

MANAGEMENT OF NATURAL ACADIAN FOREST

A GUIDE TO RESOURCES

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PREPARED BY FLORA JOHNSON, PICEA FORESTRY CONSULTANTS &
STAFF OF THE NOVA SCOTIA DEPARTMENT OF NATURAL RESOURCES

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INTRODUCTION

This guide highlights and organizes resources that are available to help Nova Scotia woodlot owners and other forest stakeholders manage for natural forest and for multiple forest benefits and uses. The guide does not attempt to include every resource available but rather is a selection of resources that complement each other and introduce useful information and skills. This collection focuses on items that are available via the Internet, but also includes a selection of print and video resources. Most of these are available through Nova Scotia libraries as well as from other sources.

The guide begins with a collection of materials, classified as Basic Concepts, that are intended to provide a general introduction to woodlot ecology and management of natural forest. Remaining resources are organized by topic, as reflected in the table of contents beginning on page 3.

Each section of the guide begins with resources that were produced by the Nova Scotia Department of Natural Resource (NSDNR). These are followed by other resources produced in Nova Scotia and then by materials from outside of the province. This selection favours materials produced in the other Maritime provinces, Maine, and southern Ontario.

In the Internet-enabled version of this document, underlined text indicates a link to a web page or downloadable resource. (For web addresses, see Appendices D and E.) When a copy of the item is available for free, ordering information is also included in the text. [Appendix C](#) provides information on how to access printed materials and videos through the Nova Scotia library system and also how to find copies of materials for purchase.

This guide was prepared with funding from NSDNR. Suggestions for resources to include in this guide came from a wide variety of sources, including reading lists previously compiled by others. The authors wish to thank all who contributed.

DISCLAIMER

Inclusion of a resource in this guide is for general educational purposes only and is not meant to endorse or recommend specific organizations or activities. Forest management decisions must be tailored to the characteristics of the forest being managed and to the owner's goals, objectives, resources, and skills. Forest owners are encouraged to seek competent professional advice in order to receive management recommendations that are appropriate for their individual circumstances.

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I. BASIC CONCEPTS

Generally speaking, an *ecosystem* is a community of interacting plants and animals that are adapted to living in similar conditions. The study of how ecosystems work is called *ecology*.

In recent decades, forest managers have come to understand that to ensure the health and long-term productivity of forests, it is important to understand the functions and processes of ecosystems at work in the forest, and how all ecosystems are interconnected. This allows the forest manager to promote and protect a healthier, more diverse, and more productive forest while also pursuing economic objectives.

The Nova Scotia Department of Natural Resources (NSDNR) has available a number of new tools to help woodlot owners implement ecosystem-based forest management on their land. These are discussed in Section III of this guide. A detailed overview of NSDNR's work in this area is available in the document titled *Implementing Ecosystem-Based Integrated Resource Management in Nova Scotia* (pdf) by Bruce Stewart and Peter Neily.

Module 7 in NSDNR's Woodlot Management Home Study program, *Woodlot Ecology: Your Living Woodlot*, provides an overview of ecosystems that may be present on a woodlot and how such systems are affected by woodlot management. Printed copies of the home study program are available free from woodlot@gov.ns.ca or 902-424-5444.

Restoring the Acadian Forest: A Guide to Forest Stewardship for Woodlot Owners in the Maritimes (Res Telluris, 2nd edition 2008) by Jamie Simpson presents introductory information on many of the topics covered in this guide, including the history of the Acadian Forest, water, soils, deadwood, harvesting trees, and wildlife habitat. The book may be downloaded free for personal use from the website of Nova Scotia publisher Res Telluris.

Simpson is also the author of the *Guide to FSC Certification for Woodlot Owners in Nova Scotia* (pdf), published by the

WHAT IS THE ACADIAN FOREST?

One of eight distinct forest regions in Canada, the Acadian Forest encompasses Nova Scotia, New Brunswick, and Prince Edward Island in Canada and also extends into the northeastern portion of the United States.

The Forest of the Acadian Ecozone, a section of Lesson One, Module 7, of the NSDNR Woodlot Management Home Study program, introduces the Acadian Forest region.

The Harriet Irving Botanical Gardens website offers an overview of different natural landscapes found in Nova Scotia, *Habitats of the Acadian Forest Region*. Of particular interest to woodlot owners would be the sections on deciduous woodlands, mixed woodlands, wet woodlands, and coniferous woodlands.

There is an overview of characteristics of *New England-Acadian Forests* at the Encyclopedia of Earth.

Mersey Tobeatic Research Institute. Although focused on forest certification, this manual provides an introduction to the Acadian Forest and to management practices and basic concepts that are appropriate in natural forest, along with a glossary of terms used in management of natural forest. Printed copies are available free from MTRI, info@merseytobeatic.ca or 902-682-2371.

Nature's Way: An Introduction to Forest Ecology (Earthwood Editions, 2006) by Girvan Harrison is an overview of forest ecology written in easy-to-understand language. Harrison is also the author of *Out Roddie's Way* (Earthwood Editions, 2002) and *Roddie's New Woodlot* (Earthwood Editions, 2007), in which a fictional Nova Scotian discusses his experiences as a woodlot owner and in the process, gives lessons in woodlot management and woodlot ecology.

Positive Impact Forestry: A Sustainable Approach to Managing Woodlands (Island Press, 2004) by Thomas J. McEvoy is an introduction to ecologically based forest management. McEvoy is also the author of an earlier short work titled *Introduction to Forest Ecology and Silviculture* (Northeast Regional, 2000), which focuses on forests of the Northeast.

Woodland Ecology: Environmental Forestry for the Small Owner (Syracuse University Press, 2nd edition 1980) by L.S. Minckler is a well-regarded introduction to this topic.

Although not specific to the Acadian Forest, *The Woodlot Management Handbook: Making the Most of Your Wooded Property for Conservation, Income or Both* (Firefly Books, 2nd edition 2009) by Stewart Hilts and Peter Mitchell covers many topics addressed in this guide, including woodlot ecology, reforestation, natural succession, and silviculture. The book emphasizes an approach that balances management of healthy natural forest with economic returns.

PLEASE NOTE

Printed materials and videos mentioned in this guide are often available through the Nova Scotia library system. (See [Appendix C](#) for details.)

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II. UNEVEN-AGED MANAGEMENT

The expression *uneven-aged management* refers to management practices that are applied to a forest so that it will continually include trees of various ages, sizes, and species. This allows woodlot owners to maintain a natural Acadian Forest while pursuing a variety of goals.

The [Nova Scotia Department of Natural Resources \(NSDNR\)](#) web pages titled [Harvesting](#), [Silviculture](#), and [Selection Management](#) include information on uneven-aged management. Lesson Seven in Module 7 of NSDNR's Woodlot Management Home Study program, [Woodlot Stewardship and Sustainability](#), also contains information on uneven-aged management. Module 7 is available free in printed form from woodlot@gov.ns.ca or 902-424-5444. NSDNR also has a new [Woodlot Harvesting](#) (pdf) brochure, an overview of all types of harvesting, available free in print form from the same email address and telephone number.

NSDNR's [Tolerant Hardwood Management Guide](#) (pdf) and [Tolerant Softwood & Mixedwood Selection Management Guide](#) (pdf), both by Tim McGrath, provide keys and other information designed to be used to manage trees for economic return.

[Growing High-Value Trees](#) (pdf), published by Nova Scotia's [Association for Sustainable Forestry \(ASF\)](#), provides an introduction to uneven-aged management.

The following pages provide additional resources on concepts and techniques that are important in the practice of uneven-aged management.

II. a. Crop Trees

Crop trees typically are trees chosen by the forest manager for their potential to yield high-quality wood products. Once harvested, these trees are likely to have high value when sold individually or in small lots. However, the term *crop tree* may refer to any tree the forest manager wishes to keep, for instance a tree that has no commercial value but has high value for wildlife, or a species that is scarce in the area and thus could serve as a future seed tree.

Crop tree selection is discussed in [Choosing Which Trees to Keep & Which to Take](#) (pdf), a three-page handout that was developed as part of an outreach project designed to encourage increased uptake of funding available through the [Association for Sustainable Forestry](#).

[Crop Tree Management in Eastern Hardwoods](#) (pdf) by Arlyn W. Perkey and others is a [United States Department of Agriculture \(USDA\) Forest Service Northeastern Area](#) book that explains how crop tree management can be used to further a variety of woodlot owner goals. Most of the information in this resource is of a general nature and thus could be applied in the Maritimes and in mixedwood stands.

II. b. Tree Marking

Tree marking makes cutting and extracting timber easier for contractors and helps to ensure that harvests are appropriate for the landowner's goals. It is a new idea in Nova Scotia but one that is expected to catch on as woodlot owners become familiar with this practice.

Both crop tree selection and tree marking are covered in [Choosing Which Trees to Keep & Which to Take](#) (pdf), which was described in [Section II. a.](#)

New Brunswick-based [INFOR Inc.](#) published a brief article explaining the benefits of tree marking, [An Introduction to Tree Marking](#) (pdf), on page 10 of their Winter 2008 newsletter.

Tree marking is widely used in Ontario, where some tree species are the same as those found in Nova Scotia. The following articles from the [Ontario Woodlot Owners Association](#) (first two) and Rideau Valley Conservation Authority's [LandOwner Resource Centre](#) explain tree marking and why it benefits woodlot owners:

- [An Introduction to Tree Marking](#) (pdf)
- [Tree Marking](#)
- [Promoting a Healthy Forest Through Tree Marking](#) (pdf)

In Ontario, it is possible to take training and become a certified tree marker. The [Ontario Ministry of Natural Resources](#) has published the full [Ontario Tree Marking Guide](#) (Ontario Government, Ministry of Natural Resources, 2004), which is used in training of tree markers. The guide covers not only tree marking for economic return but also selection of trees for wildlife habitat and biodiversity. Woodlot owners who want to manage natural forest will want to concentrate on the sections devoted to tree marking for individual tree selection and group selection.

II. c. Tending & Regenerating

The [Canadian Encyclopedia](#) defines [Silviculture](#) as “the branch of forestry that deals with establishing, caring for, and reproducing stands of trees for a variety of forest uses.”

Silvicultural activities may also be referred to as *tending* and *regenerating*, as they often involve ongoing care for the trees while they are growing (*tending*) and creation of conditions that will encourage establishment of desired species (*regenerating*).

[Growing High-Value Trees](#) (pdf), which is described at the beginning of [Section II](#), introduces three silviculture treatments that are used in tending and regenerating high-value trees: *crop tree release*, *crop tree pruning*, and *selection management*.

A companion to the above is the [Leaving a Legacy](#) video, which can be downloaded in three parts from the [Association for Sustainable Forestry](#) website. This 30-minute video briefly describes the Acadian Forest, explains the three quality-improvement silviculture treatments, and discusses funding available from the ASF. Copies of the video are available free, while supplies last, from david.sutherland@asforestry.com or 902-895-1179.

II. c. i. Crop Tree Release

In *crop tree release*, a woodlot manager removes trees that are competing with trees the manager has identified as crop trees. This gives the more desired trees room to expand their crowns, which increases their food supply and thus helps them to grow in height, diameter,

and root system.

NSDNR will soon publish a new brochure on crop tree release. It will be available free in printed form from woodlot@gov.ns.ca or 902-424-5444 and will be available in pdf format on NSDNR's [Publications for Woodlot Owners](#) web page.

[Understanding and Measuring Basal Area](#), a section of Module 4 in NSDNR's Woodlot Management Home Study program, provides an explanation of how to determine the basal area of trees growing on a woodlot. This information is a measure of how much of the area of a woodlot is taken up by trees, and is used to determine how many trees should be removed during crop tree release. Module 4 is available free in printed form from woodlot@gov.ns.ca or 902-424-5444.

[Crop Tree Management: A New Tool to Help You Achieve Your Woodland Goals](#) is an [Ohio State University Extension](#) fact sheet that covers the basics of selecting and managing crop trees. [It is also available in pdf format.](#)

II. c. ii. Crop Tree Pruning

The silvicultural technique known as *crop tree pruning* is used to grow clear (knot-free) wood, which is highly valued for use in making veneer-quality products. Crop tree pruning is often used in combination with crop tree release to grow trees that will be economically valuable once harvested.

NSDNR will soon publish a new brochure on crop tree pruning. This will be available free in printed form from woodlot@gov.ns.ca or 902-424-5444 and will be available in pdf format on NSDNR's [Publications for Woodlot Owners](#) web page.

