

The United Counties of Prescott and Russell
County Forest Lands
Forest Management Plan
2009-2028



Section A: Forest Policy Plan

Authored By:



Steven Hunter R.P.F., Forestry Specialist
South Nation Conservation

Approved By:



United Counties of Prescott and Russell.

Approval Date:

October 8th, 2008

THE UNITED COUNTIES OF PRESCOTT AND RUSSELL
COUNTY FOREST LANDS:
FOREST MANAGEMENT PLAN

Documents

SECTION A: FOREST POLICY PLAN

SECTION B: TWENTY YEAR MANAGEMENT PLAN (2009 to 2028)

SECTION C: FIVE YEAR OPERATING PLAN (2005 to 2010)

Commonly Used Terms and Acronyms

United Counties of Prescott and Russell	“UCPR” or “County”
UCPR County Forest	“County Forest” or “Forest”
Eastern Ontario Model Forest	EOMF
Forest Resource Inventory	FRI
Geographic Information System	GIS
Ontario Ministry of Natural Resources	OMNR
Registered Professional Forester	R.P.F.
South Nation Conservation	SNC

THE UNITED COUNTIES OF PRESCOTT AND RUSSELL
COUNTY FOREST LANDS:
FOREST MANAGEMENT PLAN

County Forest Lands Advisory Committee

Achilles Drouin	Boisés Est (President of the County Forest Lands Advisory Committee)
Louis Prévost	Director of Planning and Forestry, UCPR
Dennis Pommainville	UCPR Elected Official
Nicolas Gauthier	Senior Forest Technician, UCPR
Manon Besner	Forest Technician, UCPR
Steven Hunter	Forestry Specialist, SNC
Josée Brizard	Director of Conservation Programs, SNC
Chris Craig	First Nations Representative
Brian Barkley	General Manager, EOMF
Linda Touzin	District Forester, OMNR
Christine Hanrahan	Ontario Field Naturalists Club
Pierre Boileau	Member at Large
Pierre Soucy	Boisés Est
Raymond Bouvier	Member at Large
Rob Argue	Stewardship Coordinator, OMNR

UCPR County GIS Department

Sonia Roy	GIS Coordinator, UCPR
-----------	-----------------------

THE UNITED COUNTIES OF PRESCOTT AND RUSSELL
COUNTY FOREST LANDS:
FOREST MANAGEMENT PLAN

TABLE OF CONTENTS

<u>SECTION A:</u>	FOREST POLICY PLAN	PAGE
	A-1.0 Introduction	5
	A-1.1 Plan Administration	6
	A-2.0 Preparation of the Forest Management Plan	6
	A-3.0 Mission and Objectives	9
	A-3.1 UCPR County Forest Mission Statement	9
	A-3.2 Objectives	9
	A-4.0 Implementation Targets and Strategies	12

THE UNITED COUNTIES OF PRESCOTT AND RUSSELL
COUNTY FOREST LANDS:
FOREST MANAGEMENT PLAN

SECTION A) FOREST POLICY PLAN

A-1.0 INTRODUCTION

The United Counties of Prescott and Russell (UCPR) owns a large amount of property that includes forest, wetlands, developed land and roads in the United Counties. To ensure a consistent and balanced approach to forest management the overall objectives and direction for the forested properties owned by UCPR is described in a long – term (20 year) forest management plan. This encompasses 10,761.4 hectares (26,580.7 acres) of forested properties owned by UCPR. It includes, but is not limited to, what is identified as Larose Forest in the UCPR Official Plan. This forest management plan will guide forestry activities for the twenty year period, from January 1, 2009 to December 31, 2028.

The Forest Management Plan consists of three sections:

A) Forest Policy Plan

This section introduces the plan, and describes the mission, objectives, and strategies for the UCPR County Forest. This document has been adopted by County Council as the basic policy plan for the UCPR County Forest. The objectives are the general goals for the Forest and the strategies are the policies, or means of achieving these objectives. An overall implementation target is also identified for each section.

B) Twenty Year Management Plan (2009 to 2028)

This section describes the resources and management of the Forest and is a technical reference document for the management of the UCPR County Forest.

C) Five Year Operating Plans

The five year operating plans outline detailed schedule of forestry operations for each five year period. It is expected that four operating plans will be prepared over the next twenty years. Section C is the 5 Year Operating Plan that was in place prior to the development of this 20 Year Management Plan. It covers the period of January 1, 2005 to December 31, 2010.

A-1.1 Plan Administration

This Plan shall normally be reviewed every five years to ensure currency and relevancy. Adjustments to the long-term strategic direction described in the 20 Year Management Plan may be adjusted based on updated legislation or new science. Any amendment to the 20 Year Management Plan will be endorsed by the County Forest Lands Advisory Committee and approved by County Council.

A-2.0 PREPARATION OF THE FOREST MANAGEMENT PLAN

Long-term strategic direction for the UCPR County Forest is approved by County Council based on advice provided by the County Forest Lands Advisory Committee. The mission, objectives and strategies for the Forest are documented in the Forest Policy Plan. The Forest is managed in accordance with this long-term direction to accommodate a wide variety of values and uses.

To ensure that the management plan was prepared in a timely manner and consistent with the Council’s direction, the “County Forest Lands Advisory Committee” was created to guide the preparation of the management plan.

The **County Forest Lands Advisory Committee** consisted of:

Achilles Drouin	Boisés Est (President of the County Forest Lands Advisory Committee)
Louis Prévost	Director of Planning and Forestry, UCPR
Dennis Pommainville	UCPR Elected Official
Nicolas Gauthier	Senior Forest Technician, UCPR
Manon Besner	Forest Technician, UCPR
Steven Hunter	Forestry Specialist, SNC
Josée Brizard	Director of Conservation Programs, SNC
Chris Craig	First Nations Representative
Brian Barkley	General Manager, EOMF
Linda Touzin	District Forester, OMNR
Christine Hanrahan	Ontario Field Naturalists Club
Pierre Boileau	Member at Large
Pierre Soucy	Boisés Est
Raymond Bouvier	Member at Large
Rob Argue	Stewardship Coordinator, OMNR

Public input is critical in shaping the development of a management plan, especially when formulating the long-term strategic direction for forest management. Public input was collected through public open houses held at various stages of plan development in

2007 and 2008. The County Forest Lands Advisory Committee reviewed the public input and made alterations where appropriate.

Table 1 summarizes some key dates in the management planning process for plan input, review and approval.

Table 1: Management Plan Schedule

EVENTS	Date
1 st Open House	Casselman, January 27 th , 2007
Update the Public on the Status of the Management Plan	Limoges, September 27 th , 2007
Approval of Objectives by the County Lands Advisory Committee	March 7 th , 2008
County Lands Advisory Committee endorsement of the First Draft of the Management Plan	May 23, 2008
2 nd Open House	Limoges, May 28 th , 2008
Forestry Committee County Lands Advisory Committee Approval of the Final Draft of the Management Plan	September 29, 2008
Management Plan Approval by County Council	October 8, 2008
Plan Implementation.	January 1, 2009

UCPR County Forest Mission Statement:

1. To manage the UCPR County Forest to provide diverse environmental, economic and social benefits;
2. To ensure the County Forest is managed in a sustainable manner consistent with the Forest Management guidelines set out by the Ontario Ministry of Natural Resources;
3. To ensure that the needs of the community are considered in the management of the County Forest;
4. To ensure the long-term viability of the County Forest by managing in an ecologically sustainable manner; and
5. To manage and operate the County Forest in a cost-effective manner such that the Forest Reserve Fund supports and provides opportunities for investment in the Forest, and that future revenues derived from the forest be directed back to the Forest Reserve Fund.

Objectives:

WOOD PRODUCTS

1. To provide for a regular and sustainable harvest of forest products through the use of economically, socially and environmentally sound management practices.
2. To ensure that the management practices of the County Forest are consistent with emerging environmental policies and programs.

RECREATION AND EDUCATION

1. To promote the responsible and respectful use of the County Forest.
2. To ensure that recreational uses of the County Forest are mutually compatible and do not compromise the sustainability of forest management.
3. To promote and participate in scientific initiatives on County Forest properties, which enhance knowledge and management of the forests and natural heritage features.

ECOSYSTEM PROTECTION

1. To ensure the presence of a wide diversity of native plant and wildlife habitats.
2. To be an important part of the contiguous forest cover that is necessary for ecosystem protection.
3. To identify, protect and preserve unique, rare, threatened, and endangered species of flora and fauna as well as old growth forests.
4. To ensure that the management practices and uses permitted in the County Forest are consistent with the most current version of the UCPR Official Plan.

RESPONSIBLE LANDOWNER AND GOOD NEIGHBOUR

1. To mitigate the risk to public safety and to prevent potential accidents related to forestry activities on the County Forest.

2. To minimize the risk of forest fire and other natural hazards.
3. To ensure that the use and management of the County Forest is compatible with the uses on adjacent lands and to take measures to reduce land use conflicts.
4. To cooperate and coordinate efforts with other public agencies and community organizations so that the County Forest can serve multiple public objectives.

FINANCIAL BENEFITS

1. To provide for cost-effective management of the County Forest.

A-4.0 IMPLEMENTATION TARGETS AND STRATEGIES

WOOD PRODUCTS TARGET

Harvest, using sustainable forest management practices, 157.8 hectares (389.7 acres) of conifer forest and 9.9 hectares (24.4 acres) of hardwood forest annually during the term of the first Five Year Operating Plan, 2005 to 2010. Subsequent Five Year Operating Plans will be developed and management strategies may be adjusted based on an analysis of the forest management activities undertaken in previous Five Year Operating Plans and/or new science.

WOOD PRODUCTS STRATEGIES

1. The County will maintain a Geographic Information System - based Forest Resource Inventory that will be the basis for setting the available harvest area (AHA) and the development of Five Year Operating Plans.

2. The sustainable available harvest area for the forest will be calculated for Five Year Operating Plans to ensure that rate of timber harvest is less than or equal to growth of the forest.
3. Harvest blocks will be identified within the Five Year Operating Plan to match the sustainable allowable harvest area based on an up to date forest resource inventory.
4. Annual plans will schedule harvest operations to maintain a reasonably balanced level of timber harvesting throughout each Five Year Operating Plan period.
5. Address the gap in the younger age classes by employing silvicultural treatments that will encourage the establishment of regeneration of desirable species.
6. For each harvest area, a site specific Harvest Plan will be prepared outlining the forest operations prescription, access requirements, boundary lines, and prescriptions for protecting natural and cultural heritage values.
7. Forest operations prescriptions shall be consistent with the forest management guidelines set out by the Ontario Ministry of Natural Resources tailored to knowledge of the local forest conditions.
8. Forest management documents (e.g. harvest plans, Five Year Operational Plans, etc.) shall be prepared using sound professional judgment and will be certified by a Registered Professional Forester.
8. Silvicultural treatments will be designed to increase the future value of the forest by retaining optimum levels of healthy growing stock, increasing the average tree size, and encouraging the regeneration of tree species that are native to the region and appropriate for the site.

9. Trees will be marked for harvest by certified Ontario Tree Markers, or under the direct supervision of a certified Ontario Tree Marker, and will be performed in accordance with the forest operations prescription developed for the area to be treated.
10. Prior to harvest operations, a Stumpage Sale Contract will be signed between the Purchaser and the County which describes in detail wood volumes and prices, operating conditions, and safety, regulatory, insurance and Workplace Safety and Insurance Board (WSIB) requirements.
11. Logging operations will be regularly inspected by the County to monitor compliance with the Stumpage Sale Contract.
12. A monitoring plan will be implemented to update forest resource inventory information, evaluate silvicultural success, schedule silvicultural treatments, as well as promoting continual improvement.
13. The County will continue to participate in a cost-effective forest certification program which provides an independent assessment to an internationally recognized sustainable forest management standard.
14. The County will encourage the use of the Forest properties for research which enhances knowledge of the forest and its management.
15. The County will inventory known forest management research sites that are active within the County Forest and develop protection measures to preserve the integrity and function of those sites where required (e.g. growth and yield, seed production areas, silvicultural trials, Ice Storm Forest Research and Technology Transfer plots, etc.).

RECREATION AND EDUCATION TARGET

Provide a venue for public recreational and educational uses which promote the sustainable management of the Forest and that foster awareness and education regarding the Forest and its natural and cultural heritage values.

RECREATION AND EDUCATION STRATEGIES

1. The properties of the County Forest will be open to the public for multiple use recreation activities such as hunting, horseback riding, hiking, wildlife viewing and light motorized uses provided such activities are mutually compatible and do not interfere with the primary objective for the property involved.
2. The County will permit the use of Forest properties as part of a network of recreational trails, provided that such activities can be carried out consistent with the Mission and Objectives for the Forest.
3. The County may restrict certain uses from any or all forest properties if these activities are deemed to be in conflict with the designated use of the property, or are degrading the forests, natural or cultural heritage values, roads or trails.
4. Forest operations adjacent to UCPR designated recreation trails 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.
5. The County will provide information to the public which identifies the location of Forest properties.

6. The County will work with other agencies to develop and deliver activities that foster awareness and education regarding the Forest, its natural and cultural heritage values, and its sustainable management.

ECOSYSTEM PROTECTION TARGET

Forest management will not compromise the integrity of the natural heritage features of the County Forest.

ECOSYSTEM PROTECTION STRATEGIES

1. The County will maintain a GIS based Natural Heritage Inventory, using data obtained from the OMNR, SNC, the Protection and Development Plan of the Larose Forest (2008) and local knowledge sources.
2. The County will work with other agencies to inventory and develop management and conservation strategies for natural heritage features within the County Forest.
3. Forest management activities in and adjacent to significant natural heritage features will be designed to preserve the integrity of the feature. These features include, but are not limited to, provincially and locally significant wetlands, areas of natural and scientific interest and high conservation value forests (e.g. old growth forests).
4. Forest management operations will be modified adjacent to the habitat of known species at risk as defined by the Endangered Species Act (2007), and for other plants and animals in the Forest, to conserve the habitat for these species. Provincial advice will be sought when developing operational prescriptions in the vicinity of species at risk.

5. Natural heritage values will be identified prior to operations and the appropriate area of concern prescription will be applied based on the conditions encountered.
6. Silvicultural treatments will be designed to encourage the regeneration of native species on appropriate sites.
7. Forest management activities will be planned and implemented to maintain a diversity of forest types and ages.
8. Tree marking and forest operations will promote healthy forests which encourage a diversity of wildlife habitats and values; including tree species diversity, cavity trees, snags, downed woody debris, supercanopy trees, nut and berry producing trees, minor conifers, and woodland (vernal) pools.
9. Roads, water crossings and access trails will be constructed, maintained and/or rehabilitated to minimize impacts on natural and cultural heritage values and will be consistent with local best management practices, the *Conservation Authorities Act* and the *Fisheries Act*. Applicable approvals and permits will be obtained prior to construction.
10. New access roads will be designed to be temporary to minimize creation of new long-term access to the properties.
11. The County may permit the commercial harvesting of non-timber forest products which are carried out in a controlled and sustainable manner.
12. The County will inventory known natural heritage research sites that are active within the County Forest and develop protection measures to preserve the integrity and function of those sites (e.g. SAR monitoring, medicinal plants, etc.)

13. The County will consider the acquisition of lands that enhance the forest cover, natural or cultural heritage value, connectivity between significant woodlands or recreation opportunities of the County.

RESPONSIBLE LANDOWNER AND GOOD NEIGHBOUR TARGET.

Be viewed as a good neighbour by landowners adjacent to the County Forest properties and as a responsible landowner by the residents of the County.

RESPONSIBLE LANDOWNER AND GOOD NEIGHBOUR STRATEGIES.

1. The County will communicate with the public to raise awareness of the County Forest and address concerns regarding the management, use, or misuse of the properties.
2. Property boundary fences will be maintained as needed consistent with the *Line Fences Act*.
3. The boundaries of forest operations will be verified on the ground and adjacent landowners will be notified prior to implementation of forestry activities.
4. Incidences of timber theft will be investigated and appropriate action taken to ensure that theft is discouraged.
5. Forestry operations will be monitored to verify that harvesting equipment and practices are applied safely, consistent with legislation and best management practices.
6. Forestry staff and contractors will carry fire protection equipment designed for initial suppression of fires in the vicinity of forest operations. Participation in the

Industrial Training Course for Basic Forest Fire Suppression (S-102) or a similar wildfire training course will be encouraged.

7. Area of concern protection will be applied for known and newly identified cultural heritage values to maintain the integrity of the site.
8. The County shall embark upon public relations programs such as signage, a brochure and/or media campaigns to foster the identification of County Forest property, to encourage the appropriate public use of the County Forests, to promote safety and to reduce incidents of trespass, vandalism and illegal dumping.
9. The County will encourage and may participate in events that relate to the promotion and/or responsible management of the County Forest (e.g. Larose Forest Day).

FINANCIAL BENEFITS TARGET

Ensure cost recoverability and financial self-sufficiency while applying sustainable forest management practices.

FINANCIAL BENEFITS STRATEGIES

1. An annual forest management budget will be prepared and will be approved by the County.
2. Harvest operations will be scheduled to provide a reliable source of income to support forest and property management and maintenance costs.

3. Non-commercial silvicultural investments will focus on projects that increase the future value of the forest and its ability to adapt to changing market conditions.
4. Commercial timber harvest blocks will be sold by tender to ensure fair value to the County and where appropriate may enter into harvesting contracts of more than one year in duration.
5. Tender sale processes will be designed to provide open opportunities to logging contractors and mills.
6. Timber cruises and local volume tables will be applied to ensure the highest possible level of accuracy of volume estimates.
7. A Bill of Lading system will be used to monitor the harvest, trucking and measurement of wood cut from the County Forest as described in the stumpage sale contract.

The United Counties of Prescott and Russell
County Forest Lands

Forest Management Plan
2009-2028



Section B: Twenty Year Management Plan

Authored By:

Steven Hunter R.P.F., Forestry Specialist
South Nation Conservation

Approved By:

United Counties of Prescott and Russell.

Approval Date:

October 8th, 2008

THE UNITED COUNTIES OF PRESCOTT AND RUSSELL
COUNTY FOREST LANDS
FOREST MANAGEMENT PLAN (2009-2028)

Documents

<u>SECTION A:</u>	FOREST POLICY PLAN
<u>SECTION B:</u>	TWENTY YEAR MANAGEMENT PLAN (2009 to 2028)
<u>SECTION C:</u>	FIVE YEAR OPERATING PLAN (2005 to 2011)

Commonly Used Terms and Acronyms

United Counties of Prescott and Russell	“UCPR” or “County”
UCPR County Forest	“Larose Forest” or “Forest”
Eastern Ontario Model Forest	EOMF
Forest Resource Inventory	FRI
Geographic Information System	GIS
Ontario Ministry of Natural Resources	OMNR
Protection and Development Plan of Larose Forest	PDP
Registered Professional Forester	R.P.F.
South Nation Conservation	SNC

THE UNITED COUNTIES OF PRESCOTT AND RUSSELL
COUNTY FOREST LANDS
FOREST MANAGEMENT PLAN (2009-2028)

County Forest Lands Advisory Committee

Achilles Drouin	Boisés Est (President of the County Forest Lands Advisory Committee)
Louis Prévost	Director of Planning and Forestry, UCPR
Dennis Pommainville	UCPR Elected Official
Nicolas Gauthier	Senior Forest Technician, UCPR
Manon Besner	Forest Technician, UCPR
Steven Hunter	Forestry Specialist, SNC
Josée Brizard	Director of Conservation Programs, SNC
Chris Craig	First Nations Representative
Brian Barkley	General Manager, EOMF
Linda Touzin	District Forester, OMNR
Christine Hanrahan	Ontario Field Naturalists Club
Pierre Boileau	Member at Large
Pierre Soucy	Boisés Est
Raymond Bouvier	Member at Large
Rob Argue	Stewardship Coordinator, OMNR

UCPR County GIS Department

Sonia Roy	GIS Coordinator, UCPR
-----------	-----------------------

THE UNITED COUNTIES OF PRESCOTT AND RUSSELL
COUNTY FOREST LANDS
FOREST MANAGEMENT PLAN (2009-2028)

TABLE OF CONTENTS

B-1.0 INTRODUCTION	1
B-2.0 UCPR COUNTY FOREST DESCRIPTION	3
B-2.1 Forest Resource Inventory	3
B-2.2 Land-base and Forest Summary	4
B-2.3 Forest Health	8
B-2.3.1 Insects, Disease and Abiotic Stress Agents	8
B-2.3.2 Ice Storm 1998	11
B-2.3.3 Exotic Species	12
B-2.3.4 Fire	17
B-3.0 FOREST PRODUCTS	17
B-3.1 Forest Product Markets	17
B-3.1.1 Conifer	18
B-3.1.2 Hardwood	19
B-3.1.3 Loggers	20
B-3.2 Sale of Wood Products	21
B-3.3 Harvest Operations	22
B-3.4 Forest Access	22
B-3.4.1 Spring Road Restrictions	23
B-3.4.2 Forest Access Roads	23
B-3.4.3 Harvester, Skidder and Forwarder Trails	24
B-3.4.4 Forest Operations In and Adjacent to a Watercourse	25
B-3.5 Non-Timber Forest Products	26
B-3.6 Forest Certification	27
B-4.0 FOREST UNITS AND SILVICULTURAL TREATMENT OPTIONS	27
B-4.1 Mid to Late Successional Hardwoods	28
B-4.1.1 Lowland Hardwoods	28
B-4.1.2 Upland Hardwoods	32
B-4.2 Early Successional Hardwoods	34
B-4.3 Other Conifers	36
B-4.4 White Spruce	38
B-4.5 White Pine	41
B-4.7 Red Pine	47
B-4.8 Other Conifer Plantations	51
B-4.9 Mixed Conifer Plantations (“Larose Mix”)	52
B-4.10 Plantation Management	52
B-5.0 NATURAL AND CULTURAL HERITAGE VALUES	54
B-5.1 Operational Prescriptions for Areas of Concern	55
B-5.2 Natural Heritage Values	64
B-5.2.1 High Conservation Value Forests (HCVF)	64

B-5.2.2 Stick Nests.....	67
B-5.2.3 Recreation Trails.....	68
B-5.2.4 Research Plots	68
B-5.3 Cultural Heritage Values	68
B-5.4 Values Inventory and Mapping.....	69
B-5.4.1 Data Sensitivity.....	70
B-5.5 Tree Marking Considerations For Natural Heritage Values.....	70
B-6.0 MONITORING THE SUSTAINABILITY OF THE UCPR COUNTY FOREST MANAGEMENT	71
B-6.1 Indicators of Sustainability.....	72
B-6.1.1 Wood Products Indicators.....	72
B-6.1.2 Recreation and Education Indicators.....	73
B-6.1.3 Ecosystem Protection Indicators	74
B-6.1.4 Responsible Landowner and Good Neighbour Indicators.....	75
B-6.1.5 Financial Benefits Indicators.....	76
B-6.2 Monitoring Silvicultural Effectiveness	77
B-6.2.1 Monitoring Forest Operations	77
B-6.2.2 Monitoring Silvicultural Success	79

APPENDICES

- 1. UCPR County Forest Compartment Maps and Treatment History**
- 2. Stand Density Index Curves For Plantation Management**
- 3. Age of Onset for Old Growth Forest Ecosystems**
- 4. Glossary of Technical Terms**
- 5. Bibliography**

THE UNITED COUNTIES OF PRESCOTT AND RUSSELL **COUNTY FOREST LANDS:** **FOREST MANAGEMENT PLAN**

SECTION B) TWENTY YEAR MANAGEMENT PLAN (2009-28)

B-1.0 INTRODUCTION (Sources: OMNR 1979, OMNR 1989, LandOwner Resource Center 1997, Streit 2007, UCPR 2001)

At the turn of the 20th century, logging, agricultural land clearing and large fires had reduced the majority of the area that is now the UCPR County Forest to what has been referred to as the “Bourget Desert.” Ferdinand Larose, the Agricultural Representative for UPCR at the time, is credited for the initiation of the reclamation of waste lands in an attempt to control blow sand and water erosion, produce a “useful crop,” provide employment for local residents and provide a good reforestation demonstration area.

In 1928, the first "Agreement Forest" in eastern Ontario was created after successful negotiations between UCPR and the Ontario Department of Lands and Forests (now Ontario Ministry of Natural Resources). Under the auspices of this agreement, the Counties acquired degraded properties from private landowners and the lands were managed by the Department of Lands and Forests. The first plantation was established in 1928 on approximately 40.5 ha and with it began the rehabilitation of the “Bourget Desert” and the establishment of the Larose Agreement Forest.

Since 1928, approximately 18 million trees were planted on 5,410 ha (13, 365 acres) on the property owned by UCPR. Land that is not in conifer plantation consists of naturally regenerated hardwood and conifer forests, streams, wetlands, roads and trails. Over 80% of the UCPR County Forest is located in the municipalities of Clarence/Rockland and The Nation, with the remainder located in Alfred/Plantagenet and Russell.

In 1999, a change in Provincial government priorities resulted in the end of the Agreement Forest Program and OMNR ceased forest management in the County Forest in May 2000. In 2001, UCPR and OMNR executed a Termination Agreement which transferred full responsibility for the management of the County owned forests to UCPR prior to the expiry of the original agreement. In response to the transfer of management responsibilities from OMNR, in 2001 UCPR produced “Larose Forest Strategic Plan: The Larose Forest – A Forest For Its Community.” This strategic plan outlined the mission and overall objectives that were to be used to guide the planning and management of the County Forest. The ability of the Forest to provide environmental, social and economical benefits was recognized, as was the need to ensure that the activities that occur within Larose do not compromise the underlying goal of enhancing and preserving these benefits. The strategic plan provides general direction for management, development and land-use.

All activities on County Forest properties must conform to the most current version of the UCPR Official Plan which provides overriding principles and policies governing land-use within the United Counties of Prescott and Russell. The County Forest is falls within the Urban Policy Area and the Natural Heritage Policy Area, which are described in Sections 2 and 5 respectively. The County Forest provides many natural heritage features that warrant special consideration regarding land-use. Landform specific land-use policies have been specified under the Natural Heritage Policy Area which provide some additional management direction (e.g. Significant Wildlife Habitat, Natural Sites of County Significance, Significant Woodlands, etc.).

The mission and principles outlined in the Larose Forest Strategic Plan, in conjunction with the principles and land-use policies described in the UCPR Official Plan, were used to develop the mission with associated objectives, strategies and targets that will guide forest management on the County Forest. The mission, objectives, strategies and targets were developed with public consultation and were approved by the County Forest Lands Advisory Committee prior to inclusion in this plan (see Section A).

