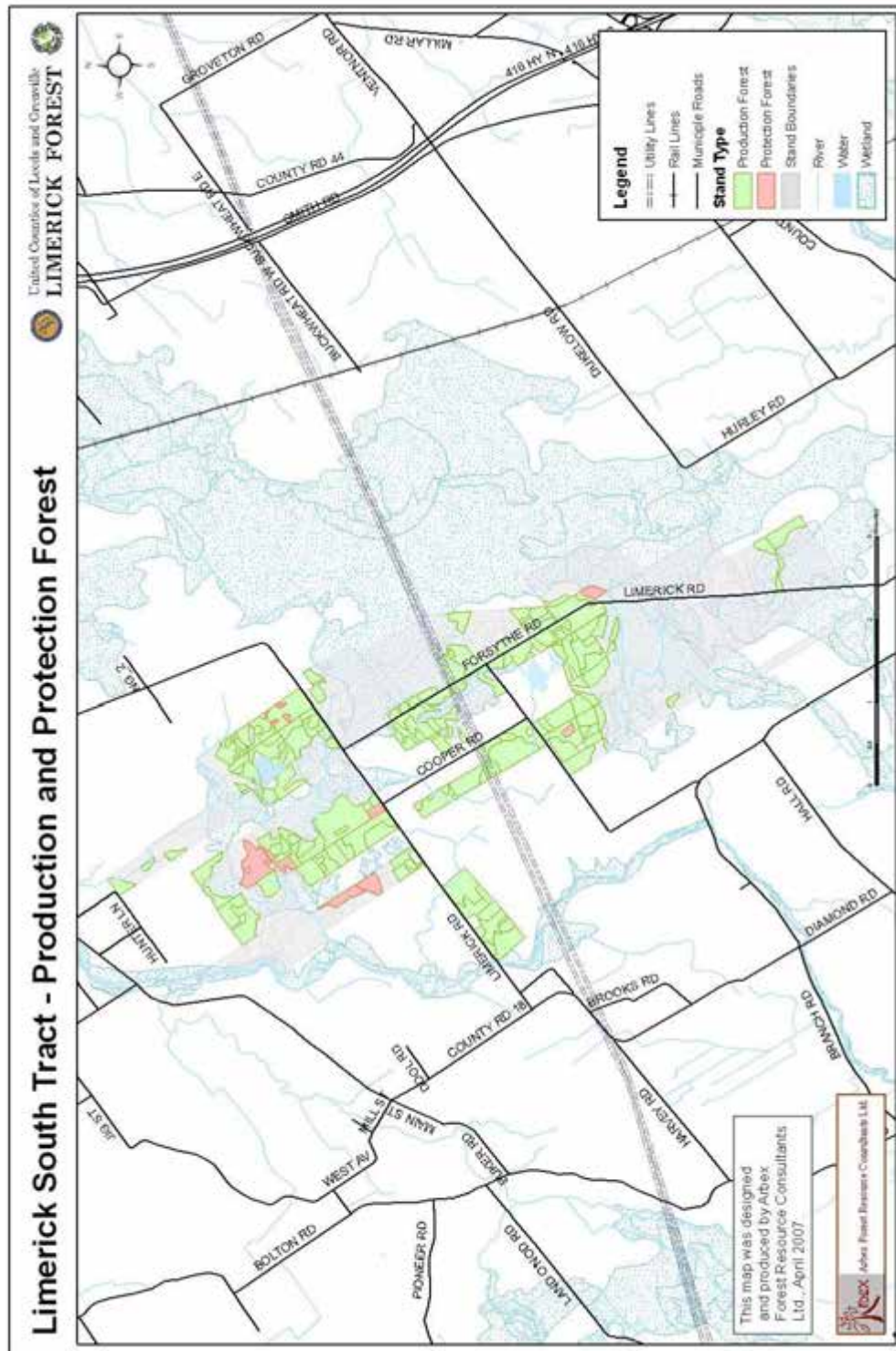
LOCATION	COMP	KEY	AREA	WG	SPECIES_CO
		174h	5.9	Mh	Mh8Ew1OH1
	Lim 174 Total:		147.3		
	Lim 175	175a	1.9	Ce	Ce10
		175b	1.6	Ce	Ce10
	Lim 175 Total:		3.5		
Leeds Total:			508.5		
Other Leeds	Lim 88	88b	2.1	Sw	Sw10
		88c	1.3	Pr	Pr10
		88d	1.1	Pj	Pj10
		88e	0.9	Pr	Pr10
		88f	1.2	Pw	Pw10
		88g	2	Oh	Aw10
		88h	1.2	Pj	Pj9Oh1
		88i	1.2	Sw	Sw6Aw4
		88j	0.4	Pj	Pj10
	Lim 88 Total:		11.4		
Other Leeds Total:			11.4		
Limerick Forest Total:			4,047		

APPENDIX C

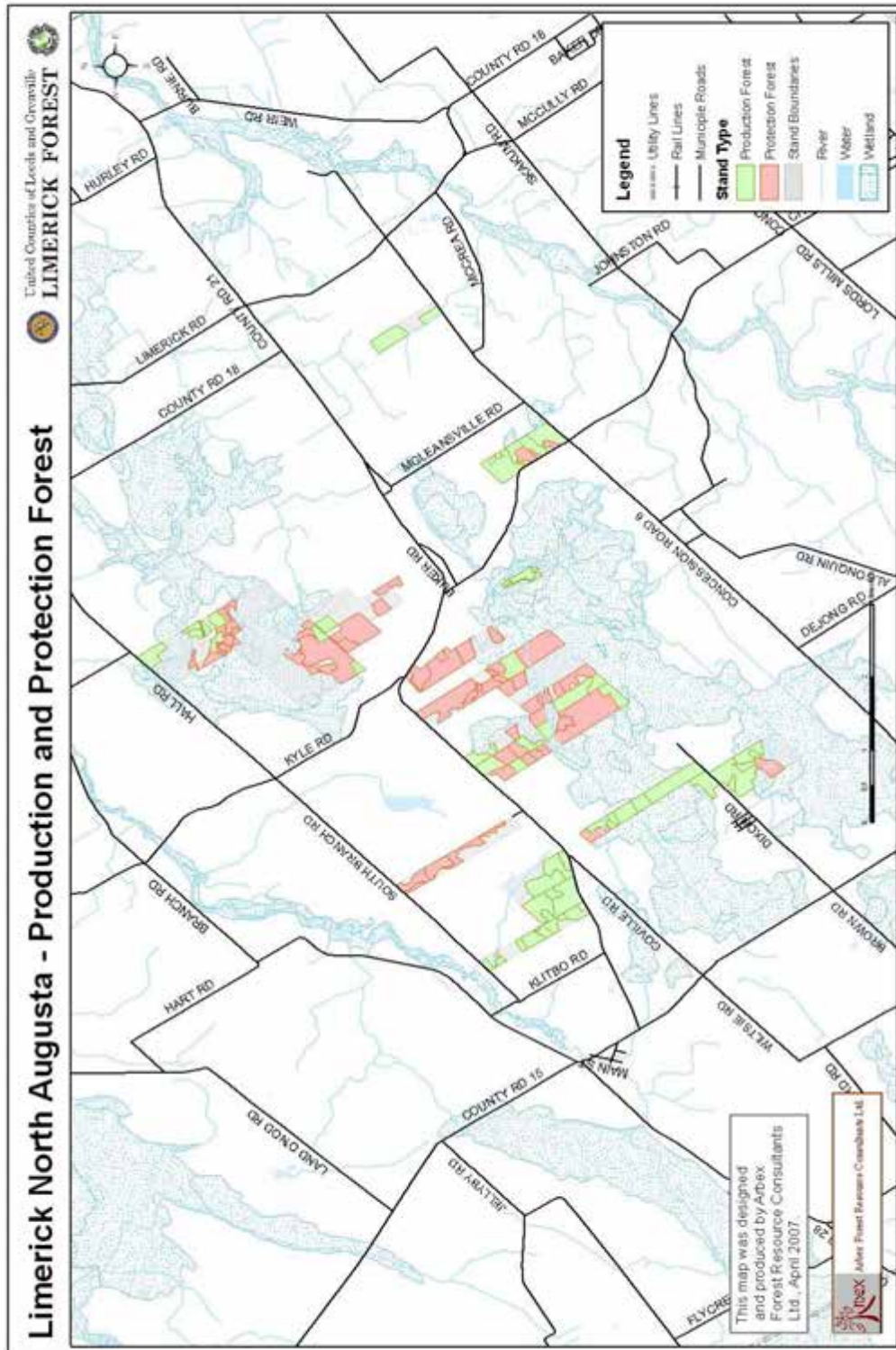
Production and Protection Areas Maps for Limerick Forest



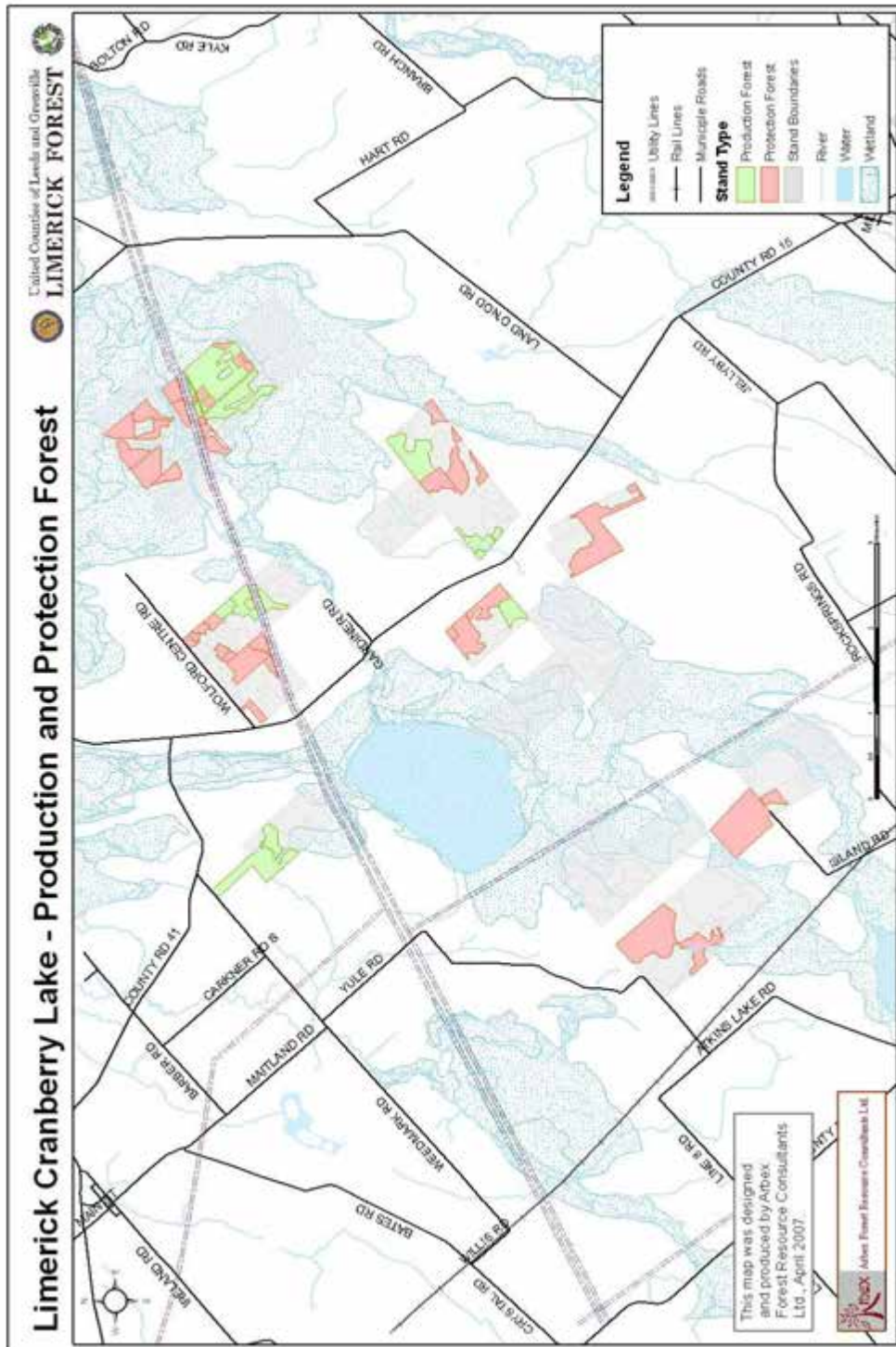
Limerick North Tract – Production and Protection Forest Areas



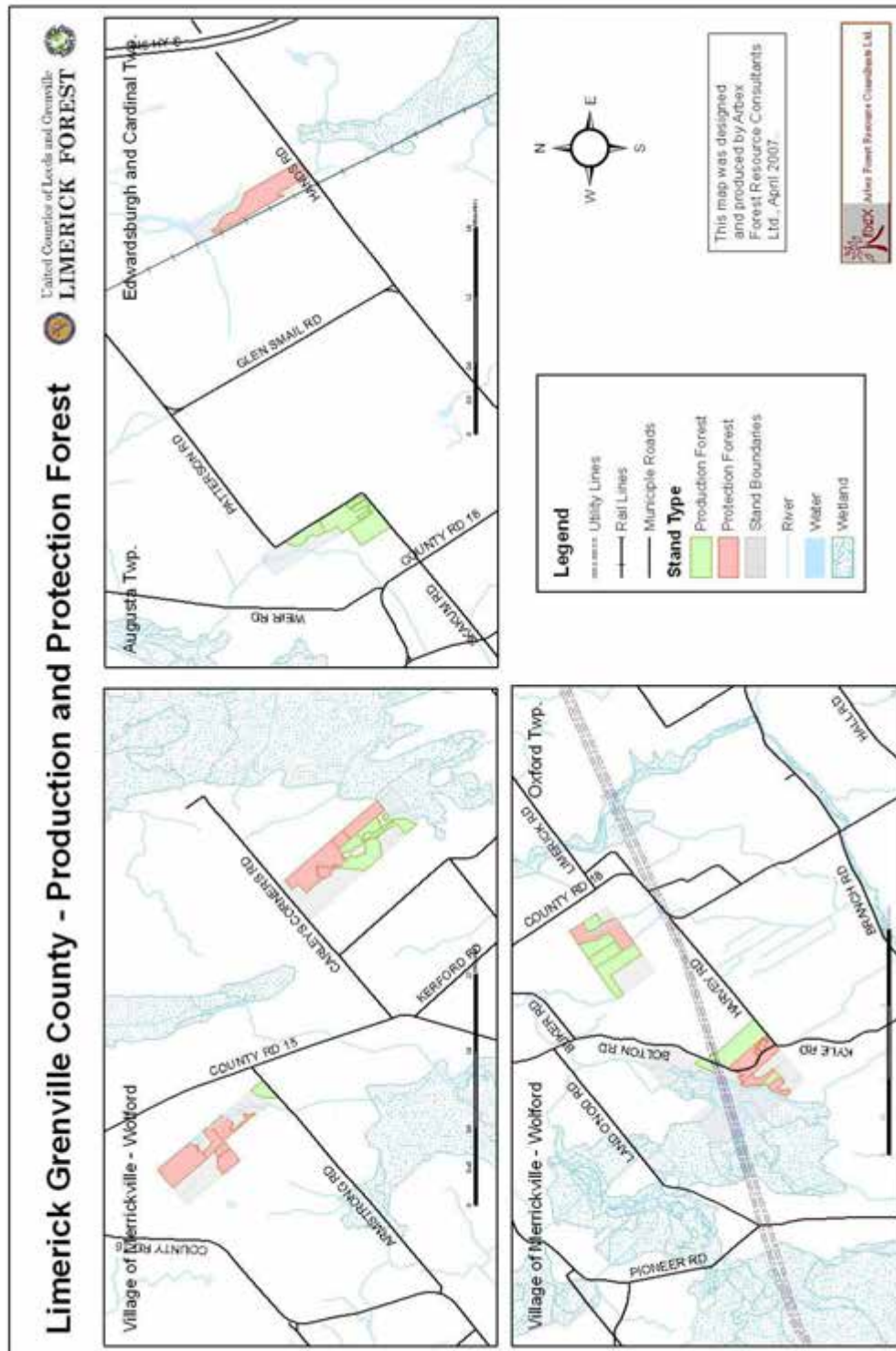
Limerick South Tract – Production and Protection Forest Areas



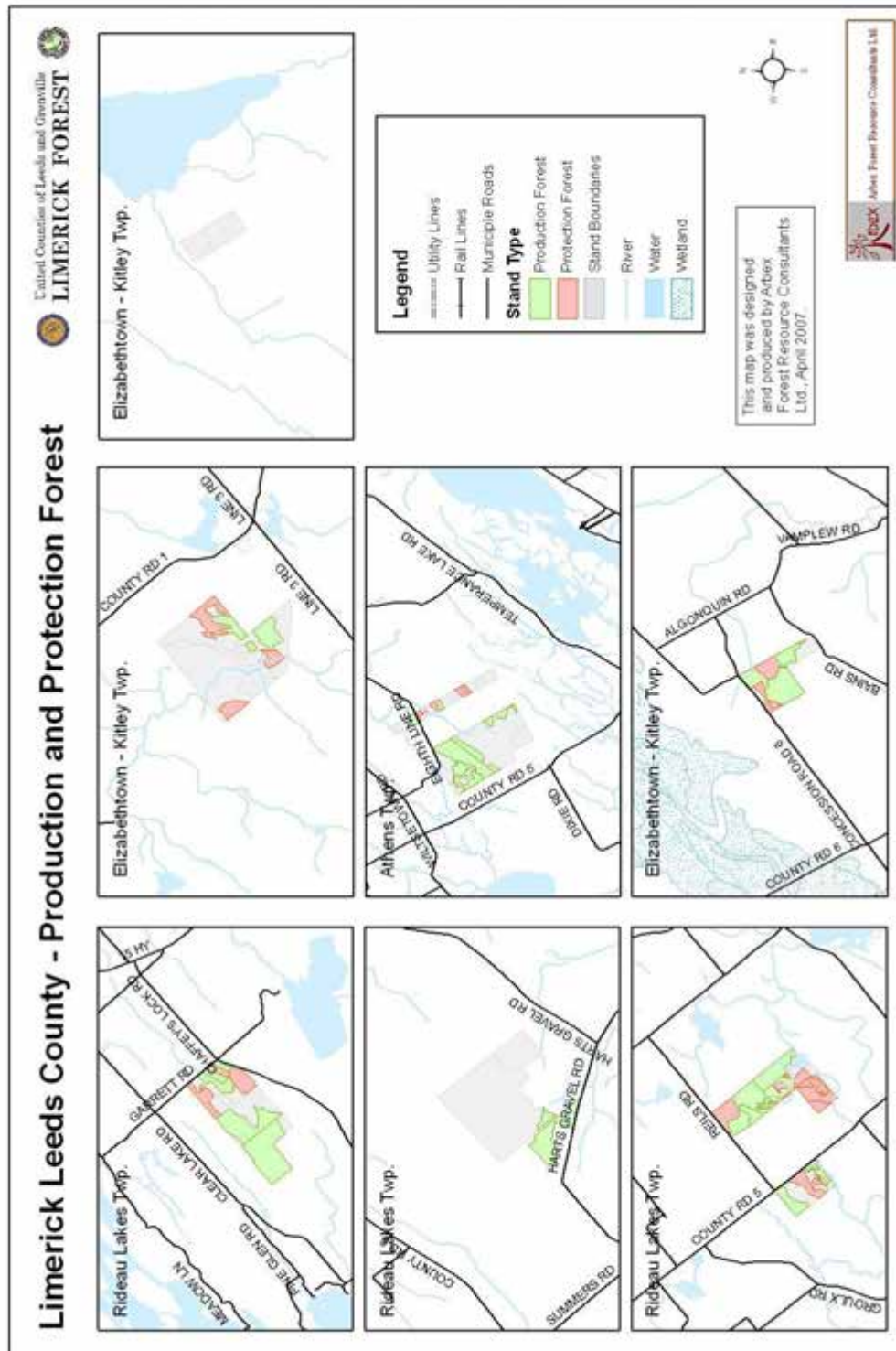
Limerick North Augusta – Production and Protection Forest Areas



Limerick Cranberry Lake – Production and Protection Forest Areas



Limerick Grenville County – Production and Protection Forest Areas



Limerick Leeds County – Production and Protection Forest Areas

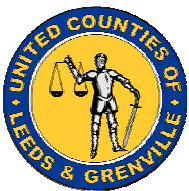
APPENDIX D

LFAC Terms of Reference

LIMERICK FOREST ADVISORY COMMITTEE

TERMS OF REFERENCE

(And Operating Procedures)



LIMERICK FOREST ADVISORY COMMITTEE TERMS OF REFERENCE

TABLE OF CONTENTS

1.0	PURPOSE
2.0	OBJECTIVE
3.0	SUB-COMMITTEES
	3.1 Administration
	3.2 Forest Resources
	3.3 Recreation
	3.4 Ecology
	3.5 Education & Communications
	3.6 Chairperson Selection
	3.7 Chairperson Committee
4.0	ADMINISTRATION SUPPORT
5.0	MEMBERSHIP
	5.1 LFAC
	5.2 Sub-committees
	5.3 Chairpersons Committee
6.0	MEETINGS
	6.1 Sub-committee
	6.2 Chairpersons Committee
	6.3 Annual Progress
	6.4 Annual Public
7.0	COMMUNICATIONS
8.0	AMENDMENTS

1.0 PURPOSE:

The Limerick Forest Advisory Committee (LFAC) is a group of interested citizens and representatives from organizations and government agencies, dedicated to the sustainable development of the public lands in the United Counties of Leeds and Grenville, commonly referred to as "Limerick Forest".

These Terms of Reference (TOR) will provide the mechanism for the effective communications among the United Counties of Leeds and Grenville (UCLG), LFAC and the public, on issues dealing with Limerick Forest.

2.0 OBJECTIVE:

The objective of the LFAC is to provide an opportunity for interested persons to be involved in the management of Limerick Forest. All recommendations will be communicated to the United Counties of Leeds and Grenville for consideration and approval in the management of Limerick Forest.

3.0 SUB COMMITTEES:

To undertake this role, the following structure and reporting relationships have been developed:

There will be five subcommittees with the following mandates:

3.1 Administration:

To establish rules and regulations for the use of the resources in Limerick Forest.

3.2 Forest Resources

To manage the resources of Limerick Forest on a sustainable basis for a wide variety of goods and services.

3.3 Recreation

To provide for a wide range of quality recreational opportunities in a safe environment.

3.4 Ecology

To promote the scientific understanding of biodiversity and to protect the ecological features and values of Limerick Forest.

3.5 Education & Communications

To provide outdoor education opportunities and to foster a strong understanding of sustainable resource management.

3.6 Chairperson Selection

Each subcommittee will select a chairperson *prior to December each year*. This chairperson will convene all subcommittee meetings and be responsible to bring forward all subcommittee recommendations to the Chairpersons committee.

3.7 Chairpersons Committee

This committee, made up of the five subcommittee chairpersons, a Grenville Land Stewardship Council representative, and a United Counties Councillor, will be responsible to:

- Review and approve subcommittee recommendations.
- Ensure that clear, concise recommendations are presented to County Council for approval.
- Select a chairperson to be part of the delegation to present the recommendations of the LFAC to County Council for approval and provide communications between Counties Council and the subcommittee chairs. The delegation will also include the GLSC Co-ordinator, GLSC representative and the United Counties Councillor.
- Attend annual progress meeting with the County Council and communicate the results of these discussions to the LFAC and the public.
- Make minor decisions on pressing matters as required
- Review project proposals for the use of the lands and resources of Limerick Forest when requested by the Public Works committee, United Counties of Leeds and Grenville, as outlined in the attached schedule "A" Operating Procedures.
- Advise *Public Works Committee* of the names of the Chairpersons Committee. The *Forest Manager* will arrange for this each *December*, in writing.

4.0 Administration Support:

Administration support for the LFAC will be provided by the *United Counties of Leeds and Grenville*. The United Counties of Leeds and Grenville will be responsible for all files, documents and maps relating to the Limerick Forest.

5.0 Membership:

5.1 LFAC

Any citizen or representative of an organization or government, interested in contributing to the sustainable development of Limerick Forest may become a member by contacting the *Forest Manager, UCLG at 613-342-9246 ext 12416*. *This membership list will be updated each January by the UCLG.*

5.2 Subcommittees

Any LFAC member is welcome to join any subcommittee(s) of their choice. Each subcommittee will select a chairperson to represent their interests on the Chairpersons Committee. Any Chairperson can be removed by a majority vote of all subcommittee members. *All membership lists will be updated each December by the UCLG. Members not returning to a Sub-committee will remain as a LFAC member for the next year.*

5.3 Chairpersons Committee

All selected subcommittee Chairpersons and a Grenville Land Stewardship Council Representative will form this committee and will function by consensus. The United Counties will appoint one Counties Councillor to act as a resource person (*not as a voting member*). Chairpersons can only be removed from this committee by their respective subcommittee.