[Crop Tree Pruning](#) (pdf) is an introductory brochure produced by the [Association for Sustainable Forestry](#). The ASF also has published [Crop Tree Pruning Quality Standards](#) (pdf), which they use in determining whether a given pruning job will qualify for funding.

Though not specific to Nova Scotia, [Pruning Your Forest Trees](#) (pdf) from the [Maine Forest Service](#) provides a detailed introduction.

Tree Basics (Shigo and Trees, 1995), *Tree Anatomy* (Shigo and Trees, 1994), *100 Tree Myths* (Shigo and Trees, 1993), *Modern Arboriculture: A Systems Approach to the Care of Trees and Their Associates* (Shigo and Trees, 1991), *A New Tree Biology and Dictionary: Facts, Photos and Philosophies on Trees and Their Problems and Proper Care* (Shigo and Trees, 1989), and *Tree Pruning: A Worldwide Photo Guide* (Shigo and Trees, 1989) are all by Alex L. Shigo, a recognized authority on pruning.

II. c. iii. Selection Management

In *selection management*, trees are harvested individually or in small groups, with the aim of achieving and maintaining an uneven-aged forest. By creating small gaps in the forest canopy, selection management may also be used to encourage natural regeneration of

valuable Acadian Forest species. Resources providing information on ways to regenerate specific species of trees will be found in [Section II. e.](#) of this guide.

[Harvesting Systems: The Selection System](#), Lesson Three in Module 2 of NSDNR's Woodlot Management Home Study program, provides a brief overview of selection management. This is available free in printed form from woodlot@gov.ns.ca or 902-424-5444.

NSDNR will soon publish a new brochure on selection management. This will be available free in printed form from woodlot@gov.ns.ca or 902-424-5444 and will be available in pdf format on NSDNR's [Publications for Woodlot Owners](#) web page.

NSDNR's [Tolerant Hardwood Management Guide](#) (pdf) and [Tolerant Softwood & Mixedwood Selection Management Guide](#) (pdf), described in the beginning of [Section II](#), provide keys and other information that may be used for selection management.

[Scenes from a Selection Harvest](#) by Sandy Hyde is a brief photographic record (slideshow) of a selection harvest completed by horse logging in winter 2010 on a Nova Scotia woodlot. It can be found on the bottom of the first page of the website of the [Acadian Forest Keepers](#).

The [Nova Scotia Woodlot Owners and Operators Association](#) published [Introduction to Low-Impact Forestry](#). This is a short account of research, conducted between 1946 and 1989 in New Brunswick, in which a selectively logged site yielded more wood than a clearcut area.

In 2008, Nova Scotia-based [GPI Atlantic](#) released a report titled [GPI Forest Headline Indicators for Nova Scotia](#) (pdf) by Linda Pannozzo and Ronald Colman, which gives reasons for using selection harvesting more often in the province. In addition to the full version, a [press release summarizing the report](#) is also available online.

A 2001 report by GPI Atlantic, [The Nova Scotia Genuine Progress Index Accounts Volume 2: A Way Forward: Case Studies in Sustainable Forestry](#) (pdf) by Linda Pannozzo and Minga O'Brien, profiles Windhorse Farm, Pictou Landing First Nation, and the late Jeremy Frith to show how selection harvesting and other low-impact forestry approaches are used on local woodlots. A [summary](#) is also available online.

The [Windhorse Farm](#) website contains [a section about their forest](#), including a paper on forest management practices used on the farm by owner Jim Drescher, [Enrichment Forestry at Windhorse Farm](#) (pdf).

[Ecological Forestry in the Maritimes](#) is a seven-minute video from New Brunswick-based [Community Forests International](#) in which woodlot owners Clark Phillips and Susan Tyler describe how they have practiced selection management for more than 30 years on Whaelghinbran Farm in New Brunswick. The video begins with a description of natural Acadian Forest and an explanation of why selection harvesting is usually the most appropriate way to manage natural Acadian Forest.

[Group Selection Cutting for the Landowner](#) (PowerPoint®) is a slide presentation from the [USDA Forest Service Northeastern Area](#), Maine Department of Conservation, and Small

Woodlot Owners Association of Maine. It provides an overview of selection cutting including reasons to use this approach and equipment and methods used.

II. d. Low-Impact Logging

Uneven-aged management is closely related to *low-impact logging*, in which forestry operations are carried out in a way that minimizes damage to forest ecosystems.

There are many resources available to help woodlot owners conduct general harvesting operations (not specifically selection management) in the least damaging way possible. One resource that has been used in Nova Scotia for many years is *The Trees Around Us: A Manual of Good Forest Practice for Nova Scotia* (Nova Scotia Department of Lands and Forests, 1980).

[Guide to Woodlot Certification for Woodlot Owners in Nova Scotia](#) (pdf), which is described in [Section I](#), includes information on low-impact logging.

Awakening: Living With Today's Forest is a short book created by the First Nations Forestry Program of Nova Scotia in cooperation with the [Confederacy of Mainland Mi'kmaq](#). For print copies, contact Alton Hudson, 902-895-6385 or forestry@cmmns.com. Copies are free while supplies last.

Terry Pearson of the [Federation of Nova Scotia Woodlot Owners](#) has compiled a collection of articles on [Low-Impact Forest Practices](#) (pdf).

The [Nova Forest Alliance's Contractors & Operators Best Management Practices Manual](#) (pdf) is a reference designed to be used by professionals on job sites. Topics covered include developing landowner agreements, road construction, wildlife habitat, harvesting, and safety.

[Certification Standards for Best Forestry Practices in the Maritimes Region: Standard for Small and Low Intensity Managed Forests](#) (pdf) contains guidelines specific to the Maritimes produced by the [Forest Stewardship Council](#)[®].

Principles, Goals, Guidelines and Standards for Low-Impact Forestry, an excerpt from Mitch Lansky's *Low-Impact Forestry: Forestry as if the Future Mattered* (Maine Environmental Policy Institute, 2nd edition 2003) has been reprinted online by the

LAWS & REGULATIONS

Anyone managing forested land in Nova Scotia should be familiar with provincial laws and regulations. The [NSDNR](#) website has information on [Nova Scotia's Wildlife Habitat and Watercourses Protection Regulations](#), which came into effect in 2002. These are mandatory on all lands, including small private woodlots.

Also at the NSDNR website, [Nova Scotia's Code of Forest Practice](#) (pdf) is the official framework for forest management on Crown Land. While it is not required for private landowners, it is encouraged. [Interim guidelines](#) may be downloaded in pdf format.

[Nova Scotia Environment](#) has information on the new [Nova Scotia Wetland Conservation Policy](#), which was enacted in 2011.

The [Nova Scotia Department of Justice](#) website provides the [Forest Sustainability Regulations](#), [Protected Water Areas](#) designations and regulations, and [Species at Risk List Regulations](#).

The [Nova Scotia Legislature](#) website has copies of the [Endangered Species Act](#), [Environment Act](#), [Forests Act](#), [Special Places Protection Act](#), [Wilderness Areas Protection Act](#), and [Wildlife Act](#).

Nova Scotia Woodlot Owners and Operators Association under the title Guidelines for Low-Impact Forestry. The Maine Organic Farmers and Gardeners Association's Low-Impact Forestry Project has placed pdf versions of Principles, Goals, Guidelines and Patient Money: The Economics of Low-Impact Forestry, also by Lansky, online.

From the Greater Fundy Ecosystem Research Project at the University of New Brunswick, Forest Management Guidelines to Protect Native Biodiversity in the Fundy Model Forest (pdf) contains guidelines that cover a wide variety of management issues, including roads, protected areas, wildlife habitat, deadwood, and watercourse buffers.

In 2010 the Ontario Ministry of Natural Resources published a new forest management guide, Forest Management Guide for Conserving Biodiversity at the Stand and Site Scales, which covers protection of waterways and habitat, road and water crossings, and soil and water conservation.

The Horse in the Forest: Caring, Training, Logging by G. Sennblad (Swedish University of Agricultural Sciences, 1993) is a comprehensive look at this style of low-impact logging.

II. e. Tree Identification & Silvics

Silvics is the study of the conditions tree species need to regenerate and grow, as well as how trees respond to specific silvicultural treatments. Many books that assist in the identification of trees also provide at least some silvicultural information.

A wide variety of guidebooks and web-based resources aid in the identification of trees. From NSDNR, the Interactive Guide to Common Native Trees of Nova Scotia is a way to identify common trees and get basic information about them. This guide is available in pdf and PowerPoint[®] formats, and a CD is expected soon.

NSDNR's *Identification of Nova Scotia Woody Plants in Winter* is available free in print form while supplies last from woodlot@gov.ns.ca or 902-424-5444. Like other NSDNR publications, it is also available through Nova Scotia libraries.

Introduction to Silviculture, Module 1 of NSDNR's Woodlot Management Home Study program, includes information on silvics of all major species. Module 1 is available free in print form from woodlot@gov.ns.ca or 902-424-5444.

The two-volume *Roland's Flora of Nova Scotia* by A.E. Roland and E.C. Smith, first published by Nimbus in 1966 (Part I) and 1969 (Part II) and revised by Marion Zinck in 1998, is a detailed guide to the plant life of this province. The first edition, Part I and Part II, has been made available online by the DalSpace Repository as it appeared in the *Proceedings of the Nova Scotian Institute of Science*. The 1998 edition was recently reprinted by Nimbus.

Trees of Nova Scotia (Nimbus Publishing, 1996) by Gary L. Saunders includes a guide to identification of tree species along with profiles of the major hardwood and softwood species, including introduced species. Saunders is also the author of *At a Glance: A Guide to Identifying and Managing Nova Scotia Hardwoods* (Nova Forest Alliance, 2004).

The Macphail Woods Ecological Forestry Project's *Native Trees of Prince Edward Island* profiles 10 conifers (softwoods) and 12 deciduous trees (hardwoods) that are common in Nova Scotia as well as on Prince Edward Island, where the Macphail project is located. Each profile includes a photograph and description along with brief information on growing conditions, propagation, wildlife uses, and areas of usage. At the end of each profile there is a link to the web page for that species at the *Silvics of North America* website, which is described below.

From the United States Department of Agriculture (USDA) Forest Service Northeastern Area, the *Silvics of North America* (USDA Forest Service, 1990) by Russell M. Burns and Barbara H. Honkala provides silvicultural information on approximately 200 forest tree species native to the United States. It is available in two volumes:

- *Volume 1: Conifers*. This is also available as a pdf.
- *Volume 2: Hardwoods*. This is also available as a pdf.

Trees in Canada (Fitzhenry & Whiteside, 1995) by John Laird Farrar is a highly regarded resource on this topic.

Field guides are designed for identification of species while in the field. A wide variety of printed field guides to trees are available through booksellers and the Nova Scotia library system. One example is *A Field Guide to Eastern Trees* (Houghton Mifflin, 1998) by George A. Petrides, from the Peterson Field Guides series.

One web-based guide that provides extensive information on almost all plants found growing in the wild in North America is the USDA's *Plants Database*. Although created and maintained by the USDA's Natural Resources Conservation Service, this database provides detailed information on plants found in both the United States and Canada. The entry for each plant is typically accompanied by at least one illustration, range maps showing the plant's present distribution and where it is native, and links to other information available online. Most listings also include information about the plant's characteristics, and often a fact sheet. By clicking on "State PLANTS Checklist" it is possible to get a list of plants found in Nova Scotia in a format that can be imported into many databases and spreadsheets.

PLEASE NOTE

Printed materials and videos mentioned in this guide are often available through the Nova Scotia library system. (See Appendix C for details.)

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III. ECOLOGICAL APPROACHES TO FOREST MANAGEMENT

During the last few decades, the forestry profession has moved increasingly toward management approaches that treat forested areas, forests, and individual stands as individual ecosystems requiring management approaches that are tailored to their specific structure, functions, and species. At the large-scale level, *ecological land classification* is being used to divide landscape areas into ecological units based on similarities in features such as climate, soils, geology, topography, water, and plants. At the level of the forest stand, *forest ecosystem classification* is being used to provide information that can be used in making management decisions.

The [Nova Scotia Department of Natural Resources \(NSDNR\)](#) has available a number of new tools to help woodlot owners implement ecosystem-based forest management on their land. The department's introduction to [ecosystem management](#) can be found at the NSDNR website. A detailed overview of NSDNR's work in this area is available in the document titled [Implementing Ecosystem-Based Integrated Resource Management in Nova Scotia](#) (pdf), which is described in [Section I](#).