To ensure the sustainability of the forest management activities that were occurring on the County Forest and to reassure the public that the County Forests are properly managed, UCPR sought forest sustainability certification through the Forest Stewardship Council (FSC). In 2006, the UCPR County Forest became certified under the umbrella of the Eastern Ontario Model Forest's FSC certificate. To retain this certification, management of the County Forest must conform to the most current version of the "Eastern Ontario Model Forest – Forest Certification Policies and Procedures Manual" and "Forest Stewardship Council Canada - Certification Standard for the Great Lakes / St. Lawrence Region."

B-2.0 UCPR COUNTY FOREST DESCRIPTION

B-2.1 Forest Resource Inventory

Forest managers use the forest resource inventory (FRI) to develop the forest management plan, to determine treatment eligibility for inclusion in the 5 Year Operating Plan and to develop Harvest Plans. It is also used to identify areas that contribute to the objectives described in the plan (e.g. wildlife habitat) and to forecast how the forest and the values that are associated with it will respond to certain activities. Maintenance of a comprehensive forest resource inventory is essential for monitoring progress and improves the quality of forecasting forest change over time.

The United Counties of Prescott and Russell has a GIS department that maintains the Forest Resource Inventory and generates forest maps. The inventory for the UCPR County Forest is based on timber cruising that was performed by OMNR in the late 1970's and the early 1980's and updates made by OMNR based on silvicultural treatments that were implemented. Information from aerial photographs produced in 1991 and field information collected by Horizon Multiresource Inc. for the development of the Protection and Development Plan of Larose Forest (2008) have also been incorporated into UCPR's forest resource inventory. UCPR has also used information provided by other groups (e.g. Ottawa Field Naturalists) to ensure the description of the

resource is as complete as possible.

Forestry staff identifies changes or updates to the forest information to be included in the GIS-based FRI database. These changes / updates will occur when actual conditions are found to differ from the existing FRI or after the forest condition is altered as a result of a silvicultural treatment. A monitoring plan has been developed as part of this plan to ensure forest information is updated, silviculture treatments are recorded and that the success of those treatments is tracked (Section B-6.0).

B-2.2 Land-base and Forest Summary

“The forests of eastern Ontario lie within the Great Lakes-St. Lawrence (GLSL) Forest Region, south and east of the Canadian Shield. The GLSL Forest Region occupies a broad geographic range in Ontario and Quebec as well as south-eastern Manitoba and north-western New Brunswick. The forests are dominated by sugar maple and beech, with red maple, yellow birch, basswood, white ash, largetooth aspen and red and bur oaks. White oak, red ash, grey birch, rock elm, blue beech and bitternut hickory occur intermittently. Black ash is common on poorly drained areas which may also include black spruce and eastern white cedar. Eastern hemlock, eastern white pine and white spruce are common on shallow, acidic or eroding materials. White pine, red pine and red oak are common on coarse textured drier soils. (EOMF, 1999)”

Tables 1 and 2 summarize the land-base and forests of the UCPR County Forest. The forests have been grouped into 9 forest units. Forest units are forest stands with similar tree species and site conditions. A detailed description of the characteristics and the silvicultural treatment options for the nine forest units are described in section B-5.0.

Ninety percent (90%) of the lands of UCPR County Forest are forested and approximately ten percent (10%) are open lands, most of which are associated with wetlands (Table 1). This contrasts to UCPR as a whole, which has approximately 28% forest cover (UCPR 2006).

Forty-one percent (41%) of the UCPR County Forest are hardwood dominated forests and forty-nine percent (49%) are dominated by conifers (Table 1). The majority of the hardwood dominated portions of the Forest are a result of the re-colonization of abandoned agricultural lands. The majority of the conifer dominated portions of the Forest are plantations consisting primarily of white spruce, white pine and red pine.

Table 1. UCPR County Forest Summary (Source: UCPR County Forest Inventory).

Forest Unit	Productive	Barren and Scattered	Total	Percentage
Hardwoods				
Lowland Hardwoods Tolerant	1,558.9	1.7	1,560.6	14.5%
Hardwoods Intolerant	326.0	0.5	326.5	3.0%
Hardwoods	1,728.7	764.7	2,493.4	23.2%
Sub-total Hardwoods	3,613.6	766.9	4,380.5	40.7%
Conifers				
Other Conifers	77.9	33.5	111.4	1.0%
White Spruce	2,009.9	509.8	2,519.7	23.4%
White Pine	828.6	70.4	899.0	8.4%
Red Pine	1,505.0	19.5	1,524.5	14.2%
O. Conifer Plantations	250.0	8.5	258.5	2.4%
Sub-total Conifers	4,671.4	641.7	5,313.1	49.4%
Sub-total All Forests	8,285.0	1,408.6	9,693.6	90.1%
Non-Forest				
Brush and Alder	663.7		663.7	6.2%
Grass and Meadow	27.1		27.1	0.3%
Swamp	330.8		330.8	3.1%

Forest Unit	Productive	Barren and Scattered	Total	Percentage
Un-classified	46.2		46.2	0.4%
Sub-total Non-forest	1,067.8		1,067.8	9.9%
Total UCPR County Forest	9,352.8	1,408.6	10,761.4	

Table 2. UCPR County Forest Forest Unit Age Class Summary (Source: UCPR County Forest Inventory – Age corrected).

Forest Unit	B-S	1-20	21-40	41-60	61-80	81-100	101+	Total
Hardwoods								
Lowland Hardwoods	1.7	0	2.2	330.0	1,188.1	38.6	0	1,560.6
Tolerant Hardwoods	0.5	0	4.5	58.0	230.2	30.0	3.3	326.5
Intolerant Hardwoods	764.7	0	51.0	767.1	889.8	20.8	0	2,493.4
Sub-total Hardwoods	766.9	0	57.7	1,155.1	2,308.1	89.4	3.3	4,380.5
Conifers								
Other Conifers	33.5	0	0	58.1	18.1	1.7	0	111.4
White Spruce	509.8	0	395.0	1,241.9	373.0	0	0	2,519.7
White Pine	70.4	0	35.3	649.0	144.3	0	0	899.0
Red Pine	19.5	0	43.6	1,047.8	413.6	0	0	1,524.5
O. Conifer Plantations	8.5	0	10.7	200.0	39.3	0	0	258.5
Sub-total Conifers	641.7	0	484.6	3,196.8	988.3	1.7	0	5,313.1
Total	1,408.6	0	542.3	4,351.9	3,296.4	91.1	3.3	9,693.6
Percentage	14.5%	0%	5.6%	44.9%	34.0%	0.9%	0.03%	100%

The forests of UCPR have been heavily influenced by the previous 200+ years of European settlement. The UCPR County Forest is typically young second growth, which owes its origin to the abandonment of poor quality agricultural lands. Approximately 98% of the hardwood stands and 100% of the conifer plantations within the UCPR

County Forest are 80 years of age or younger (Table 2). Seventy-nine percent (79%) of the forest falls between 40 and 80 years of age. As a result there is a significant gap in the 1-20 year age class (0% \leq 20 years) and in stands exceeding 100 years of age (0.03% $>$ 100 years).

A gap in the younger age classes can result in deficiencies in future harvest eligibility if it is not addressed. This gap in stands younger than 20 years is somewhat misleading since only the overstory trees are described in the FRI (Table 2). Under-planting has occurred in several stands by OMNR and UCPR in the last 20 years and approximately 200,000 trees were planted after the ice storm in 1998. Natural regeneration has also occurred in many other areas. This has resulted in the development of young stand in the understory that will ultimately replace the some of the older stands that are represented in Table 2. This being said, additional efforts should be made to ensure continual recruitment into the youngest age classes and to create a more balanced age class distribution. Efforts will focus on regenerating forest units that are managed under even-aged silvicultural systems (i.e. clearcut, uniform shelterwood, etc.). These harvest methods are designed to mimic disturbances that cause the either complete or eventual mortality of the overstory ultimately resulting in a new stand of roughly the same age. White and red pine, white spruce, poplar and larch are examples of species that are well adapted to even-aged silvicultural systems that mimic these types of natural disturbance. Forest units adapted to small scale disturbances (e.g. single tree or small groups of trees) are not affected in the same way as those that are adapted to more drastic disturbance regimes. These forest types are dominated by shade tolerant tree species that are capable of self-perpetuation and usually have a wide range of age classes represented in a single stand. When managed appropriately (i.e. single tree or group selection) these stand types will be eligible for harvest indefinitely on a regular rotation. Sugar maple, hemlock and cedar are examples of species that are well adapted to uneven-aged silvicultural systems. Generating young, even-aged stands of these types is generally not recommended, since they are not well adapted to large, stand replacing disturbances and would likely succumb to competition from other species that are better adapted to those disturbance regimes.

A gap in older age classes has resulted in a deficiency in stands eligible for harvest during the period of this management plan (e.g. upland tolerant hardwoods). Many forest types cannot support a commercially viable harvest operation prior to reaching 80-100 years of age without silvicultural treatments (e.g. tree planting, pre-commercial thinning, stand improvement, etc.). As these stands age, they will become available for harvest and the gap in older age classes will be addressed from a harvest perspective. Young stands will be evaluated to determine those that would benefit from silvicultural treatments, perhaps becoming available for harvest at a younger age.

B-2.3 Forest Health (Source: Evans et al 2006, OMNR 2004, OMNR 2006, OMNR 2007a)

The Ontario Ministry of Natural Resources defines forest health as, “The condition of a forest ecosystem that sustains the ecosystem's complexity while providing for the needs of the people of Ontario.” Forest health is typically measured in relation to biotic and abiotic factors that affect the value, growth and survival of trees and forests as a whole. Biotic factors affecting forest health include forest insects and diseases, while abiotic factors include weather events and fire.

B-2.3.1 Insects, Disease and Abiotic Stress Agents

There are many insects, diseases and abiotic stress agents that currently impact the health of forests. Typically, these stress agents are omnipresent in the forest, but not normally at a level that results in significant damage to the forest.

The overall health of the UCPR County Forest is generally good, but there are stress agents that have the potential to cause significant mortality (Table 3). Multiple ice storms are the most significant abiotic factor responsible for substantial tree decline and mortality in recent years. Spruce budworm has caused significant decline and mortality in spruce, but the budworm population appears to be in decline. Root and stem diseases cause significant damage to a tree's water and nutrient distribution system, as well as weakening its structural support. As a result, these diseases have the potential to cause significant mortality, however occurrences of mortality resulting from root and

stem diseases appear to be fairly low in recent years. Diseases and insects that cause foliar mortality can reduce tree vigour due to a loss in photosynthesis, but they generally do not cause extensive mortality except under outbreak conditions. Occurrences of these stress agents vary, but generally none would be considered an outbreak. Probably the greatest biotic threats to the Forest are invasive pests with few or no natural biological controls. Three exotic pests, Sirex wood wasp (*Sirex noctilio*), emerald ash borer (*Agrilus planipennis*) and Asian long-horned beetle (*Anoplophora glabripennis*) have not been located in Larose to date but they pose a substantial future threat due to their rate of spread and since the forests of UCPR contain suitable hosts for all three species.

Maintaining species and genetic diversity is the best defence against most forest health issues. Sustainable forest management practices are designed to maintain a diversity of healthy tree species growing on suitable sites and to favour natural regeneration of a wide range of species. Another strategy is to retain healthy individuals of tree species under threat of disease (e.g. elm, butternut). For example, despite continued extensive mortality in white elm, healthy elm trees continue to develop seed and seedlings. These trees are retained during tree marking and logging operations to provide a seed source for the future.

The Canadian Forest Service (CFS), Canadian Food Inspection Agency (CFIA) and OMNR continue to monitor local forest health conditions and provide updates and recommendations to forest managers through regular information meetings and discussion groups. Detailed descriptions of pests and other forest health issues and current forest health status reports can be found on the CFS, CFIA and OMNR websites.

Table 3: Summary of the stress agents affecting the health of the UCPR Forest (Source: OMNR 2006, OMNR 2007a).

Stress Agent	Favoured Hosts	Current Damage	Damage Trend	Potential Damage
Insects				
Spruce Budworm	Spruce, Fir	Moderate-High	Declining	Moderate-High
Forest Tent Caterpillar	Poplar, Other Hardwoods	Low	Stable	Low to Moderate
Gypsy Moth	Oak, Other Hardwoods	Low	Stable	Low
Larch Casebearer	Tamarack	Moderate	Increasing	Moderate
Cedar Leaf Miner	Cedar	Low	Declining	Low
White Pine Weevil	White Pine	Moderate	Stable	Low
Pine Spittlebug	Scots Pine, White Pine, Jack Pine	Low	Stable	Low
European Pine Sawfly	White Pine	Low	Stable	Low
Bronze Birch Borer	White and Grey Birch	Moderate	Increasing	Moderate
Birch Casebearer	Birch	Low	Stable	Low
Sirex Wood Wasp	Softwoods	N/A	N/A	High
Emerald Ash Borer	All Ash	N/A	N/A	High
Asian Long - Horned Beetle	All Hardwoods	N/A	N/A	High
Diseases				
Dutch Elm Disease	Elm	High	Stable	High
Butternut Canker	Butternut	High	Increasing	High
White Pine Blister Rust	White Pine	Low	Stable	Moderate
Beech Bark Disease	Beech	Low	Stable	High
Root Rot Fungus (e.g. Armillaria, Fomes)	Spruce, Red Pine	Low to moderate	Stable	Low to moderate
Diplodia Tip Blight	Red Pine	Low	Stable	Low
Septoria Leaf Blight	Birch	Low	Increasing	Low
Abiotic				
Ice, Snow	Poplar, Birch, Red Pine, Scots Pine, Cedar, Beech, Red Maple	Moderate	N/A	High (Localized)
Drought	Ash, Red Pine	Low	N/A	Moderate (Localized)
Wind	All Species	Low	N/A	High (Localized)
Flooding	All Species, especially Red Pine	Low	N/A	High (Localized)

B-2.3.2 Ice Storm 1998

“January 1998 saw the largest ice storm to hit eastern Canada and north-eastern USA in recorded history. The storm started on January 5th and lasted for four days, depositing heavy accumulation of freezing rain. Over 3 million people were left without electricity in the United States and Canada. Downed power lines prevented restoration of power to many areas of Quebec and Ontario until the later part of January (Young, 1998).”

“Woodlots that contained early successional species such as trembling aspen, hybrid poplar and white birch suffered severe damage. In some areas, these species were stripped of all major branches, leaving just one stem. The damage to the other hardwoods was variable and patchy, with some stands being completely stripped of their fine and main branches while other areas suffered relatively little damage. The extent of the damage to conifers varied from species to species, hitting red pine plantations and eastern white cedar the hardest. Eastern white pine, white spruce and balsam fir suffered relatively little damage (EOMF, 1999).”

Most of UCPR experienced minor ice damage overall, with some significant patches of moderate to severe damage. The response to the ice storm was the first concerted effort to manage the impacts of a local forest health issue in many years. The OMNR provided UCPR with financing under the ice storm assistance program to assist in managing plantations and woodlots that had been severely affected. Most of the effort was concentrated in compartments with heavily damaged red pine plantations. These plantations were salvaged and most were planted to red pine, white pine and Norway spruce. Many compartments suffered minor ice storm damage, but did not warrant a salvage operation.

The impacts of the ice storm continue to be observed, as trees with partially damaged crowns exhibit progressive decline and mortality. This was accentuated by severe summer droughts in 2001, 2002 and 2007. Mortality has been most noticeable in poplar

and white birch. Decline also continues in major commercial species such as red maple, green ash, red pine and cedar. Ice storm damaged stems continue to be discovered and salvaged in red pine plantations that suffered minor damage.

B-2.3.3 Exotic Species

An exotic (a.k.a. alien, non-native) species is an organism that has been introduced, either intentionally or unintentionally, into an area outside its natural distribution. An exotic species is considered invasive when it is able to establish and spread in this new environment. From an ecological perspective, the major concerns include invasive exotic species out-competing and displacing native species in the same ecological niche, the likely negative impacts on interrelated species (e.g. those that rely on native species for food and other values), exotic pathogens or pests causing decline or mortality in native species and a reduction in genetic diversity of native species.

Scots pine (*Pinus sylvestris*), European buckthorn (*Rhamnus cathartica*) and purple loosestrife (*Lythrum salicaria*) are some of the best known examples of invasive exotic species that occur in the County Forest. The majority of the Scots pine was planted in the County Forest. To date have invasive exotic species have not been observed at levels which significantly preclude native species, however anecdotal reports suggest that European buckthorn populations are increasing rapidly.

Norway spruce (*Picea abies*), European larch (*Larix decidua*) and Japanese larch (*Larix kaempferi*) are non-invasive exotic tree species that were planted in limited quantities in Larose Forest in the past. Observations by forest managers indicate that regeneration in these plantations is dominated by native hardwood and conifer species. The greatest impact of Norway spruce is that the large cones are favoured for collection by squirrels over native species, which impacts on the distribution of seed of the native species.

Exotic tree species are known to occur on approximately 232.8 ha which equates to approximately 2.2% of the County Forest. The exotic tree species were most often

planted with native tree species in varied stocking mixtures. Exotic species were planted in pure concentrations ($\geq 90\%$) on 13 of the 50 compartments (26%). The largest pure plantations are 3.4 ha for Scots pine, 3.7 ha for Norway spruce and 8.0 ha for European larch and there are no pure plantations of Japanese larch. Compartments that contain exotic tree species are described in Table 4.

At the time of writing, there were no active management activities carried out on the UCPR County Forest for control of invasive exotic species. Tree markers favour retention of native over non-native tree species in marking decisions, but prescriptions do not require the complete removal of all exotic tree species, particularly those that are not invasive. The goal is to promote a transition to native hardwood and softwood species through a series of treatments over time in areas where exotic species are present.

Forest managers will monitor the presence of invasive exotics as part of existing forest monitoring programs (e.g. property inventory or reconnaissance, harvest plans, harvest monitoring). Research is being undertaken to examine proven control methods for invasive plants that threaten the County Forest (e.g. European and glossy buckthorn, garlic mustard, etc.). A ranking system for control efforts is also under development. UCPR will attempt to engage the local citizens in an effort to broaden their ability to monitor and control invasive exotic species. The use of exotic species in tree planting programs will be limited and will be restricted to non-invasive tree species.

Table 4: Exotic tree species in UCPR County Forest.

Compartment	Sub-Compartment	Area (ha)	Proportion of Stocking (%)
Scots Pine (Invasive)			
58	c	11.0	10
77	i	2.3	60
77	k	1.1	100
78	c	1.0	100
81	b	4.2	10
95	b	1.4	80
179	g	3.4	100
220	a	4.8	40
220	c	4.0	30
220	e	4.4	60
265	e	1.2	100
271	d	1.1	50
279	b	5.8	10
335	e	3.4	20
336	b	0.7	100
341	a	1.9	20
368	c	1.4	100
375	h	2.5	90
375	l	5.5	10
Total		61.1	

Compartment	Sub-Compartment	Area (ha)	Proportion of Stocking (%)
Norway Spruce (Non-Invasive)			
32	b	6.4*	Planted '01
63	g	8.0	20
96	a	4.0	10
97	c	1.1	60
123	g	2.0	100
141	g	8.5*	Planted '01
158	g	6.1*	Planted '01
199	f	3.9*	Planted '01
205	b	1.6	50
225	a	12.4*	Planted '01
225	b	6.4*	Planted '01
226	b	7.8*	Planted '01
243	d	8.7*	Planted '01
265	d	3.7	100
334	a	11.8*	Planted '01
335	c	9.3*	Planted '01
Total		101.7	

Compartment	Sub-Compartment	Area (ha)	Proportion of Stocking (%)
European Larch (Non-Invasive)			
64	e	6.0	60
64	f	6.5	20
64	h	2.8	40
184	f	6.0	20
185	k	2.3	90
186	e	8.0	90
191	d	2.2	100
247	f	3.6*	Planted '01
333	c	0.6	30
333	e	1.1	100
Total		39.1	
Japanese Larch (Non-Invasive)			
161	b	3.3	80
203	l	2.2	50
235	b	9.4	30
315	b	11.3	20
315	c	4.7	10
Total		30.9	

* Areas shown in the table represent the entire sub-compartment, not necessarily the area actually planted within the sub-compartment. The stocking proportion could not be provided since these trees are not yet part of the overstory.

B-2.3.4 Fire

Forest fire control is the responsibility of the 7 local municipalities and the City of Clarence-Rockland. In some cases, the Ontario Ministry of Natural Resources will be called upon to provide personnel and equipment.

Forestry staff and forest contractors carry basic fire protection equipment, primarily oriented for vehicle or equipment fires (i.e. fire extinguishers, back-pack pumps). Contractors will be encouraged to attend the Industrial Training Course for Basic Forest Fire Suppression (S-102) or a similar wildfire suppression training course. Within the scope of their training and experience, contractors are to undertake initial attack of fires in the vicinity of their operations. A designated employee(s) from the UCPR is to be contacted immediately in the event of a fire.

Should a major fire occur, UCPR has developed a fire response plan involving specially trained individuals from municipal fire departments and UCPR staff. Two trailers complete with initial attack fire equipment are strategically located for the use in the event of a fire that cannot be reached or extinguished using the municipal fire suppression vehicles. OMNR may be called upon for emergency assistance in the event that a fire cannot be contained by municipal fire departments and UCPR staff.

B-3.0 FOREST PRODUCTS

B-3.1 Forest Product Markets (Sources: Begin et al. 2005, Copestake 2005, OMNR 1979, OMNR 1992, Streit 2007)

The 21st century has brought many challenges to the forest industry. The rapid rise in the Canadian dollar, increased global competition from low-cost producers and rapidly escalating energy, labour and fibre costs have affected all forest products companies. Additional pressures facing individual mills and sectors include aging equipment (Domtar's mill in Cornwall was the oldest continuously operating pulp and paper mill in

Canada), a reduction in the rate of growth of North American paper demand and the softwood lumber tariffs imposed by the U.S.A.

In 2002-2003, the Kemptville District of the OMNR identified 12 licensed primary wood-using mills, consisting of 1 pulp and paper mill, 6 medium sized sawmills, 4 small sawmills and 1 miscellaneous mill. When viewed in a global context, all mills would be considered to be small in their sector. These mills reported total wood consumption of 538,992 M3. Over 75% of this wood was harvested outside the boundaries of the Kemptville District. By 2005 the Domtar pulp and paper mill in Cornwall and five of the medium sized sawmills had experienced either permanent or temporary closures. These six mills represent more than 90% of the wood consumption within Kemptville District.

The Canadian and provincial governments are investing increasing amounts of money in the research and development of non-traditional forest products in an attempt to adapt to the changing markets. Bio-energy, bio-fuels, bio-chemicals, medicines, engineered wood products are just a few examples of products being explored in an effort to rejuvenate the Canadian forest industry.

B-3.1.1 Conifer

Today's markets continue to evolve. Small timber harvested during conifer thinnings was traditionally shipped to the Canadian - International Paper (CIP) pulp and paper mill in Hawkesbury. However, this mill closure in 1982 greatly reduced the marketability of conifer plantation thinnings, which represent approximately 49% of the UCPR County Forest. In the 1990s, two Ottawa Valley sawmill entrepreneurs recognized the opportunity to harvest this underutilized wood supply. They developed markets for the products and modified their sawmill operations to generate lumber from these smaller trees. To improve efficiencies in the logging of these smaller trees, small mechanized tree harvesters and forwarders were introduced. Declining conifer supply from crown lands in Quebec has also increased the demand for these products from Ontario

sources. Today, conifer plantation thinnings are the primary revenue source for the UCPR County Forest.

Red pine, white pine and larch thinnings produce small dimension lumber for furniture and pressure treating, while white spruce thinnings are used to augment the supply for traditional dimension lumber industries. There are also specialized markets for some conifer products. For example, large, straight, knot-free red pine are the preferred supply for manufacturers of utility poles and log homes. As the forests age, the supply for traditionally higher value conifer products will increase.

B-3.1.2 Hardwood

Hardwood markets have also fluctuated substantially in recent years. Thinning in the young hardwood forests typical to UCPR typically results in the removal of small diameter and lower quality trees; there are relatively few hardwood sawlogs harvested. Over 90% of the volume typically thinned from hardwood woodlots is low grade or small trees. Approximately 41% of Larose Forest is composed of hardwood species, however only 3% of the Forest contains enough stocking and quality to support a commercial operation during the term of this plan.

Traditionally the majority of the low quality hardwood products were delivered as four or eight foot pulpwood to Domtar's pulp and paper mill in Cornwall. Domtar accepted mixed loads of all hardwood species (including oak) except poplar, which had to be delivered in pure loads. With the closure of this facility in March of 2005, the market and price for hardwood pulpwood has declined. Some hardwood pulpwood is being shipped to Fraser Papers in Thurso, Quebec. Fraser requires hardwood loads to be sorted into three species groups. They accept all hardwood species except oak, but their preference is for maple, beech and birch. Fraser also purchases limited quantities of conifer pulpwood. Preference is given to wood that has been harvested from forests that are certified by the Forest Stewardship Council (FSC).

Firewood demand grew during the 1970s as a result of dramatic increases in oil prices, but declined slowly during the 1980s and 1990s as oil prices dropped and natural gas availability increased. With recent drastic spikes in oil, electricity and natural gas prices, the demand for firewood is again on the upswing and is helping to offset the loss of the Domtar market for low quality hardwood. Firewood is sold by the full cord in 8 foot lengths and by the face cord as cut and split. Preferred firewood species include maple, beech and yellow birch for their heat value and ash because of its low moisture content and ease of splitting.

In recent years, most of the limited quantity of sawlogs found its way to hardwood sawmills in Hawkesbury (Laroque Lumber) or Dalkeith (C.A. Spencer). These markets have traditionally provided a ready market for the higher value sawlogs, although these operations have not been exempt from the challenging operating environment facing the forest industry. Due to a number of factors, C.A. Spencer shut down Dalkeith Lumber permanently in 2007. The predominant species of sawlogs cut in UCPR are soft maple, poplar and green ash, which are typically in the lower to mid price range for hardwood sawlogs. Sugar maple, which is available in lesser quantities, has provided a consistently high price for sawlogs over the last decade.

In the foreseeable future, hardwood thinning operations will remain as a less profitable enterprise for the UCPR County Forest than conifer thinnings. In particular, it will be difficult to find buyers for pre-commercial timber sales with a large component of small diameter hardwoods. However, with proper management, long-term yields of quality hardwood sawlogs will increase, creating better revenue opportunities for the County from these forest types.

B-3.1.3 Loggers

The changes that have occurred in the local forest industry have had substantial impacts on the local logging community. These changes were clearly in effect even prior to the mill shutdowns which occurred between 2005 and 2007.

Over the last 20 years, three major changes have brought about a drastic decline in the numbers and fortunes of logging contractors. First, uncontrolled logging on private land greatly reduced the availability of quality sawlogs, both through a decline in woodlot quality and a greater reluctance of a changing demographic of private landowners to allow logging on their property. Second, continued cost pressures on large pulp and paper mills resulted in minimal real price increases for pulpwood. Finally, the advent of mechanized harvesting equipment designed to harvest conifer plantations at low cost reduced the competitive advantage of traditional loggers, who relied on traditional cut and skid methods. As a result of these changes, there are few full-time logging contractors remaining in eastern Ontario.