6.0 Meetings:

6.1 Subcommittees

Each sub-committee will meet at least once per year and on an "as required" basis to provide recommendations to the Chairperson's Committee.

6.2 Chairpersons Committee

This committee will meet to review the recommendations from the five subcommittees and prepare a final submission for County council by December 15, annually. This final submission will be presented to *Public Works Committee* prior to the annual budget process. Other meetings will be on an "as required" basis to review budget approvals etc. or as outlined in schedule "A" Operating Procedures for the review of project proposals.

6.3 Annual Progress Meeting

The Director of Public Works for the United Counties of Leeds and Grenville or delegate, will arrange an annual meeting with LFAC. This meeting is to take place within two months following the Counties year end (on/before March 1). A progress report will be prepared by the Counties, which will provide a review of the previous years work programs in Limerick Forest and proposals for activities in the upcoming year.

6.4 Annual Public Event

The LFAC will organize a meeting for the public each year. This meeting will be designed to keep everyone informed about the status of the LFAC and the activities in Limerick Forest.

7.0 Communications:

All scheduled meetings will be communicated through the *United Counties of Leeds and Grenville* to LFAC *Sub-committee members*.

All scheduled meetings will have minutes recorded and distributed by the *UCLG* to all LFAC *Sub-committee* members.

8.0 Amendments:

Any amendments to this document or the Operating Procedures as outlined in schedule "A", will require the approval of LFAC *Chairpersons Committee*, as per sect. 3.7 and will be communicated in writing to *Public Works Committee and LFAC*.

[Revised Feb. 23, 2005]

Schedule "A"

**Mandate and
Operating Procedures for the
Limerick Forest Project Proposals Sub-Committee**

TABLE OF CONTENTS

i DEFINITIONS

1.0 PURPOSE OF THIS SUB-COMMITTEE

1.1 Authority

2.0 SCOPE AND MANDATE OF THE SUB-COMMITTEE

2.1 Request For Review

2.2 Limerick Forest

2.3 Projects with Off-Site Implications

2.4 Projects on adjacent lands

3.0 STRUCTURE OF THE SUB-COMMITTEE

4.0 PROJECT PROPOSALS FOR REVIEW

4.1 Submission of a Project Proposal for Review

4.2 General Guide To The "Project Description"

4.3 The Project Description Format

4.4 Multi Year Projects

4.5 Changes To Project Descriptions

5.0 PROJECT REVIEW PROCESS

5.1 Entry Point

5.2 Timing Requirements

5.3 Responsibilities

6.0 EXEMPTIONS FROM THE PROJECT REVIEW PROCESS

7.0 MEETINGS OF THE SUB-COMMITTEE

7.1 Regular Meetings

8.0 REVIEW

8.1 Briefs and Presentations

8.2 Proceedings

DEFINITIONS:

Project refers to an undertaking, commercial or non-profit by a person, a company, government agency, Crown Corporation, including the United Counties of Leeds and Grenville.

Public Works Committee refers to the Public Works Committee of the United Counties of Leeds and Grenville or the designated officer of the Committee.

Limerick Forest Projects Proposals Sub-Committee refers to the body within the Limerick Forest Advisory Committee responsible for the review of project proposals

United Counties refers to the United Counties of Leeds and Grenville.

1.0 PURPOSE OF THIS SUB-COMMITTEE

The purpose of this Sub-committee of the Limerick Forest Advisory Committee (LFAC) is to review project proposals for the use of the lands and resources of the Limerick Forest in the United Counties of Leeds and Grenville and to provide advice on acceptability of these project proposals in the form of recommendations to the Public Works Committee of the United Counties. This sub-committee in its review of project proposals will consult, as required and as set out in these operating procedures, with other members/sub-committees of the LFAC.

1.1 Authority

This Sub-committee, referred to as the Limerick Forest Project Proposals Sub-Committee, is a sub-committee of the Limerick Forest Advisory Committee which is governed by the Terms of Reference approved by the United Counties of Leeds and Grenville.

2.0 SCOPE AND MANDATE OF THE SUB-COMMITTEE

- projects proposed to take place in Limerick Forest or utilise the resources of the Limerick Forest;
- projects on adjacent lands for which the County is normally consulted (i.e., change in zoning, severances etc.);
- projects within the watershed of the Limerick Forest which have the potential to negatively impact on the ecological or other values of the Limerick Forest;
- types of projects to review include, but are not limited to: scientific research projects; land or building leases; zoning changes; severances; forest exploitation; recreation activities; trail improvements; new trails; camping; hunting and hunting camps; and granular removal;
- County Council will consult this Sub-committee before authorising developments outlined in these Operating Procedures in Limerick Forest; and
- this Sub-committee will provide recommendations to County Council within thirty working days on behalf of the LFAC.

2.1 Request For Review

- project proposals referred by the Public Works Committee will be reviewed by this Sub-committee according to these operating procedures.

2.2 Limerick Forest

- projects that involve the use of Limerick Forest, the resources of Limerick Forest or projects that may otherwise impact on the Limerick Forest and its resources.

2.3 Projects with Off-Site Implications

- the Sub-committee will consider and advise the Public Works Committee on those projects proposed for Limerick Forest which have the potential for off-site impacts; and
- the Sub-committee may consult other interested parties to obtain information on the off-site implications of a project proposal.

2.4 Projects on Adjacent Lands

- the Public Works Committee will consult the Sub-committee when a project or land-uses on adjacent lands have the potential to impact on Limerick Forest and its resources.

3.0 STRUCTURE OF THE SUB-COMMITTEE

- the members of Chairpersons Committee of the LFAC are the members of this Sub-committee;
- the Sub-committee members will determine a chair and vice-chair for the Sub-committee;
- the Sub-committee will determine a recording secretary for the Sub-committee;
- technical and administrative support will be provided by the Public Works Committee; and
- the Sub-committee may seek the advice of the Grenville Land Stewardship Council, the Leeds Land Stewardship Council or other organisations or individuals as required.

4.0 PROJECT PROPOSALS FOR REVIEW

4.1 Submission of a Project Proposal for Review

- project proposals are to be submitted to the Sub-committee from the Public Works Committee; and
- the Sub-committee will undertake to review project proposals within thirty working days of the receipt of project proposal from the Public Works Committee.

4.2 General Guide to The "Project Description"

- project proponents are to contact the Public Works Committee for information on what to include in the project description.

4.3 The Project Description Format - refer to Appendix 'A' for details

4.4 Multi-Year Projects

- the Sub-committee will be responsible for the review of multi-year projects.

4.5 Changes To Project Descriptions

- any amendments or changes to the project proposal submitted to, and accepted by the Public Works Committee after the project proposal has been referred to the Sub-Committee may extend the thirty working day review period.

5.0 PROJECT REVIEW PROCESS

5.1 Entry Point

- all project proposals are to be submitted to the Public Works Committee .

5.2 Timing Requirements

- the Sub-committee will review each project proposal and provide recommendations to the Public Works Committee within thirty working days of receiving a project proposal; and
- the Sub-Committee may request additional time to review a project proposal where a project proposal is of such a nature that additional information or consultations are required by the Sub-committee.

5.3 Responsibilities

- the project proponent is responsible for providing the information requested on the project outlined in Appendix 'A';
- the Public Works Committee is responsible for reviewing each project proposal to ensure the completeness of each proposal and to refer the accepted project proposal to the Sub-committee chair person;
- the Sub-committee is responsible for reviewing, in a timely manner the project proposal and providing the Public Works Committee with its recommendations on the project proposal; and
- the Limerick Forest Advisory Committee, when requested by the Sub-committee will review a project proposal to determine the implications of the project for the Limerick Forest and resources.

6.0 EXEMPTIONS FROM THE PROJECT REVIEW PROCESS

- projects specified in the LFAC approved Limerick Forest Management Plan, as revised from time to time, and any other planning document prepared, and approved by County Council, to guide the sustainable use of Limerick Forest; and
- other types of projects specified by the Limerick Forest Advisory Committee in consultation with the Public Works Committee.

7.0 MEETINGS OF THE SUB-COMMITTEE

7.1 Regular Meetings

- the Sub-committee will meet at least annually to review the operating procedures. Any proposed changes to the operating procedures will be forwarded to the LFAC for their review and approval.

7.2 Review Meetings

- the Sub-committee on an as needed basis but generally not more frequently than once a month.

Limerick Forest Advisory Committee

Environmental Review of Projects

Every project, unless otherwise exempted in the Management Plan, is subject to an environmental review by the Chairperson's Committee of the Limerick Forest Advisory Committee (LFAC). This review process is outlined in Schedule "A" of the LFAC Terms of Reference. The attached Limerick Forest Proposal outline contains the information requested on each project and is to be submitted by the project proponent.

LIMERICK FOREST PROPOSAL (as per Sec. 4.3 T.O.R.)

APPLICANT:

DATE:

LIMERICK COMPARTMENT:

PROPOSAL:

TIME PERIOD FOR PROPOSAL:

IS PROPOSAL PERMITTED BY PRESENT ZONING?

IS THE PROPOSAL CONSISTENT WITH THE MANAGEMENT PLAN?

HOW DOES THE PROPOSAL FURTHER THE OBJECTIVES OF THE
MANAGEMENT PLAN?

DESCRIBE ANY NEGATIVE OR POSITIVE EFFECTS RELATING TO:

- A/ environment and ecological systems in the area
- B/ surface and ground water
- C/ roads
- D/ recreational use of area
- E/ adjacent property
- F/ interference with other activities
- G/ resources used

DESCRIBE ANY MITIGATIVE MEASURES TO BE TAKEN IN THE EVENT OF
DAMAGE:

DESCRIBE ANY RESTORATIVE MEASURES WHICH WILL BE UNDERTAKEN
IN THE EVENT OF ENVIRONMENTAL DEGRADATION:

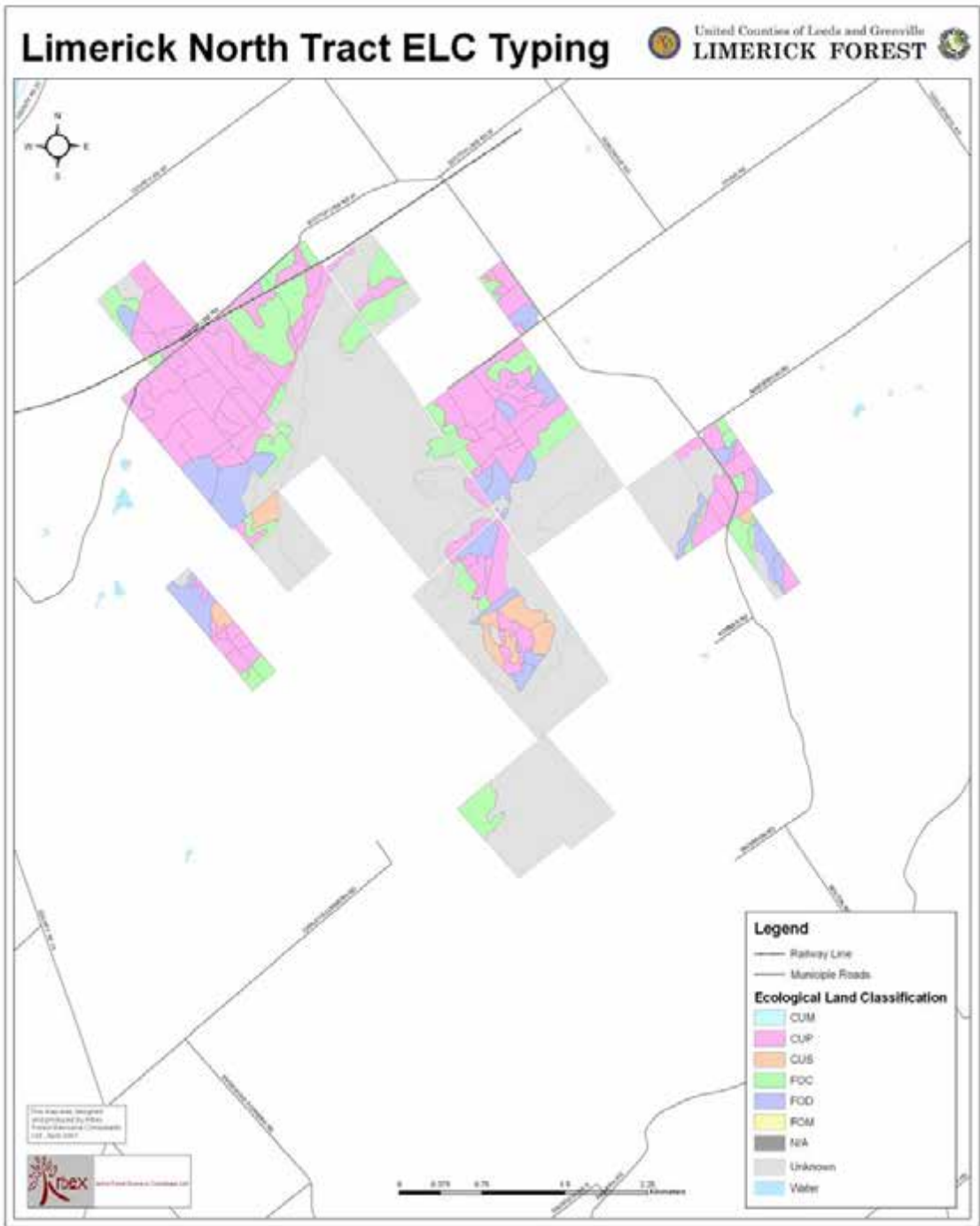
APPENDIX E

Ecological Land Classification Maps

The following table provides the key to the Legend Ecological Land Classifications found in the following ELC maps.

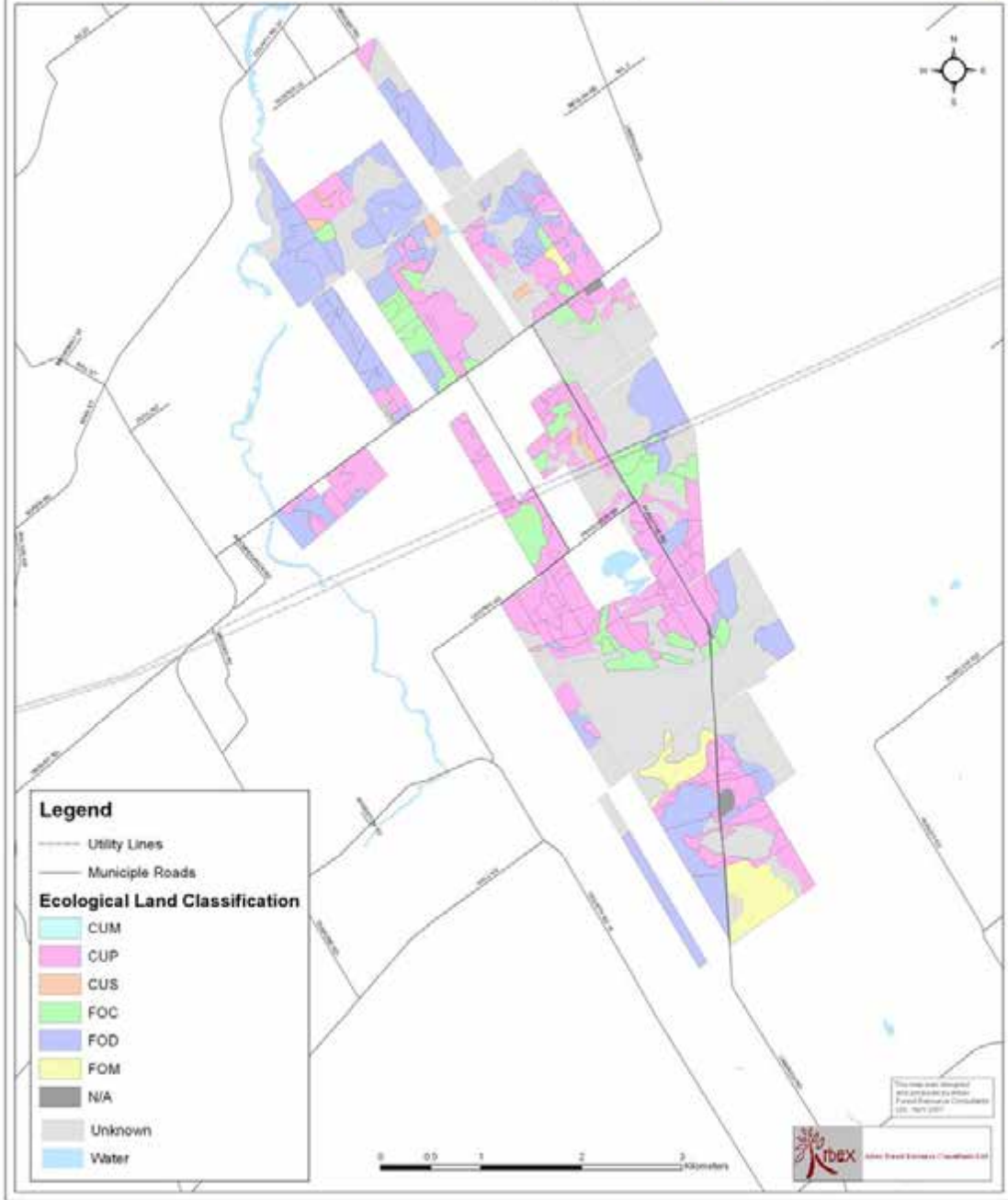
Table 1. Legend Definitions for ELC Maps

ELC	Legend Definition
CUM	Cultural Meadow
CUP	Cultural Plantation
CUS	Cultural Savannah
FOC	Coniferous Forest
FOD	Deciduous Forest
FOM	Mixed Forest
N/A	Not Applicable
Unknown	Stands without ELC typing



Limerick North Tract – Ecological Land Classification by Stand

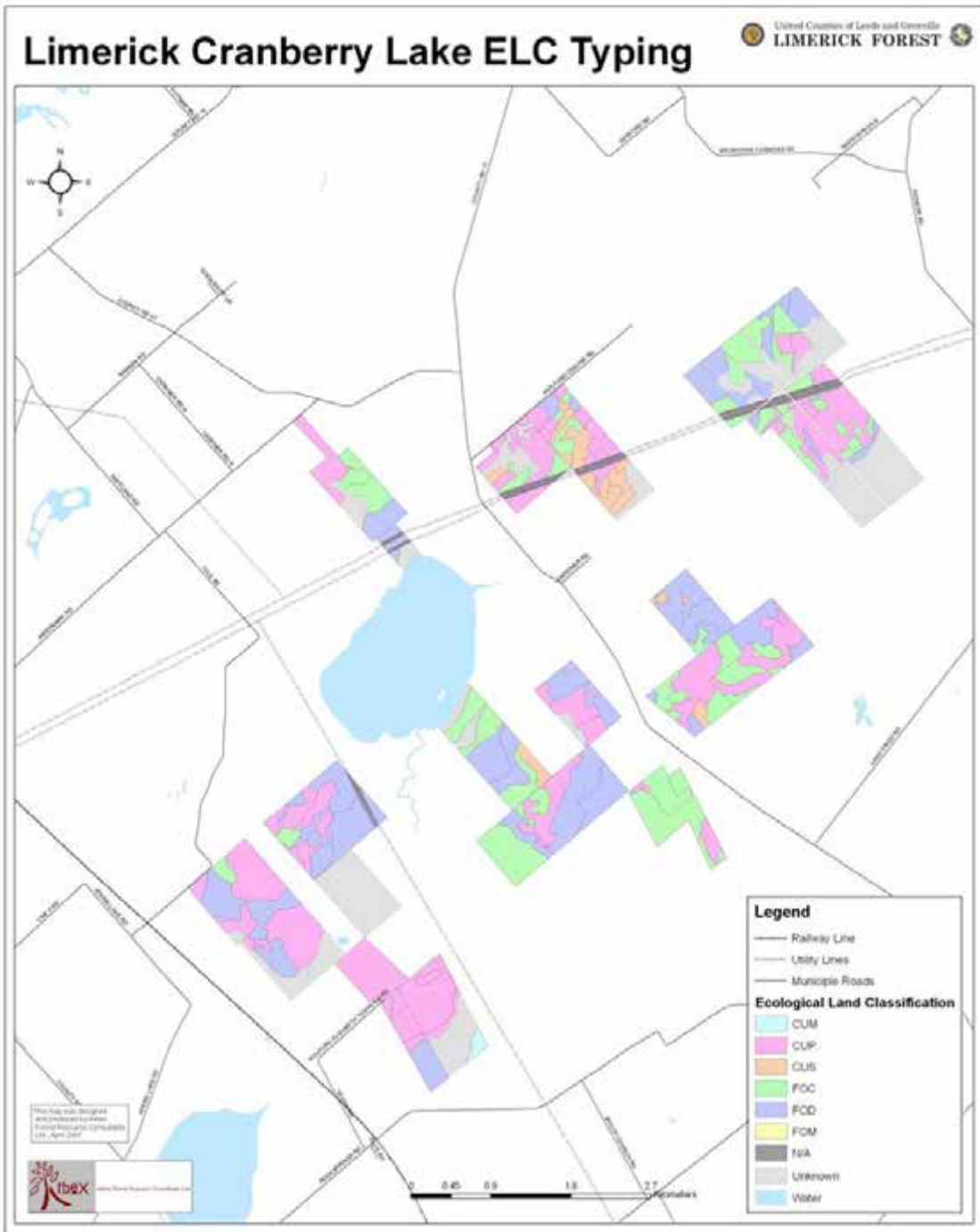
Limerick South Tract ELC Typing



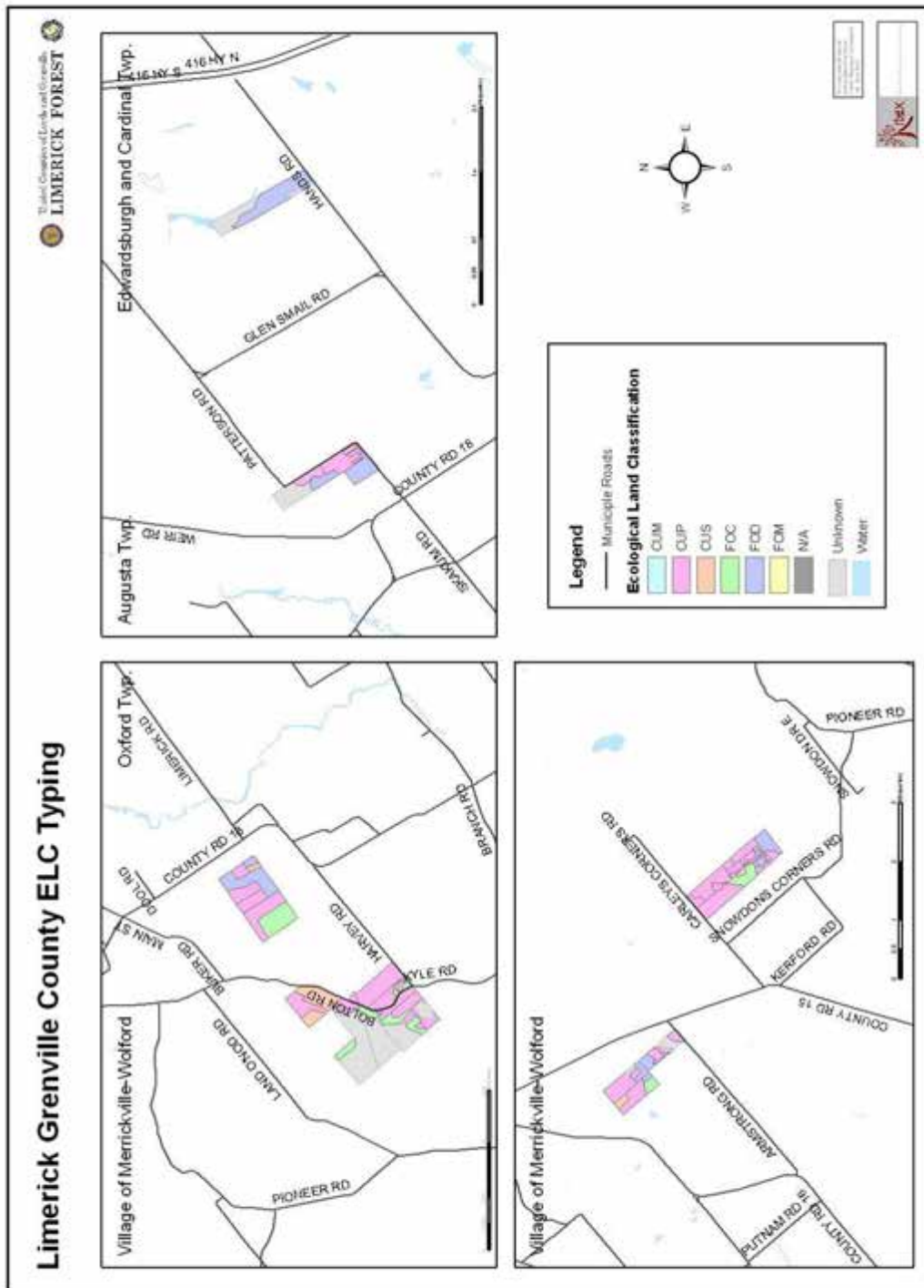
Limerick South Tract – Ecological Land Classification by Stand