For a glimpse of why Canada is moving in the direction of ecosystem-based forest management, and what this entails, see the [Canadian Forest Service](#) web page devoted to [Ecosystem-Based Management](#).

The 500-page [Natural History of Nova Scotia](#) has been made available online by the [Nova Scotia Museum of Natural History](#), providing a comprehensive overview of different ecosystems found in the province, with their associated plant and animal types. [Volume I: Topics & Habitats](#) covers topics such as the geological history of Nova Scotia, climate, the ocean, freshwater, soils, plants, animals, and how the landscape we have today evolved since the time of the glaciers. The habitat section covers offshore, coastal, freshwater, freshwater wetlands, and terrestrial unforested habitats in addition to hardwood, softwood, and mixedwood forests. Each of these forest habitats is further broken down into forest types, which are described in terms of physical aspects, successional sequence, plants and animals, special features, and distribution in Nova Scotia. The online version of [Volume II: Theme Regions](#) includes an interactive map. Clicking on a region will yield information about the history of a specific area, including how soils were formed.

III. a. Ecological Land Classification

In order to manage natural forest, it is important for a forest manager to understand the land's geological history, past human uses, climate, drainage, and other features that affect it from an ecological perspective. It is also important to know how it fits in with the surrounding landscape. One tool available to help landowners visualize how their forested property fits

into the larger landscape is NSDNR's [Forest Inventory](#) web page, which has links to an interactive map and other tools.

The primary tool used to understand how a property fits into a larger landscape is ecological land classification. Using this approach, Nova Scotia has been divided into nine *ecoregions*, defined primarily based on climate. These have been divided into 39 *ecodistricts*, which range in size from 126 square km to 6,481 square km.

One way to determine what ecoregion and ecodistrict a particular woodlot is in is to visit NSDNR's [Ecodistricts of Nova Scotia map](#) (pdf). Locating an area on the main map will provide the name and number of the ecodistrict. The smaller map in the lower right hand corner shows ecoregions.

Another useful resource is the interactive [Ecological Land Classification Map for Nova Scotia](#). There are some tips for using this map at right.

Once the ecodistrict and ecoregion of a woodlot have been established, [Ecological Land Classification for Nova Scotia: Volume 1— Mapping Nova Scotia's Terrestrial Ecosystems](#) (pdf) by Peter D. Neily and others will provide information on the history of the area, elevation, soils, drainage, and forest species associated with different growing conditions found within the ecoregion. This document also explains how Nova Scotia's ecological classification system was developed.

Note that the nine "theme regions" discussed in [Volume II](#) of the [Natural History of Nova Scotia](#), which is described at the beginning of [Section III](#), have almost the same boundaries as the nine ecoregions currently delineated by NSDNR.

TIPS FOR USING THE INTERACTIVE
[ECOLOGICAL LAND CLASSIFICATION
MAP FOR NOVA SCOTIA](#)

- "Layers" in the upper right-hand corner allows you to choose whether you want to see ecoregions or ecodistricts, and which of these will be the "active" layer. You must use the "Refresh Map" button in order to see the new view.
- To see a key that will identify the ecoregions or ecodistricts, click on the button in the upper left-hand corner.
- While viewing a layer, click on the "i" button on the left side of the screen, then click on an ecoregion or ecodistrict to be given information about it. This information will appear below the map.
- For a closer look at an area, click the "+" button on the left side and then click on the area you are interested in. You will "zoom in" on this area and will be able to see additional information such as community names and roads.
- Click on the button with the hand on it and then on the map to move the map area. Use the magnifying glass with a plus sign to zoom in.

III. b. Forest Ecosystem Classification

NSDNR is in the process of developing tools that can help forest managers make decisions based on an understanding of the ecology of their woodlots. While ecological land classification provides information for relatively large areas, forest ecosystem classification (FEC) is used to provide information at the level of the forest stand.

The *Forest Ecosystem Classification for Nova Scotia* manual is comprised of three volumes prepared by the NSDNR Forestry Division's Ecosystem Management Group: *Part I: Vegetation Types* (for a copy of the entire manual in pdf format, see the *Printable Versions* web page), *Part II: Soil Types* (pdf), and *Part III: Ecosites* (pdf). Used together, these volumes provide information that has many practical applications in woodlot management, particularly in developing appropriate prescriptions and operating plans. A limited number of printed copies of these guides are available from the Forestry Division, NSDNR, Arlington Place, 664 Prince Street, Truro, 902-893-5692.

In FEC management of a woodlot, generally the first volume of the FEC manual is used first, in order to determine the vegetation type or types present. The second volume is then used to determine soil type. Once these are known, the third volume is used to determine what *ecosites* are present on the woodlot. Ecosites are the smallest level of ecological classification.

Produced by the Association for Sustainable Forestry, *Managing the Natural Forest* (pdf) is an introduction to FEC and the new tools being developed by NSDNR. Note: At the time *Managing the Natural Forest* was written, the provincial FEC manual had not been completed. However, the manual for applying FEC in Nova Scotia was published in 2011.

III. b. i. Vegetation Types

Vegetation type refers to groups of plants that are typically found together in areas with similar characteristics. Identifying the vegetation type or types present on a woodlot can provide the forest manager with information about the site's disturbance pattern, successional state, and moisture and soil conditions.

III. b. i. 1. Natural Disturbance & Succession

Natural succession and *natural disturbance* are important concepts in forest ecology. They are ways of describing changes that take place in an ecosystem and are particularly useful for understanding vegetation patterns. The *Disturbance & Succession* page of the NSDNR website provides a brief introduction to these topics.

Forest Stages, a section of Lesson One, Module 3, of NSDNR's Woodlot Management Home Study program, provides an account of how an area of forest in southwestern Nova Scotia changed as a result of the 1869 Saxby Gale and the process by which the area slowly

evolved from a high shrub and early tree stage to eventual maturity. Module 3 is available free in printed form from woodlot@gov.ns.ca or 902-424-5444.

NSDNR's *Mapping Nova Scotia's Natural Disturbance Regimes* (pdf) by Peter Neily and others is a detailed examination of the types of events that initiate change in the Acadian Forest and where these may occur.

Several books mentioned in Section I of this guide provide introductions to disturbance and succession. More detailed explanations of *Natural Disturbance Regime* and *Plant Succession* may be found at the Encyclopedia of Earth.

The Acadian Forest: Historical Condition and Human Impacts by J.A. Loo and others is a detailed overview of the history of the Acadian Forest in the Maritimes. The full article, which appeared in a 2003 issue (Volume 79) of *The Forestry Chronicle*, may be obtained free from the Canadian Forest Service website, which also has a summary of the article.

Also by Dr. Loo (and others), *Changing Forest Landscapes in the Atlantic Maritime Ecozone* was published in *Assessment of Species Diversity in the Atlantic Maritime Ecozone* (NRC Research Press, 2010). The article is summarized at the Canadian Forest Service website, where a free copy may be ordered.

III. b. i. 2. Identification Guides

The first step in using FEC on a woodlot is to identify plants growing in the area. This includes not only tree species but also shrubs, wildflowers, ferns, mosses, and lichens. Several guides that were mentioned in Section II. e. of this guide could be useful in identifying woodlot vegetation.

Guidebooks published by Halifax-based Nimbus Publishing include *Common Wildflowers & Plants of Nova Scotia* (2004) by Diane LaRue, *Weeds of the Woods: Small Trees and Shrubs of the Eastern Forest* (2004) by Glen Blouin, *Native Orchids of Nova Scotia* (2001) by Carl Munden, *Spring Wildflowers* (1993) by A.E. Roland, and *Shrubs of Nova Scotia: A Guide to Native Shrubs, Small Trees and Woody Vines* (1998) by Raymond R. Fielding.

From the Mersey Tobeatic Research Institute, *Common Shrubs, Herbs & Mosses of Nova Scotia* (pdf) by Alain Belliveau is a guide to identification of 39 common plants. Also by Belliveau, *Ferns of Southwest Nova Scotia* (pdf) aids in the identification of 21 common ferns. Each fern is accompanied by information on the type of woodland in which it is usually found.

Mersey Tobeatic also has created posters on tree lichens of Nova Scotia and Species at Risk in Nova Scotia. These may be viewed online by clicking on the images on MTRI's Products page.

Species of plants that are commonly found in areas with wet soils have special value because they may be used to identify the boundaries of wetlands, a type of habitat that is

of special conservation concern. Wetlands are discussed in [Section V](#) of this guide, which includes a link to a [Nova Scotia Environment](#) introduction to the [Wetland Indicator Plant List](#) and a [Wetland Indicator Plant List](#) in spreadsheet format (Excel® document).

For assistance in identifying Nova Scotia vegetation, also see the [Nova Scotia Wild Flora Society Species Gallery](#) and [Blupete's Wildflowers of Nova Scotia](#).

Information designed for use in nearby provinces may often be used in Nova Scotia because many of the species are the same. The following short essays are from the [Macphail Woods Ecological Forestry Project](#) on Prince Edward Island:

- [Native Trees and Shrubs](#) (pdf)
- [Native Shrubs of Prince Edward Island](#)
- [Native Wildflowers of Prince Edward Island](#)
- [Native Ferns of Prince Edward Island](#)

Additional essays on Acadian Forest shrubs and wildflowers may be found on the Macphail Woods [Wildlife Enhancement](#) page.

A wide variety of printed field guides to various types of ground vegetation are available from booksellers and through Nova Scotia libraries. Examples include *A Field Guide to Trees and Shrubs: Northeastern and North-Central United States and Southeastern and South-Central Canada* (Houghton Mifflin, 2nd edition 1972 and 1986) by George A. Petrides from the Peterson Field Guides series, *National Audubon Society Field Guide to North American Wildflowers: Eastern Region* (Random House, 2001) by John W. Thieret and others, and *A Field Guide to Ferns and Their Related Families: Northeastern and Central North America* (Houghton Mifflin, 2005) by Boughton Cobb and others from the Peterson Field Guides series.

III. b. i. 3. The Vegetation Types FEC Manual

Forest Ecosystem Classification for Nova Scotia Part I: Vegetation Types by Peter Neily and others may be downloaded in sections (as pdfs) from the NSDNR web page titled [Forest Vegetation Types](#). Many sections are also available on the website. The contents of the full manual are shown on the next page of this guide.

To use the manual, consult [Using the Vegetation Types Guide](#). The recommended approach is to first identify tree and understory species using resources such as those listed in [Section III. b. i. 2.](#) of this guide. Photos in the *Vegetation Types* manual may also be useful for this purpose.

The next recommended step is to use the [Forest Group Key](#) (pdf) to determine what forest group the property is in. There are instructions for using a key in the introduction to the forest group key.

Once the forest group is determined, the recommendation is to use the [Vegetation Types](#)

Key (pdf) to refine the classification of the area from forest group down to vegetation type.

The next step is to learn more about that group and vegetation type by consulting the web page titled Choose by Forest Group or by downloading a fact sheet on that group from the Printable Versions page. The information on vegetation type includes successional dynamics, ecological features, characteristic plants, distinguishing features, site characteristics, and a map showing where this vegetation type is likely to be found.

Having determined what vegetation type is currently present on a woodlot, use the information on Successional Development to determine what vegetation types the site might have included at an earlier stage of succession or might be capable of developing into at a later stage. This information can be used to determine a site's potential for growing specific tree species.

III. b. i. 4. Coarse Woody Debris & Snags

Deadwood includes both *coarse woody debris*, which refers to limbs and other dead wood lying on the ground, and *snags*, which refers to standing dead trees. These are important features of natural Acadian Forest, as explained in the section on Coarse Woody Debris and Snags of the NSDNR Vegetation Types manual (also available in pdf format).

For additional information on the value of deadwood, Deadwood—Living Forests: The Importance of Veteran Trees and Deadwood

CONTENTS OF THE FOREST ECOSYSTEM CLASSIFICATION MANUAL PART I: VEGETATION TYPES

Cover Pages (pdf)

Introduction (pdf)

Using This Guide. Also in pdf format.

Forest Group Key (pdf)

Vegetation Types Key (pdf)

Choose by Forest Group

Cedar Forest Group. In pdf format.

Coastal Forest Group. In pdf format.

Flood Plain Forest Group. In pdf format.

Highland Forest Group. In pdf format.

Intolerant Hardwood Forest Group. In pdf format.