For the remaining small contractors operating successful logging businesses in southeastern Ontario, Community Forests like the UCPR County Forest offer opportunities for sustainable timber harvesting. UCPR periodically reviews tendering procedures to ensure that these remaining operators have opportunities to bid on wood sales and/or to sub-contract harvesting projects.

B-3.2 Sale of Wood Products

Commercial conifer wood sales on the UCPR County Forest are issued through a competitive tendering process. Volume estimates are calculated through a sample cruise of marked trees and wood is sold on a unit-price measure. Although lump sum sales have been used in the past, unit price sales are preferred because the bidder only pays for the wood that is actually harvested. This practice is fair to both the logging contractor and the County.

The use of unit price sales has been greatly facilitated by the increased use of weigh scales to measure wood. Alternatively, arrangements may be made for an on-site measurement of sawlogs by a timber scaler that has been approved by UCPR at the contractor's cost. Firewood can be measured by a sample scale of truckloads. Wood

hailed from UCPR County Forest is monitored through a bill of lading system. UCPR retains the right to monitor and dictate any conditions on wood scaling that it feels are necessary to protect its interests.

In an effort to make timber sales accessible to small and large logging contractors, UCPR:

- makes timber sales available in a variety of sizes,
- defers a portion of deposit payments until cutting commences, and
- considers flexible wood scaling arrangements provided that the County's interests are protected.

B-3.3 Harvest Operations

All harvest operations are carried out according to a signed contract between the purchaser and UCPR. The contract describes in detail the terms of the Stumpage Sale Agreement, including volumes and prices, wood measurement, operating conditions and legal and safety requirements. Logging contractors must carry appropriate insurance and WSIB coverage to protect the County from liability.

All logging operations are monitored regularly by UCPR staff to ensure compliance with the contract and operating standards. In the event of a compliance issue on logging operations, the "Dispute Resolution Policy" as outlined in the "EOMF Forest Certification Policies and Procedures Manual" may be employed.

B-3.4 Forest Access

Many levels of access are involved in the process of transferring standing trees to the mill. Harvesters, forwarders and skidders require trails in the bush in order to harvest trees and transport them to the forest access roads where log trucks are loaded with roundwood that is either left as tree length or cut to specific lengths based on the intended final product and/or the mill to which it is being shipped. Provincial and

Municipal roads are then used to deliver the roundwood to the mills where it is processed. In some instances, the installation or maintenance of water crossings are required on equipment trails and forest access roads.

B-3.4.1 Spring Road Restrictions

Provincial highways 17, 138, 401 and 417 are built to accommodate heavy loads year-round and do not post load restrictions during the spring break-up period. However, all county and township roads have posted seasonal load restrictions. These restrictions are enforced by UCPR and the townships through the Ontario Provincial Police (OPP) and Ministry of Transportation (MTO). The spring load restrictions usually last 6 to 8 weeks depending on the weather and they generally begin in early March as frost begins to thaw. During the period of load restrictions, special permits for hauling can be sought through the township's roads engineer. To avoid costly damage to these roads, few permits are given.

B-3.4.2 Forest Access Roads

Access to the compartments of the Larose Forest is fairly well established, especially in the Main Block. If a harvest area is close to a municipal road, wood can be piled at roadside (with permission of the Road Superintendent) and no road construction is required. When road work is required, minor maintenance to existing roads or trails (e.g. brushing and resurfacing) often provides sufficient access to the area that is to be treated. Whenever possible, access will be established on previously disturbed areas to avoid loss of productive forest. In some instances, a small section of new road or new landings may need to be constructed by harvesting contractors. All new roads and landings must be approved by UCPR before operations commence. Some new landings are approved during operations if the conditions warrant and if the objectives in the forest management plan and the harvest plan are not compromised. Cutting and skidding of the road right-of-way and landings, followed by smoothing of the surface with a skidder blade is usually sufficient to allow vehicle access. A back hoe may be

used to clear the road surface of stumps. Since most new roads are designed for winter use, fill is rarely required.

The construction of new access onto a property from a township road requires the permission of the Township Road Superintendent. To avoid creating new permanent access roads, which can lead to misuse of the property (e.g. garbage dumping), these roads are generally designed to be temporary. After use the entrance to the road is usually decommissioned by culvert removal and/ or physical blocking with trees or other debris.

Existing access roads and water crossings must be left in the same or better condition than they were at the beginning of harvest operations. Logging contractors must repair to original condition damage to roads, trails, fences, gates, culverts, bridges, utilities or other improvements damaged beyond ordinary wear and tear.

Sometimes the best access is through adjacent private property, either through an existing laneway or field. In this case, UCPR may assist the logging contractor to develop an access agreement with the adjacent landowner.

B-3.4.3 Harvester, Skidder and Forwarder Trails

Logging contractors must establish access trails for logging equipment to extract harvested trees. In plantations, access trails are generally created by removing marked rows of trees, usually ranging from every third to every fifth row. In addition to row removal, individual trees may require removal to allow for equipment access. In natural stands, access trails are located in more open areas of the forest, usually where trees are marked for harvest.

The stumpage sale contract between UCPR and the logging contractor provides operational standards regarding:

- acceptable area covered by equipment trails,
- acceptable levels of trail rutting,
- acceptable levels of damage to residual trees, and
- acceptable levels of damage to advanced regeneration.

Every effort is made in the preparation of the Harvest Plan to ensure the purchaser and the operator are aware of the specific operating conditions and the potential issues that may arise during harvest. For example, some of the sites in UCPR are low and wet which are prone to excess rutting and compaction in the frost-free season. These sites cannot be harvested in compliance with the contract standards until significant frost has developed in the ground. Generally, a winter harvest restriction will be described in the Harvest Plan.

B-3.4.4 Forest Operations In and Adjacent to a Watercourse

The *Fisheries Act* prohibits the harmful alteration, disruption or destruction of fish habitat (HADD), unless approved by the Department of Fisheries and Oceans (DFO). Certain activities occurring in or adjacent to a watercourse require a review by DFO to assess the risk of a HADD resulting from a specific activity. South Nation Conservation has entered an agreement with DFO which allows SNC to review activities in and around water within the South Nation watershed on DFO's behalf. Heavy equipment traffic (e.g. skidder) in or in close proximity to a water course and water crossing installation are some examples of activities that have the potential to cause a HADD as described by the *Fisheries Act*.

In an effort to streamline the review process, DFO has generated a list of "Operational Statements" that outline activities in and adjacent to watercourses that are deemed to be a low risk of a HADD provided the specific criteria and standards outlined in the applicable Operational Statement are met. Some examples of DFO operational statements include culvert maintenance, ice bridge construction and installation of a clear span bridge. The DFO website houses the most current versions of these

operational statements. Since new statements are often added and updates are made to existing statements, the DFO website will be the source of the most current versions of these documents. The DFO Operational Statements do not override other legislation that requires the acquisition of permits for certain activities in or adjacent to a watercourse (e.g. *Conservation Authorities Act*).

In addition to the *Fisheries Act*, the *Conservation Authorities Act* stipulates that all development, as defined in the Act (see Appendix 4 - Glossary), within or adjacent to watercourse (e.g. stream, wetland, municipal drain, etc.) will require review and possible permit issuance by the appropriate conservation authority. The County Forest falls entirely within the jurisdiction of South Nation Conservation with respect to the administration of the Act. Details regarding development in the vicinity of regulated watercourses will be submitted to SNC for review and possible permit issuance.

UCPR will provide details to the appropriate agency to allow for their review and to obtain permits where required for forest operations within or immediately adjacent to a watercourse.

B-3.5 Non-Timber Forest Products

Non-timber forest products (NTFP) are any products that are derived from the forest, but do not include the harvest of trees for traditional forestry purposes (e.g. sawlogs, veneer, utility poles, etc.). They include products like maple syrup, mushrooms, medicinal plants, boughs for wreaths, etc. UCPR may undertake or allow for the commercial harvest of non-timber forest products provided it can be done sustainably and does not compromise the ecological integrity of the site. Consultation with the Algonquin and Mohawk communities will occur to determine whether the NTFP is a traditional resource and/or traditional harvest site for those communities.

B-3.6 Forest Certification

Forest certification involves the independent evaluation of forestry practices to a common standard, which can be used to label forest products such as lumber or paper as harvested from a “well managed forest.” The Eastern Ontario Model Forest has evaluated forest certification, or “green labelling” of forest products and the potential costs and benefits for private woodlot owners and “Community Forests.”

The EOMF was certified in 2003 under the Forest Stewardship Council (FSC) and successfully renewed their certificate in 2008. The certificate permits the EOMF to incorporate other Forest Managers under their umbrella certificate. Forest Managers must sign a Memorandum of Understanding with the EOMF and commit to following standard policies and standard operating procedures (EOMF 2007). Forest Managers are included in the annual independent audit and the recertification audit. In 2005, South Nation Conservation became a Forest Manager under EOMF’s FSC certificate.

Through UCPR’s partnership with SNC, the Larose Forest was included under the EOMF FSC certificate in 2006. FSC certification provides UCPR residents with the assurance that their forests are managed to a world-recognized standard. FSC certification also positions the County to benefit from the sale of certified wood should markets develop for FSC certified lumber, poles, paper or firewood. The current market advantage for FSC certified wood involves Fraser Papers in Thurso, Quebec. Fraser Papers will accept wood from forests that are certified to the FSC standard 52 weeks a year, even when they are not accepting wood from other sources.

B-4.0 FOREST UNITS AND SILVICULTURAL TREATMENT OPTIONS: (Streit, 2007)

OMNR defines a forest unit as, “A classification system that aggregates forest stands for management purposes that will normally have similar species composition, will develop in a similar manner (both naturally and in response to silvicultural treatments), and will be managed under the same silvicultural system “ (OMNR 2004).

Silvicultural treatments are designed to emulate the natural disturbance regimes to which the varied forest types have become adapted. Single-tree and group selection emulate mortality of single trees or groups of trees that would normally succumb to age, insects or disease. Shelterwood systems emulate ground fires that clear the understory and cause partial mortality of the overstory, allowing a new, relatively even-aged stand to develop ultimately replacing the original. Clearcutting emulates the larger scale, stand replacing disturbances such as severe wind storms and intense forest fires. Each system has variations to address specific site characteristics and the composition of the tree species involved.

B-4.1 Mid to Late Successional Hardwoods

The UCPR County Forest has a relatively small component (329.8 hectares) of mid to late-successional hardwoods with potential stocking and quality for selection management. The majority of the forests are still relatively young, with 61 to 80 as the dominant age class. Most mid to late successional hardwood forests less than 60 years of age are even-aged. Older stands usually exhibit a two aged or all-aged distribution. These forests are subdivided into lowland hardwood (red maple) and upland tolerant hardwood (sugar maple) forests.

B-4.1.1 Lowland Hardwoods

Typically, most mid to late successional lowland forests are found on imperfectly to poorly drained soils and in ravines, and are dominated by the lowland hardwood species red maple. The soils have low agricultural capability due to drainage problems or steep terrain. Fresh to moist sites typically support a diverse group of tree species including basswood, yellow and white birch, white, green and black ash, black cherry, white elm, bur and red oak, bitternut hickory, white cedar, largetooth aspen, and balsam poplar. Hemlock and white pine are usually only found in ravines or other less-disturbed sites. Pockets of planted white pine and other conifer species may be mixed throughout

the forest, usually on hummocks or small hills.

Many lowland hardwood forests in the UCPR County Forest have their origin in agricultural use, either as pasture or as hay fields. Eventually these sites were abandoned due to drainage problems, allowing pioneering mid-tolerant tree species to become established. The forests in ravines were typically the least disturbed. Higher quality stands have an abundance of single stems which have arisen from seed rather than coppice, and higher stocking. Lower quality stands tend to be dominated by coppice growth, or are of lower stocking. The quality of these poor stands has declined further as a result of the ice storm of 1998.

Most of the existing mid-tolerant species can successfully regenerate on the variety of microsites found within these forests. Red maple is a prolific seed producer that regenerates on most microsites. Green ash, basswood, white elm and white pine become established on soil hummocks and small hills, while yellow birch and hemlock favour rotting wood as a substrate. Small mammals and songbirds transport acorns and hickory nuts which establish under the canopy of mature mixed lowland hardwoods and adjacent plantations.

Silvics (adapted from O.M.N.R.: A Silvicultural Guide To Managing Southern Ontario Forests, and A Silvicultural Guide For the Tolerant Hardwood Forest in Ontario, **Silvics of N.A.** , Silver Maple A Bottomland Hardwood in Ontario (D. McDonald, 2003), and local knowledge)

Silvics of Red Maple

- red maple is a prolific, regular seed producer.
- seedlings can germinate in a wide variety of seedbeds.
- spring seed dispersal and germination allows red maple to take advantage of increased area of suitable microsites in swamps during prolonged droughts.
- red maple can thrive on a wide range of soil types, textures, moisture and pH; it is

found on sites ranging from dry ridges to peat bogs and swamps.

- red maple is a pioneer species that is more shade tolerant and longer lived than the usual early successional species, such as poplar and birch; it can regenerate in disturbed areas such as abandoned fields, plantations, clearcuts, and ice-storm damaged stands.
- on certain wet sites, red maple can maintain itself indefinitely as a climax species.
- red maple seedlings can persist in the understory for several years and respond to release in a variety of sizes of canopy openings.
- while red maple is well known for its prolific sprouting ability, single stems from seedlings are more desirable for producing quality timber.
- red maple is moderately shade tolerant to tolerant; seedlings are more shade tolerant than larger trees.
- red maple responds well to thinning.
- release of suppressed stems often results in the development of epicormic branches.
- on wet sites red maple is shallow rooted, but on dry sites it develops taproots.
- major damaging agents include the Columbian timber beetle (wood quality degrade), windthrow on wet soils, ice and snow damage, internal rot which enters through broken branches or decaying stems of coppice clumps, and deer browsing on seedlings.
- silver and red maple are known to hybridize in nature.

The silvics of the other tree species of the lowland hardwood forest unit are detailed in Silviculture Guides produced by the O.M.N.R..

Long-term Management Objective:

While lowland hardwood species such as red maple, green ash and basswood are of moderate value as sawlogs, the high rate of volume growth on these sites makes sawlog production a sound long-term financial objective. Yields of 1200 to 1500 board feet per acre of sawlogs are typical from light selection thinning of mature mixed lowland

Ms-ash-elm forests. Ash is the preferred lowland hardwood species for firewood, while red maple, birch and poplar are preferred locally for pulpwood.

Management of lowland hardwoods in the UCPR County Forest focuses on fresh to moist sites. The long-term management objectives for these sites are:

- maintain a continuous forest canopy,
- develop or maintain an all-aged forest condition,
- improve the overall timber quality of the stands, with particular emphasis on growing single stems rather than coppice clumps,
- enhance/ restore the components of large trees, white pine and hemlock,
- maintain/ regenerate a diversity of mid-tolerant tree species
- maintain / regenerate a component of minor tree species
- provide protection for significant wildlife habitat and wildlife trees

Management

The majority of lowland hardwood forests are managed using the group selection system. Table 5 summarizes the key parameters for selection management used on the forest. Detailed guidelines for selection management are provided in the Silviculture Guides produced by the O.M.N.R..

Table 5: Silviculture Summary Lowland Mixed Hardwoods (Streit 2008).

Full stocking basal area	30 to 38 m ² / ha			
Desired residual basal area	20 to 26 m ² / ha			
Full stocking crown closure	75-90%			
Desired residual crown closure	60-70%			
Desired Structure DBH cm	10-24	26-36	38-48	50+
BA m ² / ha	5	6	6	5 - 7
Cutting cycle	15 to 20 years			
Group openings	1 to 2 per hectare, ½ to full tree height			

B-4.1.2 Upland Hardwoods

Upland tolerant hardwood forest associations on the UCPR County Forest are uncommon, and are characterized by the shade tolerant tree species sugar maple growing with red maple on moderately well-drained to imperfectly drained soils. There are only 28.1 hectares of sugar maple dominated stands in the UCPR County Forest. Typical associates on drier sites also include beech, black cherry, white ash, and bitternut hickory, while yellow birch, basswood, green ash and white elm are more common on fresh sites. Poplar is a common associate on the more disturbed sites, while hemlock and white pine are typically found on less disturbed sites. Other associates include white birch and red oak.

Advanced regeneration in upland tolerant hardwoods is generally dominated by sugar maple and red maple. Suppressed advanced regeneration of most mid-tolerant species will be present within these stands. Mid-tolerant species may develop into saplings if located within crown openings.

Long-term Management Objective:

Sugar maple is a high value hardwood which is sought after for sawlog production. The rate of volume growth on these sites is less than lowland hardwood forests (typical yields of 800 to 1200 board feet per acre of sawlogs from light selection thinning of mature tolerant hardwoods), but higher average value per board foot makes sawlog production a sound financial objective. Hard maple and beech are also preferred species for firewood and pulpwood.

The long-term management objectives for upland tolerant hardwood forests are:

- maintain a continuous forest canopy,
- develop or maintain an all-aged forest condition,
- improve the overall timber quality of the stands,
- enhance/ restore the components of large trees, white pine and hemlock,
- maintain/ regenerate a diversity of shade tolerant and mid-tolerant tree species
- maintain/ regenerate a component of minor tree species
- provide protection for significant wildlife habitat and wildlife trees

Silvics (adapted from O.M.N.R.: A Silvicultural Guide To Managing Southern Ontario Forests and A Silvicultural Guide For the Tolerant Hardwood Forest in Ontario and local knowledge)

Silvics of Sugar Maple

- sugar maple has regular seed crops; seed production begins at about age 40 to 60 years
- seedlings have a vigorous root radicle which easily penetrates leaf litter
- sugar maple is shade tolerant: early growth can occur in as little as 5% of full sunlight
- older seedlings persist under heavy shade but exhibit slow growth.
- sugar maple responds well to release at nearly all ages

- excessive release of suppressed stems often results in the development of epicormic branches and top decline
- sugar maple is deep rooted and relatively resistant to windthrow
- major damaging agents include a number of trunk and butt infections such as eutypella and nectria canker.

The silvics of the other tree species of the upland tolerant hardwood forest unit are detailed in Silviculture Guides produced by the O.M.N.R..

Management

Upland hardwood forest types are managed using the single tree and group selection system. Table 6 summarizes the key parameters for selection management used on the forest. Detailed guidelines for selection management are provided in the Silviculture Guides produced by the O.M.N.R..

Table 6: Silviculture Summary Upland Tolerant Hardwoods.

Full stocking basal area	26 to 32 m ² / ha			
Desired residual basal area	18 to 20 m ² / ha			
Full stocking crown closure	85-100%			
Desired residual crown closure	65-75%			
Desired Structure DBH cm	10-24	26-36	38-48	50-60
BA m ² / ha	6	6	5	3
Cutting cycle	20 to 25 years			
Group openings	1 to 2 per hectare, ½ to full tree height			

B-4.2 Early Successional Hardwoods

Early successional hardwoods comprise the majority of hardwood forests in the UCPR County Forest. There are early 4,050.7 hectares of early successional hardwoods on the UCPR County Forest. 2,493.4 hectares are classified as intolerant hardwoods, and

1,258.9 hectares are classified as lowland hardwoods. These forests developed after the clearing and drainage of nutrient poor soils for agriculture purposes, which was followed by land abandonment and reclamation by pioneer tree species.

Early successional forests are dominated by disturbance dependant tree species. Intolerant hardwood forests are dominated by poplar and grey and white birch. Lowland hardwood forests are young red maple stands, many of which contain a component of poplar and grey and white birch. Trembling and largetooth aspen dominate the better drained sites, with balsam poplar occurring on imperfectly to poorly drained soils. Stand stocking and quality of these stands is usually low, and has declined further as a result of flooding from beaver dam construction and the ice storm of 1998.

The forest are transitory by nature, and may contain a well-stocked understory of good quality mid-tolerant and shade tolerant tree species. Regeneration is usually dominated by red maple, although most other hardwood species can be found in the understory if seed source is available. Substantial quantities of aspen suckers developed after the ice storm: they continue to thrive in open stands, but most have died off in the better stocked stands.

The dominant age classes are 41-60 and 61-80. Most early successional forests were even-aged, but the ice storm of 1998 has created some two-aged forests.

Long-term Management Objective:

Most of these forests have limited merchantable volume and at best a few low – value sawlogs. Wet sites create further operability limitations. The long-term management objective is to allow continued natural succession until the forests reach a point of commercial merchantability. This point is not anticipated to occur for most stands in this forest unit during the term of this management plan.

Management:

Active forest management is generally a low priority for these forests at this time, and no allowable harvest has been calculated. If stands are encountered with sufficient volume to warrant a harvest cut, silvicultural options include thinning of red maple dominated stands (if stand stocking and quality are sufficient), or patch clearcutting of red maple-poplar-birch stands.

Management knowledge of poorly drained maple swamps is limited, although thinning of younger stands has been shown to be effective. Larger scale cutting has typically been approached with caution by forest managers because of the potential for wholesale changes in the water table and subsequent flooding, and potential for windthrow of shallow rooted trees species. Partial cutting is also critical in controlling the dense shrub and herb competition present on some rich lowland sites. In acidic peat bogs, thinning of lowland red maple has been shown to increase natural recruitment of yellow birch seedlings.

B-4.3 Other Conifers

Other Conifers is the smallest conifer forest unit on the UCPR County Forest and the only conifer forest unit dominated by natural stands. There are 111.4 hectares of other conifer forests on the County Forest. The history of these forests is not significantly different from that of the hardwood forests. These forests typically developed after clearcutting or the clearing of nutrient poor soils for agriculture purposes, which was followed by land abandonment and reclamation by a mix of pioneer conifer and hardwood tree species. The wettest sites typically experienced the lowest levels of agricultural disturbance. Although imperfect to poorly drained soils are the most common, upland Other Conifer forests may also occur. Most Other Conifer forests are in the 41 to 60 year age class.

The forest is dominated by tamarack, with lesser components of white cedar, balsam fir and white spruce and common hardwood associates including red maple, poplar, white and grey birch, green and black ash, and white elm. Black spruce may form a component of the forest on acidic bog sites. Trembling and largetooth aspen dominate the better drained sites, with balsam poplar occurring on imperfectly to poorly drained soils. Sugar maple, basswood and other upland hardwoods can form a component of upland cedar stands. Stand stocking and quality of these stands is typically low and has declined further as a result of flooding from beaver dam construction and the ice storm of 1998.

Lowland conifer forests form a late successional tree species association. Few tree species besides white cedar, black ash, red maple, white and black spruce, balsam fir and tamarack can survive in these wet, nutrient poor sites. Most trees are small, but larger specimens may be found areas in transition to more upland sites. Red maple, black ash and balsam fir tend to be the most common species regenerating in the understory of lowland conifer stands.

Most other conifer forests are even-aged, but the ice storm of 1998 has created more two-aged forests by causing severe breakage on cedar stems.

Long-term Management Objective

Most of these forests have limited merchantable volume and at best a few low – value sawlogs. Wet sites create further operability limitations. Cedar does have the potential for producing a range of forest products. Larger trees can produce sawlogs, while smaller trees are used for posts and pickets. However, cedar is uncommon in the forest, and provides important winter cover for wildlife where it occurs.

The long-term management objective is to allow continued natural succession until the forests reach a point of commercial merchantability. This point is not anticipated to occur for most stands in this forest unit during the term of this management plan.

Regeneration objectives are to manage succession towards a mixture of conifer patches for wildlife cover interspersed with hardwood tree species.

Management

Active forest management is generally a low priority for these forests at this time and no allowable harvest has been calculated. If stands are encountered with sufficient volume to warrant a harvest cut, even-aged thinning of younger stands and patch-clearcutting of older stands can be applied.

B-4.4 White Spruce

There are 2,519.7 hectares of white spruce stands on the UCPR County Forest. Most of the forests are plantations, with only a few natural stands dominated by white spruce. The plantations are predominantly in the 21 to 40 and 41 to 60 year age classes, although there are significant areas classed as barren and scattered. White spruce plantations have typically been planted on imperfectly to poorly drained soils.

Most white spruce plantations on the UCPR County Forest are mixed species plantations (white and red pine, tamarack) although pure white spruce plantations also exist. Many spruce plantations are poorly stocked because they have been planted on poorly drained, nutrient deficient soils. Mortality from spruce budworm and root rot compounds the problem. Red maple, poplar, white and grey birch and elm are common associates under these conditions. Pure spruce plantations on well to moderately well drained soils tend to be better stocked and in good condition. Dense crown closures in these plantations generally limit the development of advanced regeneration, although red maple and spruce regeneration will develop in areas of crown opening.

White spruce has commonly been planted as a mixture with white pine and/ or red pine. Unless these other species represent a minor component of the stand (<20%), the slower-growing white spruce is often out-competed by the faster growing pine species

and declines and dies before reaching commercial size. When white spruce is planted with tamarack, both species typically co-exist. White spruce has dominated over cedar in a mixed plantation at the south end of compartment 159.

SILVICS (adapted from OMNR 1998b and local knowledge)

- White spruce is a very adaptable species that can grow under a wide range of climatic, soil and moisture conditions.
- Large cone crops do not begin until trees are 30 years of age, with good seed crops produced every 2 to 6 years.
- White spruce will germinate on a variety of seedbeds.
- Seedlings will not survive in less than 15% full sunlight.
- White spruce is intermediate in shade tolerance and persists under the shade of broadleaf competition.
- White spruce seedling and sapling growth rate is generally slow.
- White spruce responds well to release, provided that trees contain at least a 1/3 live crown ratio.
- Individual tree crown dominance is strongly expressed in white spruce plantations, resulting in self-thinning and subsequent mortality of suppressed trees.
- White spruce is a shallow-rooted species which is susceptible to windthrow.
- The most common damaging agents of white spruce are drainage problems, spruce budworm and various root and butt rots.

Long-term Management Objective

White spruce is used to produce commercial dimension lumber and newsprint. Demand for plantation white spruce has increased as the supply has decreased from traditional sources both in Ontario and Quebec.

The long-term management objective for white spruce plantations is to regenerate

mixed conifer (spruce, white pine, cedar, tamarack) and hardwood (red maple-beech-cherry) forests.

Management

Commercial first thinning in white spruce dominated plantations typically requires a minimum average diameter of around 20 centimeters and a minimum basal area of 38 m²/ha. This is rarely reached before plantations are 35 years old on moderately drained sites and 40+ years old on imperfectly drained sites.

The wide range in diameters of the trees usually makes a first selection thinning uneconomical. Typically first thinning is a row thinning removing every third row to establish access. Subsequent thinnings are selective, using the previously harvested rows for access. Basal area stocking guides for thinning white spruce plantations are provided in Table 7. For a particular stand, the prescription for residual basal area should typically fall between the SDI target and a 1/3 basal area removal. The associated stand density indices are found in Appendix 3.