Limerick North Augusta – Ecological Land Classification by Stand



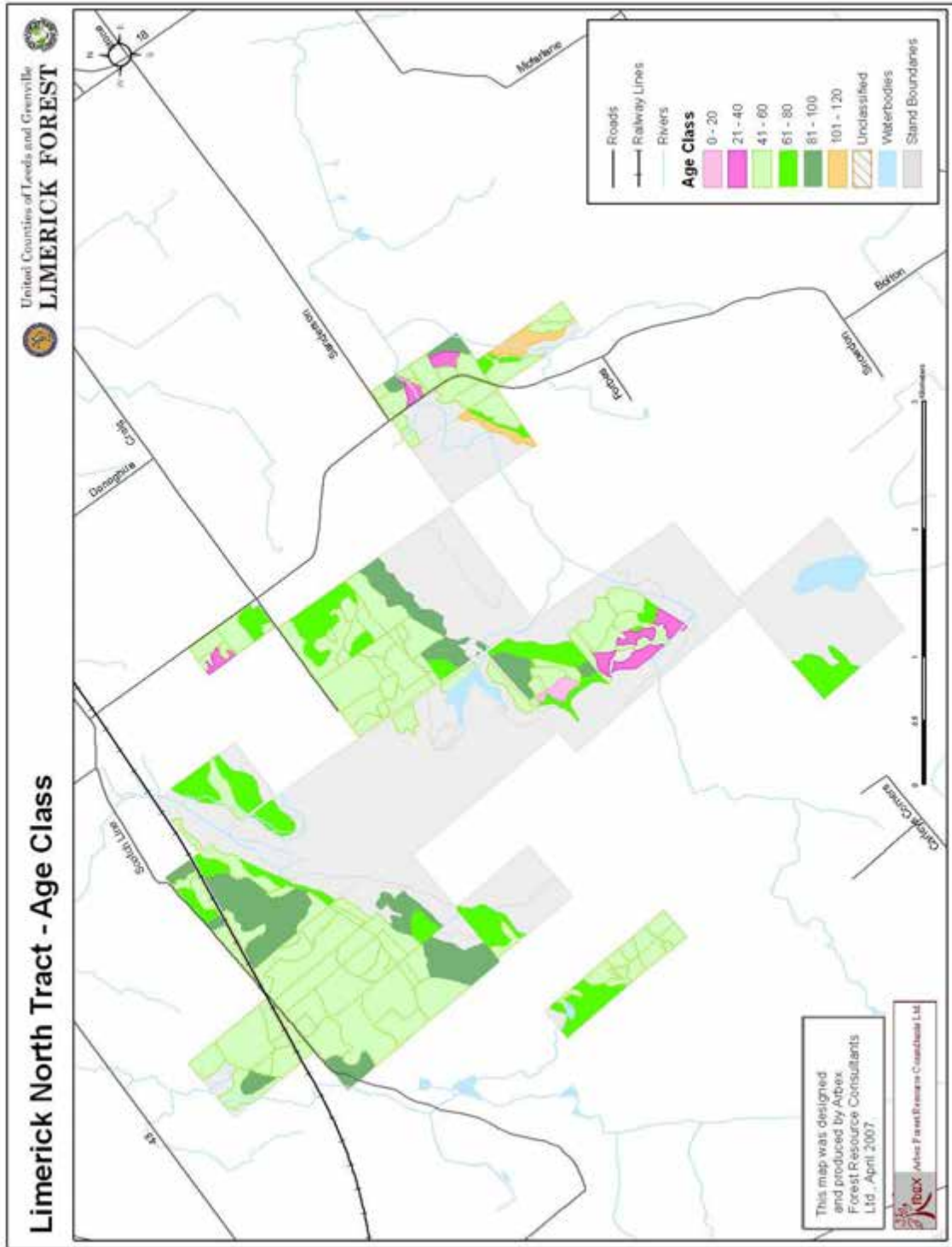
Limerick Cranberry Lake – Ecological Land Classification by Stand

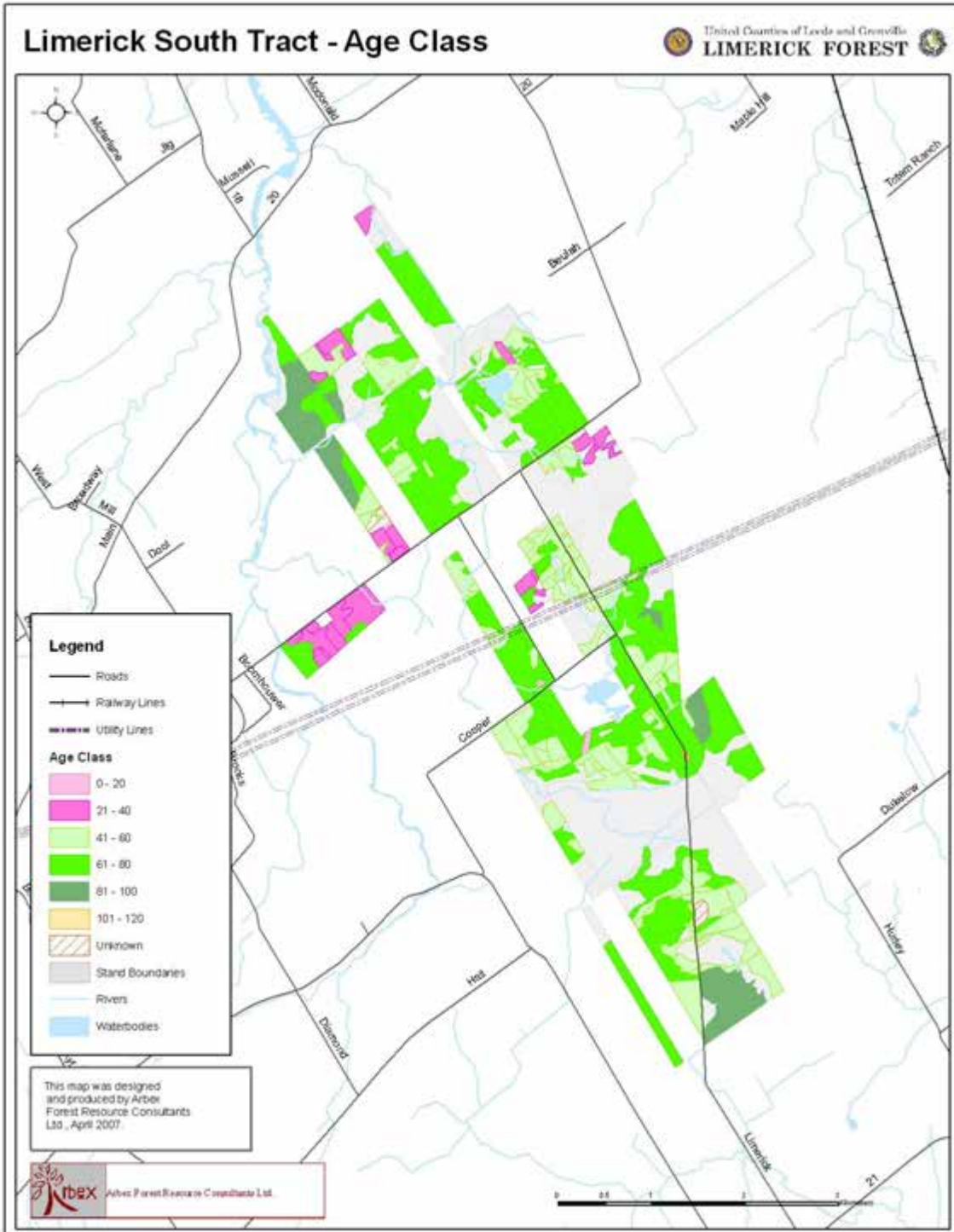


Limerick Grenville County – Ecological Land Classification by Stand

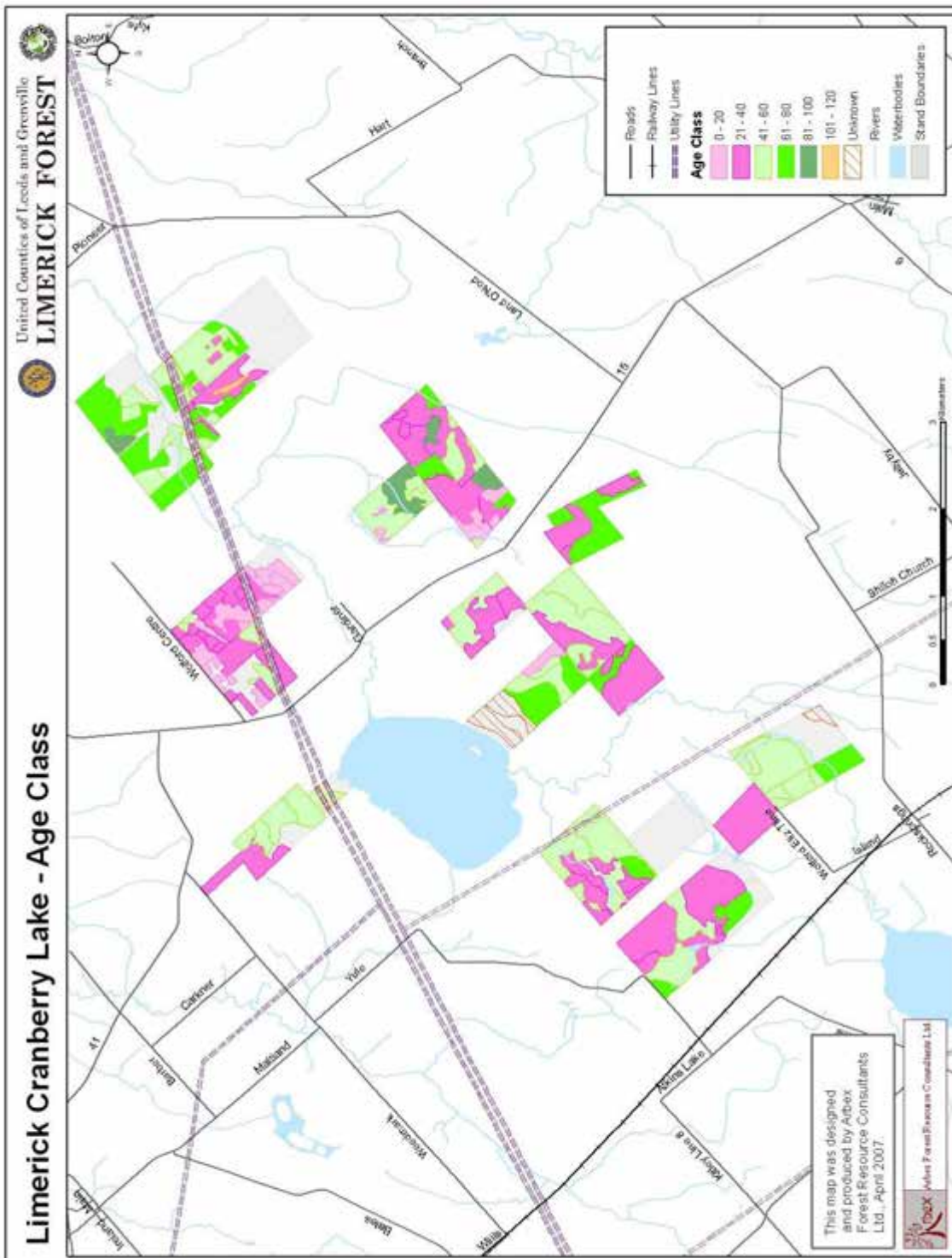
APPENDIX F

Limerick Forest Tract Age Class Distribution Maps And Working Group Age Class Charts

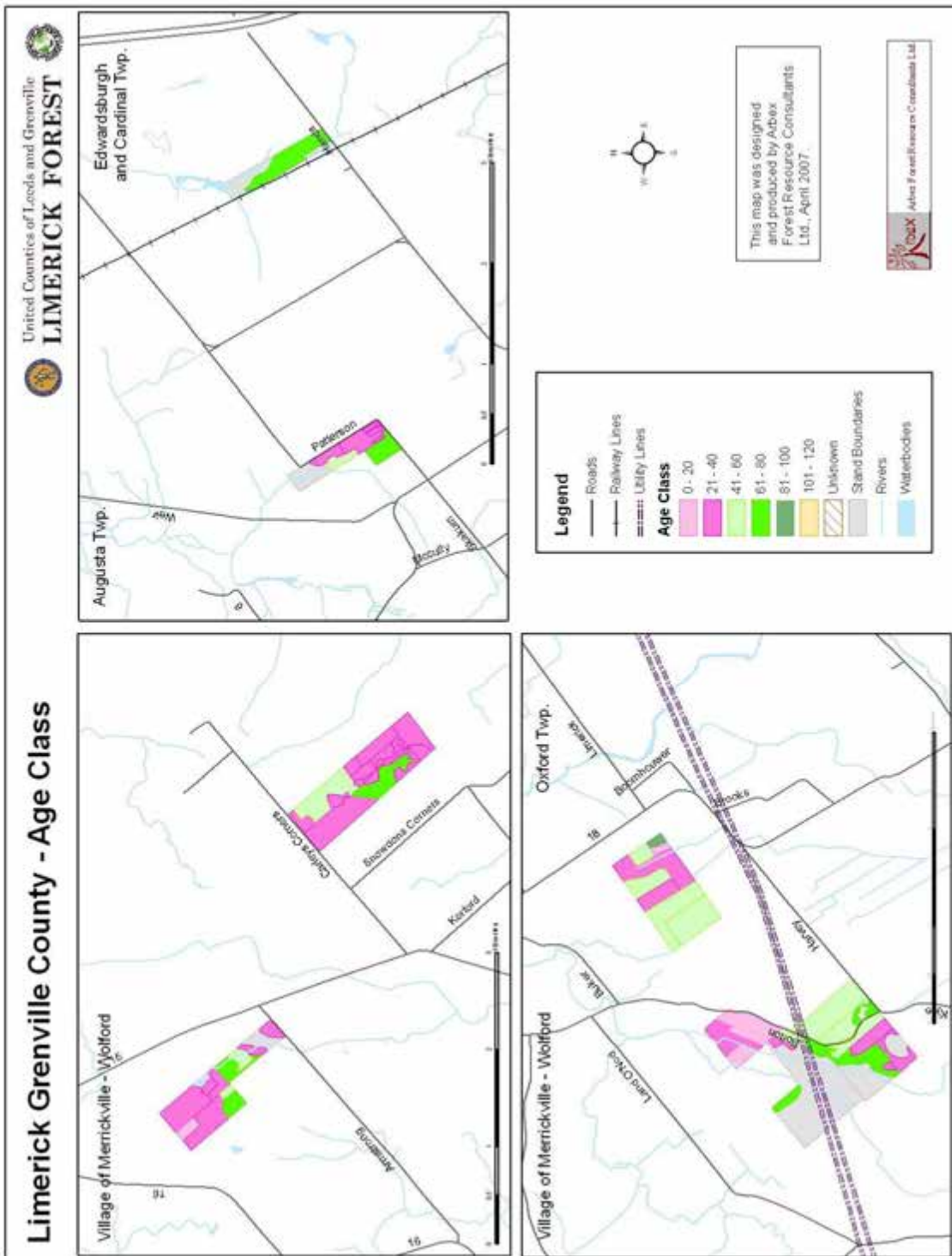




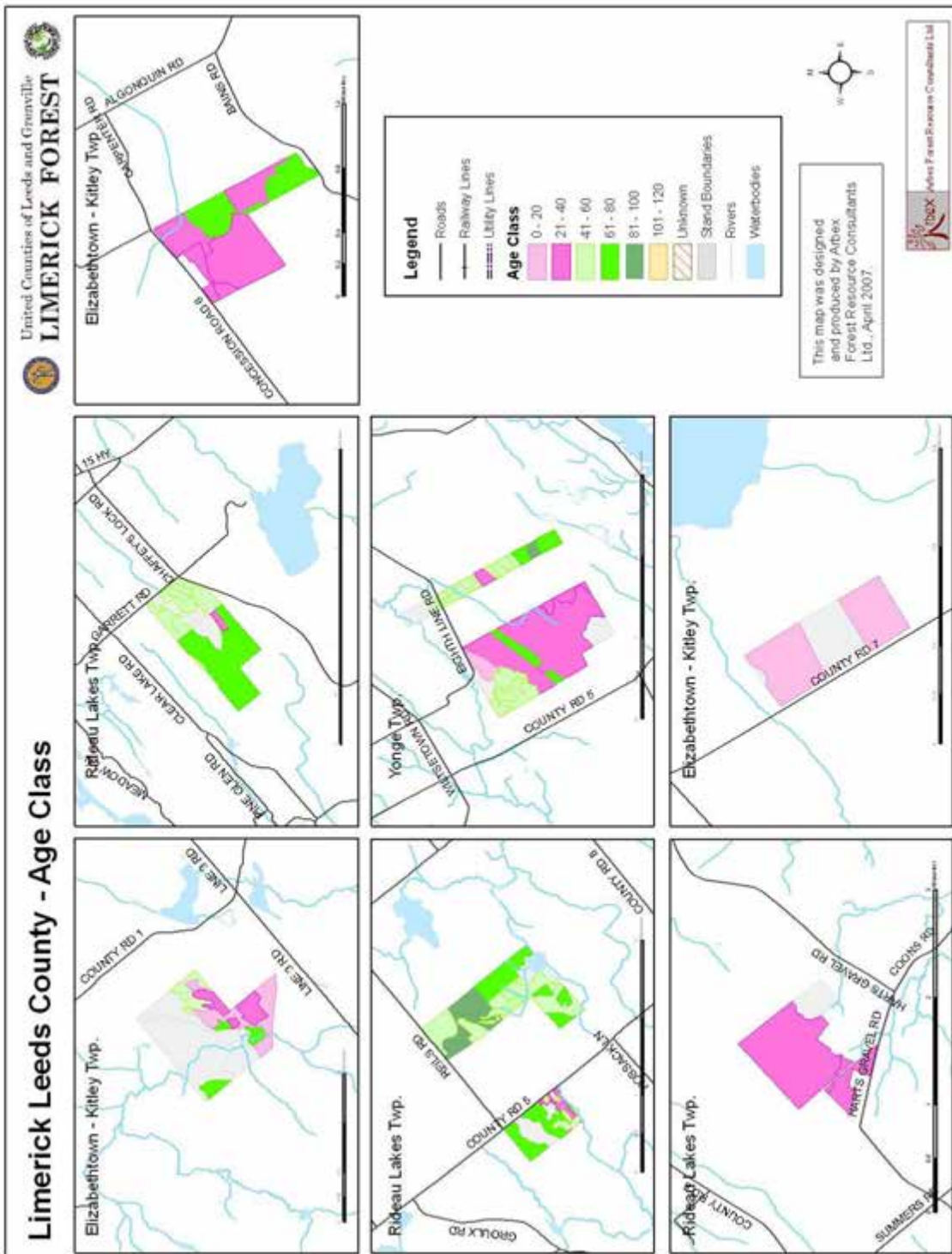
Age Class Area Distribution in Limerick South Tract



Age Class Area Distribution in Limerick Cranberry Lake

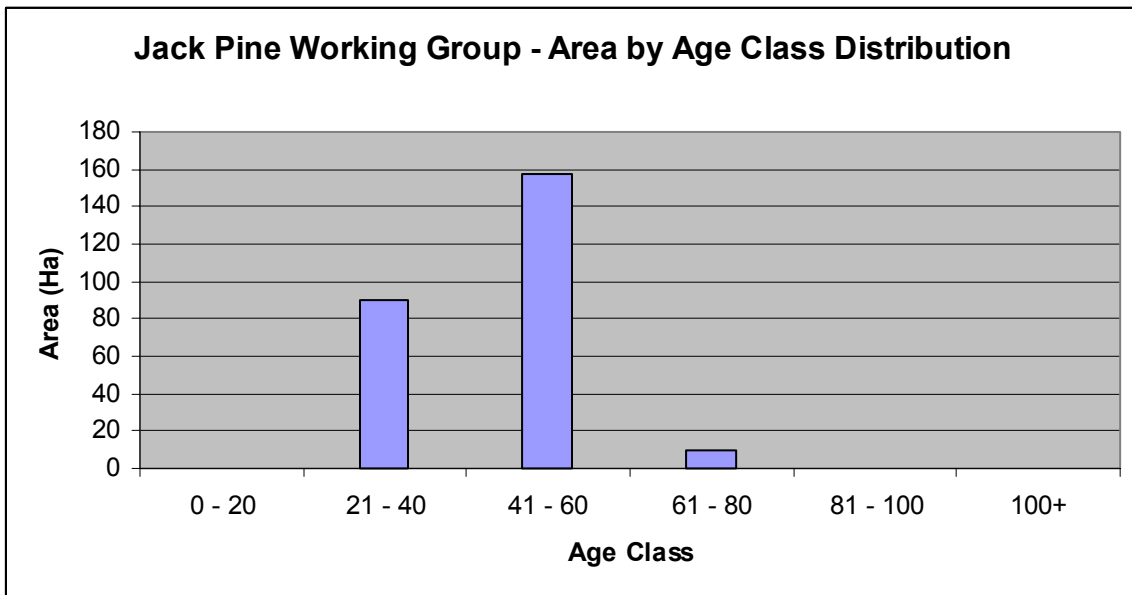
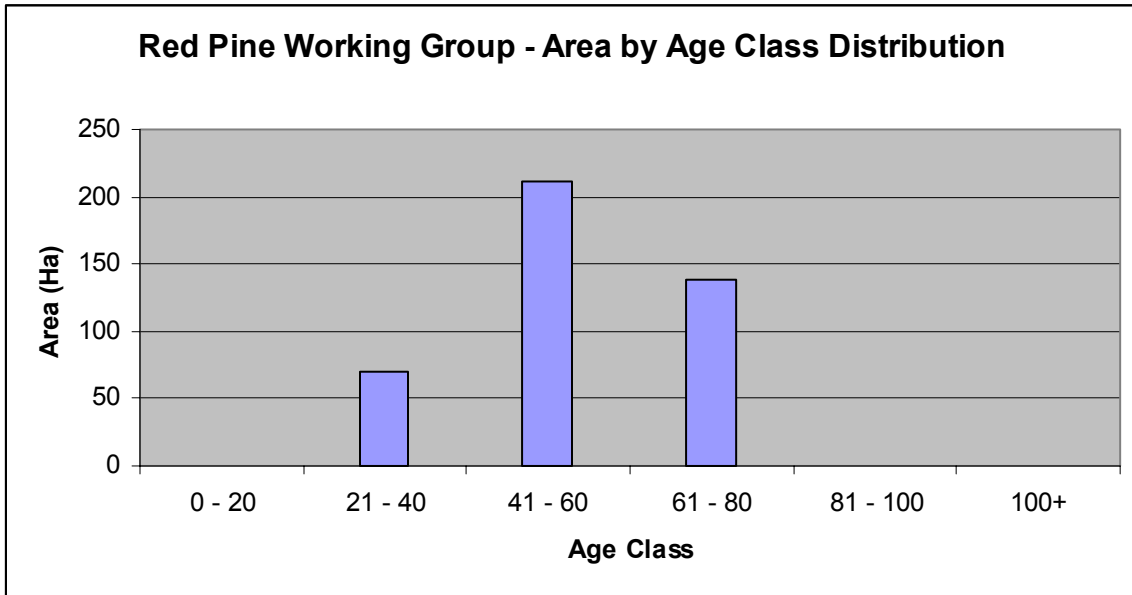