Karst Forest Group. In pdf format.

Mixedwood Forest Group. In pdf format.

Old Field Forest Group. In pdf format.

Open Woodland Forest Group. In pdf format.

Spruce Hemlock Forest Group. In pdf format.

Spruce Pine Forest Group. In pdf format.

Tolerant Hardwood Forest Group. In pdf format.

Wet Coniferous Forest Group. In pdf format.

Wet Deciduous Forest Group. In pdf format.

Successional Development. In pdf format.

Coarse Woody Debris and Snags. In pdf format.

Glossary. In pdf format.

Synonymy Tables (pdf).

Estimating Percent Cover (pdf).

Scientific and Common Names (pdf).

Ecoregions and Ecodistricts (pdf)

Snag Volume Functions (pdf)

to Biodiversity (World Wide Fund for Nature, 2004) by the World Wildlife Fund discusses the effect of removal of coarse woody debris and snags from European forests. The study demonstrates the importance of deadwood for healthy forests and healthy communities.

The following resources provide further information on deadwood:

- *When a Tree Falls in the Forest* by Renee Wissink, *Elements Online Environmental Magazine*
- *Dead Standing Trees (They're Still Full of Life!)*, Macphail Woods Ecological Forestry Project
- *The Importance of Wildlife Trees*, Macphail Woods
- *Cavity Trees—Nature's Refuge* (pdf) by Brian Naylor, Ontario Woodlot Owners Association
- *Cavity Trees and Your Woodlot* (pdf), Ontario Woodlot Owners
- *Guide to Wildlife Tree Management in New England Northern Hardwoods* (pdf) by Carl H. Tubbs and others, USDA Forest Service Northeastern Research Station
- *Managing Cavity Trees for Wildlife in the Northeast* (pdf) by Richard M. DeGraaf and Alex L. Shigo, USDA Forest Service

III. b. ii. Soil Types

The next step in applying FEC on a woodlot is to determine soil type or types. It can be helpful to first gain an understanding of how soils are formed over time and how this process is related to the land forms found on a woodlot.

III. b. ii. 1. Soils, Geology & Topology

NSDNR's *A Virtual Field Trip of the Landscapes of Nova Scotia* takes viewers on an airborne, ground-level, and sometimes below-ground tour of the province. In the process readers are introduced to the history of each area as well as its notable landscape features. The "field trip" may be taken by paging through all stops or using an interactive map.

Also on NSDNR's "Virtual Field Trip" page, look for three "Vistas of the Month" and a tour of *The "Great Ditch" of Nova Scotia*, an eight-foot-deep trench that was dug across the province in 1999 in order to bury the Sable Island gas pipeline.

Having begun in the 1960s as the library of the Nova Scotia Department of Mines, the NSDNR Library has an extensive collection of materials on the geology of Nova Scotia.

Much of Nova Scotia's contemporary terrain was formed by the glaciers that were here more than 10,000 years ago. NSDNR's *Reading Room 1: The Story of Glaciers in Maritime Canada* tells the story of how Nova Scotia land forms were created by glaciers. *Reading Room 5* contains a variety of maps, including a map of the regional bedrock geology of Maritime Canada, a map of bedrock areas, and maps of various types of landforms left behind by glaciers.

From the Macphail Woods Ecological Forestry Project on PEI, *Healthy Soil in a Healthy Ecosystem* is a brief overview of why soil is important, with a few suggestions for how to protect it.

An introduction to the different landforms left behind by glaciers may be found under “Depositional Features” in the *Glaciation* section of the Canadian Encyclopedia.

III. b. ii. 2. The Soil Types FEC Manual

Forest Ecosystem Classification for Nova Scotia Part II: Soil Types (pdf) by Kevin Keys and others provides a detailed explanation of how to determine soil types on a woodlot. This volume describes 19 currently recognized FEC soil types and provides management interpretations that permit a forest manager to assess potential risks of conducting operations on a particular site.

Kevin Keys has also developed a number of tools for identifying and recording information on soils that are associated with areas that are saturated or under water for at least part of the year (aka *wetlands*). These are listed in Section V. b. of this guide.

III. b. iii. Ecosites

Once the vegetation type and soil type of an area are determined, the next step in FEC is to determine the *ecosite*.

An ecosite is the smallest level of ecological classification. As explained in the introduction to *Forest Ecosystem Classification for Nova Scotia Part III: Ecosites* (pdf) by Kevin Keys and others, Nova Scotia is divided into two main ecosite groups: the Acadian group and the Maritime Boreal group. Each group has its own set of ecosites which encompass different moisture and nutrient combinations that affect growth and the type of vegetation that can grow naturally under those conditions.

Information about ecosites tells the forest manager what species will grow naturally on a specific site and what the growth potential for each species is. To determine which ecosites are found on a woodlot, use information on the site’s vegetation and soil type, along with tables found in Appendices B and C (pages 59-74) of the ecosites portion of the FEC manual. To further assist with identification, Appendix E (pages 83-86) contains a list of provincial vegetation types with the ecosite group with which they are associated.

This volume contains an introductory section (pages 5-16) with definitions and other information useful in interpreting the entire FEC manual. This is followed (pages 17-46) by fact sheets for each ecosite. Each fact sheet includes a description and information about disturbance and succession, drainage, vegetation and soil types, and other information.

Following the fact sheets is a section on land capability interpretations (pages 47-55). These tables show the maximum stand productivity under natural conditions for species or groups of species associated with specific ecosites.

PLEASE NOTE

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IV. RESTORATION OF NATURAL ACADIAN FOREST

Many Nova Scotia woodlots have been intensively harvested at some point, or perhaps several times, in the past. The individual trees currently growing on such land may be of low value, and the land may no longer be suitable for other uses such as wildlife habitat and recreation. Because of this situation, there is growing interest in Acadian Forest *restoration*—that is, taking an area that has been degraded by past harvesting practices and restoring the structure, functions, and species that are characteristic of healthy, natural Acadian Forest.

The [Nova Scotia Department of Natural Resources \(NSDNR\)](#) Forest Ecosystem Classification manual (described in [Section III. b.](#) of this guide) can be used to inform decisions on Acadian Forest restoration.

One of the few resources that talks specifically about Acadian Forest restoration is [*Restoring the Acadian Forest: A Guide to Forest Stewardship in the Maritimes*](#), which is described in [Section I](#) of this guide.

Another locally produced resource that speaks directly about restoration of natural Acadian Forest is *Honour in the Woods*, a 30-minute video by the [Eastern Shore Forest Watch Association](#) that explains the need for restoration and introduces Nova Scotia woodlot owners who are practicing restoration on their properties.

Restoring Acadian Forest can be a long-term commitment, as explained in [A Matter of Time](#), an essay by Nova Scotia woodlot owner Wade Prest, at the website of the [Ecology Action Centre's Forestry Program](#).

IV. a. Old Growth Acadian Forest

While recognizing that it can take hundreds of years for a degraded forest to develop the characteristics of a mature old forest, known as *old growth*, forest managers interested in Acadian Forest restoration often use the characteristics of old growth forest as an inspiration for their efforts and a way to gain insight into the elements that make up a healthy older forest.

NSDNR maintains a [web page](#) titled [Old Growth](#). The department also has published a [Field Assessment Score Sheet](#) with characteristics used to determine whether a stand qualifies as old growth. [Selected Nova Scotia Old Growth Forests: Age, Ecology, Structure, Scoring](#) (pdf) by Bruce Stewart and others provides a detailed description of four old-growth Acadian forests in Nova Scotia.

Old Growth Forests (pdf), a fact sheet produced by the Nova Scotia Nature Trust, paints a portrait of what Nova Scotia's natural Acadian Forest would have been like 300 years ago and how it has changed since.

The Mersey Tobeatic Research Institute has published *Seeing Old Forests in a New Light*, a poster that describes the characteristics and benefits of old growth Acadian Forest. The poster may be viewed online on MTRI's Products page.

Old Growth Forests of the Acadian Forest Region by Alex Mosseler and others is a detailed study of the structure and composition of natural Acadian Forest prior to European settlement. The article originally appeared in a 2003 issue of *Environmental Reviews* (Volume 11). A summary is available online, and the full article may be obtained free from the Canadian Forest Service.

From the Food and Agriculture Organization of the United Nations, *Old Growth Forests in Canada—A Science Perspective* by Alex Mosseler and others describes old growth characteristics with a focus on the Acadian Forest.

Restoring Old-Growth Characteristics (pdf) by Anthony D'Amato and Paul Catanzaro, from the Harvard Forest, gives reasons why restoring old growth characteristics is important and lays out strategies for doing so. While this document is focused on the forests of southern New England, the general principles laid out are equally applicable further north.

From the LandOwner Resource Centre in Ontario, *The Old-Growth Forests of Southern Ontario* (pdf) provides a non-technical overview of the structure and functions of old forests that are quite similar to those found in the Acadian Forest region.

Late-Successional Forest: A Disappearing Age Class and Implications for Biodiversity (pdf) by John M. Hagan and Andrew A. Whitman, from the Manomet Center for Conservation Sciences in Maine, discusses the role older forests play in maintaining biodiversity, even if they do not yet qualify as old growth.

IV. b. Indicator Species

Another approach to restoration directs efforts toward creating conditions suitable for specific species. The theory behind this approach is that the manager can promote overall biodiversity and a healthy, balanced ecosystem by managing for one or more specific species with habitat requirements that will support many other species.

In ecological restoration, such species may be referred to as *indicator species*. This concept is discussed in *Forest Management Guidelines to Protect Native Biodiversity in the Fundy Model Forest* (pdf) which is described in Section II. d. of this guide, and in *Old-Growth Forests in Canada—A Science Perspective*, which is discussed in Section IV. a.

The indicator-species concept is also used in *Biodiversity in the Forests of Maine: Guidelines for Land Management* (pdf) (University of Maine Cooperative Extension, 1999) by Gro Flatebo and others, which was the product of a multi-year process in which forest stakeholders came together to develop voluntary guidelines to maintain biodiversity in the state. It is made available online by the Maine Forest Service.

Indicator species may be plants or animals, but this approach to restoration has special appeal for woodlot owners who wish to create habitat for specific types of animals (e.g., birds) or specific species of animals (e.g., flying squirrels). Listing of resources on the habitat needs of individual species is beyond the scope of this guide. However, resources on general principles for creation of wildlife habitat are listed in Appendix A.

IV. c. Restoration Tools

Any forest management tool that helps to create a healthier forest can be used in Acadian Forest restoration. Thus most of the resources already listed in this guide can be considered tools for Acadian Forest restoration, including NSDNR's Forest Ecosystem Classification manual, which is described in Section III. b.

Restoring Biodiversity, an essay in *Elements Online Magazine* by Gary Schneider, the manager of the Macphail Woods Ecological Forestry Project on Prince Edward Island, explains the "whys" of restoring natural Acadian Forest and introduces some of the methods used at Macphail Woods. At the Macphail Woods website, *Acadian Forests of Prince Edward Island* gives a portrait of natural Acadian Forest and discusses options for restoration.

From the LandOwner Resource Centre, *Restoring Old-Growth Features to Managed Forests in Southern Ontario* (pdf) cites benefits of restoring features of old forests in a region that has many species in common with the Acadian Forest, and provides an overview of principles and techniques. Also from the LRC, *Do You Have a Healthy Woodlot?* (pdf) explains some basic approaches that are useful in keeping a woodlot healthy for the long term.

The Society for Ecological Restoration is an international non-profit organization that promotes ecological restoration as both a way of protecting biodiversity and a way to support sustainable human communities. The society's *Ecological Restoration: A Means of Conserving Biodiversity and Sustaining Livelihoods* (pdf) brochure summarizes what ecological restoration is and basic principles of ecological restoration. *The SER International Primer on Ecological Restoration* (pdf) and *Guidelines for Developing and Managing Ecological Restoration Projects* by Andre Clewell and others outline general principles and practices used by restoration professionals.

Abandoned farmlands (aka *old fields*) present special restoration challenges. There is a strategy for restoring old fields in the article titled *An Introduction to Ecosystem*

Management at the Macphail Woods website. The LandOwner Resource Centre offers *Management Options for Abandoned Farm Fields*.

Former plantations also present special challenges. *Managing Regeneration in Conifer Plantations to Restore a Mixed, Hardwood Forest* (pdf), from the LandOwner Resource Centre, presents a strategy.