Table 7: White Spruce Plantations

DBH		SDI Fully Stocked		SDI Target Residual BA			Minimum Residual BA (33% Removal)	
cm	Inches	m ² /ha	ft ² /acre	m ² /ha	ft ² /acre	% Removal	m ² /ha	ft ² /acre
15	6	34.3	149	25.1	109	27%	22.8	100
17.5	7	36.7	160	26.4	115	28%	24.4	106
20	8	39.3	171	28.3	123	28%	26.2	114
22.5	9	40.7	177	29.8	130	27%	27.1	118
25	10	42.9	187	31.2	136	27%	28.6	124
27.5	11	43.6	190	32.7	142	25%	29.0	126

DBH		SDI Fully Stocked		SDI Target Residual BA			Minimum Residual BA (33% Removal)	
30	12	45.9	200	33.9	148	26%	30.6	133

Source: OMNR 2001 (Draft)

Live crown ratio is usually 30 to 50% at the time of first thinning, with large amounts of dead limbs persisting on the tree boles. However, pruning is not economically justified for white spruce plantations which have been managed within the SDI stocking range.

Harvest Cuts

There are no harvest cuts anticipated in the next 20 years in white spruce due to the young age and slow growth rate of the plantations. Harvest of severely declining spruce plantations may be considered.

B-4.5 White Pine

There are 899.0 hectares of white pine stands on the UCPR County Forest. Most of the forests are plantations, predominantly in the 41 to 60 year age class. White pine plantations are typically planted on moderately well drained soils.

White pine is rarely planted as pure species plantations on the UCPR County Forest; usually tree species have been carefully matched to site. Typically white pine has been planted on moderately well drained soils, with red pine planted on sand hills and white spruce and tamarack planted on lower sites. Regeneration is sparse in young, well-stocked white pine plantations, but red maple, white pine and to a lesser extent red oak regeneration develops quickly after stands have undergone a first thinning. If the seed source is available, white pine regeneration is typically abundant on sand hills.

Managers of Agreement Forests in eastern Ontario experimented with a variety of methods of implementing mixed species white pine plantations. The primary objectives

were to minimize the impacts of white pine weevil and to match tree species to varying microsites. The primary methods were:

- Alternating rows of white pine with rows of red pine, white spruce and/ or tamarack/ larch
- Alternating one row of white pine with multiple rows of white spruce and/ or tamarack/ larch
- A planting bag mix of white pine with red pine, white spruce, Norway spruce, Scots pine, jack pine or tamarack/ larch.

These plantations may also have been refilled with a variety of conifer species and may also contain naturally regenerated pioneer species such as red maple, poplar, white and grey birch. Rows are sometimes difficult to identify.

On well drained soils, red pine, larch and Norway spruce tend to dominate the upper canopy, with white pine in the codominant-intermediate canopy and white spruce suppressed or dead. Jack pine mixtures are limited to shallow, rocky soils. Most of the jack pine in mixed species plantations is of very poor form and quality, a situation which has worsened substantially since the ice storm in January 1998. On moister soils, white pine can eventually out-compete most species.

Alternate row mixtures of white pine and tamarack on imperfectly drained soils have been shown to produce white pine of high quality due to the nurse crop effect of the tamarack. Early in the plantation's life tamarack assumes a dominant crown position, providing shade and protection to the white pine. Eventually the white pine surpasses the tamarack in height, creating a self-thinning by overtopping the shade-intolerant tamarack. In pockets of poor drainage, the tamarack tends to retain its dominant crown position.

SILVICS (adapted from OMNR 1998b and local knowledge)

- White pine grows under a wide variety of soil and moisture conditions. While typically associated with well-drained sandy or shallow soils, large white pine can also be found growing on hummocks in swamps.
- Although cone production can begin as early as 15 years of age, optimal seed crops occur after 50 years.
- Moist mineral soil, mineral soil and humus mixtures and moist organic seedbeds are suitable for germination.
- White pine seedlings can establish under 20 to 25% of full sunlight.
- White pine is intermediate in shade tolerance: leader growth increases with light intensity up to approximately 45 to 55 per cent of full sunlight.
- Young white pine seedlings are slow growing for their first five years and are adversely affected by competition from understory brush and hardwood species.
- White pine response to release is best if the tree is not overly suppressed and has at least a 1/3 live crown ratio.
- Individual tree crown dominance is moderately expressed in white pine plantations, resulting in self-thinning and subsequent mortality of suppressed trees.
- White pine is usually a deep rooted species which is relatively windfirm.
- The most common damaging agents of white pine are white pine weevil, white pine blister rust and ice and snow damage.

Long-term Management Objective

White pine is used to produce lumber used for furniture, cabinets and mouldings, boltwood and as a minor component of the furnish for fine papers. Demand for plantation white pine has been limited by the quality problems associated with white pine weevil and blister rust.

The long-term management objective for white pine plantations is to regenerate white pine forests, although regeneration of a variety of associated species (red pine, white spruce, red maple, beech, red oak, and black cherry) is also expected.

Management

The primary limitation on commercial first thinning in white pine plantations is short merchantable height because of white pine weevil damage and/ or site limitations. Fortunately, most white pine plantations had pre-commercial sanitation cuts and pruning operations applied by the OMNR in the 1980s and 1990s. This has allowed the stands to develop to an average diameter where commercial thinning can now commence.

Where average merchantable height exceeds 8 meters, first thinning can be carried out when the stand reaches an average diameter of 20 centimeters and a basal area of 35 m²/ha. This is usually reached when plantations are 35 to 40 years of age. Typically first thinning is a row thinning removing every fourth to fifth row to establish access, with selection thinning within the remaining rows. Full row removal is preferred. Jogs in the row to avoid areas of high quality timber are acceptable provided they are limited; repeated short jogs in rows create problems for machine operators and may reduce the ability to market the thinnings.

Subsequent thinnings are selective, using the previously harvested rows for access. Basal area stocking guides for thinning white pine plantations are provided in Tables 8 and 9. For a particular stand, the prescription for residual basal area should typically fall between the SDI target and a 1/3 basal area removal. The associated stand density indices are found in Appendix 3.

Two sources have been used for basal area stocking guides for white pine. At average diameters of 25 cm (10 inches) and up, the OMNR targets (Table 9) have been field assessed and are appropriate. For stands with average DBH of less than 25 cm, OMNR guidelines for residual basal area suggest thinning white pine plantations to a level that

is lower than recommended by local managers. For these younger stands, thinning guidelines will also consider the more conservative targets as provided by the USDA (Table 8). A residual basal of 26 m²/ ha (115 ft/ acre) is considered a minimum for a first thinning in any commercial white pine plantation.

The nature of mixed species plantations must be considered in determining the timing of first thinning. Where the white pine forms an intermediate canopy under red pine, larch, or Norway spruce, timing of thinning is most affected by the size and stocking of the dominant species. Where white pine has achieved dominance over white spruce or tamarack/larch, the first thinning is usually accomplished through natural mortality of these species and thinning can be deferred until the white pine achieves the full stocking level, often at age 50 or later.

Live crown ratio is usually 30 to 50% at the time of first thinning. While some self pruning will have occurred, most plantations on better sites have been manually pruned to increase the lumber yield and to reduce the incidence of blister rust infections.

Table 8: White Pine (Less than 22.5 cm average diameter)

DBH		Fully Stocked		Target Residual BA			Minimum Residual BA (33% Removal)	
cm	Inches	m ² /ha	ft ² /acre	m ² /ha	ft ² /acre	% Removal	m ² /ha	ft ² /acre
15.2	6	33.3	145	20.9	91	37%	22.2	97
17.8	7	35.6	155	24.1	105	32%	23.7	103
20.3	8	39.0	170	27.9	121	29%	26.0	113
22.9	9	41.3	180	29.0	126	30%	27.5	120
25.4	10	43.6	190	32.1	140	26%	29.0	127
30.5	12	48.2	210	36.4	159	24%	32.1	140
35.6	14	50.5	220	38.7	169	23%	33.6	147
40.6	16	52.8	230	39.8	174	25%	35.2	153
45.7	18	55.1	240	42.2	184	23%	36.7	160

Source: Wisconsin Extension (1996)

Table 9: White Pine Plantations (25 cm and up average diameter)

DBH		SDI Fully Stocked		SDI Target Residual BA			Minimum Residual BA (33% Removal)	
cm	Inches	m ² / Ha	ft ² /acre	m ² /ha	ft ² /acre	% Removal	m ² /ha	ft ² /acre
15	6	24.7	108	18.5	81	25%	16.5	72
17.5	7	27.6	120	20.4	89	26%	18.4	80
20	8	30.8	134	22.6	98	27%	20.5	89
22.5	9	33.0	144	23.8	104	28%	22.0	96
25	10	35.6	155	25.8	112	28%	23.7	103
27.5	11	37.4	163	27.6	120	26%	24.9	109
30	12	40.6	177	29.0	126	29%	27.0	118
35	14	44.2	193	31.7	138	28%	29.4	128
40	16	47.7	208	35.2	153	26%	31.8	138
45	18	50.9	222	37.4	163	27%	33.9	148

Source: OMNR (1997)

Harvest Cuts

Harvest cuts differ from thinning operations in that management is primarily focused on the biological needs of the regeneration, rather than the mature trees. Harvest cuts will be scheduled in mature white pine plantations, in stands with limited potential for future quality development, or in stands with dense advanced regeneration of white and/ or red pine. Harvest cutting and regeneration of white pine, and to a lesser extent red pine is a priority to address the growing gap in age class structure of the forest.

Harvest cuts in white pine plantations will be consistent with OMNR Silviculture Guidelines. Typically, a three-cut uniform shelterwood system (seeding, release and final removal cuts) is planned. Deferral of the final removal cut may be considered to preserve aesthetic values.

Natural white pine, red pine and red oak regeneration is preferred, but under-planting will also be required to supplement natural regeneration. Manual or chemical tending will be scheduled as required to control competition.

Many plantations which have already been thinned multiple times, or which were damaged by the ice storm, have a dense understory of red maple regeneration. Pine and oak regeneration options for these stands are limited, but may be attempted if the site is poorly adapted for hardwood growth. Under-planting will usually focus on sand hills within the plantations where the lowest levels of hardwood competition exist. In stands where hard maple or other tolerant hardwood species are regenerating (e.g. Bd, By, Cb, etc.) these species will be encouraged.

B-4.7 Red Pine

There are 1,524.5 hectares of red pine plantations on the UCPR County Forest. Most are in the 41 to 60 and 61 to 80 year age classes. Red pine plantations are typically planted on well drained sandy soils.

Most red pine plantations on the UCPR County Forest are pure red pine or red pine-white pine mixtures and have been thinned previously. Although these plantations are generally well stocked and in good condition, their stocking and quality was reduced by the ice storm of 1998. Regeneration is sparse in young, well-stocked red pine plantations, but mixed hardwood (primarily red maple) and white pine (where suitable seed source and site exist) regeneration develop quickly after stands have undergone a first thinning. The highest concentrations of white and red pine natural regeneration occur on dry sand hills. Ice-damaged pockets in the plantations typically contain dense red maple saplings.

Red pine has also been planted as a mixture with white pine, jack pine, Scots pine and/or white spruce. In most instances red pine eventually outgrows the other conifer species and forms the dominant canopy. Red pine plantations may also contain

naturally regenerated pioneer species such as poplar, red maple, elm, green ash, white and grey birch.

SILVICS (adapted from OMNR 1998b and local knowledge)

- Red pine typically grows on dry, sandy, acidic sites with low fertility.
- Red pine planted on calcareous soils typically start dying back after 30 years.
- Cone production begins at 15 to 25 years of age for open grown red pine and 50 to 60 years for red pine in closed stands.
- The infrequency and irregularity of red pine seed crops are limiting factors affecting natural red pine regeneration.
- Moist mineral soil or mineral soil with a sparse covering of organic materials and partial shade provide conditions suitable for germination.
- Red pine seedlings require at least 35% of full sunlight for successful establishment.
- Shade tolerance of red pine seedlings decreases with age: maximum seedling height growth will occur at 45 per cent of full sunlight until 5 years of age, but older seedlings prefer 65 to 100% of full sunlight.
- Red pine seedlings are adversely affected by competition from understory brush and hardwood species.
- Red pine response to release is best if the tree is not overly suppressed and has at least a 1/3 live crown ratio.
- Individual tree crown dominance is poorly expressed in red pine plantations, resulting in stagnation of dense stands.
- Red pine is usually a deep rooted species which is relatively windfirm.
- The most common damaging agents of red pine are ice and snow damage and root rots.

Long-term Management Objective

Red pine has become a sought-after species to produce utility poles, sawlogs and boltwood and as a minor component of the furnish for fine papers. Demand for plantation red pine thinnings significantly increased in the mid 1990s with the development of boltwood markets.

The long-term management objective for red pine plantations is to regenerate mixed pine (primarily white pine with a red pine component) and hardwood (hard and soft maple, elm, beech, cherry) forests. Some openings created by ice storm damage have also been planted with pine, spruce or red oak.

Management

First thinnings in red pine can be carried out when the stand reaches an average diameter of 18 centimeters and a basal area of 40 m²/ha. This is usually reached once plantations reach 25 years of age.

Typically first thinning is a row thinning removing every fourth to fifth row to establish access, with selection thinning within the remaining rows. Many older plantations have had every 2nd or 3rd row removed during the first thinning. Full row removal is preferred. Jogs in the row to avoid areas of high quality timber are acceptable provided they are limited; repeated short jogs in rows create problems for machine operators and may reduce the ability to market the thinnings.

Subsequent thinnings are selective, using the previously harvested rows for access. Basal area stocking guides for thinning red pine plantations are provided in Table 10. For a particular stand, the prescription for residual basal area should typically fall between the SDI target and a 1/3 basal area removal. The associated stand density indices are found in Appendix 3. Live crown ratio is usually 25 to 40% at the time of first thinning. Red pine has excellent self-pruning properties in well-stocked stands.

Table 10: Red Pine Plantations

DBH		SDI Fully Stocked		SDI Target Residual BA			Minimum Residual BA (33% Removal)	
cm	Inches	m ² /ha	ft ² /acre	m ² /ha	ft ² /acre	% Removal	m ² /ha	ft ² /acre
15	6	37.1	162	28.3	123	24%	24.7	108
17.5	7	38.5	168	30.1	131	22%	25.6	112
20	8	40.8	178	31.4	137	23%	27.2	118
22.5	9	42.1	183	31.8	139	24%	28.0	122
25	10	44.2	193	33.4	145	24%	29.4	128
27.5	11	44.5	194	34.4	150	23%	29.6	129
30	12	45.9	200	34.6	151	25%	30.6	133
35	14	47.1	205	36.5	159	23%	31.4	137
40	16	48.4	211	37.7	164	22%	32.2	140

Source: OMNR 1997.

Harvest Cuts

Harvest cuts differ from thinning operations in that management is primarily focused on the biological needs of the regeneration, rather than the mature trees. Harvest cuts will be scheduled in mature red pine plantations, in stands with limited potential for future quality development, or in stands with dense advanced regeneration of white and/ or red pine. Harvest cutting and regeneration of white pine, and to a lesser extent red pine is a priority to address the growing gap in age class structure of the forest.

Harvest cuts in red pine plantations will be consistent with OMNR Silviculture Guidelines. Typically, a three-cut uniform shelterwood system (seeding, release and final removal cuts) is planned. Deferral of the final removal cut may be considered to preserve aesthetic values. Group selection may be employed where the potential for hardwood competition is deemed to be minimal and in areas where initial stocking and/or quality are not conducive for the uniform shelterwood system (i.e. areas with extensive ice storm damage).

Natural white pine, red pine and red oak regeneration is preferred, but under-planting will also be required to supplement natural regeneration. Manual or chemical tending will be scheduled as required to control competition.

Many plantations which have already been thinned multiple times, or which were damaged by the ice storm, have a dense understory of red maple regeneration. Pine and oak regeneration options for these stands are limited, but may be attempted if the site is poorly adapted for hardwood growth. Under-planting will usually focus on sand hills within the plantations where the lowest levels of hardwood competition exist. In stands where sugar maple or other tolerant hardwood species are regenerating (e.g. Bd, By) these species will be encouraged.

B-4.8 Other Conifer Plantations

There are 258.5 hectares of other conifer plantations on the UCPR County Forest. These include plantations dominated by larch/ tamarack (168.9 ha), red spruce (37.3 ha), jack pine (21.6 ha), Scots pine (20.5 ha), black spruce (3.4 ha), and Norway spruce (6.8 ha). The plantations are predominantly in the 41 to 60 and 61 to 80 year age classes, and are typically small and often are associated with other planted conifer species. They may also contain naturally regenerated pioneer species such as poplar, red maple, elm, white and grey birch. Ice storm damage was severe in the Scots and jack pine plantations.

Long-term Management Objective

The long-term management objective for other conifer plantations is to regenerate mixed conifer and hardwood forests. Jack pine, Scots pine and Japanese larch are considered as transition species which are growing outside their range in the forest and there are no plans to regenerate these species. Renewal of selected stands in the Norway spruce and European larch working groups is considered desirable for scientific and seed production purposes, provided that the stands remain non-invasive. Red

spruce, black spruce and tamarack are native species adapted to growth in eastern Ontario and will be considered as permanent working groups on suitable sites.

Management

Specific prescriptions for these plantations are developed as they are encountered, using available silviculture guidelines. Other conifer species plantations with a substantial component of red pine, white pine or white spruce generally follow the management guidelines for these species.

B-4.9 Mixed Conifer Plantations (“Larose Mix”)

Plantations of a particular forest unit may be found to contain different conifer species planted in blocks within the same stand. For instance, a red pine forest unit plantation may contain sand hills with pure red pine, side hills with pure white pine, and a mixture of white pine-white spruce-tamarack in the lower areas. A component of native hardwood species, primarily red maple and poplar is also typical within these stands. Presumably these plantations were established to match the species to varying soil and moisture regimes, although stock availability and plantation refilling were also factors. Management prescriptions for these plantations will vary to suit the dominant species of the particular block. Tree markers use their knowledge of species and site to adapt their marking to reflect these changing stand conditions.

B-4.10 Plantation Management

Forest Certification Standards for the Great Lakes / St. Lawrence Forest Region (FSC 2007) provides the following definition:

“...plantations are defined as forest areas that are established primarily for timber production purposes, are not managed to provide other values or amenities on the

planted sites, and some or all of the following characteristics are maintained in a highly altered state or eliminated:

- a. tree species diversity;
- b. stand diversity;
- c. stand structure;
- d. early successional habitats;
- e. mature and old trees; and/or
- f. coarse woody debris.”

The long-term management objective for the majority of the plantations is to promote natural regeneration of species that are well suited to the site to allow for a gradual transition to a more natural state. In some instances, tree planting may occur in areas with the objective to augment natural regeneration in a natural stand or to promote the transition from intensively managed plantations to a more natural state. Intensive plantation management strategies will not be applied to the new plantation. These stands are not considered plantations as they are defined in Forest Certification Standards for the Great Lakes / St. Lawrence Forest Region (FSC 2007).

In accordance with the FSC standard, intensively managed plantations may occur according to the following:

- the plantation is created as a result of a land use change from a non-forest use (e.g. agricultural field, aggregate extraction site, etc.),
- natural forest that is converted to plantation
- existing plantations at the time of certification

Conversion of natural forest shall not exceed 5% of the forested landbase and may not occur on high conservation value forest. The forest manager must demonstrate that the establishment of a new plantation will provide conservation benefits across the landscape (e.g. reduced harvest pressure in sensitive areas). Typically, conversion will

be limited to natural forest that is dominated by pioneer tree and/or shrub species that are poorly adapted to the site being considered. Candidate sites will generally be in an advanced stage of decline (not old growth) and/or void of adequately stocked natural regeneration of species that is well adapted to the site. The species selected to be planted must be ecologically appropriate and must not compromise the objectives and targets described in the Forest Policy Plan (Section A).

Some existing plantations will continue to be subject to intensive plantation management. Typically, these plantations will be those that are likely to have the greatest economic benefit from intensive plantation management, thus relieving pressure on other values in the UCPR Forest. New plantations may be considered to replace over-mature plantations or severely declining plantations that are lacking desirable regeneration.

The total combined area of conversion of natural forest and existing plantations shall not exceed 10% of the forested landbase.

B-5.0 NATURAL AND CULTURAL HERITAGE VALUES

The County Forest provides numerous benefits that contribute to the environmental, economic and social well-being of the United Counties of Prescott and Russell (e.g. streams, wildlife, recreation trails, Grant Settlement, etc.). These values are given special consideration when planning and implementing forestry operations.

The UCPR Official Plan (2006) introduced policies that direct land-use within UCPR. Section 5 addresses the preservation and enhancement of natural heritage features such as wetlands, woodlands and wildlife habitat. The UCPR Official Plan identifies natural heritage features within UCPR that are significant to the province and/or the Counties and it outlines general and landform specific land-use policies to ensure the identified natural heritage features are “conserved and protected from the negative impacts of development.”

In 2006, UCPR commissioned Horizon Multiresource Inc. to analyze the state of Larose Forest to balance current and future development with the conservation of the environmental, social and economic benefits the forest provides. The result was the Protection and Development Plan of Larose Forest (2008), which provided a description of the physical and environmental features, an analysis of the benefits the forest currently provides and recommendations for sustainable development of the Larose Forest.

Values were defined at the onset of forest management planning by the County Lands Advisory Committee based on provincial guidelines, the UCPR Official Plan, the Protection and Development Plan of Larose Forest and public consultation. The 20 Management Plan and all forest management activities on the UCPR County Forest shall conform to the land-use policies presented in the UCPR Official Plan.

B-5.1 Operational Prescriptions for Areas of Concern

UCPR recognizes that the forest management activities that occur on the County Forest have the potential to negatively impact the multiple benefits that the Forest provides. An area of concern (AOC) is a term used to identify an area that requires special consideration when planning forestry operations, including road building in order to mitigate the potential negative impacts on an identified value. Operational prescriptions for areas of concern may include a reserve, where no activities are carried out, and/or a modified area, where forestry activities are modified to protect the value. Each prescription provides site specific direction for each value to be protected. Landscape-level targets have been described in the Protection and Development Plan of Larose Forest.

The operational prescriptions for areas of concern (Table 12) for this 20 Year Management Plan have been developed based on OMNR forest management guides, operational prescriptions for AOC's on Crown land in the Great Lakes – St. Lawrence

forest region, the EOMF Forest Certification Policies and Procedures Manual, the UCPR Official Plan and the Protection and Development Plan of Larose Forest. These guidelines will continue to evolve to reflect the best available science. UCPR may grant permission for activities within AOC's as outlined in Table 12.

Generally, values are identified in the field well in advance of forest operations and areas of concern are marked in the field with flagging tape or paint. However, values are sometimes discovered during operations (e.g. newly constructed stick nest). In these situations, operations will be suspended in the vicinity, UCPR forestry staff will be notified immediately and the appropriate area of concern will be applied prior to resuming operations.

Table 12. Operational prescriptions for areas of concern (AOC) to protect natural and cultural heritage values. These prescriptions have been developed to meet or exceed the standards presented in EOMF Forest Certification Policies and Procedures Manual (SOP 1.5).

VALUE	RESERVE	MODIFIED MANAGEMENT AREA		ROADS
	DIMENSION	DIMENSION	CONDITIONS	
Cold Water Streams	Slope dependant no harvest reserve 0-15% = 30 m 16-30% = 50 m 31-45% = 70 m >45% = 90 m			<ul style="list-style-type: none"> - Roads and landings should avoid the AOC wherever possible. Roads and landings may be permitted within the AOC when there are no other feasible options. - Stream crossings require the appropriate permits. - For approved crossings, the cleared Right of Way (ROW) width should not exceed 10 m. - No culvert installation between Oct 1 and June 30 unless risk to fish populations can be prevented or mitigated.
Warm and Cool Water Streams	Minimum reserve of 15m from the normal high water mark. No harvest reserve on all steep slopes.	Slope dependent MMA 0-15% = 15 m 16-30% = 35 m 31-45% = 55 m > 45% = 75 m	<ul style="list-style-type: none"> - 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. 	<ul style="list-style-type: none"> - Roads and landings should avoid the AOC wherever possible. Roads and landings may be permitted within the AOC when there are no other feasible options. - Stream crossings require the appropriate permits. - For approved crossings, the cleared Right of Way (ROW) width should not exceed 10 m. - No culvert installation between April 1 and June 30 unless risk to fish populations can be prevented or mitigated.
Intermittent Watercourses, Moderate to deep ditches (> 1.0 meter depth). May be intermittent or permanent drains or natural watercourses.	Reserve of 5m from bank edge.	15 meters from water's edge.	<ul style="list-style-type: none"> - 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. 	<ul style="list-style-type: none"> - Roads and landings should avoid the AOC wherever possible. Roads and landings may be permitted within the AOC when there are no other feasible options. - Stream crossings require the 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.

VALUE	RESERVE	MODIFIED MANAGEMENT AREA		ROADS
	DIMENSION	DIMENSION	CONDITIONS	
Intermittent Drainage Ditches Shallow (< 1.0 meter 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 and Locally Significant Wetlands (including those that are identified as ANSI's)	No reserve	120 meters from the boundary of the wetland for PSW 15 meters from the boundary of the wetland for LSW	- Silvicultural prescriptions within the swamp will favour maintenance of partial canopy closure to favour shade tolerant plant communities and maintain water-table levels. - Focus on the maintenance of wildlife and biodiversity values (den trees, nest sites, downed woody debris, etc.) - Heavy equipment traffic restricted to frozen ground conditions within 15 meters of the swamp.	- Roads and landings should be avoided within 15 meters of the wetland wherever possible. Roads and landings may be permitted within 15 meters when there are no other feasible options.
Non-treed Wetlands (> 2 Ha)	No reserve	15 meters 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, etc). - Heavy equipment traffic restricted to frozen ground conditions within 15 meters of wetland.	- Roads and landings should avoid the AOC wherever possible. Roads and landings may be permitted within the AOC when there are no other feasible options.
Treed Wetlands	No reserve	No specific AOC	Operate with sound forest management practices. If excessive site damage is anticipated, the area should be restricted from operations.	

VALUE	RESERVE	MODIFIED MANAGEMENT AREA		ROADS
	DIMENSION	DIMENSION	CONDITIONS	
Known Cultural Heritage Value (First Nations)	Dimension of reserve to be determined by Forest Manager in consultation with the chiefs of the Algonquin and Mohawk First Nations communities, or their designate. Objective is to maintain site integrity.			-Not permitted.
Known Cultural Heritage Value (old foundations and wells)	No reserve	No specific AOC	Forest operations will be conducted such that the site is not altered from its current condition (i.e. no tree cutting, no skid trails)	- Not Permitted
Known Cultural Heritage Value (Other)	Dimension of reserve to be determined by Forest Manager in consultation with local historical representative and the Ontario Ministry of Culture (if required). Objective is to maintain site integrity.			- Not Permitted
UCPR Designated Recreation Trails	No reserve	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.	<ul style="list-style-type: none"> - 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. - The use of trails for hauling and occasional skidding is permitted as long as the trail is kept free of logging debris and left in a condition consistent with its intended use.