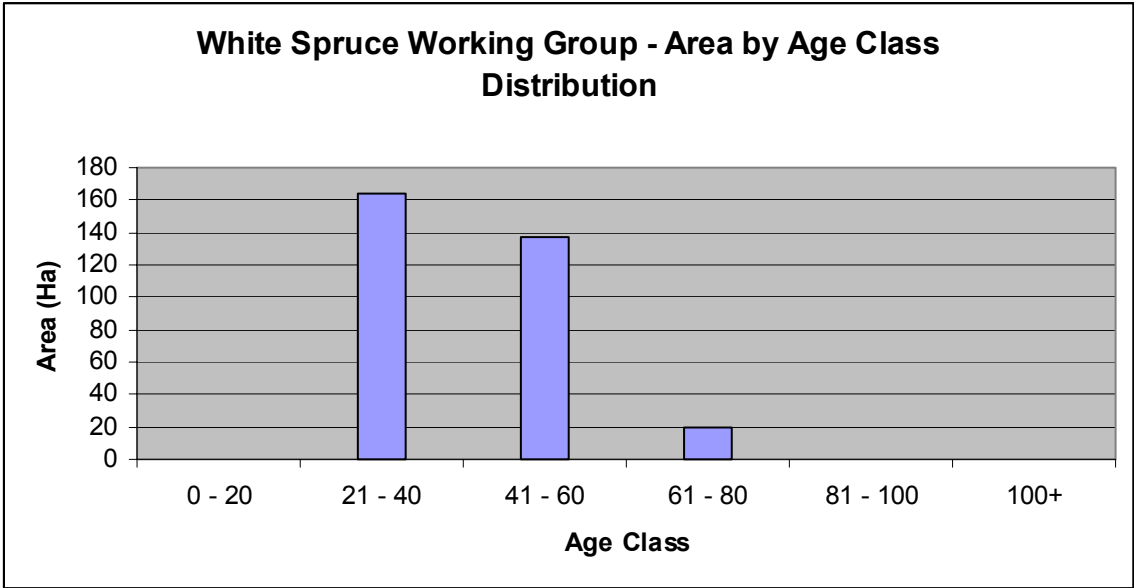
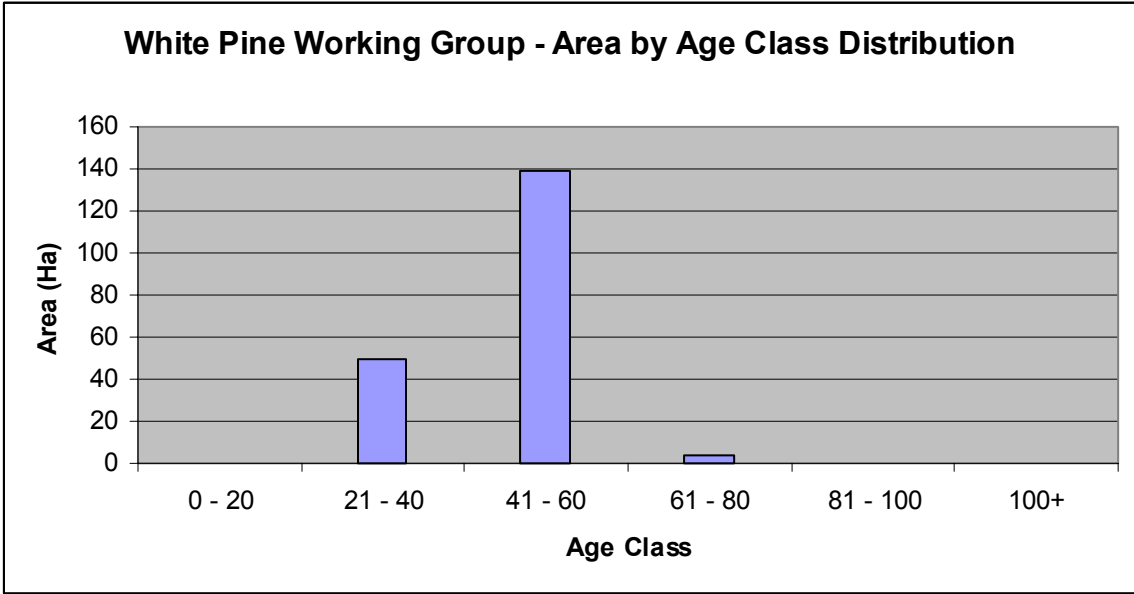
Age Class Area Distribution in Limerick Grenville County

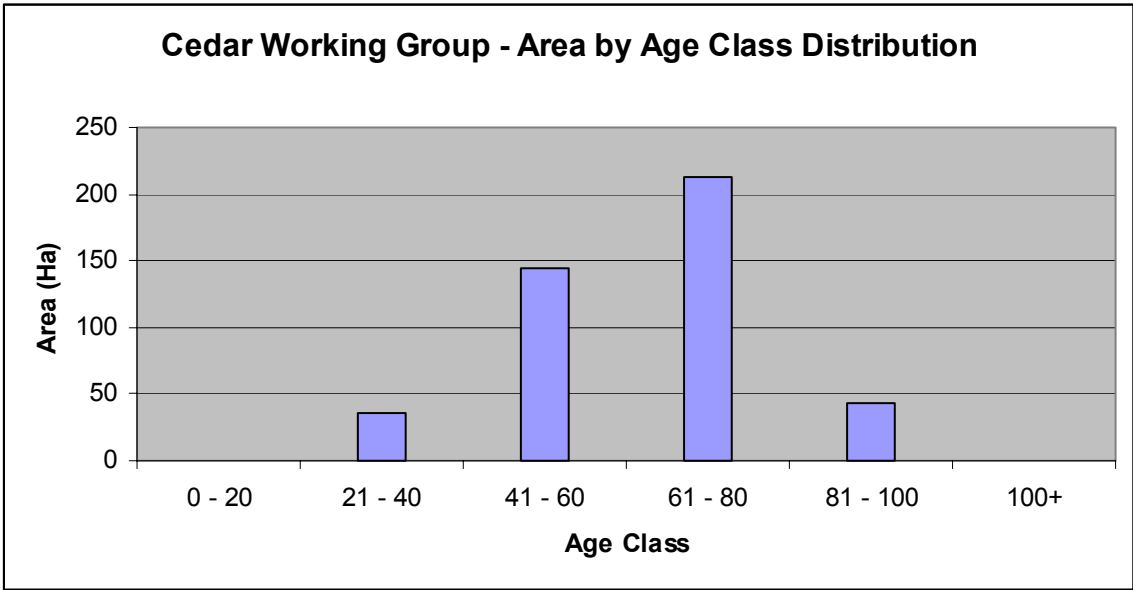
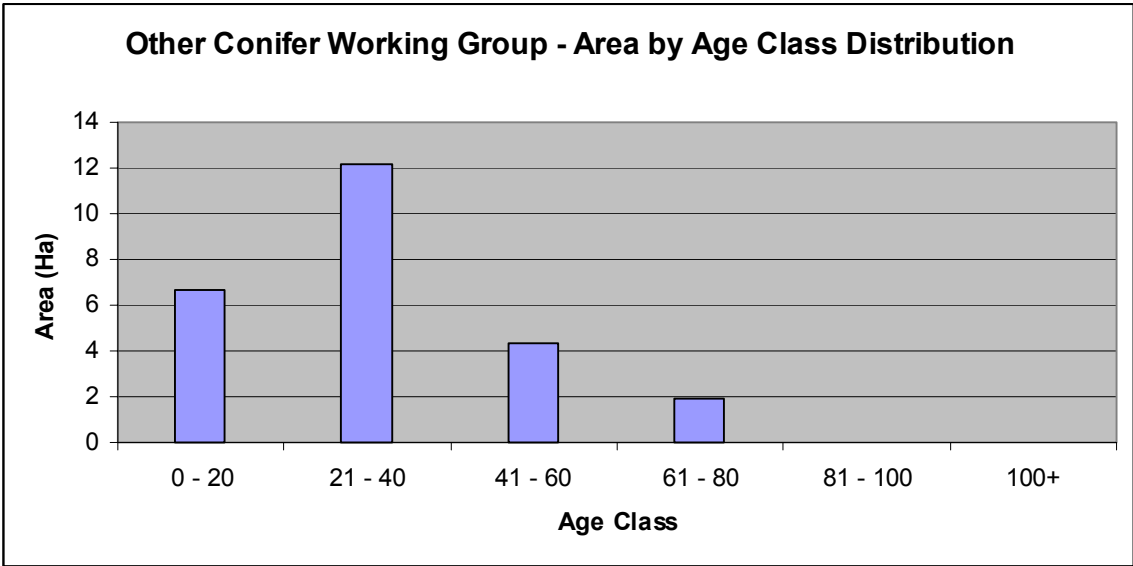


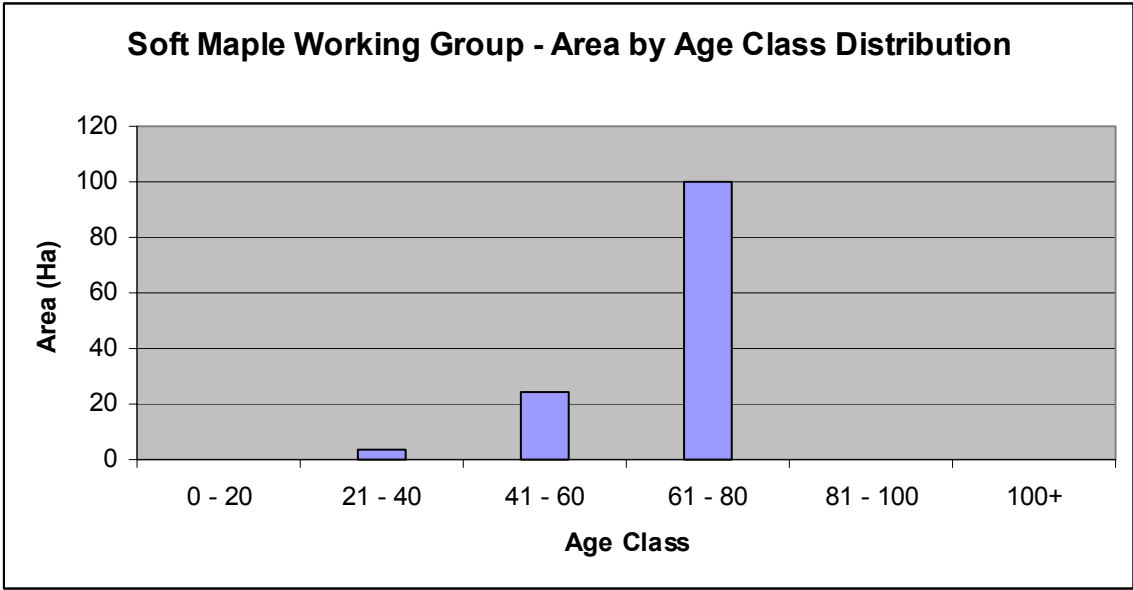
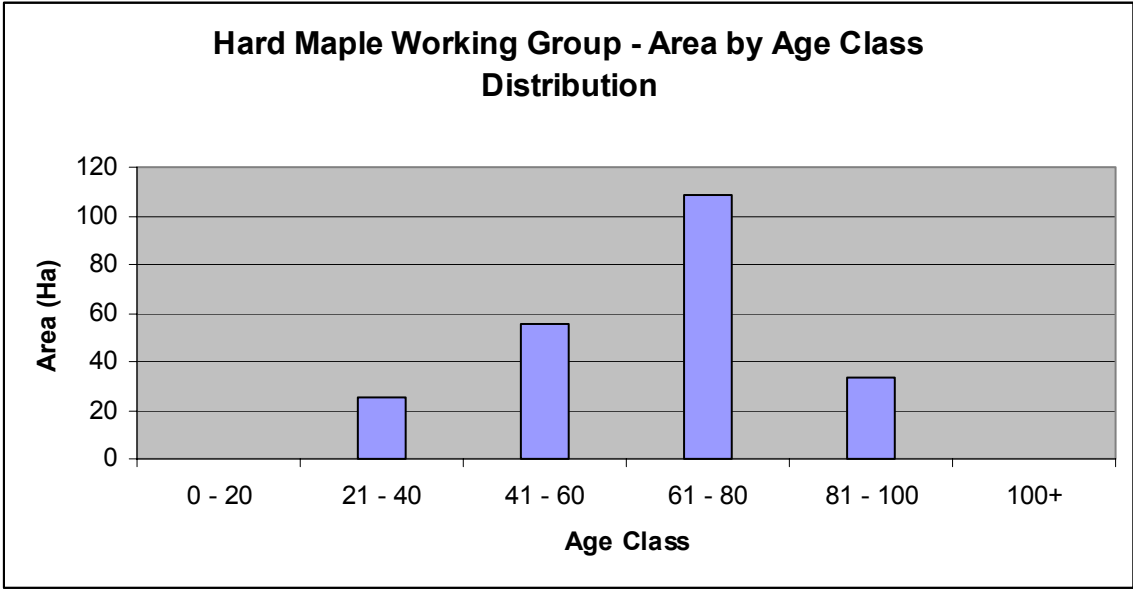
Age Class Area Distribution in Limerick Leeds County

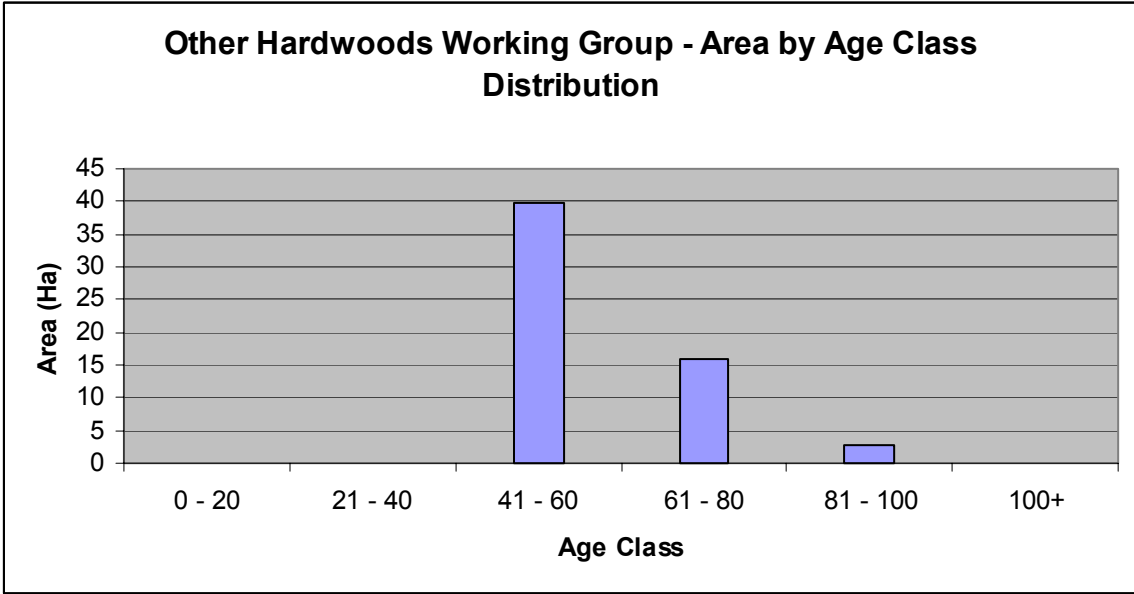
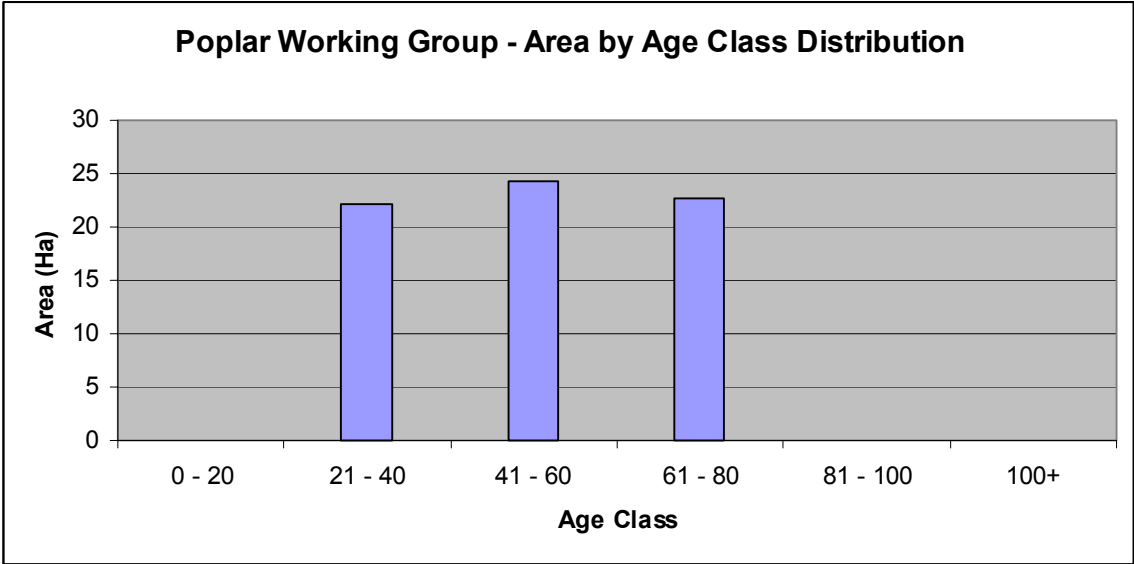
The following charts illustrate the area by age class distribution by working group.











APPENDIX G

Natural Heritage Information Centre Reports Wetlands & ANSI Areas

WOLFORD BOG PART 1 - WETLAND

Natural Heritage Information Centre Report

Area Id: 8289
Alias(es):
Size (ha): 1975.0

Area Type: WET
Significance Level: Provincial

Site District:

Counties:
LEEDS & GRENVILLE

Topographic Maps:
31B/13

UTM Centroid: 18 435000 4961000

Decimal Latitude/Longitude: 44.8013969397448 -75.821854298051

Description: A Provincially significant wetland, composed of three wetland types (11% bog, 70% swamp and 19% marsh) (McIntyre et al., 1984).

Vegetation: Vegetation Communities (McIntyre et al., 1984): One form M1: narrow-leaved emergents- wild rice, burreed, M4: robust emergents- cattails; Two forms M3: narrow-leaved emergents- rushes, lilies; M6: herbs- loosestrife, jewelweed; grass; S3: rich shrubs- dogwood; loosestrife; S9: deciduous trees- Red Maple; duckweed; S10: deciduous trees- Red Maple; ferns, bugleweed; S15: tall shrubs; floating plants; S17: tall shrubs- saplings, Buttonbush, willow; Sweet Gale; Three forms S1: deciduous trees- Red Maple; sedges, grasses; jewelweed, ferns, False Nettle; S14: tall shrubs- alder; grass; ferns; S16: coniferous trees- cedar; low shrubs; herbs; S18: deciduous trees- Red Maple; dogwood, willow; spirea; Four forms S7: tall shrubs- alder; saplings, dogwood, alder; ferns, wintergreen; Sweet Gale; M2: robust emergents- cattails; rush, grass, sedges; jewelweed, loosestrife; tall shrubs; M5: robust emergents- cattails; Buttonbush; Sweet Gale; sedges; B1: deciduous trees; dogwood; Leatherleaf; Sphagnum sp.; B2: coniferous trees- Tamarack, spruce; Mountain Holly; Sweet Gale, Leatherleaf; Sphagnum sp.; B3: tall shrubs- dogwood; Leatherleaf; S5: tall shrubs; low shrubs; moss; herbs; S8: tall shrubs- alder, willow, Buttonbush; spirea, Sweet Gale; sedges, rushes; loosestrife; S13: deciduous trees- Red Maple; tall shrubs; grasses; herbs; Five forms S12: deciduous trees- Red Maple, ash; dead deciduous trees; saplings, Buttonbush; grass; bidens, bugleweed; Six or more forms S2: deciduous trees- Red Maple, ash; saplings, alder, cedar; ferns; sedges, burreed, beggar's tick; moss; S4: deciduous trees- Red Maple; cedar; alder; ferns; sedges; moss; S6: coniferous trees; tall shrubs; low shrubs; narrow-leaved emergents; mosses; herbs; S11: deciduous trees- Red Maple; willow; grass; bugleweed, beggar's tick; duckweed.

Landform: Soils (McIntyre et al., 1984): 100% organic; Site Type (McIntyre et al., 1984): 34% palustrine (permanent or intermittent outflow), and 66% riverine;

Id **Citation**
33852 McIntyre, P., D. Healey, L. Chalmers, D. Martin and J. McDonnell. 1984. Wetland Data Record and Evaluation- Wolford Bog Part 1 (Cranberry Lake- Atkins Lake). Second Edition. September 21, and August 16, 1983 and, August 30, 1984. Ontario Ministry of Natural Resources. Manuscript. 22 pp + 1 map + 6 pp supplement.

See also Cranberry Lake Swamp ANSI

Source: Ontario Ministry of Natural Resources: Natural Heritage Information Centre Website
www.mnr.gov.on.ca/MNR/nhic/nhic.html

WOLFORD BOG PART 3 - WETLAND

Natural Heritage Information Centre Report

Area Id: 9919
Alias(es): HANLAN'S BOG
Size (ha): 1547.0

Area Type: WET
Significance Level: Provincial

Site District:

Counties:
LEEDS & GRENVILLE

Topographic Maps:
31B/13

UTM Centroid: 18 440000 4971000
Decimal Latitude/Longitude: 44.8918489146572 -75.7598229529878

Description: A Provincially significant wetland, composed of three wetland types (26% bog, 72% swamp and 2% marsh) (McDonnell, 1985).

Vegetation: Vegetation Communities (McDonnell, 1985): Swamp S1: dead deciduous trees; Black Ash; Red-osier Dogwood, willow; Reed Canary Grass, sedges; mint, Purple Loosestrife, touch-me-not; S2: deciduous trees- willow; grasses; S3: tall shrubs- willow, Speckled Alder, Red-osier Dogwood; grasses, sedges, spike-rush; arrowhead, mare's tail; S4: tall shrubs- Speckled Alder, willow; grasses; bedstraw, skullcap, Royal Fern, meadow rue, Sensitive Fern, baneberry; S4b: tall shrubs- Gray Birch, stunted Red Maple trees, Black Ash, Spiraea sp., alder, willow, cedar, Tamarack, Mountain Holly, Nannyberry; Royal Fern, herbs, mint, Marsh Fern, Sphagnum sp.; grasses; (*amount of Tamarack increases as you set further into bog) S5a: deciduous trees- Black Ash, Red Maple; cedar, willow, Red-osier Dogwood, Mountain Holly; ferns, mints, moss, beggar's-ticks, joe-pye weed, Royal Fern; grasses, sedges; S5b: deciduous trees- Black Ash, Red Maple; cedar, Black Spruce, Tamarack; Mountain Holly, willow, Red-osier Dogwood; Royal Fern, beggar's-ticks, etc.; grasses, sedges; S8: tall shrubs- willow, Mountain Holly; cattail; beggars-ticks; Bog B1: low shrubs- Leatherleaf, Labrador-tea, blueberry; Sphagnum sp., Pitcher-plant; B6: coniferous trees- Black Spruce, Tamarack; Leatherleaf, Labrador-tea, Pitcher-plant, Sphagnum sp.; B7: coniferous trees- Tamarack; Leatherleaf, Labrador-tea; Sphagnum sp., Pitcher-plant; Marsh M1: narrow-leaved emergents- sedges; beggars-ticks; W1: submergents- Chara sp.; W2: floating plants- lily pads; coontail;

Landform: Soils (McDonnell, 1985): 100% organic; Site Type (McDonnell, 1985): 100% palustrine (permanent or intermittent outflow);

Id **Citation**
55270 McDonnell, J. 1985. Wetland Data Record and Evaluation- Wolford Bog Part 3 (Hanlan's Bog). Second Edition. January 1985. Ontario Ministry of Natural Resources. Manuscript. 23 pp + 1 map + 4 pp supplement.

See also Merrickville Bog ANSI

Source: Ontario Ministry of Natural Resources: Natural Heritage Information Centre Website
www.mnr.gov.on.ca/MNR/nhic/nhic.html

WOLFORD BOG PART 5 - WETLAND

Natural Heritage Information Centre Report

Area Id: 9055
Alias(es):
Size (ha): 242.0

Area Type: WET
Significance Level: Other

Site District:

Counties:
LEEDS & GRENVILLE

Topographic Maps:
31B/13

UTM Centroid: 18 442400 4965000

Decimal Latitude/Longitude: 44.8380381692699 -75.7287508095602

Description: A Non-Provincially significant wetland, composed of two wetland types (93% swamp and 7% marsh) (Martin, 1984).

Vegetation: Vegetation Communities (Martin, 1984): Two forms M1: dead deciduous trees; narrow-leaved emergents; S1: tall shrubs; narrow-leaved emergents; Three forms S2: deciduous trees; tall shrubs; herbs; M3: dead deciduous trees; narrow-leaved emergents; herbs; S3: deciduous trees; narrow-leaved emergents; herbs; S4: tall shrubs; narrow-leaved emergents; herbs; M4: robust emergents; narrow-leaved emergents; herbs; Four forms M2: robust emergents; broad-leaved emergents; narrow-leaved emergents; herbs; S5: deciduous trees; dead deciduous trees; tall shrubs; herbs; S6: tall shrubs; low shrubs; narrow-leaved emergents; herbs;

Landform: Soils (Martin, 1984): 100% organic; Site Type (Martin, 1984): 100% palustrine (permanent or intermittent outflow);

Id	Citation
36072	Martin, D. 1984. Wetland Data Record and Evaluation- Wolford Bog Part 5. Second Edition. 1982. Ontario Ministry of Natural Resources. Manuscript. 22 pp + 1 map + 1 pp supplement.

Source: Ontario Ministry of Natural Resources: Natural Heritage Information Centre Website
www.mnr.gov.on.ca/MNR/nhic/nhic.html

INDIAN CREEK WETLAND

Natural Heritage Information Centre Report

Area Id: 9067
Alias(es):
Size (ha): 565.0

Area Type: WET
Significance Level: Other

Site District:

Counties:
LEEDS & GRENVILLE

Topographic Maps:
31B/13

UTM Centroid: 18 448600 4961500

Decimal Latitude/Longitude: 44.8070058207865 -75.6499601400202

Description: A Non-Provincially significant wetland, composed of two wetland types (92% swamp and 8% marsh) (Sine and Vipond, 1984).