Riparian zones—areas next to watercourses—also require special attention. *Living on the Edge: Using Native Plants in Riparian Zone Restoration*, a slide presentation by Gary Schneider of Macphail Woods, introduces species and techniques for use in Acadian Forest riparian zones.

IV. d. Planting for Restoration

Managers of natural forest typically design their activities so as to encourage natural regeneration of native species. This is discussed in Section II. c. iii. of this guide.

One exception to this general rule, however, is when the forest manager wants to bring back a plant species that used to be present on a woodlot but has been eradicated, for example by past harvesting practices. In these situations, planting may be used to establish the desired species, in the expectation that these plants will be seed sources for future generations.

NSDNR has a new *Tree Planting* (pdf) brochure available with basic information about tree planting. This is available free in print form from woodlot@gov.ns.ca or 902-424-5444. A longer *Tree Planting Manual* by R.G. Robertson and R.W. Young is also available free from the NSDNR Library, 902-424-8633 or nsdnrlib@gov.ns.ca.

The Macphail Woods Ecological Forestry Project has the following resources that would help forest managers decide when to plant, what to plant, and also how to obtain plant materials:

- *Maintaining Variety*
- *Why Plant Native Shrubs?*
- *Areas to be Planted and Appropriate Species*
- *Growing Native Shrubs*
- *Transplanting Tips*
- *How to Plant Trees and Shrubs*
- *Partial List of Native Trees and Shrubs and How to Obtain Them*

The Ontario Woodlot Owners Association has the following information available:

- *Planting Tips*
- *Why Seed Source Matters*
- *Knowing Your Planting Site*
- *Selecting Seedlings*

From the LandOwner Resource Centre:

- *Successful Transplanting of Woodland Vegetation for Plant Salvage or Habitat Restoration Projects* (pdf)
- *Tree Guards Protect Your Trees* (pdf)
- *Tree Shelters Help Hardwood Trees Grow Faster* (pdf)
- *Careful Handling and Planting of Nursery Stock* (pdf)

Deer browse is a growing problem in Nova Scotia, particularly among woodlot owners attempting to plant hardwoods. This problem is discussed in *Impacts of White-Tailed Deer Overabundance in Forest Ecosystems: An Overview* (pdf) by Thomas J. Rawinski, from the USDA Forest Service Northeastern Area.

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V. WATERCOURSES & WETLANDS

Wet areas are ecologically important parts of a woodlot that are highly sensitive to disturbance during forest-management operations. *Water and Watercourses*, Lesson Six in Module 7, *Woodlot Ecology*, of the NSDNR Woodlot Management Home Study program, discusses watercourses, special management areas, vernal pools, streams, and various types of wetlands.

Healthy Lakes and Wetlands for Tomorrow (pdf) from the Mersey Tobeatic Research Institute discusses the importance of protecting lakes and wetlands, with special emphasis on species at risk.

V. a. Watercourse Buffers

Protection of areas near watercourses is a very important consideration during all forest management operations, and is almost always included in resources on proper harvesting practices, especially low-impact logging. Some examples of such resources are listed in Section II. d., including *Nova Scotia's Wildlife Habitat and Watercourses Protection Regulations*.

Riparian or watercourse *buffers* are areas next to watercourses where forest-management activities are limited in order to protect these ecologically sensitive areas. From the Macphail Woods Ecological Forestry Project, *Trees Along Streamsides* explains why it is important to maintain vegetation in these areas. Macphail Woods manager Gary Schneider presented *Living on the Edge: Using Native Plants in Riparian Zone Restoration* at a conference on riparian health.

From the LandOwner Resource Centre, *Buffers Protect the Environment* (pdf) explains that buffers can be used to protect a range of sensitive areas, including watercourses.

V. b. Wetlands

NSDNR's *Nova Scotia Wet Places* web page introduces this topic and has links to detailed information on the following common wetland types: *Freshwater Wetlands*, *Freshwater Marshes*, *Bogs and Fens*, *Floodplains*, *Swamps*, and *Lakeshore Wetlands*.

Section T8.3 of the Nova Scotia Museum of Natural History's *Natural History of Nova Scotia* is devoted to *Freshwater Wetlands*.

Nova Scotia Environment maintains a web page on wetlands. The introductory page, *Nova Scotia's Wetlands*, defines wetlands, explains wetland functions and services, introduces the *Wetland Inventory* and *Wet Areas Mapping Tools*, discusses wetlands of special importance in the province, and describes the following wetland types that are common in the province: bogs, fens, coastal saline ponds, marshes, swamps, and vernal pools.

NS Environment also offers:

- A page on the new *Nova Scotia Wetland Conservation Policy*, enacted in 2011, with a link to the full text of the policy in pdf format.
- *Wetland Alteration Approval Process*, with a link to *So You Need to Alter a Wetland* (pdf), a checklist.
- *Wetland Consultants for Hire*.
- *Assessing Wetland Function*, an introduction to NovaWET, a professional tool.
- *Indicator Plant List*, an introduction to the concept of wetland indicator plants, which are commonly found in wetlands and are used to identify wetlands and their boundaries.
- *Wetland Indicator Plant List* in spreadsheet format (Excel document).
- *Resources for Wetland Assessors*.
- *Links to Wetland Resources*.

Also from NS Environment, a page devoted to the *Vernal Pool Mapping and Monitoring Project* describes an effort to identify the location of shallow wetlands located in forests. Also known as vernal pools, these are small, shallow wet areas that often dry out periodically, especially in summer. The site includes a link to a *Vernal Pool Data Sheet* (pdf) for use in reporting vernal pools, with instructions on how to use it.

Wetland Ecosystems (Wiley, 2009) by William J. Mitsch is by an authority on wetland ecology and restoration.

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APPENDIX A

GENERAL PRINCIPLES FOR IMPROVING WILDLIFE HABITAT

Different wild animal species often have different needs. Managing a natural forest for wildlife habitat may require making a determination about what species are present on a property or are able to reach the property. The manager may then choose to make decisions based on meeting the habitat needs of specific desired species.

For this level of management, the manager may require an in-depth understanding of the biology and habitat needs of specific species. This type of information is often available online or through Nova Scotia libraries by search on the species name, but is beyond the scope of this guide.

That said, there are many ways a forest manager can create or protect habitat features that will be beneficial to a wide array of animal species. These include maintaining an adequate amount of coarse woody debris and snags, as described in [Section III. b. i. 4.](#) of this guide; protection of watercourses and wetlands, as described in [Section V](#); and planting native species of plants, including not only trees but also other vegetation, which is described in [Section IV. d.](#)

Here are some [Nova Scotia Department of Natural Resources](#) (NSDNR) materials that provide information useful in providing habitat for a wide range of animal species:

- [*Woodlots and Wildlife*](#), Module 4 of NSDNR's Woodlot Management Home Study program.
- [*Wildlife & Birds of Nova Scotia*](#), selections from *Wildlife of Nova Scotia* (Province of Nova Scotia and Nimbus Publishing, 1980) by Julie Towers.
- [*Wood and Wildlife from Your Woodlot*](#) by Fred Payne.
- [*Habitats Program—Special Management Practices*](#).
- [*Living with Wildlife*](#).
- [*Wildlife Article Index*](#), a collection of wildlife articles that have appeared in NSDNR publications.
- [*Biodiversity Program Overview*](#).

[*Why We Need a Healthy Wildlife Population*](#) by the [Macphail Woods Ecological Forestry Project](#) explains why healthy populations of native wild animals are necessary in a healthy forest, then provides some tips on how to manage for wildlife habitat. Macphail Woods also has a series of publications on [*Wildlife Enhancement*](#).

[*Biodiversity in the Forests of Maine: Guidelines for Land Management*](#) (pdf), which is described in [Section IV. b.](#), contains a great deal of information about wildlife habitat. It is made available online by the [Maine Forest Service](#).

Landowner's Guide to Wildlife Habitat: Forest Management for the New England Region (University of Vermont Press, 2005) is by wildlife authority by Richard M. DeGraaf.

These resources deal with the importance of large areas of intact forest:

- *Our Fragmented Forests*, Macphail Woods
- *Conserving Forest Interior: A Threatened Wildlife Habitat* (pdf), LandOwner Resource Centre

These resources address other habitat features:

- *Building a Pond* (pdf), LandOwner Resource Centre
- *A Guide to Creating Vernal Ponds: All the Information You Need to Build and Maintain an Ephemeral Wetland* (pdf) by Thomas R. Biebighauser, IPFW Center for Reptile and Amphibian Conservation and Management
- *Brush and Rock Piles*, Macphail Woods
- *Wildlife Shrubs and Edge Habitat* (pdf), Ontario Woodlot Owners Association
- *Island Hedgerows*, Macphail Woods
- *Managing for Mast Trees in Your Woodlot* (pdf), Ontario Woodlot Owners.

The following resource from the Mersey Tobeatic Research Institute specifically addresses Species at Risk, including plants as well as animals: *Species at Risk in Nova Scotia: Identification and Information Guide*. MTRI's poster on Species at Risk in Nova Scotia may be viewed online by clicking on the image on the Products page.

PLEASE NOTE

Printed materials and videos mentioned in this guide are often available through the Nova Scotia library system. (See Appendix C for details.)

In an Internet-enabled version of this guide, underlined text indicates a link to a web page or downloadable resource, or to another page of this guide. For those not using an Internet-enabled version of the guide, web addresses (URLs) of websites and web pages mentioned in the guide are listed in Appendices D and E, which are available as a separate document.

APPENDIX B

GLOSSARIES

The following websites and web pages provide definitions of technical terms that might be encountered in the resources cited in this guide.

This glossary from Module 3 in the NSDNR Woodlot Management Home Study program contains many terms that are commonly used in woodlot management.

This page from *Module 5: Stand Establishment* in the NSDNR Woodlot Management Home Study program provides the abbreviations commonly used to designate tree species in Nova Scotia.

There are glossaries in two of the three parts of the Nova Scotia Forest Ecosystem Classification manual, which is described in Section III. b. of this guide:

- Glossary from Part I: Vegetation Types. A pdf version is also available.
- Part III: Ecosites (pdf). The glossary is on page 89.

Forestry Talk: A Glossary of Common Terms (pdf) is available from the LandOwner Resource Centre in Ontario.

This glossary is from the Macphail Woods Ecological Forestry Project on Prince Edward Island.

An extensive online glossary is maintained by the Canadian Forest Service.

APPENDIX C

HOW TO FIND PRINTED MATERIALS & VIDEOS MENTIONED IN THIS GUIDE

Nova Scotia government libraries—including the [Nova Scotia Department of Natural Resources Library](#), public libraries, and academic libraries—collaborate in order to facilitate access to their collections by Nova Scotia residents. Many of the printed resources listed in this guide, including print versions of NSDNR publications, are available through this system. Videos may also be available through libraries, along with other media.

Materials may be accessed through local libraries, which are listed on the [Nova Scotia Public Libraries](#) page of the [Nova Scotia Provincial Library](#) website.

Library catalogues may be viewed at the Nova Scotia Provincial Library's "[One-Place-to-Look](#)" for [Nova Scotia Library Resources](#) web page, which provides access to the largest catalogues, and at the [Directory of Nova Scotia Libraries](#). Please consult librarians at your favourite library for details and assistance.

The [NSDNR Library](#), 902-424-8633 or nsdnrlib@gov.ns.ca, maintains copies of NSDNR publications.

Printed books and other materials are often also available for purchase either new or used. An Internet search on the publication title will often turn up copies available from online sellers. (Place the title between quotation marks—e.g., "Title of Book"—in order to narrow your search to that specific phrase.)

In addition to the many materials it has available free, the NSDNR Library also has resources available for sale. These may be located through the [Publications, Maps, Digital Products](#) web page, particularly the section on [Forestry Publications](#).

Many of the organizations listed in this guide have materials available for sale. The following two Canada-based sellers often have forestry-related materials that are hard to find elsewhere:

- [INFOR Inc.](#), an organization of New Brunswick-based forestry-related organizations that maintains a [catalogue](#) of materials for sale.
- [The Forest Shop](#), an online bookseller specializing in forestry, nature, and outdoor books.