VALUE	RESERVE	MODIFIED MANAGEMENT AREA		ROADS
	DIMENSION	DIMENSION	CONDITIONS	
Active Northern Goshawk Nest	Circular, 50 meter radius around nest tree	Circular: 100 m radius from the reserve edge.	- No operations from March 1 to July 31. - Maintain residual crown closure of 70%.	- Avoid locating roads and landings in the AOC. - For roads that must be located 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 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.
Inactive or Satellite Northern Goshawk Nest	Circular, 20 meter radius around nest tree			- Avoid locating roads and landings in the AOC. - For roads that must be located within the AOC, the cleared Right of Way (ROW) width should not exceed 10m.
Active Red Shouldered Hawk / Cooper's Hawk Nest	Circular, 150 meter radius, or an irregular shaped reserve of 7 ha encompassing suitable habitat around the nest tree.	Circular: 150 m radius from the reserve edge or an irregular shaped modified area of 21 ha encompassing suitable nesting habitat and satellite nests.	- No operations from March 1 to July 31. - Maintain residual crown closure of 70%.	- Avoid locating roads and landings in the AOC. - For roads that must be located 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 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.
Inactive or Satellite Red Shouldered Hawk / Cooper's Hawk Nest	Circular, 20 meter radius around the nest tree	No MMA		- Avoid locating roads and landings in the AOC. - For roads that must be located within the AOC, the cleared Right of Way (ROW) width should not exceed 10m.
Active Common Raptor Nests (red-tailed, broadwing, sharp-shinned, etc.) and Active Owl Nests	Circular, 20 meter radius around the nest tree	Circular, 130 m radius from the reserve on active nests.	- No operations from March 1 to July 31 for active nests.	- 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.

VALUE	RESERVE DIMENSION	MODIFIED MANAGEMENT AREA		ROADS
		DIMENSION	CONDITIONS	
Inactive Common Raptor Nests (red-tailed, broadwing, sharp-shinned, etc.), nests where the species cannot be identified and Owl Nests	No reserve for inactive nests, but nest tree should be retained	Tree height	- Maintain residual crown closure of 70% within a tree length radius of inactive nests.	- Avoid locating roads within the modified management areas, or where the removal of the nest tree would be required. - Roads may be permitted when there are no other feasible options.
Active Heron Colony or Nest	Circular, 150 m radius from the edge of active colonies. Reserve must include a minimum 30m of live forest.	Circular: 150 m radius from the reserve edge.	- No operations from April 1 to August 15. - Shelterwood or selection harvest permitted.	- Avoid locating roads and landings in the AOC. - For roads that must be located 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 of 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.
Inactive Heron Colony or Nest	20 meter reserve from edge of colony.			- Avoid locating roads and landings in the AOC. - For roads that must be located within the AOC, the cleared Right of Way (ROW) width should not exceed 10m.
Active Osprey Nest	Circular, 150 m radius around the nest tree. Reserve must include a minimum 30m of live forest.	Circular: 150 m radius from the reserve edge.	- No operations from March 1 to July 31. - Shelterwood or selection permitted. - Retain at least 3 supercanopy trees within the MMA. - On osprey lakes, retain 1 supercanopy tree per 650 m of shoreline.	- Avoid locating roads and landings in the AOC. - For roads that must be located 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 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.
Inactive Osprey Nest	Circular, 50 meter radius around the nest tree.			- Avoid locating roads and landings in the AOC. - For roads that must be located within the AOC, the cleared Right of Way (ROW) width should not exceed 10m.
Stick nest in very poor condition or in a dead tree (except osprey or heron nests)	No reserve	No specific AOC	- Protect the nest tree where practical	- Avoid locating roads and landings where the removal of the nest tree would be required. - Roads that necessitate the removal of the nest tree may be permitted when there are no other feasible options.

VALUE	RESERVE DIMENSION	MODIFIED MANAGEMENT AREA		ROADS
		DIMENSION	CONDITIONS	
American Ginseng	Reserve extends 20 m from the outermost edge of the population.	100 m from the edge of the reserve. (Fewer than 20 plants do not require MMA).	<ul style="list-style-type: none"> - Maintain residual crown closure of 70%. - Trees will be felled away from the reserve. - Minimize harvesting equipment traffic within MMA. 	- Roads and landings should avoid the AOC wherever possible. Roads and landings may be permitted within the modified AOC when there are no other feasible options.
<u>High Conservation Value Forest</u> Species at risk habitat	To be determined in consultation with OMNR.			
<u>High Conservation Value Forest</u> Old Growth Ecosystem: At least 7 of 9 old growth forest characteristics	Forest Stand			- New roads and landings should avoid the AOC wherever possible.
<u>High Conservation Value Forest</u> High Potential Old Growth Ecosystem: Between 5-7 old growth forest characteristics	No Reserve	Boundary of Forest	Prescription to be developed to maintain and/ or enhance old growth forest ecosystem attributes. Monitoring is required to assess the effectiveness of the measures employed.	- New roads and landings should avoid the AOC wherever possible.
<u>High Conservation Value Forest</u> Culturally Significant Species	To be determined in consultation with the chiefs of the Algonquin and Mohawk First Nations communities, or their designate.			
<u>High Conservation Value Forest</u> Uncommon or Rare Tree Species	If Required	Boundary of Forest	Prescription to be developed to conserve forest ecosystem of concern. Depending upon age and condition of forest, conservation may focus on maintaining existing trees or developing regeneration.	- New roads and landings should avoid the AOC wherever possible.

VALUE	RESERVE DIMENSION	MODIFIED MANAGEMENT AREA		ROADS
		DIMENSION	CONDITIONS	
Deer Wintering Area	No reserve	AOC encompasses entire identified deer wintering area.	<p>Conifer plantations</p> <ul style="list-style-type: none"> - 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. <p>Cedar Stands</p> <ul style="list-style-type: none"> - Regenerate with patch-cut (<1.0ha 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 >=.04 ha (20m x 20m) in trees 10 m in height with 60% canopy closure. - Conifer patches <0.04ha are to be maintained as clumps with 3-5 conifer trees spaced 10-30m and no more than 60m apart. - Maintain single solitary conifers at least 10 m in height to link conifer patches. <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. 	Roads and landings should avoid critical thermal cover, bedding areas and major travel corridors.

B-5.2 Natural Heritage Values

The UCPR County Forest contains numerous significant natural heritage values. Some of these values are physical features such as streams, rivers, wetlands and significant landforms. Some examples of landscape-level natural heritage values include moose habitat, deer wintering areas, high conservation value forest (HCVF) and interior forest. Other natural heritage values include stick nests and species at risk (SAR).

UCPR, in partnership with the OMNR, EOMF and SNC, has identified some significant natural heritage features and introduced policies for their protection in the UCPR Official Plan. They include natural features that are:

“1- ecologically important in terms of functions, representation or amount, and that contribute to the quality and diversity of the natural heritage system of the United Counties, or
2 - economically or socially important in terms of resource utilization, public access, recreational enjoyment, and community values. It is especially important to Prescott and Russell that the characteristics that made these significant features be retained for the benefit of future generations.” (UCPR 2006)

Additional natural heritage values are identified the Protection and Development Plan of Larose Forest. Forest values that are not specifically addressed in terms of forest management in the UCPR Official Plan and the PDP warrant further discussion in this plan.

B-5.2.1 High Conservation Value Forests (HCVF)

High conservation value forests represent uncommon, highly significant forest ecosystems. High Conservation Value Forest is identified by local forest managers in accordance with Principle 9 and Appendix E of the FSC document Forest Certification Standards for the Great Lakes / St. Lawrence Forest Region (2007). To date the HCVF's of particular concern in the County Forest include species at risk, old growth forest ecosystems, culturally significant species and forests with substantial populations of uncommon or endangered tree species.

Species at Risk (SAR)

The Endangered Species Act, 2007 regulates the protection of species at risk (SAR). Under the Act, SAR are listed based on the best scientific information that is available and measures are developed to protect SAR and their habitat, as well as promoting their recovery. Of the known SAR found on the County Forest, only American ginseng has OMNR recommended protection measures at the time of writing (Table 12). Other SAR that are known to exist within the County Forest (e.g. butternut, Blanding's turtle, spotted turtle, bog elfin butterfly, etc.) do not currently have OMNR recommended protection measures. Operational prescriptions for areas of concern must be developed for SAR in consultation with OMNR with the intent of protecting the SAR and its habitat. If available and applicable, SAR recovery plans will be implemented.

Old Growth Forest Ecosystems

Old growth forest ecosystems are associated with natural forest (i.e. not plantation origin) that has not been subjected to human interference (e.g. logging, agriculture, etc.). As a result, the forest develops unique structural characteristics that represent a significant value on the landscape. For example, approximately 28 species of birds and mammals in southern Ontario prefer the species diversity and structural characteristics that are present in old growth forest ecosystems (LRC 1999).

The County Forest is characterized by young, second growth resulting from the natural reforestation and tree planting on abandoned agricultural fields. True old growth forest ecosystems in the County Forest are rare and none have been discovered to date. Identification and protection of old growth forest ecosystems and the restoration of old growth forest characteristics within the County Forest is a priority.

The identification of old growth forest ecosystems and those with high restoration potential within the UCPR County Forest will be undertaken during the period of this plan. The following characteristics will be considered in the field when determining whether or not a stand is classified as an old growth forest ecosystem or a stand with high restoration potential (adapted from Hendry 2005, OMNR 2003, LRC 1999a, LRC 1999b):

- 1) A minimum of 3 trees exceeding 50 cm in diameter at breast height per hectare;
- 2) A minimum of 3 “old” trees per hectare (see Appendix 3 for age of onset based on forest type);
- 3) Average basal area of the stand exceeds 20 m²/ha
- 4) Stocking of mature climax species is $\geq 40\%$ (i.e. eastern hemlock – *Tsuga canadensis*, eastern white pine – *Pinus strobus*, sugar maple – *Acer saccharum*, American beech – *Fagus grandifolia*, yellow birch – *Betula alleghaniensis*, eastern white cedar – *Thuja occidentalis*),
- 5) Four structural canopy layers (i.e. supercanopy trees, canopy trees, understory trees and shrubs and saplings),
- 6) “Mound and Pit” forest topography is apparent,
- 7) Coarse woody debris in at least three stages of decomposition,
- 8) Snags, and
- 9) Cavity trees (live or dead).

Forest stands contain at least 7 of 9 old growth characteristics will be considered old growth ecosystems and operational prescriptions for areas of concern have been developed to ensure their protection (Table 12). Forest stands that contain between 5 and 7 old growth characteristics are considered high potential for the restoration of old growth ecosystems. When encountered prescriptions will be developed that will maintain and/or enhance old growth forest ecosystems characteristics. Post-treatment monitoring will be undertaken on these sites to evaluate the effectiveness of the measures employed maintain or enhance the old growth characteristics.

Culturally Significant Species

Culturally significant species include any plant or tree species that is or has been important to the day to day activities of the Mohawk or Algonquin people. SNC, in cooperation with the Mohawks of Akwesasne, the Algonquins of Pikwakanangan and other off-reserve Algonquin communities, conducts detailed natural and cultural heritage inventories on properties within the South Nation River watershed, including UCPR County Forest compartments. Further

consultation with the First Nations communities may identify the need to develop protection measures for those culturally significant species during forest operations. Resource stewardship agreements may be developed between UCPR and the First Nations to allow for extraction of culturally significant species in a sustainable manner.

Uncommon or Rare Tree Species

Due to a variety of factors (e.g. urban development, agriculture, forestry, natural distribution, exotic diseases and pests, etc.) certain tree species are uncommon or rare in eastern Ontario, but are not listed as a species at risk. Some of these tree species are known to occur in the County Forest but their distribution and condition are not known (e.g. white elm – *Ulmus americana*, red oak – *Quercus rubra*, jack pine – *Pinus banksiana*, etc.). OMNR consultation may be required to determine the best course of action when significant concentrations of uncommon or rare tree species are encountered.

B-5.2.2 Stick Nests

Stick nests are identified and reported by forestry staff as they are encountered. Operational prescriptions for areas of concern have been developed for the protection of stick nests (Table 12). Protection efforts are focused on active nests of larger birds which are designated as species at risk, have highly specific habitat requirements, form colonies and/or tend to reuse the same nest on an annual or at least regular basis. Inactive nests in good condition are also important habitat features, especially in close proximity to active nests. Stick nests in very poor condition and where the species cannot be reasonably determined will not receive formal AOC protection. Operations should avoid damaging the nest tree and skid trails and roads should avoid the removal of the nest tree where possible. Stick nests in dead trees are generally not re-used and will not receive formal AOC protection, unless the evidence suggests that the nest belongs to an osprey or a heron.

The most common occurrences noted on the UCPR County Forest are of sharp-shinned hawks, broadwing hawks and northern goshawks, which nest in maturing conifer plantations or in hardwood stands with a white pine component. Herons, which usually nest in live or dead trees

in wetlands, are also relatively common.

B-5.2.3 Recreation Trails

The County Forest has many recreational trail networks for a variety of uses (e.g. walking trails, horseback riding, snowmobile, ATV, etc.). Recreation trails that have been designated by UCPR are protected by an operational prescription for areas of concern (Table 12). Trails that have not been designated by UCPR will not receive AOC protection.

B-5.2.4 Research Plots

The County Forest has long been involved in research projects related to the enhancement of knowledge related to the forest and the benefits that it provides (e.g. growth and yield, seed production areas, wildlife habitat, etc.). Research organizations will be contacted to generate an inventory of known research plots. Consultation with these organizations will determine the status of the projects and to determine the level of protection that may be required to preserve the integrity of active sites. Identification of new sites that have potential for research may be identified.

B-5.3 Cultural Heritage Values

Cultural heritage values are significant historical or natural features associated with either First Nations or early European use of the forest. They include significant heritage buildings, heritage districts, cultural heritage landscapes, archaeological sites and archaeological potential areas located within the County. UCPR maintains a database of cultural heritage values and the UCPR Official Plan provides general policy direction for their protection (Section 7.6.3 and 7.6.4 of the UCPR Official Plan). Section B-5.1 of this plan provides direction to forest managers to preserve the integrity of cultural heritage values (Table 12).

These values range in character and the level of protection that is required. Old foundations and wells are quite common due to the nature of land acquisition that gave rise to the creation of the County Forest. These sites will remain undisturbed (i.e. no tree cutting, no skid trails, no

roads, etc.) to maintain the character of the site (Table 12). Consultation is required with an appropriate historical representative is required to ensure adequate protection for other cultural heritage sites. The chiefs of the Algonquins of Pikwakanangan, other off-reserve Algonquin communities and the Mohawks of Akwesasne, or their designate must be consulted to identify and protect sites of special cultural, ecological, economic or religious significance.

B-5.4 Values Inventory and Mapping

A values inventory is maintained by the UCPR GIS department, which provides location and attribute information for known forest values. The inventory is derived from a variety of source information that has been provided by various organizations (e.g. OMNR, SNC, Horizon Multiresource Inc, UCPR, Ontario Field Naturalists Club, public, etc.). As new values are identified (i.e. newly defined or newly discovered), the values inventory will be updated.

This information is summarized and maintained by the UCPR GIS department. The natural and cultural heritage values inventory, when combined with the forest resource inventory, forms the basis for determining the benefits the forest is able to provide now and in the future. The inventory summarizes the location and details regarding provincially and locally significant wetlands, areas of natural and scientific interest (ANSI's), species at risk (SAR), significant woodlands, deer wintering yards, spawning areas, high conservation value forests, stick nests, recreation trails and research plots.

SNC, in cooperation with the Mohawks of Akwesasne, the Algonquins of Pikwakanangan and other off-reserve Algonquin communities, conducts detailed natural and cultural heritage inventories on properties within the South Nation River watershed, including UCPR County Forest compartments. New values information may be also discovered by staff or contractors during the course of forestry operations. When necessary, forestry staff is informed of the values and, if appropriate, activities are excluded or modified in the area to provide protection (Section 5.1). Generally, new values information is provided to UCPR for inclusion in the natural and cultural heritage values inventory. However, values which are highly sensitive or subject to exploitation are not mapped.

B-5.4.1 Data Sensitivity

Due to the sensitive nature of some values (i.e. species at risk and cultural heritage), the location of many sites will not be provided to the public. These sites are given suitable protection by forest managers as described in Section 5.1. Forest managers have participated in cultural awareness training as part of the conditions of FSC certification. This training is designed to raise awareness and assist with the future identification and preservation of cultural heritage values. Any new cultural heritage values that are identified will be reported to UCPR immediately and provided suitable protection as described in Section 5.1.

B-5.5 Tree Marking Considerations For Natural Heritage Values

Many important natural heritage features cannot be practically mapped. These features are identified and protected by the forest managers through modifications to tree marking and harvesting operations (Table 13). These guidelines have been developed by the OMNR and accepted by FSC as best management practices. The application of these guidelines contributes to the maintenance of a healthy forest ecosystem, the protection and enhancement of wildlife habitat and the conservation of forest biodiversity.

Table 13. Additional tree marking considerations for natural heritage values.

Value or Feature	Operational Guidelines
Biodiversity	Maintain a natural mix of tree species, retain species that are less common and less abundant at the stand and landscape level. Examples include: 1) Retention of mid-tolerant species (bur oak, basswood, black cherry) 2) Retention of regionally rare or uncommon tree species (butternut, shagbark hickory, black spruce, eastern cottonwood) 3) Retention of individual “veteran” trees. 4) Creating group openings 5) Planting mixed species
Wildlife Trees, Den Trees, Cavity Trees	Maintain 6 cavity or den trees per hectare (5 trees > 25cm, 1 large tree ≥ 40 cm dbh). Increase to 9 trees per hectare in riparian areas. Where cavity trees are not available, recruit such trees by leaving poor quality stems, especially living trees. Trees should be well distributed and of different species.
Snags	Encourage operators to leave snags (dead standing trees) that are not a safety

Value or Feature	Operational Guidelines
	risk. Leave snags that are in various stages of decay.
Downed Woody Debris	Downed Woody Debris (DWD) includes unmerchantable logs, limbs, branches and stumps on the forest floor. Leave coarse woody material on site. Encourage operators to leave hollow logs in the bush.
Supercanopy Trees	Maintain 1 supercanopy tree for every 4 hectares. Trees will be taller than the height of the main canopy of the forest and should be relatively healthy and windfirm.
Mast Producing Trees	Retain at least 8 mast trees per hectare (order of priority: hickories, butternut, oaks, beech, black cherry, basswood, ironwood) in tolerant hardwood and coniferous stands where feasible. Trees should be >25cm dbh, preferably larger than 40 cm, Ironwood >10cm dbh.
Individual or Clumps of Conifer in Deciduous Stands	Retain and manage individual and small groups of cedar, hemlock and pine trees in hardwood stands to provide shelter and feeding areas for wildlife and to maintain tree species and structural diversity. Retain at a minimum 10 conifer stems per hectare. Trees should be >25cm dbh where ever possible.
Woodland – Vernal Pools in Upland Forests	Where woodland pool has a surface area > 200m ² , Maintain crown closure within one tree length by removing no more than 50% of the basal area at one time. No trees to be felled into the woodland pool. Avoid cutting trees on the edge of significant woodland pools. Roads, landings and skid trails to avoid these areas.

B-6.0 MONITORING THE SUSTAINABILITY OF THE UCPR COUNTY FOREST MANAGEMENT

Forest management activities are designed to alter the current forest condition in an effort to influence the future condition of the forest such that certain desired benefits are realized within a designated period of time. The Forest Policy Plan describes what UCPR hopes to achieve through forest management (i.e. objectives), as well as the strategies that will be implemented to meet the specified targets. These targets and strategies are directly linked to sustainability. The Forest Stewardship Council outlines national and local standards for sustainable forest management that must be met to receive and maintain FSC certification.

Monitoring provides the means identify weaknesses or deficiencies in forest management that could compromise sustainability. The results of monitoring must be analyzed to determine where such weaknesses and deficiencies exist and to formulate measures to correct any that are discovered.

B-6.1 Indicators of Sustainability

To ensure forest management activities generate the desired results, indicators must be established to monitor success in achieving the objectives of forest management. The targets and strategies that are described in the Forest Policy Plan provide the basis for the evaluation of sustainability for a particular objective and to assess compliance with the FSC's Certification Standard for the Great Lakes/St. Lawrence Forest Region (FSC 2007). Sections B-6.1.1 – B-6.1.5 provide the indicators that will allow for the evaluation of sustainability of forest management and to measure compliance with the applicable FSC standards.

B-6.1.1 Wood Products Indicators

- 1) A section in each Five Year Operating plan to compare actual harvest levels by forest unit that occurred during the term of the previous Five Year Operating Plan to the available harvest area (AHA) for that period.
- 2) A record in the GIS-based forest resource inventory that indicates when forest resource inventory information has been updated.
- 3) A section in the Five Year Operating Plan to describe the calculation of available harvest area and provide an explanation for any variations in AHA from the previous Five Year Operating Plan.
- 4) A summary in the Five Year Operating Plan showing area allocated for harvest by forest unit for the upcoming 5 year term that can be compared to the AHA calculation for that period.
- 5) A summary in the Five Year Operating Plan showing area harvested by forest unit during the term of previous Five Year Operating Plan that can be compared to the AHA for that period.
- 6) Post-treatment surveys documenting density, stocking and long-term survival of acceptable regeneration after silvicultural treatment where regeneration is identified as a target of the treatment (i.e. harvest, renewal and tending).
- 7) A compartment file containing R.P.F. certified harvest plans for each area that has received silvicultural treatment during the period of the 20 Year Management Plan (i.e. harvest, renewal and tending).

- 8) A compartment file containing tree marking audit results (where a formal tree marking audit was required) including the name and certification level of the auditor and the tree markers, tally of the trees that have been marked, the distribution of acceptable and unacceptable growing stock, tree size distribution, the silvicultural system applied and stage of management.
- 9) Signed stumpage sale contracts for each harvest block shall be kept on file at UCPR for each sale.
- 10) Documentation of performance (i.e. forest operations compliance inspections) for the forest management activities that impact wood products objectives (e.g. logging damage, regeneration protection, skid trail coverage, wood utilization, etc.), including any corrective actions that have been implemented to address operational issues.
- 11) Records in the GIS database to document changes in the forest condition resulting from forest management activities.
- 12) Post-treatment surveys that document the effectiveness of silvicultural treatments (e.g. establishment of natural regeneration of a desired species, positive growth response to thinning, etc.)
- 13) An amendments section appended to controlled copies of the 20 Year Management Plan and the 5 Year Operating Plan that tracks changes that may be required to those documents during their period of implementation.
- 14) A record of the payment of Forest Stewardship Council certification fees.
- 15) An inventory of active forest management research projects occurring on the County Forests that improve knowledge of the forest and its management.
- 16) Document protection measures developed to maintain the integrity of forest management research projects (i.e. Harvest Plan).

B-6.1.2 Recreation and Education Indicators

- 1) Records of any conflicts or complaints related to permitted public recreation activities (e.g. hunting, wildlife viewing, etc.) with respect to the intended use of the property involved and the Mission and Objectives for the County Forest.
- 2) An up-to-date GIS-database of UCPR designated recreational trails.
- 3) Procedures to address unauthorized recreational use of the Forest (e.g. By-Law).

- 4) A record of enforcement regarding unauthorized recreational use of the Forest (e.g. use of an unauthorized trail or unauthorized use of a UCPR designated trail).
- 5) Documentation of performance (i.e. forest operations compliance inspections) for the forest management activities that impact designated recreation trails (e.g. public safety (i.e. warning signs) and the physical condition of the trail before, during and after operations (e.g. rutting, logging debris, etc.), including any corrective actions that have been implemented to address operational issues.
- 6) A link on the UCPR website that identifies the location of the County Forest properties (e.g. signage, maps, etc), compartments that are scheduled for treatment during the period of the 5 Year Operating Plan and compartments where forest management is active.
- 7) Up-to-date entries to the “News” section of the UCPR website that advertises activities that foster awareness and education regarding the County Forest, its natural and cultural heritage values and its sustainable management.

B-6.1.3 Ecosystem Protection Indicators

- 1) An up-to-date GIS-based inventory of natural heritage features, that documents the source of information, the level of accuracy and the date of discovery (if available).
- 2) Documentation of involvement with other agencies to inventory and conserve natural heritage features of the County Forest.
- 3) Documentation of performance (i.e. forest operations compliance inspections) for the forest management activities that occur within and adjacent to areas of concern (e.g. provincially significant wetlands, streams, stick nests, etc.), including any corrective actions that have been implemented to address operational issues.
- 4) Record of efforts to conserve and/or rehabilitate the habitat of species at risk (e.g. ginseng) in accordance with the Endangered Species Act (2007).
- 5) Record of efforts to conserve habitat for wildlife species with landscape level habitat management objectives (e.g. moose, deer, ruffed grouse, pileated woodpecker, etc.).
- 6) A compartment file containing tree marking audit results including tally of the trees that have been retained to meet stand-level wildlife objectives (e.g. tree species, tree sizes, cavity trees, snags, downed woody debris, mast trees, supercanopy trees, etc.) and

assessments of the application of the operational prescriptions for AOC.

- 7) Protocol for and documentation of the discovery of natural heritage values during forest operations (i.e. forest operations compliance inspections).
- 8) Post-treatment surveys documenting the species (noting presence and abundance of invasive plant species), density, stocking and long-term survival of regeneration resulting from silvicultural treatments (i.e. harvest, renewal, tending).
- 9) A section of the Five Year Operating Plan that details the changes in age class distribution and forest units from one Five Year Operating Plan to the next.
- 10) Post-treatment surveys documenting assessment of wildlife habitat and values after silvicultural treatments (e.g. residual tree species and their condition (i.e. AGS or UGS), cavity trees, snags, downed woody debris, mast trees, supercanopy trees, etc.).
- 8) Documentation of performance (i.e. forest operations compliance inspections) related to the appropriate approvals and permits associated with roads, water crossings and access trails, as well as their construction and use, including any corrective actions that have been implemented to address operational issues.
- 9) A record of new access that is created and/or decommissioned to permit forest management operations (i.e. forest operations compliance inspections).
- 10) An inventory of active natural heritage research projects occurring on the County Forests that improve knowledge of the forest and its management.
- 11) Document protection measures developed to maintain the integrity of natural heritage research projects (i.e. Harvest Plans).
- 12) Procedures that allow for UCPR to acquire lands that enhance the forest cover, natural or cultural heritage value, connectivity between significant woodlands or recreation opportunities of the County.
- 13) A record of the acquisition of new lands.