Vegetation: Vegetation Communities (Sine and Vipond, 1984): Three forms M2: robust emergents- cattails; milfoil; grasses, sedges, rushes; Four forms S1: deciduous trees- Red Maple; Balsam Fir; Winterberry; jewelweed; S7: deciduous trees- Black Ash; hardwood saplings; grasses; White Snakeroot; M3: narrow-leaved emergents- sedges; jewelweed; spirea; dead trees; Five forms S3: tall shrubs- willow; spirea; sedges; Purple Loosestrife; cattails; S5: deciduous trees- Black Ash; willow; spirea; sedges; ferns; S8: tall shrubs- Speckled Alder; spirea; grasses; White Birch; Purple Loosestrife; Six or more forms S2: tall shrubs- Black Ash saplings; Tamarack; sedges; White Snakeroot; dead trees; bur marigold; S4: deciduous trees- Red Maple; cedar; saplings; spirea; grasses; bugleweed; moss; M1: narrow-leaved emergents- grasses; boneset; dock; willow; spirea; dead trees; M4: narrow-leaved emergents- sedges; spirea; willow; dead trees; Purple Loosestrife; Frogbit;

Landform: Soils (Sine and Vipond, 1984): 60% clays, loams or silts, and 40% organic; Site Type (Sine and Vipond, 1984): 100% riverine;

Id **Citation**
36084 Sine, P., and G. Vipond. 1984. Wetland Data Record and Evaluation- Indian Creek Wetland. Second Edition. August 20 & 21, 1984. Ontario Ministry of Natural Resources. Manuscript. 22 pp + 1 map + 3 pp supplement.

Source: Ontario Ministry of Natural Resources: Natural Heritage Information Centre Website
www.mnr.gov.on.ca/MNR/nhic/nhic.html

CHARLEVILLE CREEK WETLAND COMPLEX

Natural Heritage Information Centre Report

Area Id: 8325
Size (ha): 1545.0

Area Type: WET
Significance Level: Provincial

Site District:

Counties:
LEEDS & GRENVILLE

Topographic Maps:
31B/12 31B/13

UTM Centroid: 18 446000 4955000

Decimal Latitude/Longitude: 44.7483028277843 -75.6821459819727

Description: A Provincially significant wetland complex, made up of five individual wetlands, composed of two wetland types (99.5% swamp and 0.5% marsh) (Sine and Vipond, 1984).

Vegetation: Vegetation Communities (Sine and Vipond, 1984): Swamp S1: dead trees; willow, alder, Red-osier Dogwood; spirea; sedges, grasses; S2: deciduous trees-willow, alder; spirea; sedges; boneset; S3: deciduous trees- Red Maple, Black Ash; Red Maple, Black Ash saplings; sedges; jewelweed, water parsnip, water hemlock, water plantain; S4: tall shrubs-willow, alder, Red-osier Dogwood; spirea; sedges; Water Arum, bur marigold, dock; water meal, duckweed; dead trees and shrubs; S5: tall shrubs- Speckled Alder, willow, Nannyberry, Southern Arrow-wood, saplings of Red Maple, Black Ash, Trembling aspen, White Elm, Red-osier Dogwood; Red Maple, Black Ash, White Elm; spirea; sedges; Marsh Fern, Royal Fern; S6: deciduous trees- Red Maple, Black Ash, elm; hardwood saplings, willow, Nannyberry, Southern Arrow-wood; spirea; sedges; Marsh Fern, Royal Fern; S7: deciduous trees- Black Ash, Red Maple, White Birch, Trembling Aspen; hardwoods saplings, Winterberry, Speckled Alder, Red-osier Dogwood; grasses, sedges, ferns, mint, White Snakeroot, strawberry; S8: tall shrubs- Speckled Alder, Winterberry, Southern Arrow-wood, saplings of Red Maple, Black Ash, elm; Trembling Aspen; Sensitive Fern, other ferns; S9: deciduous trees- White Ash, elm; hardwood saplings, Nannyberry, willow, Gray Dogwood; spirea, virginia creeper; grasses, sedges; White Snakeroot, jewelweed, False Nettle, violet; S10: deciduous tree- Black Ash, White Ash, elm; Red Maple, Black Ash saplings, Gray Dogwood, dead trees; sedges, grasses; bur marigold, smartweed, Purple Loosestrife, bugleweed, jewelweed; S11: tall shrubs-willow; spirea; ferns, boneset; S12: tall shrubs- Black Ash, White Ash, Red Maple, elm saplings; sedges; bur marigold; joe-pye weed, goldenrod; S13: tall shrubs- Winterberry, Nannyberry, Gray Dogwood; Highbush Cranberry, Chokeberry, elm, Southern Arrow-wood; Tamarack, cedar; Red Maple, Trembling Aspen; sedges; Royal Fern, bugleweed, wild strawberry, violet, White Snakeroot; S14: deciduous trees- Black Ash, Red Maple; cedar, saplings of hardwoods and conifers; sedges; False Nettle; Marsh M1: narrow-leaved emergents- grasses, sedges; willow, Gray Dogwood; Swamp Milkweed, boneset, False Nettle, bugleweed;

Landform: Soils (Sine and Vipond, 1984): 20% clays, loams or silts, and 80% organic; Site Type (Sine and Vipond, 1984): 100% palustrine (permanent or intermittent outflow);

Id **Citation**
33890 Sine, P. and G. Vipond. 1984. Wetland Data Record and Evaluation- Charleville Creek Wetland Complex. Second Edition. September 7, 1984. Ontario Ministry of Natural Resources. Manuscript. 22 pp + 1 map + 5 pp supplement.

Source: Ontario Ministry of Natural Resources: Natural Heritage Information Centre Website
www.mnr.gov.on.ca/MNR/nhic/nhic.html

COOLIGAN MARSH WETLAND COMPLEX

Natural Heritage Information Centre Report

Area Id: 8323
Size (ha): 852.0

Area Type: WET
Significance Level: Provincial

Site District:

Counties:
LEEDS & GRENVILLE

Topographic Maps:
31C/9

UTM Centroid: 18 410000 4950000

Decimal Latitude/Longitude: 44.6996780773552 -76.1359574204665

Description: A Provincially significant wetland complex, made up of six individual wetlands, composed of two wetland types (78% swamp and 22% marsh) (Sine and Thompson-Pender, 1984).

Vegetation: Vegetation Communities (Sine and Thompson-Pender, 1984): One form M11: narrow-leaved emergents- grasses; Two forms M9: narrow-leaved emergents- grasses; loosestrife; M7: narrow-leaved emergents- grasses; willow; S22: coniferous trees- cedar; herbs; S21: tall shrubs- willow; grasses, sedges; M15: robust emergents- cattails; loosestrife; M13: herbs- loosestrife; sedges; Three forms M10: herbs- loosestrife; grasses; willow; S23: deciduous trees- ash; sedges; False Nettle; S14: narrow-leaved emergents- grasses; loosestrife; duckweed; S26: dead hardwoods; cattails; loosestrife; S16: tall shrubs- willow; grasses; spirea; Four forms S20: tall shrubs- dogwood; spirea; sedges; loosestrife; S7: dead hardwoods; dead shrubs; ferns; duckweed; S9: deciduous trees- Red Maple; dogwood; loosestrife; grasses; S15: deciduous trees- Red Maple; maple saplings; duckweed; jewelweed; M5: narrow-leaved emergents- grasses; duckweed; spirea; willow; M8: narrow-leaved emergents- grasses; dead hardwoods; cattails; loosestrife; S31: deciduous trees- Red Maple; cedar; maple saplings; jewelweed; Five forms S19: deciduous trees- ash; alder; spirea; sedges; cedar; S24: deciduous trees- maple; cedar; dogwood; jewelweed; duckweed; S25: tall shrubs- willow; sedges; cattails; loosestrife; plantain; M1: robust emergents- cattails; dead hardwoods; duckweed; loosestrife; coontail; S1: deciduous trees- maple; Hemlock; ferns; spirea; moss; S3: dead hardwoods; spirea; ferns; Water Arum; moss; M2: robust emergents- cattails; grasses; willow; ferns; arum; S4: deciduous trees- maple; willow; grass; loosestrife; pondweed; S6a: deciduous trees- ash; Hemlock; elderberry; false nettle; grasses; S6b: coniferous trees- Hemlock; ash; elderberry; false nettle; grasses; M3: dead hardwoods; spirea; ferns; arum; moss; S13: deciduous trees- ash; ash saplings; ferns; moss; grasses; M4: narrow-leaved emergents- grasses; dead hardwoods; loosestrife; willow; grass; S14: tall shrubs- willow; grass; spirea; duckweed; smartweed; M6: narrow-leaved emergents- grass; willow; loosestrife; spirea; dead trees; S18: tall shrubs- willow; grass; ferns; dead hardwoods; moss; S28: coniferous trees- cedar; maple; maple saplings; ferns; moss; M16: free-floating plants- duckweed; dead hardwoods; grass; cattails; bladderwort; submergents; Six forms S29: herbs- loosestrife; dogwood; cedar; ash; grass; plantain; S2: tall shrubs- willow; dead shrubs; dead hardwoods; grasses; loosestrife; arum; S8: tall shrubs- willow; dead shrubs; loosestrife; duckweed; Chara sp.; sedges; S10: deciduous trees- maple; dogwood; loosestrife; dead hardwoods; moss; milfoil; S11: deciduous trees- ash; poplar; Balsam Fir; spirea; fern; horsetail; S12: deciduous trees- ash; cedar; dead hardwoods; ash saplings; virginia creeper; ferns; S17: dead hardwoods; grasses; ferns; moss; maple; dogwood; S30: herbs- loosestrife; elm saplings; dead trees; dead conifers; arum; grasses; S33: deciduous trees- ash; ferns; elm saplings; grass; pondweed; dead trees; Seven forms S5: dead hardwoods; maple; willow; grass; loosestrife; cattails; moss; M12: narrow-leaved emergents- grass; dogwood; Sweet Gale; arrowhead; duckweed; bladderwort; iris; M27: deciduous trees- Red Maple; cedar; dogwood; virginia creeper; ferns; grass; moss;

Landform: Soils (Sine and Thompson-Pender, 1984): 20% clays, loams or silts, and 80% organic; Site Type (Sine and Thompson-Pender, 1984): 42% palustrine (permanent or intermittent outflow), and 58% riverine;

Id **Citation**
33888 Sine, P., and J. Thompson-Pender. 1984. Wetland Data Record and Evaluation- Cooligan Marshes Wetland Complex. Second Edition. May, 1984. Ontario Ministry of Natural Resources. Manuscript. 22 pp + 1 map + 20 pp supplement.

Source: Ontario Ministry of Natural Resources: Natural Heritage Information Centre Website
www.mnr.gov.on.ca/MNR/nhic/nhic.html

HUTTON CREEK WETLAND

Natural Heritage Information Centre Report

Area Id: 9112
Alias(es):
Size (ha): 772.0

Area Type: WET
Significance Level: Other

Site District:

Counties:
LEEDS & GRENVILLE

Topographic Maps:
31C/16

UTM Centroid: 18 417000 4960000
Decimal Latitude/Longitude: 44.7905316428016 -76.049247597266

Description: A Non-Provincially significant wetland complex, made up of five individual wetlands, composed of two wetland types (86% swamp and 14% marsh) (McIntyre et al., 1984).

Vegetation: Vegetation Communities (McIntyre et al., 1984): Two forms S8: low shrubs- Sweet Gale; grass; S9: dead deciduous trees; Chara sp.; S11: tall shrubs- willow; Purple Loosestrife; M4: narrow-leaved emergents- sedges, grass; duckweed, Wolfia sp.; Three forms M1: robust emergents- bulrush, cattails, sweetflag; grass, burreed, wild rice; white lily, pondweed; S4: tall shrubs- willow; Sweet Gale; grass; M3: robust emergents- cattails; Purple Loosestrife; grass, sedges; S6: tall shrubs- willow; sedges, grasses; duckweed; Four forms M2: robust emergents- sweetflag, bulrush, cattail; grass, burreed, wild rice; white lily, pondweed; dead deciduous trees; S10: dead deciduous trees; Purple Loosestrife; cattail; grass; S5: tall shrubs- alder, Red-osier Dogwood; grass, sedge; ferns, nightshade; dead deciduous trees; S7: tall shrubs- willow, alder; grass, sedge; ferns; moss; Five forms S1: ash, Red Maple; Red-osier Dogwood, saplings, willow; Purple Loosestrife, ferns; grass, sedge; moss; S2: dead deciduous trees; ash, Red Maple; saplings; loosestrife; grass; S3: deciduous trees- ash, maple; saplings; ferns; grass; duckweed;

Landform: Soils (McIntyre et al., 1984): 10% clays, loams or silts, and 90% organic; Site Type (McIntyre et al., 1984): 100% palustrine (permanent or intermittent outflow);

Id	Citation
36153	McIntyre, P., D. Healey and G. Vipond. 1984. Wetland Data Record and Evaluation- Hutton Creek Wetland. Second Edition, July 26 & 30, 1984. Ontario Ministry of Natural Resources. Manuscript. 22 pp + 3 pp supplement

Source: Ontario Ministry of Natural Resources: Natural Heritage Information Centre Website
www.mnr.gov.on.ca/MNR/nhic/nhic.html

GROVETON BOG ANSI

Natural Heritage Information Centre Report

Area Id: 1278 **Area Type:** ANSI-LS
Alias(es): Limerick Forest Wetland **Significance Level:** Provincial
Size (ha): 1200.0

Site District: 6E-12 **Counties:** LEEDS & GRENVILLE **Topographic Maps:** 31B/13

UTM Centroid: 18 452000 4968000
Decimal Latitude/Longitude: 44.8657538164034 -75.6075837116129
Minimum Elevation: 100.0 **Maximum Elevation:** 107.0

Description:

Vegetation: The area constitutes the least disturbed core portion of a huge (1990 ha) domed peatland on a larger Sand Plain outwash deposit. The majority of forest cover consists of submature to mature mixed swamp (treed swamp forest) of White Cedar, Black Ash and White Birch, with Red Maple and Balsam Fir being locally significant. Deciduous Thicket Swamp constitutes a substantial portion of the area (especially north of the power transmission corridor), with small area of deciduous swamp forest (Silver Maple - Black Ash) and low shrub fen in the southern and northcentral areas. A large virtually pure Black Ash swamp occurs along the western side of the wetland south of the power transmission corridor. The sand ridges appear to be marine deposits (like the "islands" in the Mer Bleue Bog ?) upon which mature upland forest is present. It appears to be dominated by mature Red Maple and Eastern Hemlock with an abundance of large White Ash and White Pine. Younger upland forest dominated by White Birch is common along the eastern margin of the wetland. [Brunton 1992]

Landform: The area constitutes the least disturbed core portion of a huge (1990 ha) domed peatland on a larger Sand Plain outwash deposit. Large, essentially linear, sand-based ridges occur within it. The peatland is primarily bog with peat averaging >1 m in depth over most of the area to a maximum of over 4 m in the centre. [Brunton 1992] Landform Type(s): Organic Deposit and Sand Plain. [Brunton 1992]

Representation: The vast size of the essentially intact core wetland complex, complete with potentially very significant upland forests on the higher 'islands' and the presence of a number of significant plant species, offers a high level of significance to the site. It appears to contain peatland values, particularly the mixed swamp habitat, unsurpassed by other known sites in Site District 6E-12. [Brunton 1992]

Citation

3761
Bird and Hale Ltd. 1984. Peat and Peatland Evaluation of the Ottawa-Brockville Area. Volumes 1-5. Ontario Geological Survey, OFER 5491. 217 pp.

55164

Brunton, D.F. 1992. Life Science Areas of Natural and Scientific Interest in Site District 6-12. Unpublished Manuscript. 225 pp.

Source: Ontario Ministry of Natural Resources: Natural Heritage Information Centre Website
www.mnr.gov.on.ca/MNR/nhic/nhic.html

GROVETON BOG ANSI

Natural Heritage Information Centre Report

Area Id: 1278 **Area Type:** ANSI-LS
Alias(es): Limerick Forest Wetland
Size (ha): 1200.0 **Significance Level:** Provincial

Site District: 6E-12 **Counties:** LEEDS & GRENVILLE **Topographic Maps:** 31B/13

UTM Centroid: 18 452000 4968000
Decimal Latitude/Longitude: 44.8657538164034 -75.6075837116129
Minimum Elevation: 100.0 **Maximum Elevation:** 107.0

Description:

Vegetation: The area constitutes the least disturbed core portion of a huge (1990 ha) domed peatland on a larger Sand Plain outwash deposit. The majority of forest cover consists of submature to mature mixed swamp (treed swamp forest) of White Cedar, Black Ash and White Birch, with Red Maple and Balsam Fir being locally significant. Deciduous Thicket Swamp constitutes a substantial portion of the area (especially north of the power transmission corridor), with small area of deciduous swamp forest (Silver Maple - Black Ash) and low shrub fen in the southern and northcentral areas. A large virtually pure Black Ash swamp occurs along the western side of the wetland south of the power transmission corridor. The sand ridges appear to be marine deposits (like the "islands" in the Mer Bleue Bog ?) upon which mature upland forest is present. It appears to be dominated by mature Red Maple and Eastern Hemlock with an abundance of large White Ash and White Pine. Younger upland forest dominated by White Birch is common along the eastern margin of the wetland. [Brunton 1992]

Landform: The area constitutes the least disturbed core portion of a huge (1990 ha) domed peatland on a larger Sand Plain outwash deposit. Large, essentially linear, sand-based ridges occur within it. The peatland is primarily bog with peat averaging >1 m in depth over most of the area to a maximum of over 4 m in the centre. [Brunton 1992] Landform Type(s): Organic Deposit and Sand Plain. [Brunton 1992]

Representation: The vast size of the essentially intact core wetland complex, complete with potentially very significant upland forests on the higher 'islands' and the presence of a number of significant plant species, offers a high level of significance to the site. It appears to contain peatland values, particularly the mixed swamp habitat, unsurpassed by other known sites in Site District 6E-12. [Brunton 1992]

Citation

3761
Bird and Hale Ltd. 1984. Peat and Peatland Evaluation of the Ottawa-Brockville Area. Volumes 1-5, Ontario Geological Survey, OFER 5491. 217 pp.

55164

Brunton, D.F. 1992. Life Science Areas of Natural and Scientific Interest in Site District 6-12. Unpublished Manuscript. 225 pp.

Source: Ontario Ministry of Natural Resources: Natural Heritage Information Centre Website
www.mnr.gov.on.ca/MNR/nhic/nhic.html

MERRICKVILLE BOG ANSI

Natural Heritage Information Centre Report

Area Id: 1423
Alias(es): HANLAN'S MARSH
Size (ha): 2000.0

Area Type: ANSI-LS
Significance Level: Provincial

Site District:
6E-11

Counties:
LEEDS & GRENVILLE

Topographic Maps:
31B/13

UTM Centroid: 18 440000 4972000
Decimal Latitude/Longitude: 44.9008502866853 -75.7599415036583
Minimum Elevation: 110.0
Maximum Elevation: 116.0

Description: This site is a large and diverse wetland with extensive open and treed domed bog communities. These are the most extensive bog areas seen in the site district and are the most important feature of the site. In addition to the bog communities there is a range of most other wetland types present in the candidate including considerable mixed and coniferous swamp. The open bog habitat varies from a rather dry phase dominated by such low shrubs and *Ledum groenlandicum* (Labrador Tea) and *Chamaedaphne calyculata* (Leatherleaf) to a wetter phase that approaches graminoid bog classification dominated by *Eriophorum virginicum* (Virginia Cotton-grass) and *Eriophorum spissum* (Dense Cotton-grass). One area of open bog habitat in the northern part of the deposit is being disturbed by ATV traffic due to the easy access into the site from the east side. Evidently, this traffic is largely due to limited peat harvesting that is done for the Ministry's Kempsville tree nursery (Don Cuddy, pers. com., 1992). Clearly, such harvest should not occur in this ANSI. A smaller area of domed bog occurs in the south portion of the site and is associated with Lissons Lake and hence is lacustrine bog. [White 1992]

Vegetation:

Landform: The present candidate occurs on organic (peat and muck) land form. (Chapman and Putnam 1984). [White 1992]

Representation: Cranberry Lake Swamp offers the other lacustrine bog communities but its palustrine bog is quite limited in quality and extent. The present site is most similar to the regionally significant Blueberry Swamp, however, the latter site is less extensive and diverse. [White 1992]

Citation

37997
Lucluk, L.Y. 1976. Life Science Inventory Checklist: Merrickville Bog. Ontario Ministry of Natural Resources, Division of Parks, Park Planning Branch. 1 p.

4597

White, D.J. 1992. Life Science Areas of Natural and Scientific Interest in Site District 6-11: A Review and Assessment of Significant Natural Areas. Ontario Ministry of Natural Resources, Eastern Region, Kempsville.

Source: Ontario Ministry of Natural Resources: Natural Heritage Information Centre Website
www.mnr.gov.on.ca/MNR/nhic/nhic.html

CRANBERRY LAKE SWAMP ANSI Natural Heritage Information Centre Report

Area Id: 1153
Alias(es):
Size (ha): 2000.0

Area Type: ANSI-LS
Significance Level: Provincial

Site District:
6E-11

Counties:
LEEDS & GRENVILLE

Topographic Maps:
31B/13

UTM Centroid: 18 435000 4961000
Decimal Latitude/Longitude: 44.8013969397448 -75.821854298051
Minimum Elevation: 111.0 **Maximum Elevation:** 120.0

Description:

Vegetation: The most important aspect of this site is the extensive deciduous swamp associated with a shallow lake. A range of moisture conditions, from the very wettest areas adjacent to the lake itself to the better drained sections bordering the outlet stream of the lake, provide for a range of microhabitats. A large colony of the provincially rare shrub *Viburnum recognitum* (Southern Arrowwood) occurs in the deciduous swamp and may be the largest and most vigorous such colony in eastern Ontario (Albert Dugal, pers. com., 1991; and this study). The deciduous swamp gives way near the lake to a thicket swamp of low shrubs, such as *Decodon verticillatus* (Water-willow), *Myrica gale* (Sweet Gale), and *Ilex verticillata* (Winterberry). The candidate also includes other wetland communities such as mixed swamp, and open and treed bog. Palustrine bog communities in the northern portion of the site are quite dry, however, there are lacustrine bog areas adjacent to the lake and they appear from aerial reconnaissance to be very wet. [White 1992]

Landform:

Representation: This lacustrine and palustrine wetland occurs on organic (peat and muck) landform (Chapman and Putnam 1984) and is most similar to portions of the Innisville Wetlands, however, the latter wetland is primarily a riverine type. The Merrickville Bog is the only other site to offer provincially significant representation of lacustrine and palustrine bog communities. The present candidate is the only provincially significant representation of lacustrine deciduous swamp. [White 1992]

Citation

4597
White, D.J. 1992. Life Science Areas of Natural and Scientific Interest in Site District 6-11: A Review and Assessment of Significant Natural Areas. Ontario Ministry of Natural Resources, Eastern Region, Kemptville.

Source: Ontario Ministry of Natural Resources: Natural Heritage Information Centre Website
www.mnr.gov.on.ca/MNR/nhic/nhic.html

APPENDIX H

AOC Management Guidelines Summary Table For Known and Potential Values

VALUE	RESERVE	MODIFIED		ROADS
	Dimension	Dimension	Conditions	
Cool Water Streams	No harvest reserve on all steep slopes. Additional reserve of 15m from bank edge.	35m beyond the reserve edge.	-Retain minimum crown closure of 50% in trees > 6m in height. -management to focus on the maintenance and enhancement of wildlife and biodiversity values (den trees, nest sites, downed woody debris, provision of beaver food, etc.).	-Roads and landings should avoid the AOC wherever possible. Roads and landings may be allowed within the AOC when there are no other feasible options. - Stream crossings allowed only with appropriate permits. - For approved crossings, the cleared Right of Way (ROW) width should not exceed 10m. - No culvert installation between April 1 and June 30 unless risk to fish populations can be prevented or mitigated.
Intermittent Watercourses Moderate to deep (> 1.0m depth). May be intermittent or permanent drains or natural watercourses.	Reserve of 5m from bank edge.	15m from water's edge.	- Retain minimum crown closure of 50% in trees > 6m in height. - Management to focus on the maintenance and enhancement of wildlife and biodiversity values (den trees, nest sites, downed woody debris, provision of beaver food, etc.). - Minimize harvesting equipment traffic in AOC.	-Roads and landings should avoid the AOC wherever possible. Roads and landings may be allowed within the AOC when there are no other feasible options. - Stream crossings allowed only with appropriate permits. - For approved crossings, the cleared Right of Way (ROW) width should not exceed 10m. - No culvert installation between

				April 1 and June 30 unless risk to fish populations can be prevented or mitigated.
Unmapped Intermittent Drainage Ditches Shallow (< 1.0m depth)	No reserve.	No specific AOC.	- Avoid harvesting trees directly adjacent to ditch unless severely declining.	- Limited temporary corduroy crossings permitted to provide access to timber. - Temporary crossings to be rehabilitated after use to ensure free flow of water.
Provincially Significant Wetlands (Treed Swamps)	Modified Management Area (MMA)	120 m from boundary of swamp.	- Silvicultural prescriptions will favour maintenance of partial canopy closure to favour shade tolerant plant communities and maintain water-table levels. - Harvest and skidding restricted to frozen ground conditions. Equipment is not permitted in the wetland or within 15 m of the evaluated wetland boundary except during frozen soil conditions/ Maintenance of downed woody debris is encouraged.	- Roads and landings should avoid the AOC wherever possible. Roads and landings may be allowed within the AOC when there are no other feasible options.
Locally Significant Wetlands (Treed Swamps)	Reserve	30 m from evaluated boundary of swamp	- Silvicultural prescriptions will favour maintenance of partial canopy closure to favour shade tolerant plant communities and maintain water-table levels. - Harvest and skidding restricted to frozen ground conditions. Equipment is not permitted in	- Roads and landings should avoid the AOC wherever possible. Roads and landings may be allowed within the AOC when there are no other feasible options.