MANAGEMENT OF NATURAL ACADIAN FOREST

A GUIDE TO RESOURCES
APPENDICES D AND E

Last updated on April 9, 2012

PREPARED BY FLORA JOHNSON, PICEA FORESTRY CONSULTANTS &
STAFF OF THE NOVA SCOTIA DEPARTMENT OF NATURAL RESOURCES

Information Series EXT 2012-1



APPENDIX D

WEB ADDRESSES (URLS) OF NSDNR RESOURCES LISTED IN THIS GUIDE

Nova Scotia Department of Natural Resources

<http://www.gov.ns.ca/natr/>

Library

<http://www.gov.ns.ca/natr/library/>

Basic Concepts

Implementing Ecosystem-Based Integrated Resource Management in Nova Scotia (pdf)

<http://www.gov.ns.ca/natr/forestry/reports/Systematic-Approach.pdf>

The Forest of the Acadian Ecozone

<http://www.gov.ns.ca/natr/education/woodlot/modules/module7/less1.asp>

Woodlot Ecology: Your Living Woodlot

<http://gov.ns.ca/natr/Education/woodlot/modules/module7/>

Uneven-Aged Management

Harvesting

<http://www.gov.ns.ca/natr/forestry/programs/timberman/harvesting.asp>

Harvesting Systems: The Selection System

<http://www.gov.ns.ca/natr/Education/woodlot/modules/module2/less3.asp>

Interactive Guide to Common Trees of Nova Scotia

Web page: <http://www.gov.ns.ca/natr/forestry/treeid/>

pdf: <http://www.gov.ns.ca/natr/forestry/treeid/TreelD2007.pdf>

PowerPoint®: <http://www.gov.ns.ca/natr/forestry/treeid/TreelD.zip>

See web page for information on ordering CD when this becomes available.

Introduction to Silviculture

<http://www.gov.ns.ca/natr/Education/woodlot/modules/module1/tableofcontent.asp>

Nova Scotia's Code of Forest Practice (pdf)

<http://www.gov.ns.ca/natr/forestry/reports/NScodeofprac.pdf>

Interim guidelines (pdf):

<http://www.gov.ns.ca/natr/forestry/reports/Code-of-Forest-Practice-2008.pdf>

Nova Scotia's Wildlife Habitat and Watercourses Protection Regulations

<http://www.gov.ns.ca/natr/wildlife/habitats/protection/>

Publications for Woodlot Owners

<http://www.gov.ns.ca/natr/woodlot/publications.asp>

Selection Management

<http://www.gov.ns.ca/natr/forestry/programs/timberman/selection.asp>

Silviculture

<http://www.gov.ns.ca/natr/forestry/programs/timberman/silviculture.asp>

Tolerant Hardwood Management Guide (pdf)

<http://www.gov.ns.ca/natr/library/forestry/reports/REPORT84.PDF>

Tolerant Softwood & Mixedwood Selection Management Guide (pdf)

<http://www.gov.ns.ca/natr/library/forestry/reports/Report91.pdf>

Understanding and Measuring Basal Area

<http://www.gov.ns.ca/natr/Education/woodlot/modules/module4/basalarea.asp>

Woodlot Harvesting

<http://www.gov.ns.ca/natr/woodlot/pdf/WoodlotHarvesting.pdf>

Woodlot Stewardship and Sustainability

<http://www.gov.ns.ca/natr/education/woodlot/modules/module7/less7.asp>

Ecological Approaches to Forest Management

A Virtual Field Trip of the Landscapes of Nova Scotia

<http://www.gov.ns.ca/natr/MEB/field/start.asp>

Disturbance & Succession

<http://www.gov.ns.ca/natr/forestry/programs/ecosystems/disturbance.asp>

Ecodistricts of Nova Scotia (pdf)

http://www.gov.ns.ca/natr/forestry/ecological/pdf/ELC_Map.pdf

Ecological Land Classification for Nova Scotia: Volume 1—Mapping Nova Scotia's

Terrestrial Ecosystems (pdf)

<http://www.gov.ns.ca/natr/forestry/reports/ELCrevised.pdf>

Ecological Land Classification Map for Nova Scotia

<http://gis4.natr.gov.ns.ca/website/nselcmap/viewer.htm>

Ecosystem Management

<http://www.gov.ns.ca/natr/forestry/programs/ecosystem-management.asp>

Forest Inventory

<http://www.gov.ns.ca/natr/forestry/programs/inventory/>

Forest Stages

<http://www.gov.ns.ca/natr/Education/woodlot/modules/module3/Less1.asp>

Mapping Nova Scotia's Natural Disturbance Regimes (pdf)

<http://www.gov.ns.ca/natr/library/forestry/reports/NDRreport3.pdf>

Reading Room 1: The Story of Glaciers in Maritime Canada

<http://www.gov.ns.ca/natr/MEB/field/glacier.asp#centrecontent>

Reading Room 5: List of Maps Outlining the Route, Elevation, Physiography, Bedrock, Glacial and Surficial Geology of Nova Scotia

<http://www.gov.ns.ca/natr/MEB/field/dem.asp#dem>

Tour of the "Great Ditch"

<http://www.gov.ns.ca/natr/meb/field/ditch.asp#ditch>

Forest Ecosystem Classification for Nova Scotia

Part I: Vegetation Types

Excerpts: <http://www.gov.ns.ca/natr/forestry/veg-types/>

Printable pages: <http://www.gov.ns.ca/natr/forestry/veg-types/printable.asp>

Cover Pages (pdf)

<http://www.gov.ns.ca/natr/forestry/veg-types/pdf/cover.pdf>

Introduction (pdf)

<http://www.gov.ns.ca/natr/forestry/veg-types/pdf/introduction.pdf>

Using The Vegetation Types Guide

<http://www.gov.ns.ca/natr/forestry/veg-types/introduction.asp>

pdf: <http://www.gov.ns.ca/natr/forestry/veg-types/pdf/using.pdf>

Forest Group Key (pdf)

<http://www.gov.ns.ca/natr/forestry/veg-types/pdf/key.pdf>

Vegetation Types Key (pdf)

<http://www.gov.ns.ca/natr/forestry/veg-types/pdf/veg-key.pdf>

Choose By Forest Group

<http://www.gov.ns.ca/natr/forestry/veg-types/veg-navigation.asp>

Cedar Forest Group

<http://www.gov.ns.ca/natr/forestry/veg-types/ce/ce.asp>

pdf: <http://www.gov.ns.ca/natr/forestry/veg-types/ce/pdf/ce-full.pdf>

Coastal Forest Group

<http://www.gov.ns.ca/natr/forestry/veg-types/co/co.asp>

pdf: <http://www.gov.ns.ca/natr/forestry/veg-types/co/pdf/co-full.pdf>

Flood Plain Forest Group

<http://www.gov.ns.ca/natr/forestry/veg-types/fp/fp.asp>

pdf: <http://www.gov.ns.ca/natr/forestry/veg-types/fp/pdf/fp-full.pdf>

Highland Forest Group

<http://www.gov.ns.ca/natr/forestry/veg-types/hl/hl.asp>

pdf: <http://www.gov.ns.ca/natr/forestry/veg-types/hl/pdf/hl-full.pdf>

Intolerant Hardwood Forest Group

<http://www.gov.ns.ca/natr/forestry/veg-types/ih/ih.asp>

pdf: <http://www.gov.ns.ca/natr/forestry/veg-types/ih/pdf/ih-full.pdf>

Karst Forest Group

<http://www.gov.ns.ca/natr/forestry/veg-types/ka/ka.asp>

pdf: <http://www.gov.ns.ca/natr/forestry/veg-types/ka/pdf/ka-full.pdf>

Mixedwood Forest Group

<http://www.gov.ns.ca/natr/forestry/veg-types/mw/mw.asp>

pdf: <http://www.gov.ns.ca/natr/forestry/veg-types/mw/pdf/mw-full.pdf>

Old Field Forest Group

<http://www.gov.ns.ca/natr/forestry/veg-types/of/of.asp>

pdf: <http://www.gov.ns.ca/natr/forestry/veg-types/of/pdf/of-full.pdf>

Open Woodland Forest Group

<http://www.gov.ns.ca/natr/forestry/veg-types/ow/ow.asp>

pdf: <http://www.gov.ns.ca/natr/forestry/veg-types/ow/pdf/ow-full.pdf>

Spruce Hemlock Forest Group

<http://www.gov.ns.ca/natr/forestry/veg-types/sh/sh.asp>

pdf: <http://www.gov.ns.ca/natr/forestry/veg-types/sh/pdf/sh-full.pdf>

Spruce Pine Forest Group

<http://www.gov.ns.ca/natr/forestry/veg-types/sp/sp.asp>

pdf: <http://www.gov.ns.ca/natr/forestry/veg-types/sp/pdf/sp-full.pdf>

Tolerant Hardwood Forest Group

<http://www.gov.ns.ca/natr/forestry/veg-types/th/th.asp>

pdf: <http://www.gov.ns.ca/natr/forestry/veg-types/th/pdf/th-full.pdf>

Wet Coniferous Forest Group

<http://www.gov.ns.ca/natr/forestry/veg-types/wc/wc.asp>

pdf: <http://www.gov.ns.ca/natr/forestry/veg-types/wc/pdf/wc-full.pdf>

Wet Deciduous Forest Group

<http://www.gov.ns.ca/natr/forestry/veg-types/wd/wd.asp>

pdf: <http://www.gov.ns.ca/natr/forestry/veg-types/wd/pdf/wd-full.pdf>

Successional Development

<http://www.gov.ns.ca/natr/forestry/veg-types/successional.asp>

pdf: <http://www.gov.ns.ca/natr/forestry/veg-types/pdf/successional.pdf>

Coarse Woody Debris and Snags

<http://www.gov.ns.ca/natr/forestry/veg-types/coarse.asp>

pdf: <http://www.gov.ns.ca/natr/forestry/veg-types/pdf/coarse.pdf>

Glossary

<http://www.gov.ns.ca/natr/forestry/veg-types/glossary.asp>

pdf: <http://www.gov.ns.ca/natr/forestry/veg-types/pdf/glossary.pdf>

Synonymy Tables (pdf)

<http://www.gov.ns.ca/natr/forestry/veg-types/pdf/synonymy.pdf>

Estimating Percent Cover (pdf)

<http://www.gov.ns.ca/natr/forestry/veg-types/pdf/estimating.pdf>

Scientific and Common Names (pdf)

<http://www.gov.ns.ca/natr/forestry/veg-types/pdf/names.pdf>

Ecoregions and Ecodistricts (pdf)

<http://www.gov.ns.ca/natr/forestry/veg-types/pdf/regions.pdf>

Snag Volume Functions (pdf)

<http://www.gov.ns.ca/natr/forestry/veg-types/pdf/snag-volume.pdf>

Part II: Soil Types (pdf)

<http://www.gov.ns.ca/natr/library/forestry/reports/Soil-Types.pdf>

Forest Ecosystem Classification Manual Part III: Ecosites (pdf)

<http://www.gov.ns.ca/natr/library/forestry/reports/Ecosites.pdf>

Restoration of Natural Acadian Forest

Field Assessment Score Sheet

<http://www.gov.ns.ca/natr/forestry/programs/ecosystems/scoresht.asp>

Old Growth

<http://www.gov.ns.ca/natr/forestry/programs/ecosystems/oldgrowth.asp>

Selected Nova Scotia Old Growth Forests: Age, Ecology, Structure, Scoring (pdf)

<http://www.gov.ns.ca/natr/forestry/reports/selnsoldgrowthfor.pdf>

Tree Planting

<http://www.gov.ns.ca/natr/woodlot/pdf/TreePlanting.pdf>

Watercourses & Wetlands

Nova Scotia Wet Places

<http://www.gov.ns.ca/natr/wildlife/habitats/nswetlands/>

Bogs and Fens

<http://www.gov.ns.ca/natr/wildlife/habitats/nswetlands/bogs.asp>

Floodplains

<http://www.gov.ns.ca/natr/wildlife/habitats/nswetlands/floodplains.asp>

Freshwater Marshes

<http://www.gov.ns.ca/natr/wildlife/habitats/nswetlands/freshwater-marshes.asp>

Freshwater Wetlands

<http://www.gov.ns.ca/natr/wildlife/habitats/nswetlands/freshwater-wetlands.asp>

Lakeshore Wetlands

<http://www.gov.ns.ca/natr/wildlife/habitats/nswetlands/lakeshore.asp>

Swamps

<http://www.gov.ns.ca/natr/wildlife/habitats/nswetlands/swamps.asp>

Water and Watercourses

<http://www.gov.ns.ca/natr/Education/woodlot/modules/module7/less6.asp>

Wildlife Habitat and Watercourses Protection Regulations

<http://www.gov.ns.ca/natr/wildlife/habitats/protection/>

Wildlife Habitat

Biodiversity Program Overview

<http://www.gov.ns.ca/natr/wildlife/biodiversity/>

Habitats Program—Special Management Practices

<http://www.gov.ns.ca/natr/wildlife/habitats/terrestrial>

Living With Wildlife

<http://www.gov.ns.ca/natr/wildlife/living-with-wildlife/>

Wildlife Article Index

<http://www.gov.ns.ca/natr/wildlife/conserva/>

Wildlife & Birds of Nova Scotia

<http://www.gov.ns.ca/natr/wildlife/wns/toc.asp>

Woodlots and Wildlife

<http://gov.ns.ca/natr/Education/woodlot/modules/module4/>

Wood and Wildlife From Your Woodlot

<http://www.gov.ns.ca/natr/wildlife/conserva/wood-wildlife.asp>

Glossaries

Abbreviations commonly used to designate tree species, from Module 5 of the Woodlot Management Home Study Program