B-6.1.4 Responsible Landowner and Good Neighbour Indicators

- 1) A record of the public consultation regarding the County Forest, its management and permitted uses (i.e. Protection and Development Plan of the Larose Forest).
- 2) Documentation of performance (i.e. forest operations compliance inspections) related to forest management boundaries adjacent to private land (i.e. boundary establishment,

landowner notification and forest operations along boundary), including any corrective actions that have been implemented to address operational issues.

- 3) A record of timber theft occurrences and actions taken to ensure wood theft is discouraged.
- 4) Documentation of performance (i.e. forest operations compliance inspections) related to Ontario Occupational Health and Safety Act (e.g. harvest equipment and practices), including any corrective actions that have been implemented to address operational issues.
- 5) Documentation of performance (i.e. forest operations compliance inspections) related to the required fire protection equipment and the recommended forest fire training, including any corrective actions that have been implemented to address operational issues.
- 6) An up-to-date GIS-based inventory of cultural heritage features, that documents the source of information, the level of accuracy and the date of discovery (if available).
- 7) A record of consultation with the Mohawks of Akwesasne, Algonquins of Pikwakanangan and other off-reserve Algonquin communities regarding traditional rights and/or use areas within the County Forest regarding the identification of values and their protection.
- 8) A record of consultation and the agreement with an appropriate local cultural heritage representative regarding the identification and protection of cultural heritage sites resulting from early European settlement.
- 9) Documentation of performance (i.e. forest operations compliance inspections) for forest operations in the vicinity of cultural heritage values, including any corrective actions that have been implemented to address operational issues.
- 10) Up-to-date entries to the “News” section of the UCPR website which documents public relations campaigns to identify the County Forest, encourage appropriate use and management of the Forest, to promote safety and to reduce incidences of timber theft, vandalism and illegal dumping. Maps indicating the location and timing of forest operations will be included.

B-6.1.5 Financial Benefits Indicators

- 1) An approved, annual budget for forest management on the County Forest.
- 2) A year-end summary of forest management revenues and expenses that can be

compared to the budget that was prepared for that particular year.

- 3) Post-treatment surveys documenting response to silvicultural treatments as it relates to the economic benefits of the forest (e.g. volume increment, forest product diversity, etc.)
- 4) A record of forest products derived from the County Forest.
- 5) A record of attendance at tender sale site visits and bids received.
- 6) The tender sale packages which outline size of sale, volume estimates by species, set prices for minor species, etc.
- 7) A record of the volume estimates and actual volume harvested for each harvest block.
- 8) An inventory of bills of lading, the wood measurement method employed and volume for every load of wood hauled from each harvest block.

B-6.2 Monitoring Silvicultural Effectiveness

Due to the complexity of forest ecosystems, there is uncertainty involved in predicting the results of forest management activities. Monitoring the implementation of silvicultural treatments and the results of those treatments is crucial to ensure the objectives for the County Forest are achieved. Monitoring may determine a need to prescribe additional forest management activities (e.g. manual tending to release regeneration) or it may identify a need to alter the target forest condition for a particular stand (e.g. desirable tolerant hardwood regeneration occurring naturally where the original target species was white pine). Minimum standards for monitoring the implementation and the results of silvicultural treatments are outlined in the EOMF Forest Certification Policies and Procedures Manual.

B-6.2.1 Monitoring Forest Operations

Forest operations are the primary means with which the County will attempt to meet the objectives of forest management. Forest operations must be monitored and results must be documented. Tree marking audits will be performed where required to ensure tree marking meets the objectives of the harvest plan. Periodic forest operations inspections will be carried out during and upon completion of forest operations (i.e. harvest, access, renewal and tending) to document quality of implementation and compliance with the applicable standards and associated best management practices that are described in provincial regulations, the harvest

plan, the 20 Year Management Plan, EOMF Forest Certification Policies and Procedures Manual, the stumpage sale contract and the FSC Certification Standard for the Great Lakes/St. Lawrence Forest Region. A summary of the results of the forest operation inspections will be provided in the 5 Year Operating Plan. Corrective actions that were implemented in response to operations that were found to be non-compliant will also be summarized in the 5 Year Operating Plan.

Tree Marking

Where tree marking is required (e.g. harvest, non-commercial improvement cut, etc.), it shall be approved prior to commencing the treatment in accordance with SOP 1.4.1 and SOP 5.1 of the EOMF Forest Certification Policies and Procedures Manual. If a tree marking audit is required, the tree marking audit form provided as Appendix K of the EOMF Forest Certification Policies and Procedures Manual will be used to document the results.

The tree marking audit report shall identify the auditor and the tree markers and their respective certification level. It will identify the number of plots assessed, the tree marking quality, the nature of tree marking infractions, the distribution of marked and residual trees by their quality status (i.e. AGS or UGS) and the basal area marked and retained. It will also provide an assessment of some the wildlife attributes with stand-level targets (i.e. cavity trees, mast trees, solitary conifers). Finally, the audit report will provide an opportunity for the auditor to document stand level infractions that are not reflected elsewhere (e.g. improper AOC marking, residual crown closure, etc.).

Forest Operations Inspections - Harvest, Access, Renewal and Tending

The minimum frequency of monitoring forest operations is provided in SOP 5.1 of EOMF Forest Certification Policies and Procedures Manual. The frequency of monitoring may be increased due to the type of operation, scale and intensity of the treatment, the complexity and fragility of the environment, values identified on site, the compliance history of the operator, or other factors as determined by UCPR. SOP's 2, 3, 4, 5 and 6 of EOMF Forest Certification Policies and Procedures Manual provides the minimum standards for forest operations inspections as

well as recommended assessment methods. UCPR stumpage sale contracts will include the minimum standards for forest operations outlined in the Manual and may contain additional site specific standards that require monitoring during and upon completion of operations. The form provided in Appendix P of EOMF Forest Certification Policies and Procedures Manual, or a similar form will be used to document the inspections of forest operations.

B-6.2.2 Monitoring Silvicultural Success

Monitoring is required at certain intervals after a silvicultural treatment has been applied to ensure the desired silvicultural results have been achieved. The majority of silvicultural treatments that will be implemented in the County Forest have been rigorously field tested and produce fairly predictable results (e.g. plantation thinning). However, the results of some harvest treatments may vary considerably based on site conditions and the composition of the stand prior to treatment (e.g. clearcut, uniform shelterwood, etc.). UCPR will implement two main methods to monitor the results of silvicultural treatments; updates to the forest resource inventory and regeneration surveys. Other methods may be employed as required to assess results to treatment where FRI updates and regeneration surveys do not provide sufficient information.

Section 5.1 of EOMF Forest Certification Policy and Procedures Manual provides minimum standards for post-harvest monitoring and provides a form with minimum information collection requirements (Appendix S of EOMF Forest Certification Policies and Procedures Manual).

FRI Updates

An update of the forest resource inventory (FRI) will occur after every harvest operation, typically within 2 years of the completion of the operation. The information collected will provide, at a minimum an update on species composition, average height, average diameter, stocking and/or the stand structure.

Some stands are found to differ significantly from how they are described in the existing FRI. An FRI update will be performed in these stands regardless of harvest activity. Additional

information may be collected during FRI updates if it is required to assess the status of other values (e.g. species at risk habitat). Appendix S of EOMF Forest Certification Policy and Procedures Manual provides the minimum post-treatment information requirements.

Regeneration Surveys

A regeneration survey will be performed on all areas where the harvest plan identifies that the establishment of natural regeneration as a desired result of the treatment (e.g. uniform shelterwood regeneration cut, single tree selection, etc.) or where the protection of advanced regeneration was identified as a target of the treatment (e.g. uniform shelterwood removal cuts, single-tree selection, etc.). Surveys will normally be performed between 3-5 years of the harvest treatment (or previous survey), and will provide the species, density, average height and stocking of desirable regeneration, as well as an assessment of competition. Appendix S of EOMF Forest Certification Policies and Procedures Manual provides minimum regeneration information requirements. Sites that are tree planted (i.e. underplanting, fill planting and conversion sites) will receive a quality assessment at the time of planting and will be followed up with survival and competition assessments periodically to ensure success of the planted stock. Natural regeneration and plantations will be monitored periodically until the desired regeneration is designated free to grow.

APPENDIX 1

UCPR County Forest Compartment Maps and Treatment History (CD – All Copies, Hard Copy – Copy 1 and 2 only)

APPENDIX 2

Stand Density Index Curves For Plantation Management -
White Spruce, Red Pine, White Pine

Plantation White Spruce
Density Management Diagram
for Ontario (log/log scale).
Draft 2001

Site index curves for plantations

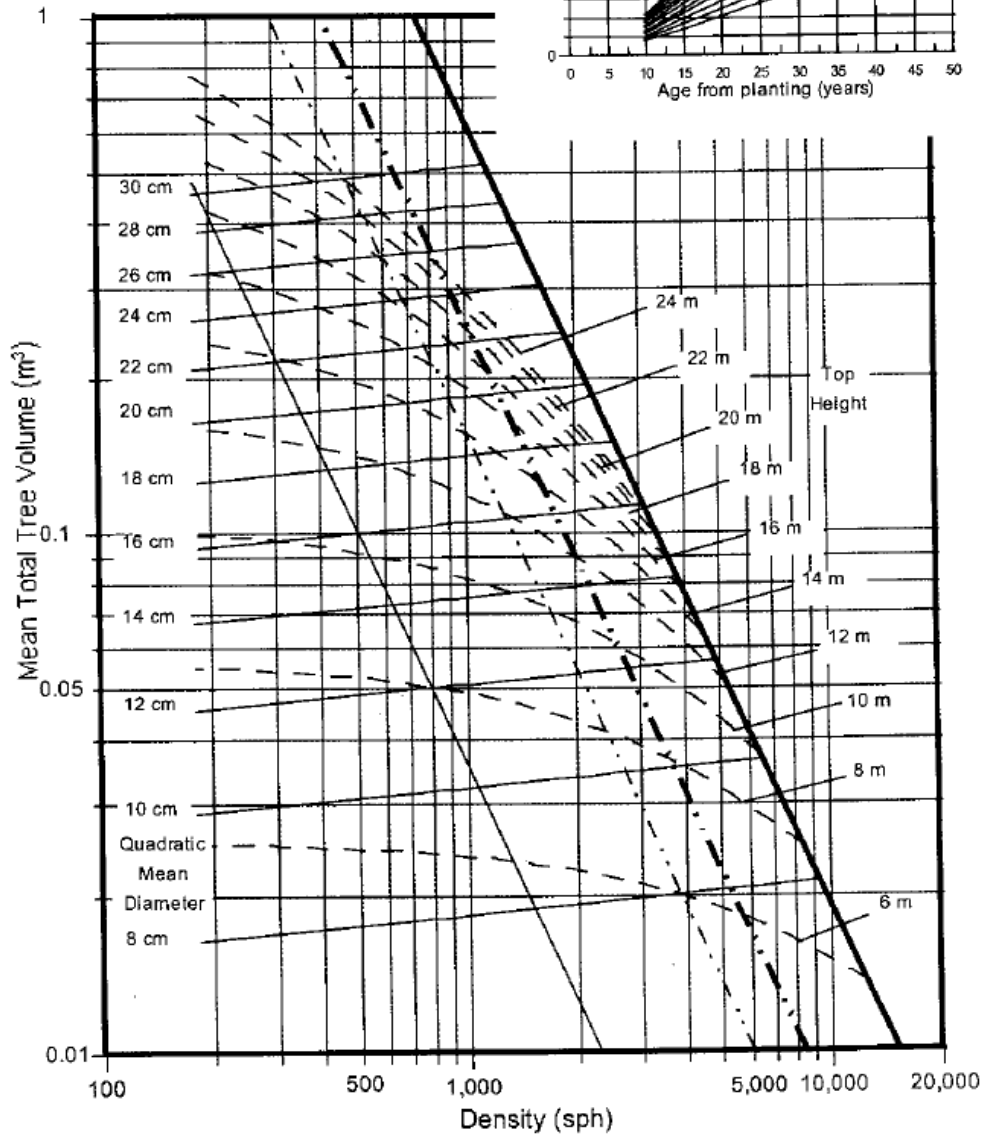
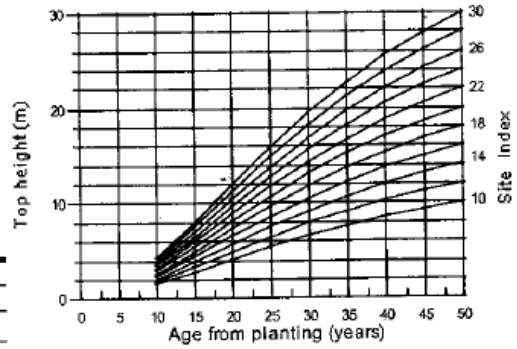


Figure 3b: Red Pine
Density Management Diagram
for Ontario (log/log scale).
D.J. Smith and M.E. Woods. 1997

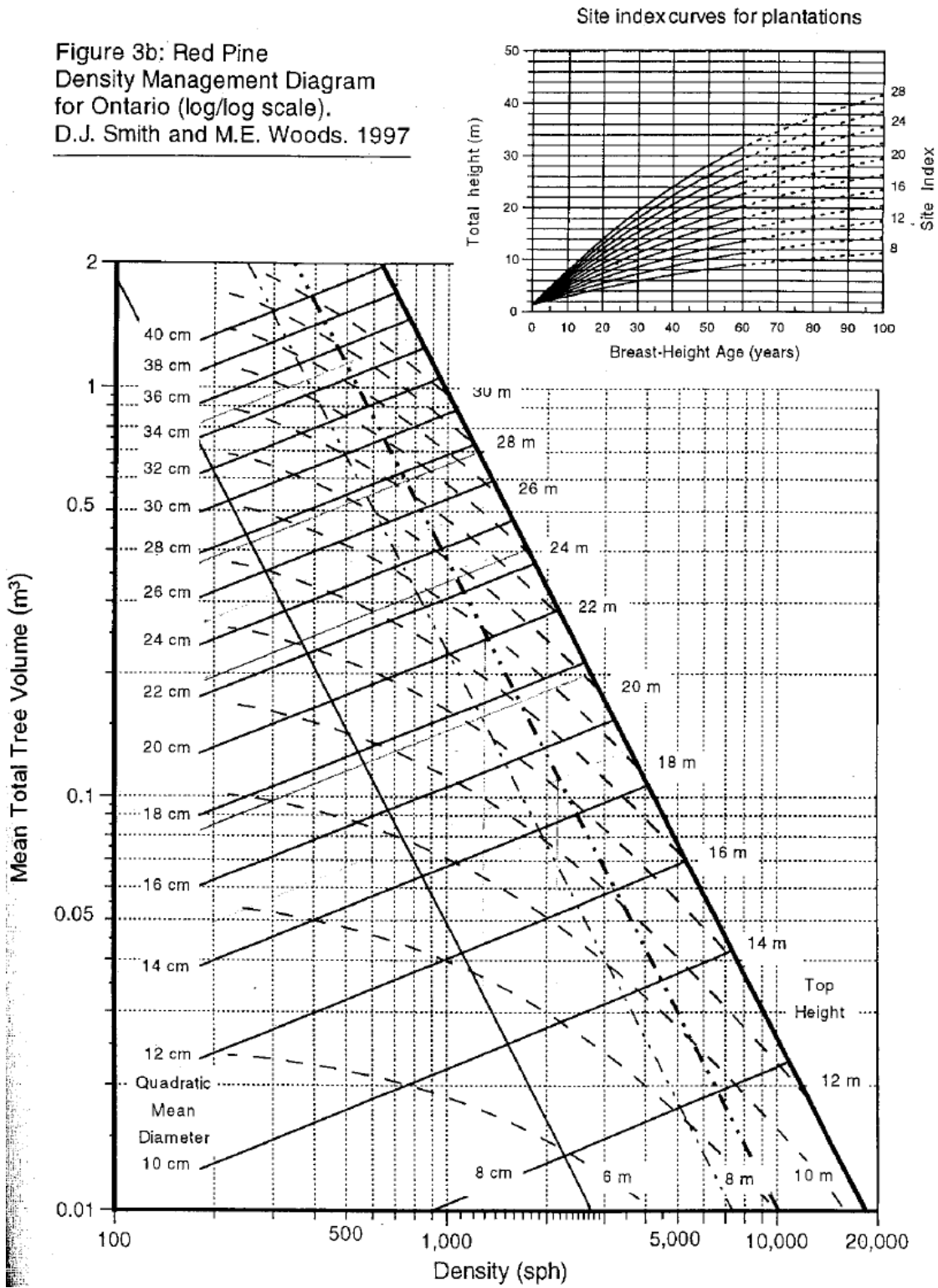
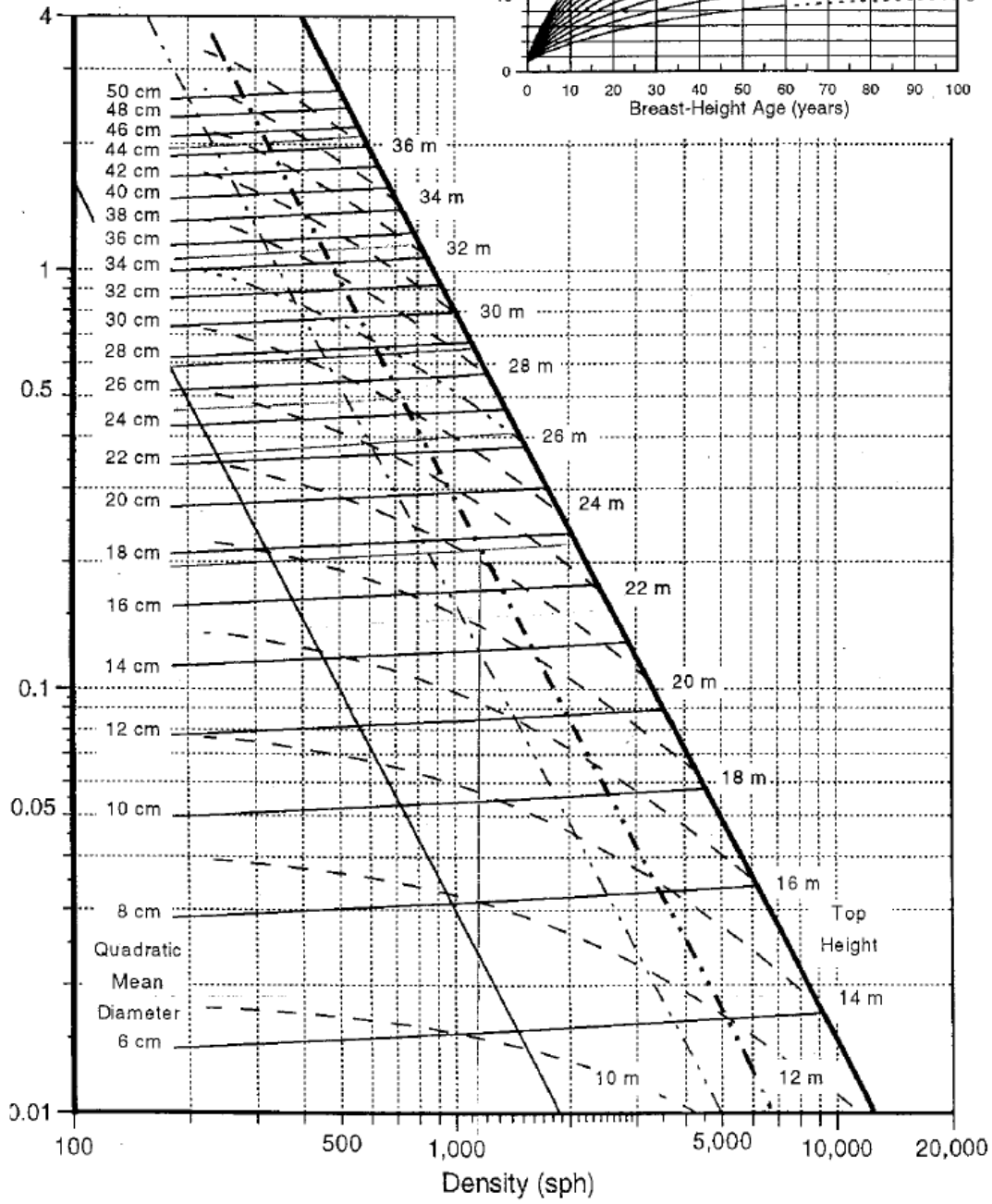


Figure 4b: White Pine
Density Management Diagram
for Ontario (log/log scale).
D.J. Smith and M.E. Woods. 1997



APPENDIX 3

Age of Onset for Old Growth Ecosystems

Ecosites	General Species Associations	Common Soil and Site Description	Associated Vegetation and Stand Structure Characteristics	Old Growth Age-of-Onset (yrs)	Old Growth Forest Stand Duration (yrs)
FOC1	White Pine, Red Pine, Jack Pine	Dry to fresh, shallow over bedrock, sandy to coarse loamy soils	Conifer dominated, with oak species; Ce, Bw, He, Bf, and Ms may occur; shrubs include blueberries, juniper, serviceberries and sweet fern.	Pw – 120	Pw – 450+
FOC2	White Cedar, Red Cedar	Dry to fresh, shallow over bedrock, sandy to coarse loamy soils	Conifer dominated, with oak and pine species; lw and Hi may occur; shrubs include blueberries, bush honeysuckle and serviceberries; may be second growth on old farm fields.	Cr – 110 Ce – 110	Cr – 500+ Ce – 1000+
FOC3, FOC4	White Cedar, Hemlock	Fresh to moist, sandy to fine loamy soils	Conifer dominated; Pw, Bf and some hardwoods may occur.	Ce – 110 He – 140	Ce – 1000+ He – 600+
FOM1, FOM2, FOD1	Oak–Pine; Oak–Hardwood	Dry to fresh, shallow over bedrock, sandy to coarse loamy soils	Oak pine mixedwoods, Mh, Ms, Bd, Aw and lw may occur (FOM1,2); Oak dominated with Or,Ow and/or Oblack (FOD1).	Or – 120 Ow – 120 Oblack – 120	Or – 200+ Ow – 200+ Oblack – 300+
FOD4–6	Tolerant–Mid–Tolerant Hardwoods	Dry to moist, wide range of soil textures	Hardwood dominated, with any of Mh, Be, lw, Bd, Ash, Oaks, Hi, Tulip Tree, Hackberry.	Mh – 120 Be – 120 Tulip Tree – 120 Bd – 120	Mh – 200+ Be – 300+ Tulip Tree – 300+ Bd – 200+
FOM3–7	Tolerant Hardwood–Conifer Mixedwood	Dry to moist, wide range of soil textures	Mixedwoods with any of Mh, Ms, He, Or, Ce, Po, Bw and By.	Mh – 120 He – 140	Mh – 200+ He – 600+
FOD7–9	Lowland–Transitional Deciduous	Fresh to moist, sandy to clayey soils, often adjacent to riparian zones	Hardwood dominated, with Ew, Bd, Black Walnut, Sycamore, Ash, Po, Sassafras, Willows, Black Maple.	Ash – 120	Ash – 200+
SWD1–7, SWM1–6	Lowland Hardwoods and Mixedwoods (forested wetlands)	Moist mineral, peaty phase to wet organic soils	Hardwood dominated ecosites with Msilver, Ab, Ag, Black Willow, Hackberry, Swamp White Oak, Bur Oak, Swamp Maple, Ew, By, Poplars; Mixedwoods with Ce and hardwoods (rich in herbs and ferns).	Obur–120 Msilver – 120 Ash – 120	Obur – 200+ Msilver – 200+ Ash – 200+
BOT1, FET1, SWC1–4	Lowland Conifers (forested wetlands)	Moist mineral, peaty phase to wet organic soils	Conifer dominated wetlands, with Sb, L, Ce, Other Conifers; includes treed bogs (Sphagnum), fens (brown moss) or swamps (may be herb, fern and shrub rich)	Insuf. data	Insuf. data

**Refer below for a full list of abbreviations and general species associations.*

Abbreviations and General Species Associations					
Ax	Ash (Mixed)	He	Hemlock	Ov	White Oak
Bd	Basswood	Ir	Ironwood	PJ	Jack Pine
Be	Beech	La	Larch	Po	Poplar (Aspen)
Bf	Balsam Fir	Mh	Hard Maple	Pr	Red Pine
Bw	White Birch	Ms	Soft Maple	Pw	White Pine
By	Yellow Birch	Msilver	Msilver	Sb	Black Spruce
Ce	Cedar	Oblack	Black Oak	Sw	White Spruce
Cr	Red Cedar	Obur	Bur Oak		
Ew	White Elm	Or	Red Oak		

Source: Uhlig, P., A. Harris, G. Craig, C. Bowling, B. Chambers, B. Naylor and G. Beemer. 2001.

APPENDIX 4

Glossary of Technical Terms (Source: OMNR 2000)

A

abiotic factors. The non-living components of the environment, such as air, rocks, soil, water, peat and plant litter.

achene. A small, dry, non-splitting one-seeded fruit, with distinct seed attached to the ovary wall at only one point.

accipiters. Long-tailed hawks with short, rounded wings that fly with several short quick beats and a sail rather than soaring in circles high in the air.

acre. An imperial measure of land area equal to 43,560 square feet, 4046.7 m² or 0.4 ha.

advance growth. Young trees that have become established naturally in a forest before cutting or regeneration begin.

advanced regeneration. Trees that have become established naturally under a mature forest canopy and are capable of becoming the next crop after the mature crop is removed.

adventitious. Arising from unusual positions, as in buds on roots.

age.

of a tree:

- **breast height:** the number of annual growth rings between the bark and the pith, as counted at breast height.
- **harvest:** the number of years required to grow from establishment to maturity.
- **stump:** the number of annual growth rings between the bark and the pith, as counted at stump height.
- **total:** the number of years elapsed since the germination of the seed or the budding of the sprout or root sucker.

of a forest, stand or forest type, the average of the trees comprising it:

- **harvest:** The number of years between the establishment and the final harvest of a forest crop.
- **total:** The average total age of the trees comprising it.

age class. One of the intervals into which the range of age classes of trees in a stand are divided into for classification and use.

AGS - acceptable growing stock. Trees suitable for retention in the stand for at least one cutting cycle (15 to 25 years). They are trees of commercial species and of such form and quality as to be saleable for sawlog products at some future date.

all-aged. Applies to a stand that contains trees of all ages.

all-aged management. A system of growing forest trees in groups where the individual trees are not the same age (theoretically, an all-aged forest has trees scattered throughout that range in age from one year to the oldest tree, whatever its age may be).

allowable cut. The volume of wood that may be harvested, under management, for a given period.

annual ring. The growth layer of one year, as viewed on the cross section of a stem, branch, or root. One year's growth consists of a layer of lighter-coloured wood (springwood) and a layer of darker-coloured wood (summerwood).