			<p>the wetland or within 15 m of the evaluated wetland boundary except during frozen soil conditions/ Maintenance of downed woody debris is encouraged.</p>	
ANSI	Modified Management Area (MMA)	120 m from ANSI Boundary	<p>-Modified harvesting permitted in MMA when values not threatened. -Maintain representation of existing forest conditions and communities and restore under-represented stands types or historic forest communities where feasible. -Maintain old growth elements in all stands where feasible. -Botanical inventory must be conducted to examine the occurrence of rare, threatened and endangered plant communities prior to forest operations. If such communities exist the operations prescription must be approved by UCLG Forest Manager and OMNR.</p>	No new construction of roads is recommended. Operational roads may be permitted if values are protected.
Non-treed wetlands (> 2 Ha).	No reserve.	15m from water's edge.	- Forest management will focus on the maintenance and enhancement of wildlife and biodiversity values (den trees, nest sites, downed woody debris, provision of beaver food,	- Roads and landings should avoid the AOC wherever possible. Roads and landings may be allowed within the AOC when there are no other feasible options.

			etc.). - Minimize harvesting equipment traffic within 15m of wetland except during periods of frozen soil conditions.	
Authorized Recreation Trails	None required.	No specific AOC.	Forest operations will be conducted with public safety in mind by installing warning signs, removing hazard trees (e.g. leaning), and keeping trails free of logging debris.	<p>- Place Warning or Caution signs at strategic points along the trail and within a reasonable distance of planned operations to advise the public of forest operations.</p> <p>- The use of trails for hauling and occasional skidding is allowed as long as the trail is kept free of logging debris and left in a condition consistent with its intended use.</p>
Northern Goshawk	Circular: 50m radius. Inactive or satellite nests receive a reserve of 20m around the nest.	Circular: 100m radius from the reserve edge.	<p>- No operations from March 1 to July 31.</p> <p>- Maintain residual crown closure of 70%.</p>	<p>- Avoid locating roads and landings in the AOC.</p> <p>- For roads approved within the AOC, the cleared Right of Way (ROW) width should not exceed 10m.</p> <p>- Hauling on new or improved roads within the AOC can continue outside the timing restriction, (March 1 – July 31). Requests to haul in early March will be evaluated on a site-by-site basis. No hauling restrictions on existing public roads.</p>

Red Shouldered Hawk / Cooper's Hawk	Circular: 150m radius, or an irregular shaped reserve of 7 ha encompassing suitable habitat. Inactive or satellite nests receive a reserve of 20m around the nest.	Circular: 150m radius from the reserve edge or an irregular shaped modified area of 21 ha encompassing suitable nesting habitat and satellite nests.	<ul style="list-style-type: none"> - No operations from March 1 to July 31. - Maintain residual crown closure of 70%. 	<ul style="list-style-type: none"> - Avoid locating roads and landings in the AOC. - For roads approved within the AOC, the cleared Right of Way (ROW) width should not exceed 10m. - Hauling on new or improved roads within the AOC can continue outside the timing restriction, (March 1 – July 31). Requests to haul in early March will be evaluated on a site-by-site basis. No hauling restrictions on existing public roads.
Other Common Raptor Nests (active only)	None required.	Circular: 150m radius from nest.	<ul style="list-style-type: none"> - No operations from March 1 to July 31. - Maintain residual crown closure of 70% within a tree length radius of the nest. - Retain inactive or satellite nest trees. 	<ul style="list-style-type: none"> - Avoid locating roads and landings in the AOC. - Hauling on new or improved roads within 50m of the active nest can continue outside of the timing restriction, (March 1 – July 31). Requests to haul in early March will be evaluated on a site-by-site basis. No hauling restrictions on existing public roads or on new or improved roads greater than 50m from the active nest.
Heron Colony	Circular: 150m radius from the edge of the colony. Reserve must include a minimum 30m of live	Circular: 150m radius from the reserve edge.	<ul style="list-style-type: none"> - No operations from April 1 to August 15. 	<ul style="list-style-type: none"> - Avoid locating roads and landings in the AOC. - For roads approved within the AOC, the cleared Right of Way (ROW) width should not exceed

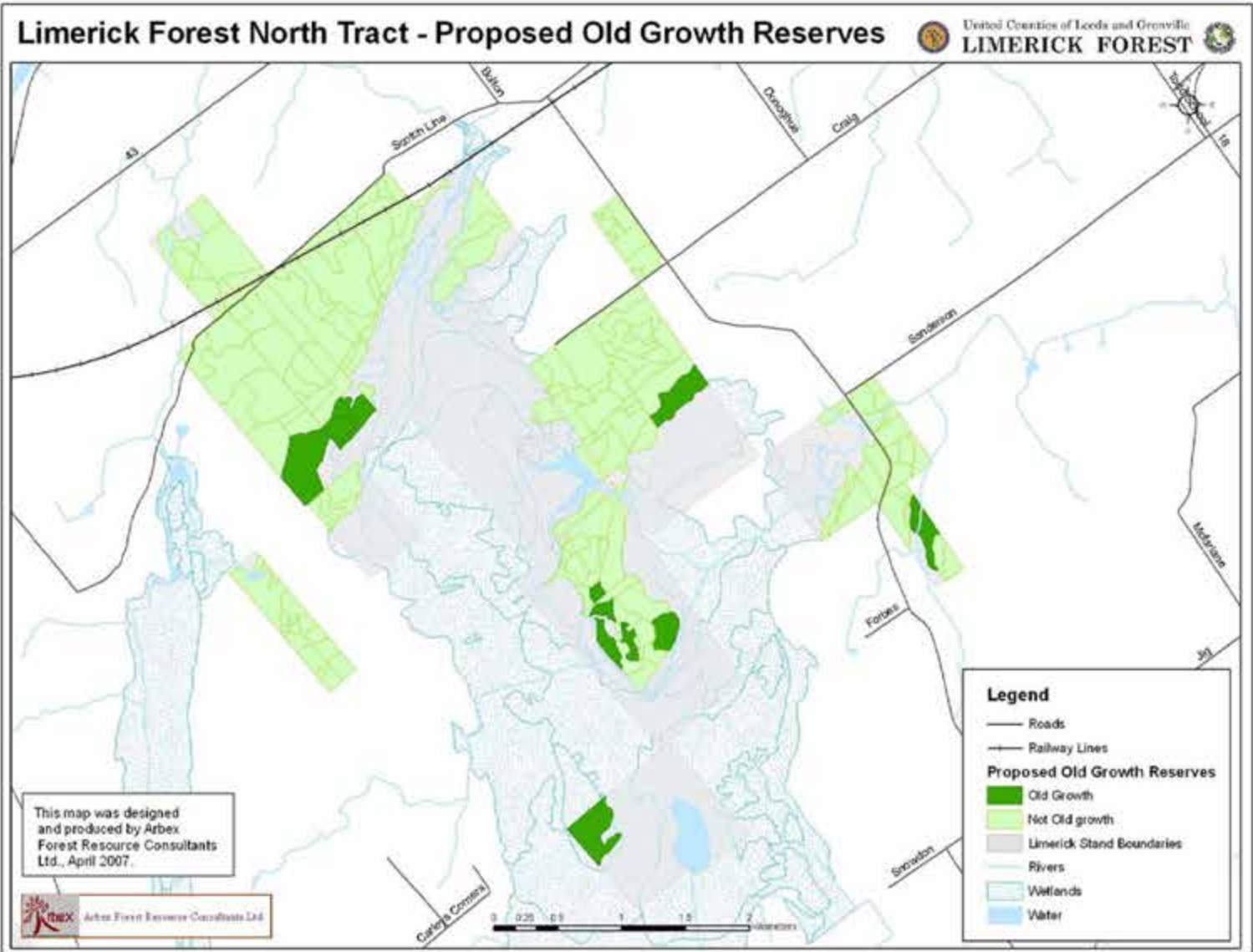
	forest. Inactive colonies receive a reserve of 20m.			10m. - Hauling on new or improved roads within the AOC can continue outside the timing restriction, (April 1 – August 15). Requests to haul in early April will be evaluated on a site-by-site basis. No hauling restrictions on existing public roads.
Osprey Nest	Circular: 150m radius from the edge of the nest. Reserve must include a minimum of 30m of live forest. Inactive nests receive a reserve of 50m.	Circular: 150m radius from the reserve edge.	- No operations from March 1 to July 31. - Retain at least 3 supercanopy trees within the modified area.	- Avoid locating roads and landings in the AOC. - For roads approved within the AOC, the cleared Right of Way (ROW) width should not exceed 10m. - Hauling on new or improved roads within the AOC can continue outside the timing restriction, (March 1 – July 31). Requests to haul in early March will be evaluated on a site-by-site basis. No hauling restrictions on existing public roads.
Deer Wintering Yards	No reserve.	AOC encompasses entire identified deer wintering area.	Conifer Plantations - Shelterwood removal cuts to maintain clumps of 3-5 conifer trees spaced 10-30m and no further than 60m apart, unless conifer regeneration is > 10m in height with 60% canopy closure.	Planning for roads and landings should avoid critical thermal cover, bedding areas and major travel corridors.

			<p>Cedar Stands</p> <ul style="list-style-type: none"> - Regenerate with patch-cut (< 1.0 ha blocks) or strip cut (20 – 40m wide). Final harvest not to occur until regeneration has 60% canopy closure and is at least 5m in height. <p>Hardwood Stands</p> <ul style="list-style-type: none"> - Maintain conifer patches \geq 0.04 ha (20m x 20m) in trees 10m in height with 60% canopy closure. - Conifer patches <0.04 ha are to be maintained as clumps with 3-5 conifer trees spaced 10 - 30m and no more than 60m apart. <p>General Provisions</p> <ul style="list-style-type: none"> - Where choices exist, conifer cover patches should be retained on south facing slopes, next to forest openings, over deer beds, and along trails. - Deer trails and travel corridors are to be kept free of logging debris. 	
American Ginseng	Reserve extends 20m from the outermost edge of the population.	100m from the edge of the reserve. (Colonies of	<ul style="list-style-type: none"> - Maintain residual crown closure of 70%. - Trees will be felled away from the reserve. 	Roads and landings should avoid the AOC wherever possible. Roads and landings may be allowed within the modified AOC

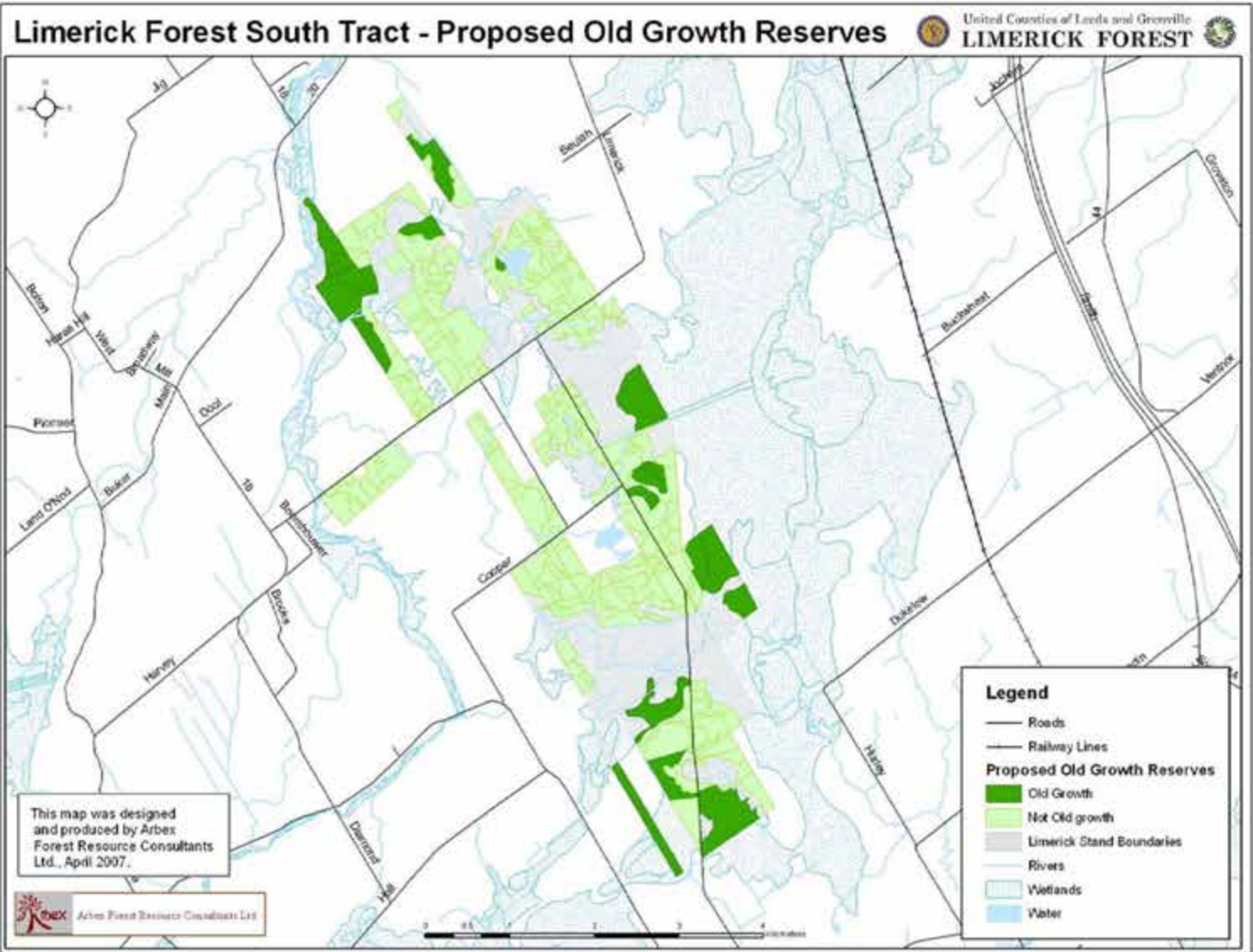
		fewer than 20 plants do not require modified area).	- Minimize harvesting equipment traffic in AOC.	when there are no other feasible options.
--	--	---	---	---

APPENDIX I

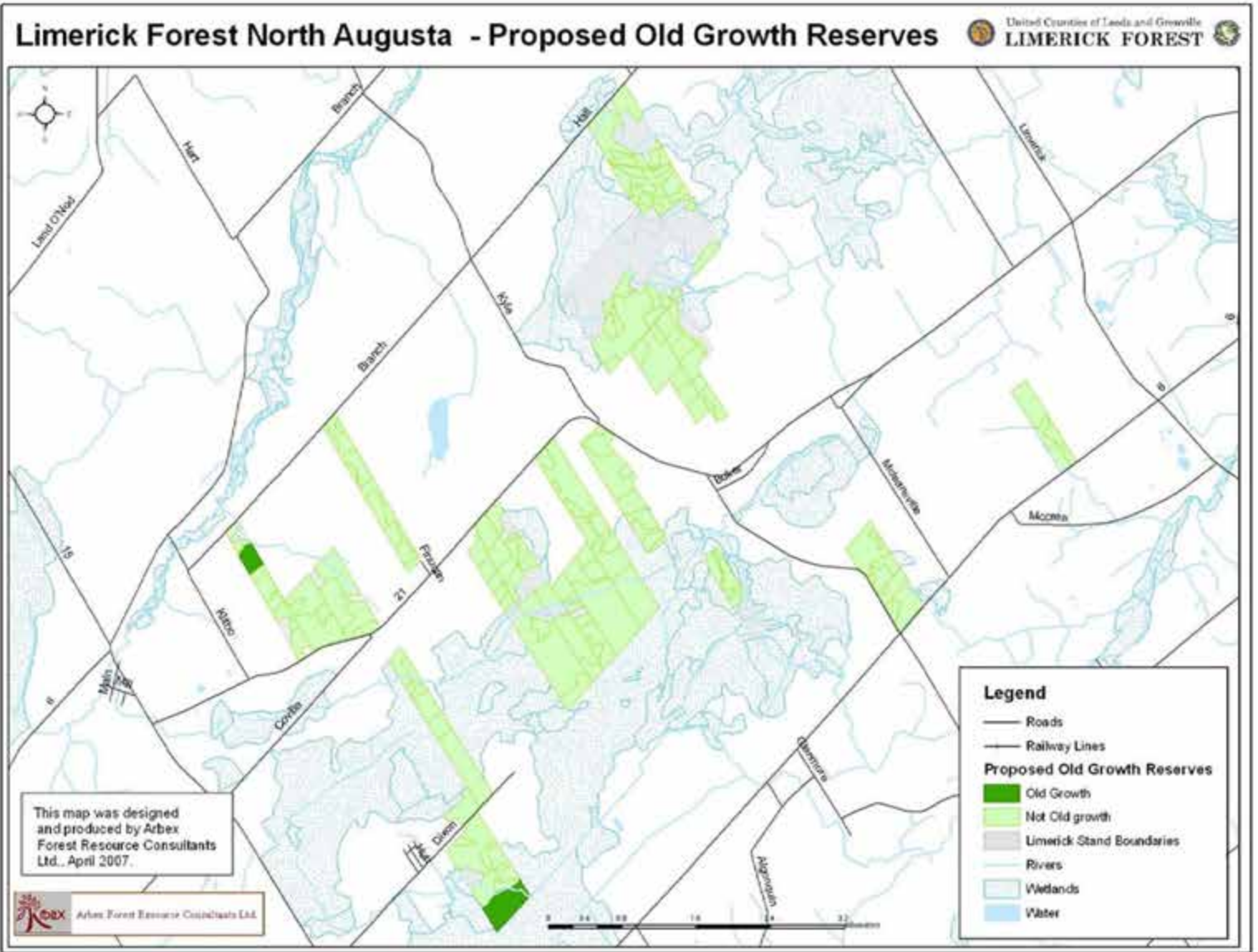
Maps of LFAC Proposed Old Growth Reserves



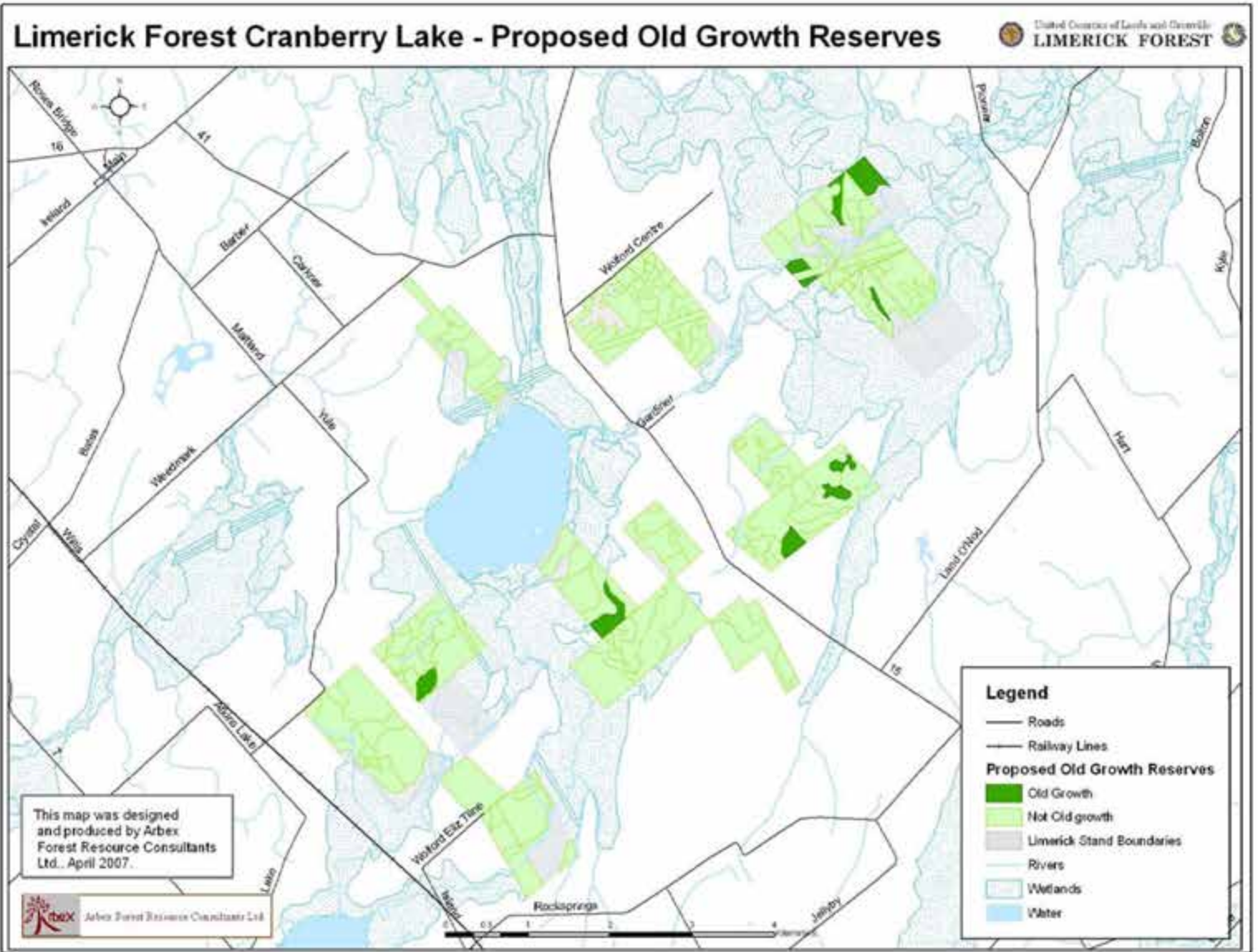
Proposed Old Growth Reserves in Limerick North Tract



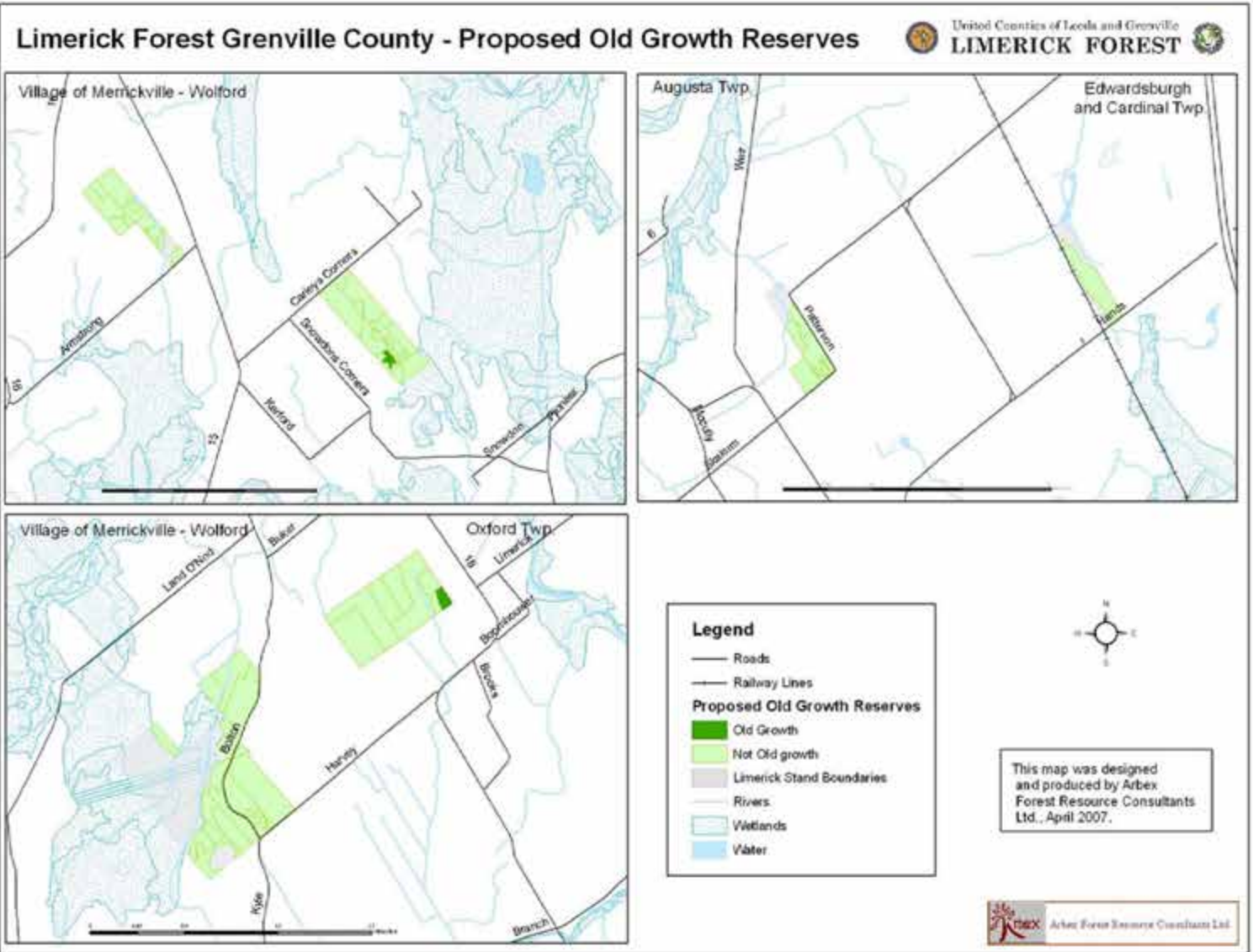
Proposed Old Growth Reserves Stands in Limerick South Tract



Proposed Old Growth Reserves Stands in Limerick North Augusta

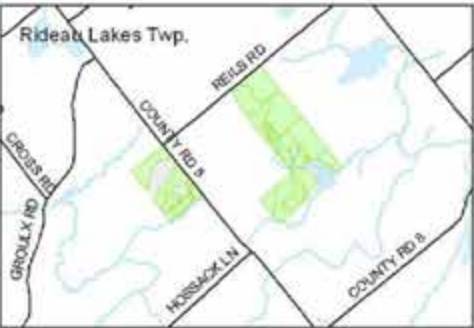
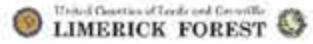


Proposed Old Growth Reserves Stands in Limerick Cranberry Lake



Proposed Old Growth Reserves Stands in Limerick Grenville County

Limerick Forest Leeds County - Proposed Old Growth Reserves



Legend

- Roads
- Railway Lines
- Proposed Old Growth Reserves**
- Old Growth
- Not Old Growth
- Limerick Stand Boundaries
- Rivers
- Wetlands
- Water



This map was designed and produced by Arbex Forest Resource Consultants Ltd., April 2007.