<http://www.gov.ns.ca/natr/Education/woodlot/modules/module5/list.asp>

Glossary of Key Terms from Module 3 of the Woodlot Management Home Study Program

<http://www.gov.ns.ca/natr/Education/woodlot/modules/module3/glossary.asp>

Glossary from *Forest Ecosystem Classification for Nova Scotia Part I: Vegetation Types*

<http://www.gov.ns.ca/natr/forestry/veg-types/glossary.asp>

pdf: <http://www.gov.ns.ca/natr/forestry/veg-types/pdf/glossary.pdf>

Glossary from *Forest Ecosystem Classification for Nova Scotia Part III: Ecosites* (pdf)

<http://www.gov.ns.ca/natr/library/forestry/reports/Ecosites.pdf>

APPENDIX E

WEB ADDRESSES (URLS) OF OTHER ORGANIZATIONS & RESOURCES LISTED IN THIS GUIDE

Acadian Forest Keepers

<http://www.forestkeepers.ca/>

Scenes from a Selection Harvest

<http://www.forestkeepers.ca/>

Association for Sustainable Forestry

<http://www.asforestry.com/>

Choosing Which Trees to Keep & Which to Take (pdf)

<http://www.asforestry.com/PDFs/cat7/Choosingtreestokeepandtake.pdf>

Crop Tree Pruning (pdf)

http://www.asforestry.com/PDFs/manual/CropTreePruning_ed.pdf

Crop Tree Pruning Quality Standards (pdf)

<http://www.asforestry.com/PDFs/manual/CropTreePruningStan.pdf>

Growing High-Value Trees (pdf)

<http://www.asforestry.com/PDFs/cat7/Growinghighvaluetrees.pdf>

Leaving a Legacy

<http://www.asforestry.com/news.htm>

Managing the Natural Forest (pdf)

<http://www.asforestry.com/PDFs/cat7/Managingthenaturalforest.pdf>

Blupete's Wildflowers of Nova Scotia

<http://www.blupete.com/Nature/Wildflowers/Wild.htm>

Canadian Encyclopedia

<http://www.thecanadianencyclopedia.com/>

Glaciation

<http://www.thecanadianencyclopedia.com/articles/glaciation>

Silviculture

<http://www.thecanadianencyclopedia.com/articles/silviculture>

Canadian Forest Service

<http://cfs.nrcan.gc.ca/home>

Changing Forest Landscapes in the Atlantic Maritime Ecozone

<http://cfs.nrcan.gc.ca/publications?id=32034>

Ecosystem-Based Management

http://cfs.nrcan.gc.ca/pages/117?lang=en_CA

Glossary

<http://cfs.nrcan.gc.ca/terms>

Old Growth Forests of the Acadian Forest Region

<http://cfs.nrcan.gc.ca/publications?id=22859>

The Acadian Forest: Historical Condition and Human Impacts

<http://cfs.nrcan.gc.ca/publications?id=22845>

Community Forests International

<http://forestsinternational.org/>

Ecological Forestry in the Maritimes

<http://vimeo.com/32804362>

Confederacy of Mainland Mi'kmaq

<http://www.cmmns.com/>

DalSpace Repository

<http://dalspace.library.dal.ca/>

Roland's Flora of Nova Scotia Part I

<http://dalspace.library.dal.ca/handle/10222/13806>

Roland's Flora of Nova Scotia Part II

<http://dalspace.library.dal.ca/handle/10222/13815>

Eastern Shore Forest Watch Association

<http://forestwatch.ca/>

Ecology Action Centre's Forestry Program

<http://www.novascotiaforests.ca/>

A Matter of Time

<http://www.novascotiaforests.ca/a-matter-of-time>

Elements Online Environmental Magazine

<http://www.elements.nb.ca/>

Restoring Biodiversity

http://www.elements.nb.ca/theme/invasive_species/gary/schneider.htm

When a Tree Falls in the Forest

<http://www.elements.nb.ca/theme/renewal/renee/renee.htm>

Encyclopedia of Earth

<http://www.eoearth.org/>

Natural Disturbance Regime

[http://www.eoearth.org/article/Natural disturbance regime?topic=58074](http://www.eoearth.org/article/Natural%20disturbance%20regime?topic=58074)

New England-Acadian Forests

[http://www.eoearth.org/article/New England-Acadian forests](http://www.eoearth.org/article/New%20England-Acadian%20forests)

Plant Succession

http://www.eoearth.org/article/Plant_succession?topic=58074

Federation of Nova Scotia Woodland Owners

<http://www.fnswo.ca/>

Low-Impact Forestry Practices (pdf)

http://www.fnswo.ca/documents/Low_Impact_Forest_Practices.pdf

Food and Agriculture Organization of the United Nations

<http://www.fao.org/>

Old Growth Forests in Canada—A Science Perspective

<http://www.fao.org/DOCREP/ARTICLE/WFC/XII/0042-B1.HTM>

Forest Stewardship Council® Canada

<http://www.fsccanada.org/>

Certification Standards for Best Forestry Practices in the Maritimes Region: Standard for Small and Low Intensity Managed Forests (pdf)

<http://www.fsccanada.org/docs/maritimesslimfstandard.pdf>

GPI Atlantic

<http://www.gpiatlantic.org/>

GPI Forest Headline Indicators for Nova Scotia

Press release: http://www.gpiatlantic.org/releases/pr_forestupdate.htm

Full text (pdf): <http://www.gpiatlantic.org/pdf/forest/forestupdate.pdf>

The Nova Scotia Genuine Progress Index Accounts Volume 2: A Way Forward: Case Studies in Sustainable Forestry

Summary: <http://www.gpiatlantic.org/publications/abstracts/forest-ab2.htm>

Full text (pdf): <http://www.gpiatlantic.org/pdf/forest/forest2.pdf>

Greater Fundy Ecosystem Research Project

<http://www.unbf.ca/forestry/centers/fundy/>

Forest Management Guidelines to Protect Native Biodiversity in the Greater Fundy Ecosystem (pdf)

http://www.unbf.ca/forestry/centers/fundy/documents/GFE_Guidelines.pdf

Harriet Irving Botanical Gardens

<http://botanicalgardens.acadiau.ca/>

Habitats of the Acadian Forest Region

http://botanicalgardens.acadiau.ca/The_Habitats_of_the_Acadian_Forest_Region.html

Harvard Forest

<http://harvardforest.fas.harvard.edu/>

Restoring Old-Growth Characteristics (pdf)

http://harvardforest.fas.harvard.edu/sites/harvardforest.fas.harvard.edu/files/publications/pdfs/Damato_umassextension_2007.pdf

INFOR Inc.

<http://infor.ca/>

An Introduction to Tree Marking (pdf)

http://infor.ca/uploads/Website_Assets/Newsletter_22-english.pdf#page=10

Catalogue

<http://www.infor.ca/catalogue>

IPFW Center for Reptile and Amphibian Conservation and Management

<http://herpcenter.ipfw.edu/>

A Guide to Creating Vernal Ponds (pdf)

<http://herpcenter.ipfw.edu/outreach/VernalPonds/VernalPondGuide.pdf>

LandOwner Resource Centre

<http://www.lronline.com/>

Careful Handling and Planting of Nursery Stock (pdf)

http://www.lronline.com/Extension_Notes_English/pdf/crflhnd.pdf

Building a Pond

http://www.lronline.com/Extension_Notes_English/pdf/pnds.pdf

Buffers Protect the Environment (pdf)

http://www.lronline.com/Extension_Notes_English/pdf/bffrs.pdf

Conserving Forest Interior: A Threatened Wildlife Habitat (pdf)

http://www.lronline.com/Extension_Notes_English/pdf/forInterior.pdf

Do You Have a Healthy Woodlot? (pdf)

http://www.lronline.com/Extension_Notes_English/pdf/hlthywdlt.pdf

Forestry Talk: A Glossary of Common Terms (pdf)

http://www.lronline.com/Extension_Notes_English/pdf/Forestry%20Terms%20Fact%20Sheet.pdf

Management Options for Abandoned Farm Fields

http://www.lronline.com/Extension_Notes_English/forestry/ab_flds.html

Managing Regeneration in Conifer Plantations to Restore a Mixed, Hardwood Forest (pdf)

http://www.lronline.com/Extension_Notes_English/pdf/Conifer%20Fact%20Sheet.pdf

Promoting a Healthy Forest Through Tree Marking (pdf)

http://www.lronline.com/Extension_Notes_English/pdf/tree_marking.pdf

Restoring Old-Growth Features to Managed Forests in Southern Ontario (pdf)

http://www.lronline.com/Extension_Notes_English/pdf/rstr_oldgwth.pdf

Successful Transplanting of Woodland Vegetation for Plant Salvage or Habitat Restoration Projects (pdf)

http://www.lronline.com/Extension_Notes_English/pdf/trnsplntng.pdf

The Old-Growth Forests of Southern Ontario (pdf)

http://www.lronline.com/Extension_Notes_English/pdf/oldgwth.pdf

Tree Guards Protect Your Trees (pdf)

http://www.lronline.com/Extension_Notes_English/pdf/trgrds.pdf

Tree Shelters Help Hardwood Trees Grow Faster (pdf)

http://www.lronline.com/Extension_Notes_English/pdf/tr_shltrs.pdf

Macphail Woods Ecological Forestry Project

<http://macphailwoods.org/>

Acadian Forests of Prince Edward Island

<http://www.macphailwoods.org/acadianforest.html>

An Introduction to Ecosystem Management

<http://www.macphailwoods.org/ecoforest/ecoforest3.html>

Areas to Be Planted and Appropriate Species

<http://www.macphailwoods.org/nursery/areaplan.html>

Brush and Rock Piles

<http://www.macphailwoods.org/wildlife/rockpiles.html>

Dead Standing Trees—They're Still Full of Life!

<http://www.macphailwoods.org/wildlife/deadtrees.html>

Healthy Soil in a Healthy Ecosystem

<http://www.macphailwoods.org/ecoforest/ecoforest8.html>

How to Plant Trees and Shrubs

<http://www.macphailwoods.org/nursery/htplan.html>

Island Hedgerows

<http://www.macphailwoods.org/wildlife/islandhedgerows.html>

Glossary

<http://www.macphailwoods.org/ecoforest/glossary.html>

Growing Native Shrubs

<http://www.macphailwoods.org/nursery/grwsrb.html>

Living on the Edge: Using Native Plants in Riparian Zone Restoration

<http://www.riparianhealthatlantic.com/speakers/gary-schneider/>

Maintaining Variety

<http://www.macphailwoods.org/ecoforest/ecoforest5.html>

Native Ferns of Prince Edward Island

<http://www.macphailwoods.org/gidferns.html>

Native Shrubs of Prince Edward Island

<http://www.macphailwoods.org/shrub/index.html>

Native Trees and Shrubs (pdf)

http://www.gov.pe.ca/photos/original/af_nt_shrubs_1c.pdf

Native Trees of Prince Edward Island

<http://macphailwoods.org/tree/index.html>

Native Wildflowers of Prince Edward Island

<http://www.macphailwoods.org/gidflower.html>

Our Fragmented Forests

<http://www.macphailwoods.org/ecoforest/ecoforest6.html>

Partial List of Trees and Shrubs and How to Obtain Them

<http://www.macphailwoods.org/nursery/partlist.html>

The Importance of Wildlife Trees

<http://www.macphailwoods.org/ecoforest/ecoforest7.html>

Transplanting Tips

http://www.macphailwoods.org/nursery/transplant_tips.html

Trees Along Streamsides

<http://www.macphailwoods.org/ecoforest/ecoforest9.html>

Why Plant Native Shrubs?