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.

aquatic system. Areas where water levels are greater than 2 m in depth.

artificial regeneration. Renewal of a tree crop by direct seeding or by planting seedlings or cuttings.

aspect. The direction towards which a slope faces.

asexual. Referring to any type of reproduction which does not involve the union of sex-cells (gametes).

audit. A formal examination of an organization's or individual's performance.

autecology. Autecology refers to the study of the ecology of a single species. It refers to information on the biological behaviour of a plant species essential to understanding its growth, reproduction and response to disturbance and essential to choosing appropriate silvicultural treatments. It includes information about a species: habitat requirements, modes of reproduction, phenology, and response to disturbance.

B

basal area.

of a tree:

- the cross-sectional area of the bole of a tree, 1.3 m above the ground. Basal area = diameter of tree (cm) squared, times 0.00007854. (Expressed in m²).

of a stand of trees:

- the sum of all the individual tree basal areas for a given land area. Commonly expressed as m²/ha.

berry. A pulpy, non-splitting fruit developed from a single pistil and containing one or more seeds.

biodiversity - *biological diversity*. The variety and variability (in time and space) among living organisms and the ecological complexes in which they occur.

biomass. The dry weight of all organic matter in a given ecosystem. It also refers to plant material that can be burned as fuel.

biota. All living organisms of an area, taken collectively.

blowdown (windthrow). Uprooting by the wind. Also refers to a tree or trees so uprooted.

board foot (bd. ft.). A volume measure of lumber, being one foot wide, one foot long and one inch thick.

bole. The main trunk of a tree.

breast height. The standard height, 1.3 m above ground level, at which diameter of a standing tree is measured.

broadleaf. *see hardwood.*

browse. Small bushes, sprouts, herbaceous plants, small trees, etc. that wildlife feed on.

brush. Commonly refers to undesirable shrubs and other low-lying vegetation.

buck. Cutting a felled tree into specified log lengths for yarding and hauling; also, making any bucking cut on logs.

buffer. A zone or strip of land that shields one area from another. Commonly used along streams or as visual barriers

bumper tree. A poor-quality, low-value tree that grows in close proximity to higher-value trees. Skid roads should be located next to bumper trees in order to protect residual trees from damage during a logging operation.

burl. An abnormal growth on a tree stem, with wood tissue growing in an irregular pattern. Usually circular in shape, these growths are widely sought for their interesting grain pattern.

butt. The base of a tree or log.

C

caliper. An instrument used to measure diameters of trees or logs. It consists of two parallel arms at right angles to a graduated rule, with one arm that slides along the rule.

calyx. The outermost group of floral parts.

cambium. A layer of cells between the woody part of the tree and the bark. Division of these cells results in diameter growth of the tree through formation of wood cells (xylem) and inner bark (phloem).

Canadian Shield. The Precambrian-aged, continental mass of the earth's crust centred on the Hudson Bay area, and which is comprised of mostly crystalline rocks in comparison with the surrounding younger, mostly stratified rock.

canker. Dead area of a branch or stem caused by fungal or bacterial attack.

canopy. A collective term for the layer formed by the crowns of the taller trees in a forest.

canopy closure. The progressive reduction of space between crowns as they spread laterally, increasing canopy cover.

canopy gap. A hole in the forest canopy that allows light penetration to the forest floor. Can be formed by naturally falling trees, standing dead trees and logging practices.

capsule. A dry, usually many seeded fruit that splits at maturity to release its seeds.

Carolinian species. A species whose range is restricted entirely to the Carolinian zone.

Carolinian zone. Also known as the Deciduous Forest Region of Canada and recognized as one of the most significant and threatened landscapes in the country.

caryopsis. A simple, dry, one-sided, non-splitting fruit with seed firmly attached to the entire ovary wall.

catkin. A scaly spike bearing inconspicuous and usually unisexual flowers.

cavity. An unfilled space within a mass, a hollowed out space. In forestry and wildlife there are several categories of cavity trees, each with their own importance in the ecosystem:

- **Pileated woodpecker roost cavities:** First priority for retention are living or standing dead trees with cavities used by pileated woodpeckers for roosting. These are usually large (40+ cm DBH) diameter trees that are hollow and have at least two excavated entrance holes. These holes are somewhat oval, about 7.5 to 10 cm wide and 10 to 12.5 cm high. Holes are symmetrically oval, smooth edged and deep.

- **Pileated woodpecker nest cavities:** Second priority for retention are living trees with cavities used by pileated woodpeckers for nesting. These are usually large (40+ cm DBH) diameter trees in which pileated woodpeckers have excavated one or more nest chambers and associated entrance holes. Nest and roost trees can be distinguished by the number of entrance holes and tree condition. Roost trees may have 2 to 10+ entrance holes and entrance holes may be less than 1 m apart. Condition is probably the best clue to separate nest and roost trees. Pileated woodpeckers excavate nest cavities in trees with white spongy heart rot (not trees with existing hollows). Roost cavities are in hollow trees (look for seams, barreling, etc. to indicate hollowness).

- **Other woodpecker nest cavities or natural nest or maternal den cavities:** The third priority for retention are living trees with cavities excavated by other woodpeckers (e.g. yellow-bellied sapsucker, hairy woodpecker, northern flicker) for nesting or cavities suitable for nesting or denning (by secondary cavity users) that formed from natural decay processes.

- **Escape cavity:** The fourth priority for retention are living trees with natural cavities that provide temporary shelter, escape from predators, food-caching sites, or resting/loafing/roosting sites. They are not ideal for nests or dens because of location, size, entrance hole size, or orientation.

- **Feeding cavity:** The fifth priority for retention are living trees with feeding excavations created by woodpeckers in search of food. They are generally

rectangular, semi-circular, or irregular. Holes do not typically enlarge into chambers suitable for nesting or escape. Edges and surfaces tend to be rough.

- **Potential cavity tree:** Trees with potential to attract excavators or develop natural cavities. Typically they have evidence of advanced heart rot. These living trees are retained when situations arise in areas that do not have at least 6 existing cavities per hectare left after tree marking.

cleaning. Elimination or suppression of competing vegetation from stands not past the sapling stage; specifically, removal of:

- weeds, climbers, or sod-forming grasses, as in plantations; or
- trees of similar age or of less desirable species or form than the crop trees, which they are, or may soon, be, overtopping.

clearcut. An area on which the entire timber stand has been harvested. **see reproduction methods.**

clear-length. Branch-free length of the bole.

climax vegetation. The final stage of natural plant succession, in which the plant composition remains relatively stable.

clone. All plants reproduced asexually from a common ancestor and having identical genotypes. (genetically identical to the parent plant) (e.g. from cuttings or suckers).

codominant trees. Trees with crowns forming the general level of the crown cover and receiving full light from above, but comparatively little from the sides; usually with medium size crowns. **see crown class.**

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 net profit.

community. An integrated group of species inhabiting a given area and influencing one another's distribution, abundance and evolution.

Community Series I. Level 3 of the Ecological Land Classification system that describes various communities such as forests, swamps, savannahs according to their respective patterns of dominant species, substrate type, geology, microclimate, and other ecological factors.

Community Series II. Level 4 of the Ecological Land Classification system that describes communities that can normally be recognized on aerial photographs or from a combination of maps, aerial photograph interpretation, and other remote sensing techniques.

competition. The general struggle for existence within a trophic level in which the living organisms compete for a limited supply of the necessities of life.

composition. The representation of tree species in a forest stand, expressed quantitatively as per cent by volume or basal area of each species.

cone. The male or female reproductive organs of conifers.

conifer. A tree belonging to the order Coniferae, usually evergreen with cones, needle-shaped leaves and producing wood known commercially as 'softwood.'

conk. A hard, spore-bearing structure of a wood-destroying fungus that projects beyond the bark of a tree.

conservation. In forestry, the wise use of natural renewable resources. A key idea for understanding 'conservation' is 'use' by people.

conventional ground skidding. Any combination of rubber-tired or tracked skidding equipment.

coppice. A shoot (sprout) originating from a stump.

cord. 128 cubic feet of stacked roundwood (whole or split, with or without bark) containing wood and airspace, with all the pieces of similar length and lined up on approximately the same direction. i.e. a pile of firewood 4'x 4' x 8'.

corridor. A band of vegetation, usually older forest, which serves to connect distinct patches on the landscape. Corridors provide connectivity, which permits the movement of plant and animal species between what would otherwise be isolated patches.

cover. Vegetation or other material providing protection. Plants or objects used by wild animals for nesting, rearing of young, resting, escape from predators, or protection from adverse environmental conditions.

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.

crook. A defect in logs and poles or pilings, consisting of an abrupt bend. Also refers to edgewise warp in a piece of lumber.

crop tree. A tree selected in a young stand, to be retained until final harvest.

crotch. The fork of a tree or branch.

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 per cent 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.'

crown touching method. Each crop tree receives a full crown release by eliminating adjacent trees that touch the crop tree crown by cutting or by killing the these trees through girdling or herbicides.

cruising. Measuring standing trees to determine the volume of wood on a given tract of land. Used for harvesting, purchasing and general management.

cubic meter (m³). A volume measure, 1 m by 1 m by 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 area. A portion of woodland on which timber is being cut or will be cut.

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.

D

DBH - diameter at breast height. The diameter of a tree outside of the bark at roughly breast height. Normally measured 1.3 m off the ground on the uphill side of the tree. It is easier to measure at this height and many trees have large swells in the stem below this point that could increase errors in computing tree volumes.

deciduous. Term applied to trees (commonly broad-leaved trees) that drop all their leaves sometime during the year.

decline causing defects. Mechanical or pathological defects that may cause decline or cause the tree to be of high risk. These defects will also cause the decline of the products which may be recovered from a tree or severely limit the potential of a tree to produce anything better than low-value products.

defect. Any irregularity or imperfection in a tree, log, piece, product, or lumber that reduces the volume of sound wood or lowers its durability, strength, or utility value.

defect class. A system of categorizing tree defects by severity of degradation of the tree and/or the merchantable portion of the tree over time:

- **major defect:** The tree will degrade rapidly.
- **moderate defect:** The tree will degrade slowly.
- **minor defect:** The tree will maintain quality over cutting cycle period.

defoliator. An agent that damages trees by destroying leaves or needles.

den tree. A tree having a hollow or cavity used by animals for refuge or hibernation.

dendro-ecology. The study of annual growth rings of trees to assess the conditions in which a tree has grown (an application to assess ecosystem health).

determinate growth. Also known as 'fixed' shoot growth, refers to shoot growth pattern where growth occurs through elongation of pre-formed stem parts, or 'stem units' after a rest period. In determinate tree species, shoot formation involves differentiation in the bud the first year (n) and extension of the preformed parts into a shoot during the second year ($n + 1$). In determinate species, the growing season during bud formation largely determines the potential size of shoot and number of leaves formed the following year. Examples: white and red pine, spruces, fir, beech.

development.

- (a) the construction, reconstruction, erection or placing of a building or structure of any kind,
- (b) any change to a building or structure that would have the effect of altering the use or potential use of the building or structure, increasing the size of the building or structure or increasing the number of dwelling units in the building or structure,
- (c) site grading, or
- (d) the temporary or permanent placing, dumping or removal of any material, originating on the site or elsewhere"

diameter class. One of the intervals into which the range of diameters of trees in a forest is divided for purposes of classification and use. Generally this is done in 2 cm, even increments (40 cm class would contain trees from 39.1 to 41.0 cm)

diameter limit. The smallest (occasionally the largest), size to which trees or logs are to be measured, cut, or used. The points to which the limit usually refer are stump, breast height, or top.

diameter-limit cutting. A system of selection harvest based on cutting all trees in the stand over a specified diameter. This eliminates marking individual trees. This is not a recognized silvicultural system in Ontario.

dioecious. Producing male and female reproductive organs on separate plants. Each plant is either male or female.

disease. Harmful deviation from normal functioning of physiological processes, generally pathogenic or environmental in origin.

dominant trees. Trees with crowns extending above the general level of the crown cover and receiving full light from above and partly from the side; larger than the average trees in the stand, with crowns well developed, possibly somewhat crowded on the sides. **see crownclass.**

dormancy.

- A biological process in which a plant ceases most growth activities and simply maintains existing tissue. Caused by periods of moisture and/or temperature stress.

- A state of reduced activity in seeds that prevents germination under favorable environmental conditions.

downed woody debris (DWD). Sound and rotting logs and stumps that provide habitat for plants, animals and insects and a source of nutrients for soil development.

drumlin. Elongated oval or 'whale-back' ridge of deep molded glacial till formed during ice advance and with long axis parallel to ice movement.

drupe. A fleshy, usually one-seeded fruit whose seed is completely enclosed in a hard, bony endocarp.

dry rot. A decay of the "brown rot" type, caused by specialized fungi capable of conducting moisture from an available source and extending their attack to wood previously too dry to decay. Found chiefly in buildings. The term is open to the misinterpretation that wood will rot when dry, which is not true.

duff. Forest litter and other organic debris in various stages of decomposition on top of the mineral soil; typical of coniferous forests in cool climates, where rate of decomposition is slow and where litter accumulation exceeds decay.

E

ecology. The science that deals with the interaction of plants and animals with their environment.

Ecological land Classification (ELC). A system devised by OMNR to describe over 80 wetland and terrestrial forest vegetation types in southern Ontario. This preliminary community classification system has six different organizational levels.

ecosite. The fifth organizational level that identifies a site based on bedrock type, soil depth, texture, and moisture regime, hydrology, drainage, nutrient regime, and vegetation structure and species composition.

ecosystem. A functional unit consisting of all the living organisms (plants, animals and microbes) in a given area, and all the non-living physical and chemical factors of their environment, linked together through nutrient cycling and energy flow. An ecosystem can be of any size—a log, pond, field, forest, or the earth's biosphere—but it always functions as a whole unit. Ecosystems are commonly described according to the major type of vegetation, for example, forest ecosystem, old-growth ecosystem, or wetland ecosystem.

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.

edge. The transitional zone where one cover type ends and another begins.

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 its survival requires assistance.

endocarp. The inner wall layer of a ripened ovary.

environment. All elements living and inanimate, that affect a living organism.

ESAs -environmentally sensitive areas. A general term for natural areas whose significance has been assessed on the basis of a series of qualitative criteria applied on a local or regional basis by municipalities, conservation authorities or others.

epicormic sprout. A branch rising spontaneously from an adventitious or dormant bud on the stem or branch of a woody plant.

epidemic. Widespread insect or disease incidence beyond normal proportions; usually accompanied by excessive damage.

even-aged. The conditions of a forest or stand composed of trees having no, or relatively small, differences in age, although differences of as much as 30 per cent 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 of essentially the same age grow together. The difference in age between trees forming the main canopy level of a stand usually does not exceed 20 per cent of the age of the stand at maturity. Regeneration in a particular stand is obtained during a short period at or near the time that a stand has reached the desired age or size for regeneration and is harvested. Cutting methods producing even-aged stands are clearcut, shelterwood, or seed-tree.

exotic. Not native; foreign.

F

felling and bucking. The process of cutting down standing timber and then cutting it into specific lengths for yarding and hauling.

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.

fire scar. An injury or wound in the bole of a tree caused or accentuated by fire.

fish habitat. Spawning grounds and nursery, rearing food supply and migration areas on which fish depend directly or indirectly in order to carry out their life processes.

fixed area plot sampling method. A controlled cruise method where small plots of a fixed size are used to sample a portion of a forest area to obtain information (such as tree volume) that can be used to describe the whole area.

fluxing. An abnormal discharge from a crack or seam.

forb. A small herbaceous plant, unlike grass.

forest. A plant community predominantly of trees and other woody vegetation, growing more or less closely together; An area managed for the production of

timber and other forest products, or maintained under woody vegetation for such indirect benefits as protection of site or for recreation.

forest management. The application of business methods and technical forest principles to the management of forest property.

forest survey. An inventory of forest land to determine size, condition, timber volume and species, for specific purposes or as a basis for forest policies and programs. Also refers to carefully measuring and marking property boundaries.

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.

form class. A measure of bole taper derived by dividing diameter inside bark at a given height (usually 5.2 or 10.4 meters) by DBH. These values are often required to use tree-volume tables.

forwarder. A machine used to move short log lengths from the stump to the landing, often in a carrier that keeps the logs off of the ground.

fragmentation. The process of transforming large continuous forest patches into one or more smaller patches surrounded by disturbed areas. This occurs naturally through such agents as fire, landslides, windthrow and insect attack. In southern Ontario, agriculture and development have contributed to forest fragmentation.

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.

frost crack. Longitudinal crack on the outside of a tree, caused by extreme cold. Especially common on thin-barked species.

fruiting body. *see conk.*

fuelwood. Trees used for the production of firewood logs or other wood fuel.

full-tree harvesting. A tree harvesting process that includes removing the trunk, branches and in some instances the roots from a forested site. In Canada this process is used to control root diseases.

fungus. A plant without chlorophyll that derives its nourishment from the organic matter of other plants.

G

gall. A pronounced localized swelling of greatly modified structure that occurs on plants from irritation by a disease or insect.

gallery. A passage or burrow, excavated by an insect under bark or in wood for feeding or egg-laying purposes.

gap. A site at which a canopy tree has died and at which active recruitment of new individuals into the canopy is occurring.

gap phase replacement. Refers to the dynamic ongoing process in undisturbed tolerant hardwood stands in which canopy gaps are continually created by the death or destruction of mature trees. The gap becomes the site of increased regeneration and survival and eventually is occupied by trees reaching into the upper canopy.

gene pool. Sum of all genes among scattered populations of a given species.

genetic diversity. The diversity of genes among members of the same species or population.

genotype. The entire genetic constitution, or the sum total of genes of an organism. The genotype interacts with the environment to produce an individual whose appearance is referred to as the phenotype.

germination. The resumption of active growth in the embryo of a seed, as demonstrated by the protrusion of a radicle (embryonic root axis).

girdle. To encircle the stem of a living tree with cuts that completely sever bark and cambium and often are carried well into the outer sapwood, done to kill the tree by preventing the passage of carbohydrates to the roots. Also refers to same process caused by animals, such as mice or beavers.

glaze damage. Damage to tree caused by ice or frost.

gley. A blue-gray colour in soil due to the reduction of iron. Formed in a process characterized by low oxygen conditions due to water logging. If water logging is seasonal rather than permanent, the periodic oxidation will give rise to mottles.

grade.

- A system of classifying lumber or logs according to quality.
- The steepness of a forest road.

grain. A small hard seed or seed-like fruit, as for any of the cereals.

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 degree days (GDD). Accumulated number of degrees of mean daily temperature above a base temperature of 5.5 °C. This provides an index, which is used to estimate the growth and development of plants and insects during the growing season.

growing stock. The sum, by number or volume, of all the trees in a forest or a specified part of it.

growth. The increase in diameter, basal area, height or volume of individual trees or groups of trees during a given period.

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.”

guild. Species which are grouped together because of common strategies and/or use of areas for life cycle stages.

H

habitat. The environment in which the plant or animal lives.

hardwood.

- Generally, one of the botanical groups of trees that have broad leaves, in contrast to the needle-bearing conifers.
- Wood produced by broad-leaved trees, regardless of texture or density.

harvest. Extraction of some type of product from the forest. Generally associated with a cutting.

heart rot. A decay characteristically confined to the heartwood. It usually originates in the living tree.

heartwood. The inner core of a woody stem, wholly composed of non-living cells and usually differentiated from the outer enveloping layer (sapwood) by its darker colour.

hectare (ha). An area measure of 10,000 square meters. Basic unit of land area.

herb. A non-woody flowering plant.

high grading. The removal from the stand of only the best trees or tree species, often resulting in a poor quality residual stand.

hip. The fleshy, false fruit of the rose.

humus. The plant and animal residues of the soil (litter excluded) that have decomposed to the point where their origin is no longer recognizable.

hydric. A general term for soils that develop under conditions of poor drainage in marshes, swamps, seepage areas or flats.

I

ice damage. Breakage of tops and branches and stripping of branches and needles by an ice storm.

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 favor of more valuable trees, typically in a mixed, uneven-aged forest.

increment. An increase in the diameter, basal area, height, volume, quality, or value of individual trees or stands over time.

- **Current Annual Increment (CAI):** Growth increment in a given year of the diameter, basal area, height or volume for a given tree or group of trees.

- **Mean Annual Increment (MAI):** The average annual increment for the total age of the diameter, basal area, height or volume for a given tree or group of trees.

increment core. That part of the cross section of a tree extracted by an increment borer. Used to determine tree age and growth.

indeterminate growth. Also known as “free” shoot growth, involves elongation of a shoot by simultaneous initiation and elongation of new stem units. Indeterminate species exhibit continuous shoot growth as long as the environment is suitable. Examples: poplar, some maples, birch.

indicator species. Species of plants used to predict site quality and characteristics.

infection courts. Paths by which insects and disease can enter a tree, leading to defect and decay (e.g. wounds)

inflorescence. A floral axis with its appendages.

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 codominant and dominant trees; receiving a little direct light from above, but none from the sides; usually with small crowns, considerably crowded on the sides. *see crown class.*

intolerance. Trees unable to survive or grow satisfactorily under specific conditions, most commonly 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 native species.

K

knot. That part of a branch that has been incorporated into the main stem.

L

landing. The area where logs are collected for loading for transport to a mill.

landscape. All the natural features, such as fields, hills, forests and water that distinguish one part of the Earth's surface from another part; usually that portion of land or territory which the eye can comprehend in a single view, including all of its natural characteristics.

layering. The rooting of an undetached branch, lying on or partially buried in the soil or other forest floor media, that is capable of independent growth after separation from the parent plant.

leader. The growing top (terminal shoot) of a tree. The distance up the main stem of the tree between each whorl of branches generally represents one year of height growth.

leave tree. Tree left in or just outside a harvest zone (often otherwise a clearcut) to re-seed the area. This is nature's method of reforestation; but it is often slower and it does not have the more assured results of direct seeding or planting. May also refer to trees left after a thinning.

litter. The uppermost layer of the soil, made up of freshly fallen or slightly decomposed organic materials.

littoral zone. Shallow shoreline areas of a waterbody where light penetrates to the bottom and is often accompanied by rooted aquatic plants.

live crown ratio (LCR). The length of the crown as a ratio of the total height of the tree, usually expressed as a per cent.

log.

- To cut and deliver logs.
- A tree segment suitable for lumber and other products.

logger. A person who is engaged in a logging operation; locally, one who moves logs to landings or skidways.

log rule. A table showing the estimated or calculated amount of lumber that can be sawn from logs of given length and diameter.

log scale. The lumber content of a log as determined by a log rule.

M

management plan. A written plan for the organized handling and operation of a forest property. It usually includes data and prescribes measures designed to provide optimum use of forest resources according to the landowner's objectives.

marking timber. Selecting and indicating, usually by a paint mark, trees to be cut or retained in a harvesting or tending operation.

mast. The fruit and nuts of trees and woody shrubs used as a food source by wildlife.

mast trees. Trees supporting mast production, e.g. oak, beech, cherry.

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.

mean annual increment (MAI). The average annual increase in volume of individual trees or stands up to the specified point in time. The MAI changes with

different growth phases in a tree's life, being highest in the middle years and then 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. That part of a tree that can be manufactured into a salable product.

merchantable height. The length of the tree stem from the top of the stump to the top of the last merchantable section. Usually expressed in meters or number of logs.

merchantable length. Length of the tree from which could be produced a merchantable product under given economic conditions.

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.

mesic. Describing the sites that are neither humid (hydric) nor very dry (xeric). The average moisture conditions for a given climate.

meter (m). Measure of length equal to 100 cm.

metric chain. A 20 m measure.

microclimate. Generally the climate of small areas, especially insofar as this differs significantly from the general climate of the region. Stands often create microclimates.

microsite. A portion of a site that is uniform in microtopography and surface soil materials. It can range in size from less than 1 m² to occasionally over 5 m². Microsites are dynamic in that their characteristics are ever-changing, imperceptibly or suddenly.

mineral soil. Soil consisting predominately of, and having its properties determined by, inorganic matter. Usually contains less than 20 % organic matter.

monoecious. Bearing separate male and female flowers on the same tree.

mortality. Death of forest trees as a result of competition, disease, insect damage, drought, wind, fire and other factors.

mottles. Spots or blotches of different colour or shade of colour interspersed with the dominant soil colour, usually the result of alternating aerobic and anaerobic soil conditions and indicative of poor drainage. In surveying soils, the colour of the matrix and the principal mottles, and the pattern of mottling are noted. The latter is indicated in terms of abundance (few, common, many), size (fine, medium, coarse), and contrast with the matrix (faint, distinct, prominent). The depth of mottles in soils of different types is a diagnostic indication of moisture regime.

mycorrhiza. A rootlet of a higher plant modified through integral association with a fungus to form a constant structure that differs from either component but is attached to the root system and functions somewhat as a rootlet. It is usually considered to be beneficial to the associated plant.

N

natural regeneration. The renewal of a forest stand by natural seeding, sprouting, suckering, or, layering seeds may be deposited by wind, birds, or, mammals.

natural thinning. Death of trees in a stand as a result of competition.

needle cast. Premature browning and dropping of needles caused by a fungus.

NMV - *net merchantable volume.* The result of removing volume associated with stain or decay from the gross merchantable volume of trees or cut timber.

nurse tree (crop tree). A tree or crop of trees, shrubs, or, other plants that foster another, generally a more important, tree or crop.

nut. A dry, non-splitting, one-seeded fruit with a woody or leathery outer surface, often encased in a husk.

nutlet. A small nut.

O

old growth. A relatively old forest that little or no evidence of human disturbance. This term is misapplied by many to describe any forest that appears to be old. Individual trees in this type of forest are usually over 200 years old and there are large standing and fallen dead trees throughout the stand.

operation. Used interchangeably for logging jobs, harvesting, cutting, milling, etc. An all inclusive term for harvesting and hauling out the forest products.

organic litter. The layer of decomposing leaves, bark, twigs and other organic debris that lies on the forest floor.

organic soil. Soil containing a high proportion (greater than 20 or 30 per cent) of organic matter.

overmaturity. That period in the life cycle of trees and stands when growth or value is declining.

overstocked. A condition of the stand or forest, indicating more trees than desired, normal, or full stocking would require.

overstory. That portion of the trees in a stand forming the upper crown cover.

overtopped tree. Trees with crowns entirely below the general level of the overstory cover, receiving no direct light either from above or from the sides. Also known as suppressed. **See** *crown class*.

P

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 hectare in size and is designed to manage each opening as a distinct even-aged opening.

per cent grade.

- The vertical rise of land in 100 horizontal units. A 16 % grade means that in 100 m horizontal, the elevation has changed 16 m.