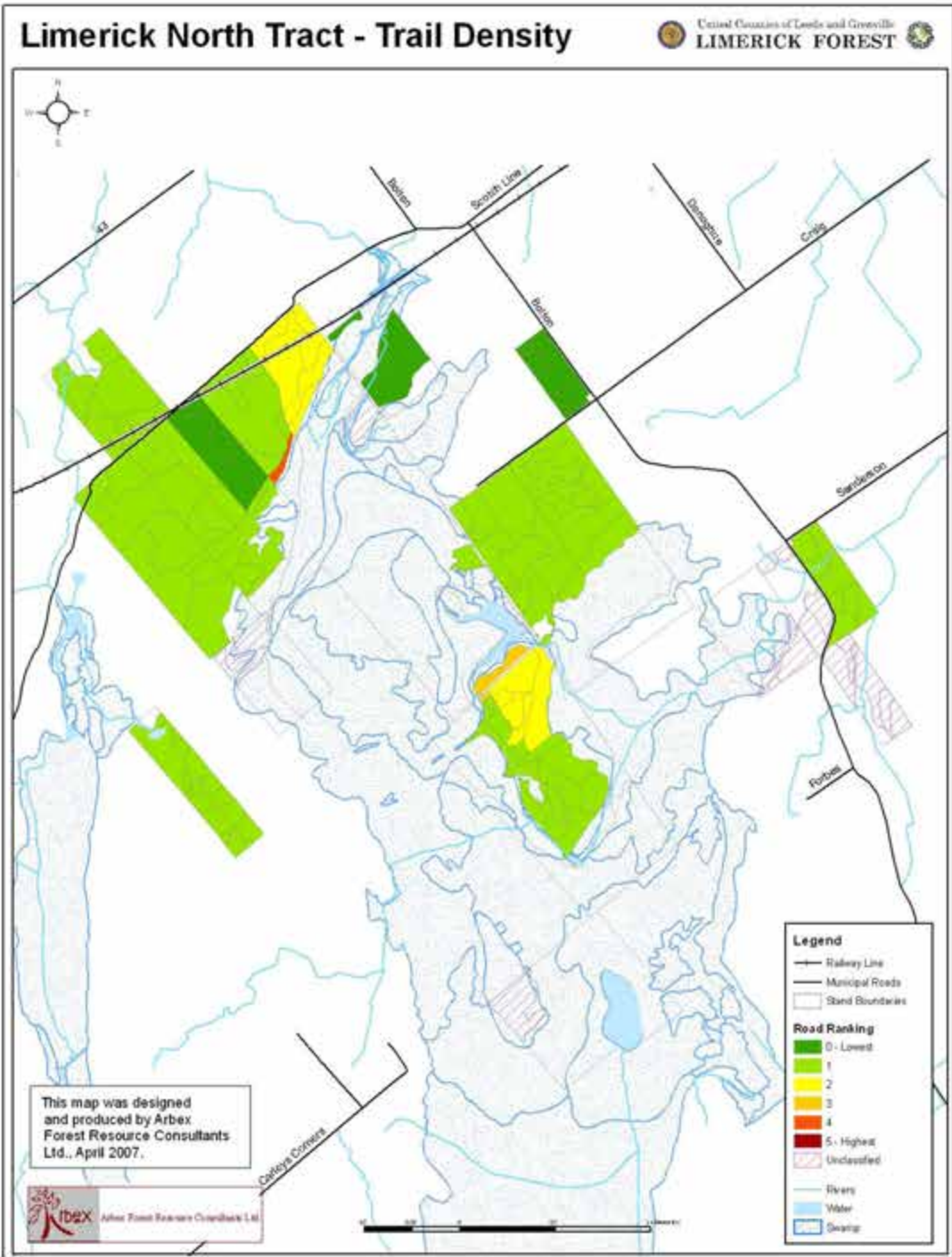
Proposed Old Growth Reserves Stands in Limerick Leeds County

APPENDIX J
Trail Density Model

In order to guide the development of the trail system in Limerick Forest, a GIS based trail density model was developed in collaboration with members of the LAFAC Recreation Sub-Committee. The purpose of the model was to spatially depict the relative density³⁵ of “dry land trails” across Limerick Forest to assist with decisions with respect to the location and distribution of future trails. Factors such as topography, forest cover density, connectivity to existing trail networks, infrastructure (i.e. parking) and other site conditions (i.e. presence of swamps etc.) will all ultimately influence the final decision as to whether or not to locate a trail in a particular forest compartment and decisions with respect to the actual trail location.

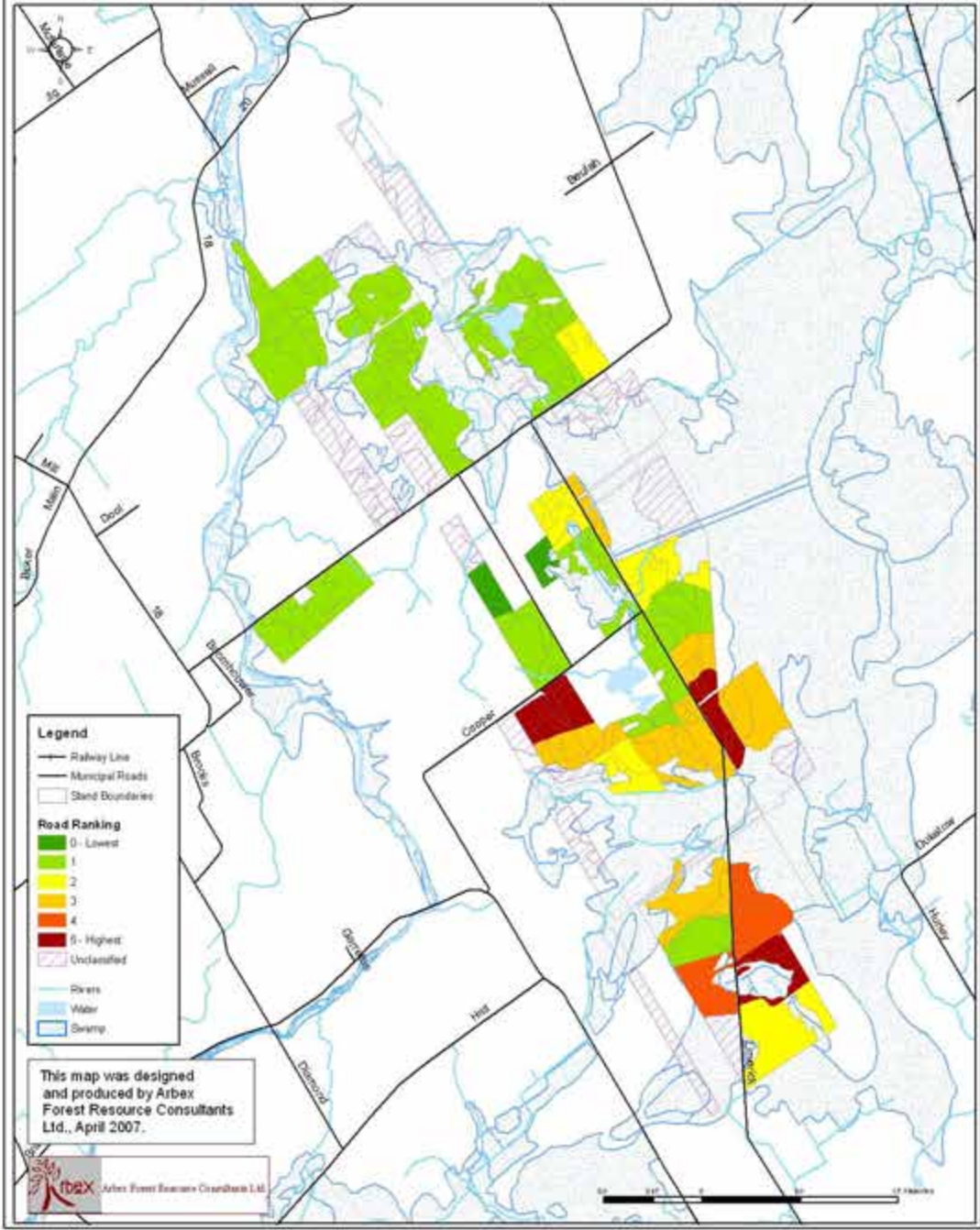
Maps 1-6 depict the calculated relative trail density within Limerick Forest Tracts by compartment. Compartments that are ‘unclassified’ are either categorized as wetlands or did not currently have a digitized trail network.

³⁵ Relative density for the model is a function of area occupied by a buffered trail. Trail buffering strategies varied with the type of trail.

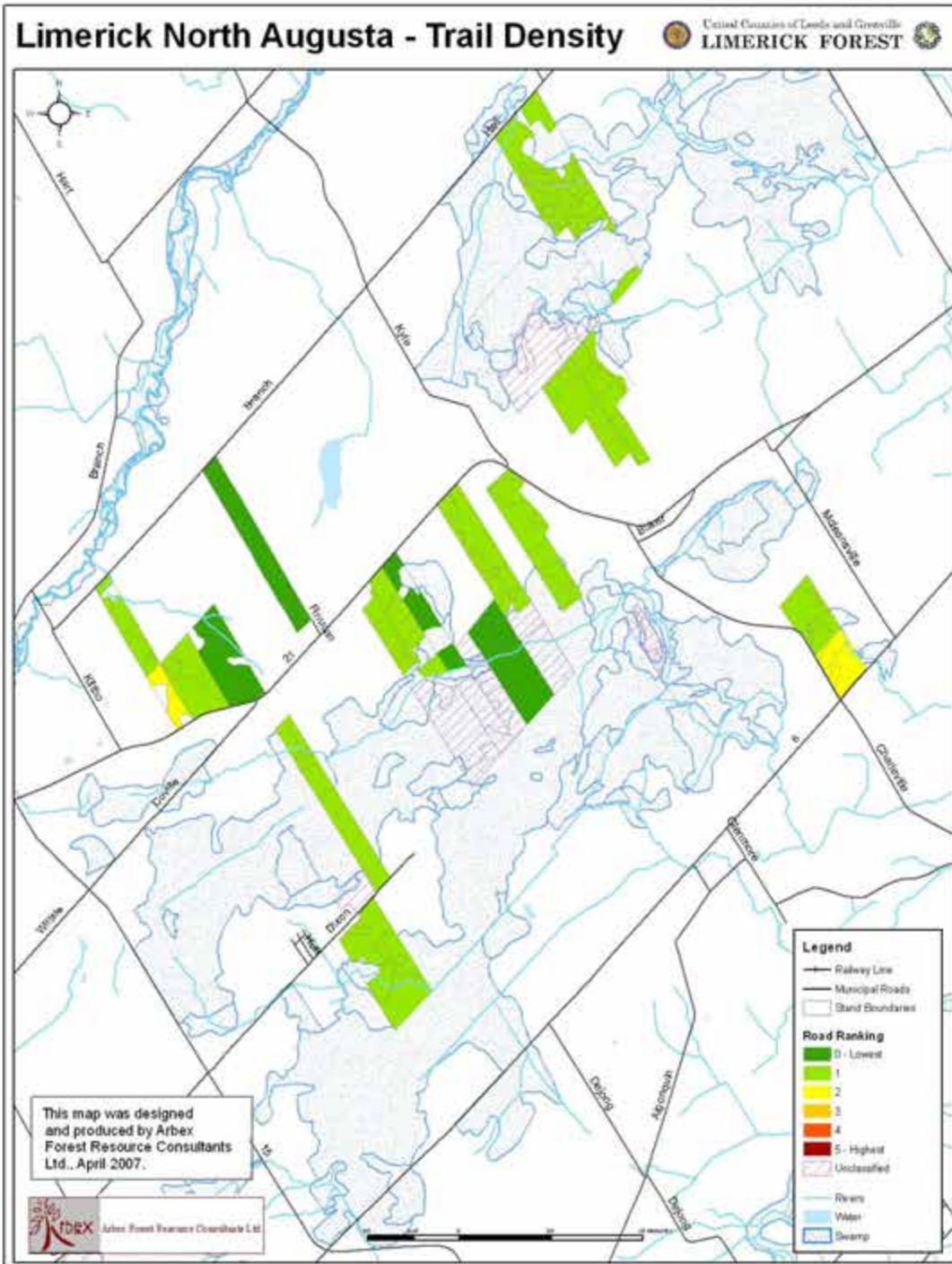


Limerick North Tract - Relative Trail Density

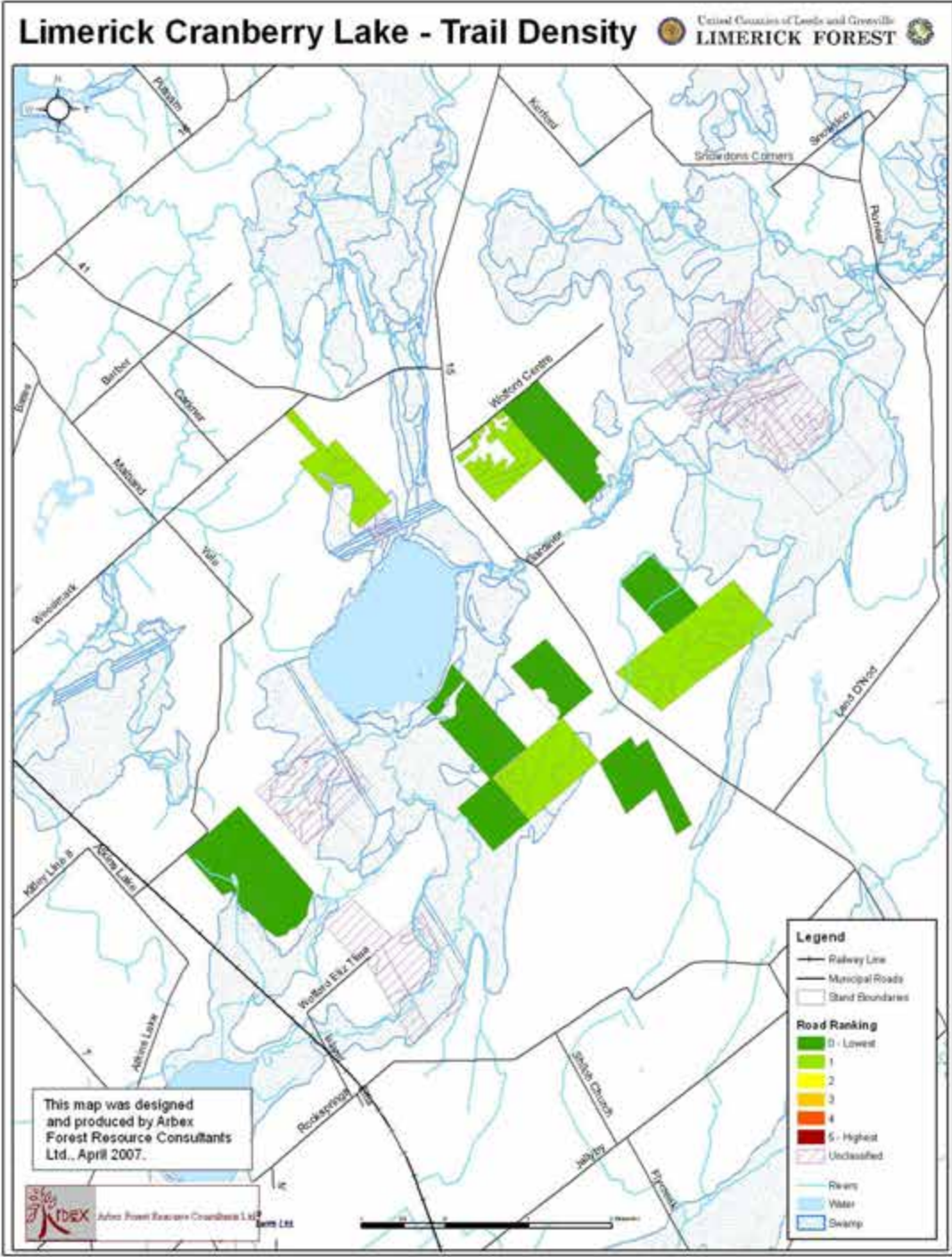
Limerick South Tract - Trail Density



Limerick South Tract - Relative Trail Density

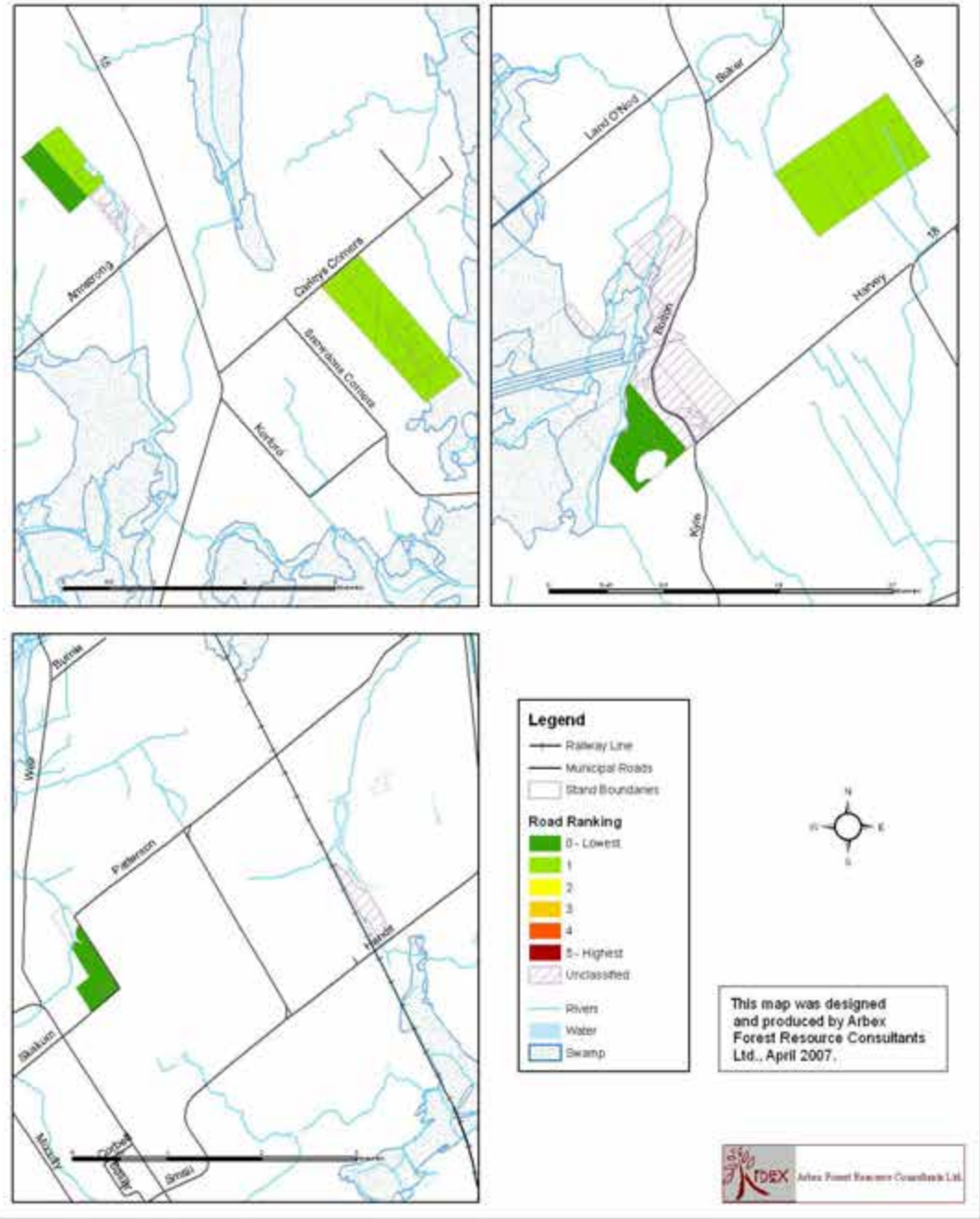


Limerick North Augusta - Relative Trail Density



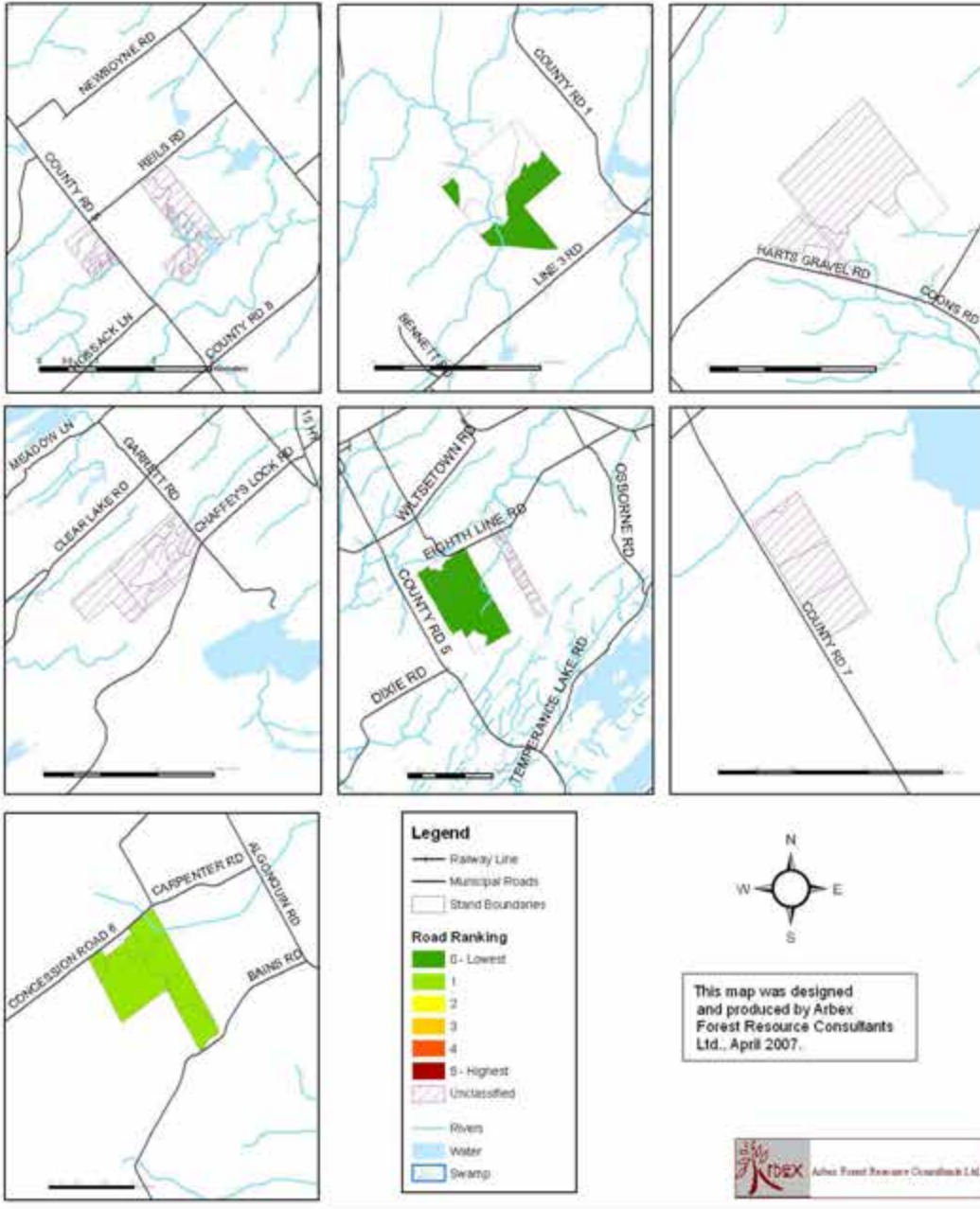
Limerick Cranberry Lake - Relative Trail Density

Limerick Grenville County - Trail Density



Limerick Grenville County - Relative Trail Density

Limerick Leeds County - Trail Density



Limerick Leeds County - Relative Trail Density

APPENDIX K

Long Term Sustainable Yield Calculation

Area Control Method

Area control requires cutting equal areas or areas of equal productivity annually or periodically. This requires cutting the same number of hectares each year in the simplest case of a normal forest with equal productivity on each hectare. The volume of the annual harvest is estimated by multiplying estimated yields by the number of hectares harvested.