<http://www.macphailwoods.org/nursery/whyshrub.html>

Why We Need a Healthy Wildlife Population

<http://www.macphailwoods.org/ecoforest/ecoforest4.html>

Wildlife Enhancement

<http://www.macphailwoods.org/wildlife/index.html>

Maine Forest Service

<http://www.maine.gov/doc/mfs/index.shtml>

Biodiversity in the Forests of Maine: Guidelines for Land Management (pdf)

http://www.maine.gov/doc/mfs/pubs/pdf/biodiversity_forests_me.pdf

Pruning Your Forest Trees (pdf)

http://www.maine.gov/doc/mfs/pubs/pdf/fpminfo/2_pruning.pdf

Maine Organic Farmers and Gardeners Association Low-Impact Forestry Project

<http://www.mofga.org/Programs/LowImpactForestry/tabid/227/Default.aspx>

Patient Money: The Economics of Low-Impact Forestry (pdf)

<http://www.mofga.org/Portals/2/Education/patient%20money.PDF>

Principles, Goals, Guidelines and Standards for Low-Impact Forestry_(pdf)

<http://www.mofga.org/Portals/2/Education/lif%20guidelines.PDF>

Manomet Center for Conservation Sciences

<http://www.manometmaine.org/>

Late-Successional Forest: A Disappearing Age Class and Implications for Biodiversity (pdf)

http://www.manometmaine.org/documents/FMSN_LSPopularVer9_10pt.pdf

Mersey Tobeatic Research Institute

<http://www.merseytobeatic.ca/>

Common Shrubs, Herbs & Mosses of Nova Scotia (pdf)

<http://www.merseytobeatic.ca/userfiles/file/products/publications/Fern%20&%20Plant%20Keys/Common%20Plants%20of%20NS.pdf>

Ferns of Southwest Nova Scotia (pdf)

<http://www.merseytobeatic.ca/userfiles/file/products/publications/Fern%20&%20Plant%20Keys/SWNS%20Fern%20Key.pdf>

Guide to FSC Certification for Woodlot Owners in Nova Scotia (pdf)

http://www.merseytobeatic.ca/userfiles/file/projects/Forest/FSC_Guide_web.pdf

Healthy Lakes and Wetlands for Tomorrow

<http://www.speciesatrisk.ca/Landowner%20Stewardship%20Guide%20for%20the%20WEB.pdf>

Products

<http://www.merseytobeatic.ca/fundraisers.php>

Species at Risk in Nova Scotia: Identification and Information Guide

<http://www.speciesatrisk.ca/SARGuide/>

Nimbus Publishing

<http://www.nimbus.ns.ca/>

Nova Forest Alliance

<http://www.novaforestalliance.com/>

Contractors & Operators Best Management Practices Manual

http://www.novaforestalliance.com/uploads/nfa/documents/BMP_Manual_Final_Mar_2012.pdf

Nova Scotia Department of Justice

<http://www.gov.ns.ca/just/>

Forest Sustainability Regulations

<http://www.gov.ns.ca/just/regulations/regs/fosust.htm>

Protected Water Areas

<http://www.gov.ns.ca/just/regulations/rxaa-l.htm#env>

Species at Risk Regulations

<http://www.gov.ns.ca/just/regulations/regs/eslist.htm>

Nova Scotia Environment

<http://www.gov.ns.ca/nse/>

Assessing Wetland Function

<http://www.gov.ns.ca/nse/wetland/assessing.wetland.function.asp>

Indicator Plant List

<http://www.gov.ns.ca/nse/wetland/indicator.plant.list.asp>

Links to Wetland Resources

<http://www.gov.ns.ca/nse/wetland/wetland.links.asp>

Nova Scotia Wetland Conservation Policy

<http://www.gov.ns.ca/nse/wetland/conservation.policy.asp>

pdf:

<http://www.gov.ns.ca/nse/wetland/docs/Nova.Scotia.Wetland.Conservation.Policy.pdf>

Nova Scotia's Wetlands

<http://www.gov.ns.ca/nse/wetland/>

Resources for Wetland Assessors

<http://www.gov.ns.ca/nse/wetland/wetland.assessment.resources.asp>

So You Need to Alter a Wetland (pdf)

<http://www.gov.ns.ca/nse/wetland/docs/So.You.Need.to.Alter.a.Wetland.pdf>

Vernal Pool Data Sheet (pdf)

<http://www.gov.ns.ca/nse/wetland/docs/Vernal.Pool.Data.Sheet.pdf>

Vernal Pool Mapping and Monitoring Project

<http://www.gov.ns.ca/nse/wetland/vernal.pool.mapping.project.asp>

Wet Areas Mapping Tools

<http://www.gov.ns.ca/natr/forestry/gis/wamdownload.asp>

Wetland Alteration Approval Process

<http://www.gov.ns.ca/nse/wetland/wetland.alteration.asp>

Wetland Consultants for Hire

<http://www.gov.ns.ca/nse/wetland/wetland.professional.resources.asp>

Wetland Indicator Plant List (Excel® spreadsheet)

<http://www.gov.ns.ca/nse/wetland/docs/Wetland.Indicator.Plant.List.xls>

Wetland Inventory

<http://www.gov.ns.ca/natr/wildlife/habitats/wetlands.asp>

Nova Scotia Legislature

<http://nslegislature.ca/>

Endangered Species Act

<http://nslegislature.ca/legc/statutes/endspec.htm>

Environment Act

<http://nslegislature.ca/legc/statutes/envromnt.htm>

Forests Act

<http://nslegislature.ca/legc/statutes/forests.htm>

Special Places Protection Act

<http://nslegislature.ca/legc/statutes/specplac.htm>

Wilderness Areas Protection Act

<http://nslegislature.ca/legc/statutes/wildarea.htm>

Wildlife Act

<http://nslegislature.ca/legc/statutes/wildlife.htm>

Nova Scotia Museum of Natural History

<http://museum.gov.ns.ca/mnhnew/en/home/default.aspx>

Natural History of Nova Scotia

<http://museum.gov.ns.ca/mnh/nature/umbrell2.htm>

Volume I: Topics & Habitats

<http://museum.gov.ns.ca/mnh/nature/nhns/index.htm>

Freshwater Wetlands

<http://museum.gov.ns.ca/mnh/nature/nhns/t8/t8-3.htm>

Volume II: Theme Regions

<http://museum.gov.ns.ca/mnh/nature/nhns2/index.htm>

Nova Scotia Nature Trust

<http://nsnt.ca/>

Old Growth Forests (pdf)

http://nsnt.ca/pdf/old_growth.pdf

Nova Scotia Provincial Library

<https://www.library.ns.ca/>

Directory of Nova Scotia Libraries

<http://dns1.ednet.ns.ca/>

Nova Scotia Public Libraries

<https://www.library.ns.ca/node/4/>

"One-Place-to-Look" for Nova Scotia Library Resources

<https://www.library.ns.ca/content/one-place>

Nova Scotia Wild Flora Society

<http://nswildflora.ca/index.html>

Gallery: Wild Flora Species

<http://nswildflora.ca/allspecies.html>

Nova Scotia Woodlot Owners and Operators Association

<http://www.nswooa.ca>

Guidelines for Low-Impact Forestry

<http://nswooa.blogspot.ca/2007/07/guidelines-for-low-impact-forestry.html>

Introduction to Low-Impact Forestry

<http://nswooa.blogspot.ca/2007/07/introduction-to-low-impact-forestry.html>

Ohio State University Extension

<http://ohioline.osu.edu/>

Crop Tree Management: A New Tool to Help You Achieve Your Woodland Goals

<http://ohioline.osu.edu/for-fact/0050.html>

pdf: <http://ohioline.osu.edu/for-fact/pdf/0050.pdf>

Ontario Ministry of Natural Resources

<http://www.mnr.gov.on.ca/en/>

Forest Management Guide for Conserving Biodiversity at the Stand and Site Scales

<http://www.mnr.gov.on.ca/en/Business/Forests/Publication/272847.html>

Ontario Tree Marking Guide

http://www.mnr.gov.on.ca/en/Business/Forests/Publication/MNR_E000526P.html

Ontario Woodlot Owners Association

<http://www.ontariowoodlot.com/>

An Introduction to Tree Marking

http://www.ontariowoodlot.com/pages_pdf_new/intro_treemarking.pdf

Cavity Trees and Your Woodlot (pdf)

http://www.ontariowoodlot.com/pdf_older/cavity_trees.pdf

Cavity Trees—Nature’s Refuge (pdf)

http://www.ontariowoodlot.com/pages_pdf_new/cavitytree_S&W.pdf

Knowing Your Planting Site

http://www.ontariowoodlot.com/seed_site.html

Managing for Mast Trees in Your Woodlot (pdf)

http://www.ontariowoodlot.com/pdf_older/man_mast.pdf

Planting Tips

http://www.ontariowoodlot.com/seed_planting.html

Selecting Seedlings

http://www.ontariowoodlot.com/seed_select.html

Tree Marking

http://www.ontariowoodlot.com/forman_marking.html

Why Seed Source Matters

http://www.ontariowoodlot.com/seed_source.html

Wildlife Shrubs and Edge Habitat (pdf)

http://www.ontariowoodlot.com/pdf_older/wildlife_shrubs.pdf

Res Telluris

<http://www.restelluris.ca/>

Restoring the Acadian Forest: A Guide to Forest Stewardship for Woodlot Owners in the Maritimes

<http://www.restelluris.ca/adownload.htm>

Society for Ecological Restoration

<http://www.ser.org/>

Ecological Restoration: A Means of Conserving Biodiversity and Sustaining Livelihoods (pdf)

https://www.ser.org/pdf/Global_Rationale.pdf

Guidelines for Developing and Managing Ecological Restoration Projects

http://www.ser.org/content/guidelines_ecological_restoration.asp

The SER International Primer on Ecological Restoration (pdf)

<http://www.ser.org/pdf/primer3.pdf>

The Forest Shop

<http://forestshop.com/>

United States Department of Agriculture (USDA) Forest Service Northeastern Area

<http://www.na.fs.fed.us/>

Crop Tree Management in Eastern Hardwoods (pdf)

<http://www.northeastforests.com/Landowner/Forestry/Crop%20Tree%20Management%20in%20Eastern%20Hardwoods.pdf>

Group Selection Cutting for the Landowner (PowerPoint®)

http://www.na.fs.fed.us/stewardship/pubs/pwrpoint/Group_Selection_Cutting.ppt

Guide to Wildlife Tree Management in Northern Hardwoods (pdf)

http://www.fs.fed.us/ne/newtown_square/publications/technical_reports/pdfs/scanned/gtr118.pdf

Impacts of White-Tailed Deer Overabundance in Forest Ecosystems: An Overview (pdf)

http://www.na.fs.fed.us/fhp/special_interests/white_tailed_deer.pdf

Managing Cavity Trees for Wildlife in the Northeast

http://www.fs.fed.us/ne/newtown_square/publications/technical_reports/pdfs/scanned/gtr101.pdf

Silvics of North America

http://www.na.fs.fed.us/spfo/pubs/silvics_manual/table_of_contents.htm

Silvics of North America: Volume 1: Conifers

http://www.na.fs.fed.us/spfo/pubs/silvics_manual/Volume_1/vol1_Table_of_contents.htm

pdf: http://www.na.fs.fed.us/spfo/pubs/silvics_manual/volume_1/silvics_vol1.pdf

Silvics of North America: Volume 2: Hardwoods

http://www.na.fs.fed.us/spfo/pubs/silvics_manual/volume_2/vol2_Table_of_contents.htm

pdf: http://www.na.fs.fed.us/spfo/pubs/silvics_manual/volume_2/silvics_v2.pdf

USDA Natural Resources Conservation Service

<http://www.nrcs.usda.gov/wps/portal/nrcs/main/national/home>

Plants Database

<http://plants.usda.gov/java/>

Windhorse Farm

<http://www.windhorsefarm.org/>

Forest

<http://www.windhorsefarm.org/pages/forest.php>

Enrichment Forestry at Windhorse Farm (pdf)

http://www.windhorsefarm.org/media/files/Enrichment_Forestry.pdf

World Wildlife Fund

<http://www.panda.org>

Deadwood—Living Forests: The Importance of Veteran Trees and Deadwood to Biodiversity

<http://www.scribd.com/doc/27870483/Deadwood-With-Notes>