- Amount of forest volume found to be in a given log grade.

perfect. Having both functional male and female reproductive organs.

pest. A plant, animal, or thing that is troublesome or annoying (from a human value perspective).

phenology. Study of the relations between seasonal climatic changes and periodic biological phenomena, such as the flowering and fruiting of plants.

pH. A measure of the hydrogen ion on a scale of 0 (very acidic) to 14 (very basic). A pH value of 7 is neutral. Every change in one unit of measure indicates a 10x change in the quantity of hydrogen ions (e.g., a pH of 5.0 is 10x more acidic than a pH of 6.0 and 100x more acidic than a pH of 7.0).

phenotype. The visible characteristics of a plant. The product of the interaction of the genes of an organism (genotype) with the environment.

phloem. The tissues of the inner bark, characterized by the presence of sieve tubes and serving for the transport of elaborated foodstuffs.

photosynthesis. The conversion by green plants of light, water and air into food energy.

physiographic system. A system that comprises the inorganic portion of the environment outside of the works of man.

pioneer (botanical). A plant capable of invading bare sites (that is, a newly exposed soil surface) and persisting there until supplanted by successor species. A species planted to prepare a site for such successor species and therefore, a nurse crop.

plantation. An artificially reforested area established by planting or by direct seeding.

plot. A carefully measured area laid out for experimentation; may be permanent or temporary.

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, angle count method. A 360° sweep is made with an angle gauge about a fixed point and the stems with breast height diameters appearing larger than the fixed angle subtended by the angle gauge are included in the sample.

pole.

- A young tree between 10 and 25 cm in DBH.

- A log cut for the manufacture of utility poles (usually trees larger than 30 cm DBH).

polewood. Trees with a DBH between 10 and 25 cm.

pome. The apple-pear type of fruit, in which the true fruits are surrounded by an enlarged fleshy calyx tube and receptacle.

population sink. A habitat insufficient in size or resources to support a viable population of a species, yet which may attract dispersing individuals.

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.

pre-harvest silviculture assessment (survey). The survey carried out on a stand prior to logging to collect specific information on the silvicultural conditions such as planting survival, free-growing status, stocking, etc.

pre-harvest silviculture prescription. A document that applies site-specific field data and develops forest management prescriptions for areas in advance of logging.

preparatory cutting. The removal of trees near the end of a rotation, which permanently opens the canopy and enable the crowns of seed bearers to enlarge, to improve conditions for seed production and natural regeneration. Typically done in the shelterwood system.

prescribed burning. The knowledgeable application of fire to a specific unit of land to meet predetermined resource management objectives.

prescription. A course of management action prescribed for a particular area after specific assessments and evaluations have been made.

primary excavator (tree cavity). Animals that excavate their own cavities.

prism. A wedge-shaped piece of clear or amber-coloured glass that is used to select trees for timber sampling or to estimate basal area.

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; the cutting away of superfluous growth, including roots, from any plant to improve its development. *see self-pruning.*

pulpwood. Wood cut or prepared primarily for manufacture into wood pulp, for later manufacture into paper, fibreboard, or other products.

punky. A soft, weak, often spongy condition in wood; caused by decay.

Q

Q-value. The relationship between number of trees and diameter classes in an uneven-aged hardwood stand is a reversed J-shaped curve. The q-value is one mathematical expression of the shape of this curve. Quotients (q-value) can be

calculated by dividing the number of trees in each DBH class by the number of trees in the next larger DBH class. The average of these quotients is the q-value for the stand.

quadratic mean diameter (DBHq). Diameter of the tree of average basal area calculated as follows:

$$\text{DBHq} = (1/N) * d_i^2$$

where

N = the number of trees sampled

d_i = the diameter at breast height (DBH) of tree i

R

radial check. A basal seam created by overgrowth of a persistent dead companion sprout (may represent a grading defect).

radicle (root). The seed contains a radicle or root meristem in the embryo from which the first tap root develops.

raptor. A bird of prey.

receptacle. The end of the flower stalk on which floral parts are borne.

Recovery Plan. A plan developed specifically for a species at risk with the primary goals being to ensure the species does not become extirpated in Canada and that population numbers increase sufficiently to allow for its recovery.

recruitment. Process of maintaining, restoring, or increasing the seedling and sapling component of a stand.

reforestation. The natural or artificial restocking of an area with forest trees.

regeneration. The renewal of a tree crop whether by natural or artificial means. Also the young crop itself which commonly is referred to as reproduction.

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 the shelterwood system that releases established seedlings. The last removal cut is called the final removal cut.

reproduction.

- The process by which a forest is renewed:
- **artificial**: Renewal by direct sowing or planting.
- **natural**: Renewal by self-sown seeds, sprouts, rhizomes, etc.
- Seedlings or saplings of any origin.

reproduction methods.

- **clearcutting**: Removal of the entire forest in one cut. This method perpetuates even-aged stands.

- **seed-tree**: Removal of the mature timber in one cut, except for a small number of seed trees; called a group cutting when the seed trees are left in groups, a reserve cutting when specifically selected seed trees are left for growth, as well as to furnish seed.

- **selection**: Removal of mature timber, usually the oldest or largest trees, either as single scattered trees or in small groups at relatively short intervals, commonly 15 to 25 years, repeated indefinitely. This encourages a continuous establishment of natural reproduction and an uneven-aged stand is maintained.

- **shelterwood**: Removal of the mature timber in a series of cuttings, which extend over a period of years. Usually equal to not more than one-quarter (often not more than one tenth) of the time required to grow the crop. The establishment of natural reproduction under the partial shelter of seed trees is encouraged, but sometimes these areas must be artificially regenerated.

- **coppice**: Forest regeneration by sprouting (vegetative reproduction) from stumps or roots.

reserve. An area of forest land that, by law or policy, is not available for harvesting. Areas of land and water set aside for ecosystem protection, outdoor and tourism values, preservation of rare species, gene pool, wildlife protection etc.

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.

residuals (residual trees). Trees left standing after harvesting.

resource values. Products or commodities associated with forest lands and largely dependent on ecological processes. These include, but are not limited to, water quality and quantity, forage, fish, wildlife, timber, recreation, energy, minerals and cultural and heritage resources.

rhizome. A horizontal stem that bears roots and leafy shoots.

riparian zone. That area adjacent to rivers and streams identified by vegetation, wildlife and other qualities unique to these locations.

roots. The below-ground tree or plant parts that provide physical support, absorb water and nutrients from the soil and store food produced by photosynthesis.

root graft. A functional union of two roots after their formation, commonly between roots of the same individual, or, roots of neighboring trees, of the same species.

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 tree crop started.

rotation age. The age at which a stand is considered ready for harvesting under an adopted plan of management.

rot. Wood in a state of decay.

S

salvage. To harvest trees that are dead or are in poor condition but can still yield a forest product.

samara. A dry, non-splitting, winged fruit, one- or two-seeded.

sample. A small collection from some larger population.

sample tree. A representative or average-size tree, chosen for detailed measurement of condition, size, growth, or quality.

sanitation cut. The removal of dead, damaged, or susceptible trees done primarily to prevent the spread of pests or pathogens and so promote forest hygiene.

sapling. A young tree of small diameter, typically 1 to 9 cm DBH.

sapwood. The light-coloured wood that appears on the outer portion of a cross section of a tree. Contains living cells; serves to conduct water and minerals to the crown.

savannah. A treed community with 11 to 35 % cover of coniferous or deciduous trees.

sawlog. A log large enough to be sawn into lumber.

sawtimber. Trees that yield logs suitable in size and quality for the production of lumber.

scale. The estimated sound volume of a log or group of logs in terms of a given log rule or formula; used to estimate the sound volume of a log or group of logs.

scarify. To disturb the forest floor and top soil in preparation for natural regeneration or direct seeding or planting.

scavenger rot. A sap rot or heart rot most prevalent on declining or dying trees.

second growth. A second forest that develops after harvest of the original, natural forest.

secondary cavity-user. Wildlife that use decay cavities or ones abandoned by primary excavators.

seedbank. The store of dormant seeds buried in the soil.

seedbed. The soil, forest floor or other media on which seed falls.

seed cutting. Removal of trees in a mature stand to effect permanent openings in the canopy (if not done in a preparatory cutting) and thereby provide conditions for securing regeneration from the seed of trees retained for this purpose. Also the first of the shelterwood cuttings.

seed tree.

- A tree that produces seed.

- Trees reserved in a harvest operation to supply seed.

seed year. A year in which a given species produces a seed crop greatly in excess of the normal. Applied usually to trees of irregular or infrequent seed production.

seed zone. Areas of similar climatic and elevation conditions, used to specify where tree seed was collected and where trees from such seed are most likely to be successfully grown.

seedbed. In natural plant reproduction, the soil or forest floor on which seed falls; in nursery practice, a prepared area in which seed is sown.

seeding. A reforestation method by sowing seeds, aurally or by hand. Often done immediately after harvest so that a new forest is started the next growing season.

seedling. A small tree grown from seed. Usually the term is restricted to trees equal to or less than 1 cm DBH.

seep. A spot where water contained in the ground oozes slowly to the surface and often forms a pool. A small spring.

selection silvicultural system. A periodic partial-cutting, controlled by basal area, using vigor and risk characteristics to determine individual tree selection. An uneven-aged silvicultural system.

selective cutting. The cutting of individual selected trees. There are generally few if any control measures. Also known as high-grading. Not to be confused with the selection silvicultural system.

self-pruning. The natural death and fall of branches from live trees due to causes such as light and food deficiencies, decay, insect attack, snow and ice; also called natural pruning.

senescence. The process of turnover of green biomass into yellow (or dead) biomass. Senescence mainly depends on origin and development of a plant, but it is also influenced by dryness and/or nutrient stress and pest diseases.

serotiny. Refers to cones that remain closed on the tree for one or more years and may open by exposure to temperature $< 50^{\circ}\text{C}$.

shade tolerance. The capacity of a tree or plant species to develop and grow in the shade of and in competition with other trees or plants.

shake.

- A lengthwise separation of wood (usually caused by wind) that usually occurs between and parallel to the growth layers.
- A thin section split from a bolt of wood and used for roofing or siding.

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-aged stand results.

shelterwood silvicultural system. An even-aged silvicultural system where in order to provide a source of seed and/or protection for regeneration, the old crop is removed in two or more successive cuttings:

- **Group Shelterwood System:** Patches of advanced regeneration arising from thinnings or from natural disturbances, commonly developed in even-aged stands. Where this condition is prominent, shelterwood cuttings can be made specifically in relation to the requirements of each group of advanced

regeneration. These clumps of regeneration are enlarged by the removal of all or most of the trees above them and initiating preparatory or seeding cuttings around them. The holes created in the canopy are gradually enlarged to keep pace with the establishment of reproduction.

- **Irregular Shelterwood System:** Harvest cutting in which opening of canopy is irregular and gradual; generally in groups, with the final cutting often in strips; regeneration natural; regeneration interval long, often up to half the rotation and the resultant crop considerably uneven-aged and irregular.

- **Strip Shelterwood System:** A shelterwood system in which regeneration cuttings are carried out on fairly wide strips, generally against the prevailing winds and progress rapidly; regeneration is mainly natural, regeneration interval short and resultant crop fairly even-aged and regular.

- **Uniform Shelterwood System:** A shelterwood system in which the canopy is opened fairly evenly throughout the regeneration area; regeneration is mainly natural, though it may be supplemented artificially; regeneration interval fairly short and resultant crop more or less even-aged and regular.

shrub. A woody perennial plant (lives more than one year) that differs from a perennial herb by its woody, persistent stems and from a tree by its low stature and branches that start from the base.

significant wildlife habitat. Wildlife habitats that are ecologically important in terms of features, functions, representation or amount, and their contribution to the quality and diversity of an area.

silvics. A knowledge of the nature of forests and forest trees, how they grow, reproduce and respond to changes in their environment.

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.

silviculture 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 silviculture treatments that will be carried out to establish a free growing stand in a manner that accommodates other resource values as identified.

single-tree selection. The cutting method that describes the silvicultural system in which trees are removed individually, here and there, each year over an entire

forest or stand. The resultant stand usually regenerates naturally and becomes all-aged. *see selection silvicultural system.*

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 District. A subdivision of a Site Region that is based on a characteristic pattern of physiographic features that distinguish fairly large areas from each other (Hills 1959).

site form. A numerical expression of forest site quality based on the height in meters (m), at a specified diameter (DBH) of dominant and codominant trees in a stand. Used for uneven-aged stands.

site index. A numerical expression of forest site quality based on the height in meters (m), at a specified age (usually age 50 years), of dominant and codominant trees in a stand. Used for even-aged stands.

site preparation. Any treatment of a forest site to prepare it for establishment of a plantation or for natural regeneration.

Site Region. Hills (1959) divided Ontario into Site Regions that are considered to be areas of similar potential biological production, based on climate as modified by physiographic landform and proximity to the Great Lakes.

skid road (skid trail). A pathway over which logs are dragged (skidded) from the stump to the landing. Logs are dragged by a machine called a skidder or by horses.

skidder. A wheeled or tracked vehicle used for sliding and dragging logs from the stump to a landing.

skidding. The process of dragging logs from the woods to a landing.

slash.

- Tree tops, branches, bark and other debris, left after a forest operation; or
- The process of cutting down undesirable vegetation.

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 six meters, it is properly termed a stub.

softwood. One of the botanical group of trees that generally have needle or scale-like leaves the conifers. Also the wood produced by such trees, regardless of texture or density.

soil. Unconsolidated mineral material or organic material that is greater than 15 cm thick that occurs at the earth's surface, has undergone soil formation processes, usually exhibits a distinct soil profile and is capable of supporting plant growth.

soil horizon. A layer of soil with distinct characteristics that separate it from other soil layers.

soil moisture. The relative amount of water in the soil; usually applied to upper levels of soil, occasionally to humus layer.

soil profile. A vertical section of soil showing the nature and thickness of the various horizons, often used in soil classification.

soil series. Grouping of soils with similar profile characteristics.

soil texture. The relative proportion of various particle sizes such as sand, silt, clay and coarser materials in a mineral soil sample. The Canadian System of Soil Classification describes the basic textural classes (clay, silty clay, sandy loam, etc.)

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 of conservation concern. Includes endangered, threatened, vulnerable (or rare) plant or animal species as well as plant or animal species currently experiencing significant population declines in the province, or plant or animal species of particular importance to the Province or to a local region for any number of reasons.

species (of trees). Trees having very similar genetic makeup, so that they freely interbreed and have common characteristics. In common language, a 'kind' or 'variety.' Each species is identified by a scientific name that consists of a genus portion and then a species portion (*Pinus strobus*, white pine).

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.

spikelet. An elongated inflorescence, consisting of one or more flowers.

spike top. A tree with a dead top, usually a mark of declining vigor.

sporangium. An organ in which spores are produced.

spore. A one-celled asexual reproductive organ. Almost exclusively associated with non-flowering plants (e.g. mosses, fungi).

sprout.

- Any shoot arising from a plant; or
- A young tree developed directly from the base, stump, or root of another tree. Relatively common among hardwoods.

stand. An aggregation of trees occupying a specific area and uniform enough in composition (species), age and arrangement to be distinguishable from the forest on adjoining areas.

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.

stand table. A summary table showing the number of trees per unit area by species and diameter classes, for a stand or type. The data may also be presented in the form of a frequency distribution of diameter classes.

stem. The trunk of a tree.

stick nest. A platform of sticks (twigs up to small branches) constructed by some bird species for nesting.

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.

- **fully stocked:** Productive forest land stocked with trees of a merchantable species. These trees, by number and distribution or by average DBH, basal area, or volume, are such that at rotation age they will produce a timber stand that occupies the potentially productive ground. The stocking, number of trees, and, distribution required to achieve this will usually be determined from yield curves. Sometimes called *normally stocked*.

- **over stocked:** Productive forest land stocked with more trees of merchantable species than normal or full stocking would require. Growth is in some respect retarded and the full number of trees will not reach rotation age according to an appropriate yield and stock tables for the particular site and species.

stock table. A summary table showing the volume of trees per unit area by species and diameter classes, for a stand or type.

stolon. An elongate stem developing along the surface of the ground that takes root and forms new plants at the nodes or apex.

stone. A part of a drupe; consisting of a seed enclosed in a hard bony endocarp.

stratification. A pre-germinative treatment to break dormancy in seeds accomplished by exposing imbibed seeds to cold (2 to 5°C) or warm conditions.

stream. A permanent or intermittent water course.

stub. A standing, dead tree or a standing section of the stem of a tree broken off at the height of six meters or less. If more than six meters, it is properly termed a snag.

stumpage. The value of timber as it stands uncut in the woods; in a general sense, the standing timber itself. Can also denote price paid for this timber.

succession. The replacement of one plant community by another in progressive development towards climax vegetation.

Types of succession:

- **primary:** Plant succession on newly formed soils or surfaces, exposed for the first time, that have never borne vegetation.

- **secondary:** Plant succession following the destruction of a part or all of the original vegetation.

sucker.

- A sprout from the lower portion of a stem, especially from the root.

- A shoot or tree originating from adventitious buds on roots.

sunscald. Death of cambial tissue on one side of a tree, caused by exposure to direct sunlight.

supercanopy tree. A living tree that sticks up well above the main canopy of a forest stand.

suppressed tree. *see overtopped.*

sustainability. The concept of producing a biological resource under management practices that ensure replacement of the part harvested, by re-growth or reproduction, before another harvest occurs.

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.

sweep. A gradual, but pronounced, bend in a log, pole, or piling; considered a defect.

T

tally. The count of trees, logs, or other products; to count trees, logs, or other products; to record products, distances, etc. as measured.

talus. Refers to fragmented rock, which has broken away from bedrock surfaces and fallen to the base of the bedrock feature where it accumulates to form a sloping broken rock surface.

taper. The gradual reduction of diameter in a stem of a tree or a log from the base to the top.

tending. Generally, any operation carried out for the benefit of a forest crop at any stage of its life, e.g., cleaning, thinning, pruning.

terrestrial system. Upland areas, where the water table is normally below the soil surface.

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.

Types of thinning

- **thinning from above.** A thinning that favors the most promising (not necessarily the dominant) stems, with due regard to even distribution over the stand, by removing those trees that interfere with them. Also known as *crown thinning*.

- **thinning from below.** A thinning that favors the dominants or selected dominants more or less evenly distributed over the stand by removing a varying proportion of the other trees. Also known as *low thinning*.

- **low thinning**: The removal of trees from the lower crown classes in a stand. Also known as *thinning from below*.

- **crown thinning**: The removal of trees from the middle and upper crown classes in a stand, to favor the most promising trees of these classes. Also known as *thinning from above*.

- **selection thinning**: Removal of dominant trees to benefit trees in lower crown classes.

- **free thinning**: Removal of trees to benefit best trees, regardless of crown class.

- **mechanical thinning**: Removal of trees based totally on their spacing or arrangement. Also known as *row thinning*.

till. Glacial deposits laid down directly by the ice with little or no transportation or sorting by water.

timber. A term loosely applied to forest stands or their products; often applied to wood in forms suitable for heavy construction.

tolerance. The capacity of a tree or plant to develop and grow in the shade of (and in competition with) other trees or plants; a general term for the relative ability of a species to survive a deficiency of an essential growth requirement (light, moisture, nutrient supply).

top height. The mean height of 100 trees per hectare of largest diameter at breast height.

tree. A woody plant having one well-defined stem and a more or less definitely formed crown, usually attaining a height of at least three meters.

tree age. The number of years since the germination of the seed, or the budding of the sprout or root sucker.

tree length. Entire length of tree, or with the top lopped off at small diameter, as in skidding tree length to a landing for bucking into logs.

tree marking. Selecting and marking trees to be harvested and trees to be left to grow. Selected trees are usually identified with coloured paint on the tree trunk at DBH and at the stump. Normal colours used in Ontario are: orange/yellow for stem removal and blue for residual stems.

U

UGS - unacceptable growing stock. These trees have a high risk of dying and are expected to decline over the next cutting cycle. They include trees that are of poor form and/or low quality.

underbrush. The brush growing in a forest.

undergrowth. Small trees and shrubs and other plants growing under a forest canopy.

understory. That portion of the trees or other vegetation in a forest stand below the canopy.

uneven-aged. Applied to a stand in which there are considerable differences in the age of the trees and in which three or more age classes are represented.

uneven-aged management. The application of a combination of actions needed to simultaneously maintain continuous high-forest cover, recurring regeneration of desirable species and the orderly growth and development of trees through a range of diameter or age classes. Cutting methods that develop and maintain uneven-aged stands are single tree selection and group selection.

unmerchantable. A tree or stand that has not attained sufficient size, quality and/or volume to make it suitable for harvesting.

V

value-limiting defect. Such features are considered to be either:

- **Scaleable Defect:** such as rot or shake, that reduce sound useable volume or durability; or

- **Grade Defect:** such as knots or stain, that reduce strength or utility.

vegetation type. The sixth and finest level of resolution in the Ecological Land Classification system. It represents recurring vegetation patterns observed on the landscape, based only on plant species composition. Normally, "Vegetation Types" include the names of dominant plant species of the community, based on relative abundance.

vegetative reproduction. Reproduction by a root, stem, leaf, or some other primary vegetative part of a plant body.

volume. The amount of wood in a tree, stand, or, other specified area according to some unit of measurement or some standard of use (e.g. m³ or m³/ha)

- **Gross Total Volume (GTV):** Volume of the main stem, including stump and top, as well as, defective and decayed wood of individual trees or stands.

- **Gross Merchantable Volume (GMV):** Volume of the main stem, excluding a specified stump and top, but, including defective and decayed wood of individual trees or stands.

- **Net Merchantable Volume (NMV):** Volume of the main stem, excluding stump and top, as well as, decayed wood of individual trees or stands.

volume table. A table showing gross volume of trees, based on given tree measurements (usually DBH and height).

W

water table. The upper surface of the water saturation zone.

wetland. Land that is seasonally or permanently covered by shallow water, or land where the water table is close to or at the surface. In either case, the presence of abundant water has caused the formation of hydric soils and has favored the dominance of either hydrophytic or water-tolerant plants.

wetland system. Areas where water levels fluctuate and are under two meters in depth.

wildlife. All wild mammals, birds, reptiles, amphibians, fishes, invertebrates, plants, fungi, algae, bacteria and other wild organisms.

windfall. A tree uprooted or broken off by wind; an area on which the trees have been thrown by wind. **see** *windthrow*.

APPENDIX 4

Bibliography

Bibliography

- Begin et al. 2005. A Background Study For Nomination of the Ottawa River Under the Canadian Heritage Rivers System.
- Domtar Communication Papers 1999. D. Hamilton. St. Lawrence Forest Twenty Year Forest Management Plan. 1999-2019.
- Eastern Ontario Model Forest. 1999. L. Johnson and P. Heaven. State of the Forest Report. (Information Report No. 42).
- Eastern Ontario Model Forest. 2005. EOMF. State of Eastern Ontario's Forests. http://sof.eomf.on.ca/Introduction/introduction_e.htm.
- Copetake, M. 2005. Wood Flow and Wood Supply Study (Information Report No. 100). Eastern Ontario Model Forest.
- Eastern Ontario Model Forest. 2007. Forest Certification Policies and Procedures Manual (Information Report #51 v.2).
- Evans et al. 2006. Status of Important Forest Pests in Ontario. Canadian Forest Service.
- FSC. 2007. Certification Standard for the Great Lakes/St. Lawrence Forest Region. Forest Stewardship Council.
- Harkness, J.G. 1946. Stormont, Dundas and Glengarry. A History.
- Hendry, J. 2005. Old Growth Forest Conservation Program - Program and Survey Protocol. Ontario Ministry of Natural Resources.
- Horizon Multiresource Inc. 2008. Protection and Development Plan of Larose Forest.
- LRC. 1999a. Extension Notes – The Old Growth Forests of Southern Ontario. LandOwner Resource Center.
- LRC. 1999b. Extension Notes – Restoring Old Growth Features to Managed Forests in Southern Ontario. LandOwner Resource Center.
- LRC. 1997. Extension Notes - Forest History in Eastern Ontario. LandOwner Resource Center.
- McDonald, D. 2003. Silver Maple A Bottomland Hardwood in Ontario.
- Ontario Government. 1948. South Nation Valley. Interim Report.

OMNR 1979. Scott Reid. Larose Forest. Ontario Ministry of Natural Resources.

OMNR. 1988. Implementation Strategy: Areas of Natural and Scientific Interest. Ontario Ministry of Natural Resources.

OMNR. 1989. Forest Management Plan for the Corporation of the United Counties of Prescott and Russell Agreement Forest (Larose Forest). Ontario Ministry of Natural Resources.

OMNR. 1992. J. Hendry. Forest Management Plan for the Domtar Agreement Forest. 1992 to 2012. Ontario Ministry of Natural Resources.

OMNR. 1997: Red Pine and White Pine Density Management Diagrams For Ontario. Ontario Ministry of Natural Resources.

OMNR. 1998a: A Silvicultural Guide For the Tolerant Hardwood Forest in Ontario. Ontario Ministry of Natural Resources.

OMNR. 1998b: A Silvicultural Guide For the Great-Lakes-St. Lawrence Conifer Forest in Ontario. Ontario Ministry of Natural Resources.

OMNR. 2000: A Silvicultural Guide To Managing Southern Ontario Forests. Ontario Ministry of Natural Resources.

OMNR. 2001 (Draft): Plantation White Spruce Density Management Diagram For Ontario. Ontario Ministry of Natural Resources.

OMNR. 2004. Forest Management Planning Manual for Ontario's Crown Forests. Ontario Ministry of Natural Resources.

OMNR 2006. Forest Health Update – Kemptville – Pembroke: July 2006. Ontario Ministry of Natural Resources.

OMNR 2007a. Forest Health Update – Kemptville – Pembroke: July 2007. Ontario Ministry of Natural Resources.

OMNR 2007b. Forest Management Guide for Cultural Heritage Values. Ontario Ministry of Natural Resources.

OMOC 2008. Archaeology. <http://www.culture.gov.on.ca/english/heritage/archaeology/arch.htm>. Ontario Ministry of Culture.

Ottawa Valley Forest. 2006. A. Van Dyke. Forest Management Plan. 2006-2011. Ottawa Valley Forest Inc.

Streit, Martin. 2007. The United Counties of Stormount, Dundas and Glengarry - SDG County Forest – Forest Management Plan. 2007-2026.

Streit, Martin. 2008. Personal Communication.

UCPR. 2001. The Larose Forest – A Forest For Its Community. Larose Forest Strategic Plan. United Counties of Prescott and Russell.

UCPR. 2006. United Counties of Prescott and Russell Official Plan. United Counties of Prescott and Russell.

UCPR. 2007. History. www.prescott-russell.on.ca. United Counties of Prescott and Russell.

Uhlig, P., A. Harris, G. Craig, C. Bowling, B. Chambers, B. Naylor and G. Beemer. 2001. Old growth forest definitions for Ontario. Ontario Ministry of Natural Resources.

Wisconsin Extension. 1996. Estimating Stocking Conditions in Your Timber Stand.

Young, W.D. 1998. Internal Domtar Report on the 1998 Ice Storm.