Table 1 depicts the mid-point rotation age³⁶ (all sites combined) selected for the development of the AAC calculations. The mid-point rotation age was selected to reduce the number of calculations required.³⁷ In practice, actual rotations will be shorter on better sites (i.e. site class 1) and longer on poorer sites (i.e. site class 3). Exceptions may occur where rotations are extended to provide for the production of larger size products (e.g. sawlogs or veneer) or to meet other management objectives (i.e. development of old growth stand characteristics). Rotations may be shortened to salvage timber damaged by natural disturbance events or in decline.

Table 1. Mid-Point Rotation Age

Working Group	Rotation Age
Jack Pine	50
Red Pine	90
White Pine	90
White Spruce	60
Cedar	60
Other Conifer	90
Hard Maple	110
Soft Maple	70
Poplar	50
Ash	70
Other Hardwood	70

³⁶ The concept of rotation age is applicable for hard maple, yellow birch, and other tolerant hardwoods only under shelterwood or clearcutting systems.

³⁷ Management rotation ages for working groups and site class are provided in Sections 8.4 and 8.5..

A 20 year cutting cycle was adopted for working groups managed under uneven-age or group selection harvesting systems.

The area control calculation was modified to account for site productivity differences within Limerick Forest and a Long Term Sustainable Yield Calculation (LTSY) calculation was developed (Table 2). This calculation provides an estimated total annual allowable cut on the basis of relative productivity, the number of hectares which may be harvested in each site class for equal yields at rotation age³⁸, and the number of years in which cutting can occur in each site class (See Table 3)

Table 2. Area Control Long Term Sustainable Yield (m³) by Working Group

Working Group	LTSY m³/yr	Period AAC (m³)
Jack Pine	684	3,420
Red Pine	2,048	10,240
White Pine	981	4,905
White Spruce	1,350	6,750
Cedar	1,370	6,850
Other Conifer	199	995
Softwood Total:	6,632	33,160
Hard Maple	492	2,460
Soft Maple	368	1,840
Poplar	281	1,405
Ash	184	920
Other Hardwood	4	20
Hardwood Total:	1,329	6,645
Total LTSY:	7,961	39,805

³⁸ Calculations for site productivity have a practical use to lay out cutting areas so that the total productivity of the area cut in a period from different parcels of different site quality is the same (Davies 1987).

Table 3. Long Term Sustainable Yield (LTSY), Hectares to Cut and Years of Cutting by Site Class Modified Area Control Calculation.

Working Group (Base Site Class)	Site Class	LTSY (m³)	Hectares to Cut per Year for Equal Yields at Rotation Age	Years of Cutting in Site Class
Jack Pine (3)	Site Class 1	155	2.9	11
	Site Class 2	132	3.8	10
	Site Class 3	397	5.9	29
Red Pine (1)	Site Class 1	1,749	4.4	77
	Site Class 2	216	5.5	10
	Site Class 3	74	7.2	3
White Pine (1)	Site Class 1	840	2.0	77
	Site Class 2	100	2.7	9
	Site Class 3	41	4.3	4
White Spruce (2)	Site Class 1a	902	4.2	40
	Site Class 1	429	7.0	19
	Site Class 2	18	9.8	1
	Site Class 3			
Cedar (2)	Site Class 1a	397	4.2	17
	Site Class 1	705	7.1	31
	Site Class 2	206	10.0	9
	Site Class 3	68	19.0	3
Other Conifer (1)	Site Class 1a	115	0.5	52
	Site Class 1	74	0.7	33
	Site Class 2	10	0.9	4
	Site Class 3			
Hard Maple (2)	Site Class 1	169	1.6	38
	Site Class 2	182	1.9	41
	Site Class 3	141	2.3	31
Soft Maple (2)	Site Class 1	206	1.8	39
	Site Class 2	147	2.2	28
	Site Class 3	14	2.7	3
Poplar (3)	Site Class 1	61	0.9	11
	Site Class 2	0	0	0
	Site Class 3	221	1.5	39
Ash (2)	Site Class 1	102	1.0	39
	Site Class 2	39	1.0	15

	Site Class 3	42	1.5	16
Other Hardwood (2)	Site Class 1	4	0.2	70

* Numbers have been rounded.

Volumetric AAC Calculation

In volume control, the essential decision involves how much volume to cut each year. The area of the annual cut is the number of hectares of eligible harvest stands required to achieve the calculated volume.

The volumetric method is particularly applicable to uneven-age forests as it combines growing stock and increment to establish volume control through the retention or cutting of a portion of the annual increment. A modification of the Austrian Formula was utilized to determine the AAC as follows:

$$AAC = Ia + \frac{(Ga - Gn)}{A}$$

Where:

- AAC is the volumetric method annual allowable cut.
- Ia is the annual increment for a given age class (20 year period).
- Ga is the actual growing stock.
- Gn is the normal growing stock for a one hectare area.
- A is an adjustment period usually equal to rotation in even-aged forest or to the cutting cycle in uneven-aged forests.

The Gn value is calculated from normal yield tables with the following formula:

$$Gn = \frac{n(Vn + V2n + V3n + \dots + Vr/2)}{R}$$

Where:

- n is the number of years between volume estimates in the normal yield tables.
- Vn, V2n etc. are volumes for year n, 2n, 3n etc.
- R is the rotation age indicated in the yield table (production curve).

Table 4 provides the results of the volumetric control calculation.

Table 4. Estimated Maximum Annual Allowable Cut (m³) by Working Group – Modified Austrian Formula Calculation

Working Group	AAC m³	Period AAC (m³)
Jack Pine	919	4,595
Red Pine	2,129	10,645
White Pine	1,714	8,570
White Spruce	1,628	8,140
Cedar	2,106	10,530
Other Conifer	238	1,190
Softwood Total:	8,734	43,670
Hard Maple	856	4,280
Soft Maple	1,169	5,845
Poplar	274	1,370
Ash	413	2,065
Other Hardwood	13	65
Hardwood Total:	2,725	13,625
Total AAC:	11,459	57,295

APPENDIX L

Glossary

³⁹Glossary of Terms

Allowable Cut. The volume of wood that may be harvested, under management for a given period.

ANSI – areas of natural and scientific interest. Areas of land and water containing natural landscapes or features that have been identified by the Ontario Ministry of Natural Resources as having life science or earth science values related to protection, scientific study or education.

AOC- area of concern. An area adjacent to an identified value that may be affected by some (or all) aspects of forest management activity.

Artificial Regeneration. Renewal of a tree crop by direct seeding or by planting seedlings or cuttings.

Available Harvest Area. The managed forest area which may be harvested during the five-year planning term.

Barren and Scattered. Productive forest land which because of natural or artificial disturbance, contains only scattered trees (stocking below 0.25 percent) or no trees at all with either shrub cover or bare soil, but with no significant amount of regeneration.

Basal Area. Of a tree – the cross-sectional area of the bole of a tree, 1.3 m above ground level (dbh). Commonly expressed as m².
Of a stand of trees – the sum of all individual tree basal areas for a given land area. Commonly expressed as m²/ha.

Biological Diversity. The variety and variability (in time and space) among living organisms and the ecological complexes in which they occur.

Board Foot. A volume measure of lumber, being one foot wide, one foot long and one inch thick.

Breast Height. The standard height, 1.3 m above ground level, at which diameter of a standing tree is measured.

Buffer. A zone or strip of land that shields one area from another. Commonly used along streams and or as visual barriers.

Clearcut. An area on which the entire timber stand has been harvested.

³⁹ Adapted from: A Silvicultural Guide to Managing Southern Ontario Forests (OMNR, 2000).

Codominant Trees. Trees with crowns forming the general level of the crown cover and receiving full sunlight from above, but comparatively little from the sides; usually with medium sized crowns.

Commercial Thinning. Removing trees from a developing young stand, so that remaining trees will have more growing space; dead and dying trees will be salvaged; and the operation will make a profit.

Composition. The representation of tree species in a forest stand, expressed quantitatively as per cent by volume or basal area of each species.

Critical Wildlife Habitat. Part or all of a specific place occupied by a wildlife species or a population of such species and recognized as being essential for the maintenance of the population.

Crop Tree. A tree selected in a young stand to be retained until final harvest.

Crown. The branches and foliage of a tree.

Crown Class. A designation of trees in a forest with crowns of similar development and occupying similar positions in the crown cover. Differentiation into crown classes applies to even-aged stands and within small even-aged groups in which trees in an uneven-aged stand are often arranged. Five crown classes are commonly recognized; dominant, codominant, intermediate, overtopped (suppressed), and wolf trees.

Crown Closure. The time at which the available crown space has become fully occupied.

Crown Cover. The canopy of green leaves and branches formed by the crowns of all trees in a forest. Generally expressed as a percent of total area.

Crown Density. The compactness of the crown cover of the forest; depends on the distance apart and the compactness of the individual crowns. A loose term combining the meanings of “crown closure” and “shade density”.

Cruise. Measurement of standing trees to determine the volume of wood on a given tract of land.

Cubic Meter (m³). A volume measure 1 m X 1 m X 1 m.

Cull. A tree or log of merchantable size rendered unmerchantable because of poor form, large limbs, rot, or other defects.

Cull Tree. A live tree of merchantable size but unmerchantable because of defects or decay.

Cutting Cycle. The planned interval between major harvesting operations in the same stand. A 20 year cutting cycle indicates a harvest is done once every 20 years.

DBH – diameter breast height. The diameter of a tree outside of the bark at roughly breast height. Normally measured at 1.3 m off the ground on the uphill side of the tree.

Diameter Class. One of the intervals into which a range of diameters of trees is divided for purposes of classification and use.

Dominant Trees. Trees with crowns extending above the general level of the crown cover and receiving full sunlight from above and partly from the side; larger than average trees in the stand, crowns are well developed. Possibly somewhat crowded on the sides.

Downed woody Debris. Sound and rotting logs, branches and stumps that provide habitat for plants, animals and insects and a source of nutrients for soil development.

Ecological Land Classification (ELC). A system devised by the Ontario Ministry of Natural Resources to describe over 80 wetland and terrestrial forest vegetation types in southern Ontario. This preliminary community classification system has six different organization levels.

Ecological Reserve. Areas of non-production forest land which have been designated as special management areas due to their ecological significance. Modified forestry operations (e.g. ANSI reserves) and traditional recreational activities may be permitted in some zones. In other areas no forestry activities are allowed (e.g. proposed old growth reserves).

Ecosite. The fifth organizational level that identifies a site based on bedrock type, soil depth, texture, soil moisture regime, hydrology, drainage, nutrient regime, and vegetation structure and species composition.

Ecosystem. A functional unit consisting of all living organisms (plants, animals, 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.

Ecosystem Management. The use of an ecological approach to achieve productive resource management by blending social, physical, economic and biological needs and values to provide healthy ecosystems.

Endangered Species. A species of native fish, wildlife or plants found to be threatened by extinction because its habitat is threatened with destruction, drastic modification, or severe curtailment or because of over-exploitation, disease, predation, or other factors for which its survival requires assistance.

Even-aged. The conditions of a forest or stand composed of trees having no, or relatively small, differences in age, although differences as much as 30 percent are admissible in rotations greater than 100 years of age.

Even-aged Management. The application of a combination of actions that results in the creation of stands in which trees are essentially the same age. Cutting methods producing even-aged stands are clearcut, shelterwood, or seed tree.

Final Cutting. The removal of seed or shelter trees after regeneration has been effected or removal of the entire crop of mature trees under a clearcut silvicultural system.

Forest Management. The application of business methods and technical forest principles to the management of a forest property.

Forest Management Plan. A document containing pertinent information and prescriptions by means which forest policy, aims, and objectives are translated into a continuity of specific treatments on a management unit for a specified period of years.

Forest Resource Inventory (FRI). A resource inventory conducted on each management unit on an average of 20 years. The FRI divides the area into a number of components, such as water, non-forested, non-productive forest and productive forest. The FRI provides descriptive information about the timber resource (i.e. stand age, height, species composition, and stocking level) in the form of aerial photographs, forest stand maps, and standard inventory ledgers.

Forest Type. A descriptive term used to group stands of similar character in composition and development, to differentiate them from other groups of stands.

Forestry. The science, art and practice of managing and using for human benefit the natural resources that occur on and in association with forest lands.

Form. The shape of a log or tree.

Free-to-grow. A condition in which a forest is considered established based on a minimum stocking standard, a minimum height and freedom from competition that could impede growth.

GMV- gross merchantable volume. Volume of main stem of tree(s), not including the stump and top (includes volume associated with stain or decay).

GTV – gross total volume. Volume of the main stem of the tree including stump and top. Volume of the stand including all trees.

Group Selection. Modification of the selection system in which trees are removed in small groups rather than as individuals.

Growing Stock. The sum, by number and volume, of all trees in a forest or a specified part of it.

Growth Rate. With reference to wood, the rate at which wood has been added to the tree at any particular point, usually expressed in the number of annual rings per centimeter. May also be stated as “annual leader growth”.

Harvest. Extraction of some type of product from the forest. Generally associated with cutting.

Hectare. An area measure of 10,000 square meters. Basic unit of land area.

Immature. Trees or stands that have grown past the regeneration stage, but are not yet mature.

Improvement Cutting. The elimination or suppression of less valuable trees in favour of more valuable trees, typically in a mixed, uneven-aged forest.

Intermediate Trees. Trees shorter than those in the dominant or codominant classes, but with crowns either below or extending into the crown cover formed by dominant or codominant trees; receiving a little direct light from above, but none from the sides; usually with small crowns, considerably crowded on the sides.

Intolerance. Trees unable to survive or grow satisfactorily under specific conditions, mostly used with respect to their sensitivity to shade but also to conditions such as wind, drought, salt and flooding.

Invasive Exotic Species. An invasive exotic species is a non-native plant or animal that threatens the survival of a native species.

Leave Tree. Tree left in or just outside a harvest zone to re-seed the area.

Live Crown Ratio. The length of the crown as a ratio of the total height of the tree, usually expressed as a percent.

Mast Trees. Trees supporting mast (fruit or nuts) production,

Maturity. For a given species or stand, the approximate age or condition beyond which the growth rate declines or decay begins to assume economic importance.

MAI – mean annual increment. The average annual increase in volume of individual trees or stands up to a specified point in time. The MAI changes with different growth phases in a tree's life, being highest in the middle years and the slowly decreasing with age. The point at which the MAI peaks is commonly used to identify the biological maturity of the stand and its readiness for harvesting.

Mechanical Site Preparation. Any activity that involves the use of mechanical machinery to prepare a site for reforestation.

Merchantable Timber. A tree or stand of trees that may be converted into salable products.

Merchantable Volume. The amount of wood in a single tree or forest stand that is considered salable.

Natural Regeneration. The renewal of a forest stand by natural seeding, sprouting, suckering or layering.

Natural Thinning. Death of trees in a stand as a result of competition.

NMV – net merchantable volume. The result of removing volume associated with stain or decay from the gross merchantable volume for individual trees or stands.

Non-forested land. Non-forested land is land that is withdrawn from timber production for at least one rotation. This includes; Developed Agricultural land, Grass and Meadow, Unclassified Land etc.

Non-productive forest land. Land within a forested area which is currently incapable of commercial timber production owing to its very low productivity or because of its vegetation cover.

Normal Yield Table. A yield table prepared for normally stocked stands.

Nurse Tree. A tree or crop of trees, shrubs or other plants that foster another generally more important tree or crop.

Old Growth. A stand of mature or overmature trees relatively uninfluenced by human activity.

Old Growth Forests. (1) Old growth forests are well past the age of maximum growth, frequently showing the great horizontal and vertical density of structure and plant species composition, and possessing one or more features not seen in younger forests such as snags, down woody material or arboreal lichens. (2) Ecosystems characterized by the presence of old trees with their associated plants, animals and ecological processes. They show little or no evidence of human disturbance (Ontario, Old Growth Policy Advisory Committee, 1994.).

Overstocked. A condition of a stand or forest indicating more trees than desired, normal or full stocking would require.

Overstory. The portion of the trees in a stand forming the upper crown cover.

Overtopped Tree. Trees with crowns entirely below the general level of overstory cover, receiving no direct light either from above or from the sides. Also known as suppressed.

Partial Cutting. Refers generically to stand entries, under any of the several silvicultural systems, to cut selected trees and leave desirable trees for various stand objectives. Partial cutting includes harvest methods used for seed tree, shelterwood, selection and clearcutting with reserves systems.

Patch Cutting. A silvicultural system that creates openings less than 1 ha in size and is designed to manage each opening as a distinct even-aged opening.

Point Sampling. A method of selecting trees for measurements and of estimating stand basal area at a sample location or point sample. Also called plotless cruising.

Polewood. Trees with DBH between 10 and 25 cm,

Precommercial Thinning. Removal of some of the trees in a young stand to reduce competition for water, nutrients and light and to accelerate commercial growth on remaining trees. Trees thinned from these stands have no commercial value.

Prescription. A course of management action prescribed for a particular area after specific evaluations have been made.

Production Forest. (PF). (1) Any forest area that will retain an adequate growth of timber on a sustained yield basis. It may not have timber currently on it depending on its stage of development (i.e. recently depleted). This could also include areas that pose an operational challenge in terms of harvest due to access, silviculture or renewal. (2) Productive forest land with no obvious limitations on the ability to practice forest management.

Productive Forest Land. All forest areas which are capable of growing commercial trees, irrespective of planning decisions, and which is further divided into “protection forest” and “production forest”.

Protection Forest. (1) A protection forest classification occurs when a stands height is below average growth for its age. These are site class 4 designated stands under “Plonski’s Normal Yield Tables”. The designation can occur because of low site productivity, its stand history, or as a result of an “off-site” species. Crown closure must be equal to or greater than 26%. These areas have been designated as a reserve for the protection of the site or ecosystem and are excluded from forest operations. (2) Productive forest land on which forest management activities cannot normally be practiced without incurring deleterious environmental effects because of obvious physical limitations such as steep slopes and shallow soil over bedrock.

Pruning. The removal of live or dead branches from standing trees, usually the lower branches of young trees and the removal of multiple leaders in plantation trees, for the improvement of the tree or its timber.

Release. Freeing a tree or group of trees from competition by cutting or otherwise eliminating growth that is overtopping or closely surrounding them.

Removal Cut. One or more cuts in a shelterwood system that releases established seedlings.

Residual Basal Area. The basal area per hectare of acceptable trees left standing after harvest.

Residual stand. Trees often of sawlog size left in a stand after thinning to grow until the next harvest. Also called leave trees.

Residual Trees. Trees left standing after harvest.

Riparian Zone. That area adjacent to rivers and streams identified by vegetation, wildlife or other qualities unique to these locations.

Rotation. The period of years required to establish and grow a timber crop to a specified condition of maturity, when it may be harvested and a new crop started.

Rotation Age. The age at which a stand is considered ready for harvesting under an adopted plan of management.

Sanitation Cut. The removal of dead, damaged, or susceptible trees done primarily to prevent the spread of pests or pathogens.

Sawtimber. Trees that yield logs suitable in size and quality for the production of lumber.

Selection Silvicultural System. A periodic partial cutting, controlled by basal area, using vigour and risk characteristics to determine individual tree selection. An uneven-aged management system.

Shelterwood. The cutting method that describes the silvicultural system in which, in order to provide a source of seed and/or protection for regeneration, the old crop (the shelterwood) is removed in two or more successive shelterwood cuttings. The first cutting is ordinarily the seed cutting, though it may be preceded by a preparatory cutting and the last is the final cutting. Any intervening cutting is termed removal cutting. An even-age stand results.

Silvicultural System. A process whereby forests are tended, harvested and replaced, resulting in a forest of distinctive form. Systems are classified according to the method of carrying out the fellings that remove the mature crop with a view to regeneration and according to the type of forest thereby produced.

Silviculture. The art and science of producing and tending a forest; the theory and practice of controlling forest establishment, composition, growth and quality of forests to achieve the objectives of management.

Silvicultural Prescription. A site specific operational plan that describes the forest management objectives for an area. It prescribes the methods for harvesting the existing forest stand and a series of silvicultural treatments that will be carried out to establish a free growing stand in a manner that accommodates other resource values as identified.

Site. An area of land, especially with reference to its capacity to produce vegetation as a function of environmental factors (climate, soil, biology etc.)

Site Class. A grouping of similar site indexes that indicates relative productivity. The common system in Ontario is Site Class X, 1,2,3,4 (PFR).

Site Index. A numerical expression of forest site quality for even-age stands based on the height in meters, at a specified reference age (usually 50 years) of dominant and codominant trees in a stand.

Site Preparation. Any treatment of a forest site to prepare it for establishment of a plantation or natural regeneration.

Snag. A standing dead tree or a standing section of the stem of a tree broken off at the height of six meters or more. If less than 6 m, it is properly termed a stub.

Soil Moisture. The relative amount of water in the soil.

Soil Series. Grouping of soils with similar profile characteristics.

Strategy. The means or steps to achieving an objective.

Spacing. The distance between trees in a plantation, a thinned stand or a natural stand. The removal of undesirable trees within a young stand to control stocking, to maintain or improve growth, to increase wood quality and value, or to achieve other resource management objectives.

Species Composition. The percentage of each recognized tree species comprising the forest type based upon the gross volume, the relative number of stems per hectare or basal area.

Stand Density. The number of trees usually expressed on a per hectare basis.

Stand Structure. The distribution and representation of age and/or size classes and of crown and other tree classes within a stand.

Stocking. A qualitative expression of the adequacy of tree cover on an area, in relation to a pre-established norm, expressed in terms of crown closure, number of trees, basal area or volume.

Stumpage. The value of timber as it stands uncut in the woods; can also denote the price paid for timber.

Sustainable Forest Management. Management regimes applied to forest land which maintain the productive and renewal capacities as well as the genetic, species and ecological diversity of forest ecosystems.

Sustained Yield. A policy, method, or plan of forest management that calls for continuous production, to achieve, at the earliest practicable time, an approximate balance between net growth and amount harvested.

Swamp. A mineral-rich wetland characterized by a cover of deciduous or coniferous trees

Tending. Generally, any operation carried out for the benefit of a forest crop at any stage of its life.

Thinning. Cutting in an immature stand to increase the growth rate of the leave trees. The goal is to foster quality growth, improve composition, promote sanitation and recover and use material that would otherwise be lost to mortality.

Thinning does not generally increase per-hectare volume growth, but it can increase lumber yield.

Unclassified Land. Unclassified land areas are all areas not clearly defined by other land classifications. This includes roads, railways, pipelines, gravel pits, transmission line corridors etc.

Volume Table. A table showing gross volume of trees, based on given tree measurements.

Wetland. Land that is seasonally or permanently covered by shallow water or land where the water table is close to or at the surface.

Windfirm. Descriptive of trees and plantations that, because of species, soil, or relative exposure are unlikely to suffer windthrow.

Windthrow. Uprooting or breakage of trees caused by strong winds.

Yield. Growth or increment accumulated by trees at specified ages expressed by volume or weight to defined merchantability standards.

Yield Curve. A graphical or mathematical representation of the yield of a given species, on a given site, at a given time.

Yield Table. A summary table for stands of one or more species on different site qualities, showing characteristics at different ages. The stand characteristics usually include average diameter and height and total basal area, number of trees and volume per hectare.