

TO: Karen Bennett
FROM: Ann Davis, landowner
RE: Comments on Second Draft of Good Forestry in the Granite State
04/23/10

Dear Karen,

This draft is much improved over the one I reviewed in fall 2009.

In general, the writing is clearer. The tone in regard to forestry operations is much more positive. And, as a result of your work to reorganize the manual, the organization and flow of information in this draft is logical.

The chapter on how landowners can set goals is a welcome addition and should be useful to those who are interested in actively managing their land.

Brad Simpkins' introductory letter also is a welcome addition.

However, the chapter on vernal pools, especially as it relates to areas beyond the pools themselves is problematic. Vernal pools are defined by the animals and plants that live and use them and by the fact that they do not contain water year-round. But by including specific distances of 200 and 950 feet respectively from the edges of vernal pools as areas used by animals dependent on vernal pools – while stating that these distances are not established by research, only suggested could in the future create regulatory issues.

Furthermore, in the references cited at the back of the manual, only two are from New Hampshire. Most of the 19 references cannot be identified by state – so how do we know whether the science would apply to this state?

Also, ensure that readers clearly understand the difference between a best management practice and an RSA, the law. If feasible, include copies of the RSAs and administrative rules referred to throughout the manual as an appendix.

Still a fair amount of space dedicated to relatively rare forests – old growth, pine barrens, high-elevation – for instance.

The format used in the Natural Communities chapter still is not consistent with the other chapters. Rich woods and Small Whorled Pogonia singled out.

As with the previous review, I have broken my comments into categories – just two, this time, since I've already addressed the general comments on tone, writing and organization – editing and specific comments page by page.

Editing comments: (you will notice that some of these comments repeat those from October 2009).

1. ly compound adjectives should not be hyphenated.
2. Punctuation should be inside quotation marks (with a couple exceptions).
3. Spell out percent.
4. The bulleted lists are more consistent, but some still are missing capital letter at the start and a period at the end.
5. Contractions – I know we talked about this. But it still seems too chatty for this important manual.
6. Over refers to height.
7. Use more than when referring to an amount or number.
8. Consistent use of names for birds, trees, plants and insects. Birds: Short- Hawk, Cooper's Hawk; Trees: Capitalize all words unless part of the name is hyphenated. I am not sure of style for insects, disease names, etc.
9. Consistent use of numbers. Use AP style. Spell out numbers less than 10, unless it is a distance, age, or measurement. Also spell out “to” between numbers rather than using a

- dash. For example: 10 percent to 15 percent. 25 to 30 people attended the workshop.
10. Most of the time the phrase "in order" is superfluous.
 11. Under way is two words unless it is used to describe a ship leaving the harbor. Then you would write, "The ship left Portsmouth and was underway to Boston."
 12. Be consistent when using the name of the publication. Italicize *Good Forestry in the Granite State*.
 13. Watch subject/verb agreement.
 14. Abbreviation of New Hampshire, if not an acronym, should be N.H. Division of Forests and Lands. Use periods. But it would be UNH Cooperative Extension.
 15. When referring to the process, i.e. deciding where roads will go, should be two words. Lay out truck roads, skid trails, landings.
 16. Even-aged – hyphenated compound adjective.
 17. Spell out GIS on first use.

Specific Comments:

Brad Simkins' message, pages 1 and 2

Punctuation inside quote marks. Put **voluntary** in bold face type. Define difference between a best management practice and an RSA. Include Brad's title, and the date of the document.

Using This Manual, pages 3 to 6

Use bold face for **This is not a regulatory document**.

Use of ellipses. Three periods between info in same sentence or at the start of a sentence, four at end – one period, a space, and then three. Like this: "...in accordance with the recommended practices contained in *Good Forestry*. ..."

Subject verb agreement, page 5. Landowner, singular, should take singular pronoun.

First Steps in Forest Management, pages 8 to 11

pg. 9 – On first reference, it should be the New Hampshire Timberland Owners Association (NHTOA)

Setting Objectives, pages 12 to 15

This will be useful to anyone who is motivated to manage his/her land. However, is it fair to set up an expectation that a person can determine how that land will be used 100 years from now?

Pgs. 16 through 27, a few editing comments; content OK.

The Right Tree for the Right Site, pages 29 to 36

Excellent information. But does it contain too much detail?

Pgs. 37 to 40. some editing comments; content OK.

Managing for High-value Trees, pages 41 to 47

Excellent information. But does it contain too much detail?

Pgs. 49 to 68, content OK. A few editing comments.

Water Quality, pages 69 to 71

Probably need to suggest the use of vegetable-based bar and chain oil just once – twice on the same page is redundant.

Use of bullet points.

Wetlands, pages 72 to 74

pg. 73 – refer to N.H. Heritage Bureau as *a source* not the best source of info about whether a wetland is rare, an exemplary natural community, etc.

Forest Management in Riparian Areas, pages 75 to 79

pg 76 – if you use elevated numbers, it might make it easier for readers to understand the relationship between numbers and the numbered information that follows the chart.

Stream Crossings and Habitat, pages 80 to 84

Will this chapter reflect the changes in the stream crossing rules currently being vetted?

Insects and Diseases, pages 86 to 91

What is correct style for insect names?

Quite a bit of detail here. Is it necessary?

Invasive Plants, pages 92 to 96

What about the potential loss of timber value as a result of invasive species.

Pgs. 97 to 102, a few editing comments.

Mast, pages 103 to 105

pg. 104, do you want to include the names of some native species that folks can substitute for the illegal, non-native species you've listed?

Cavity Trees, Dens and Snags, pages 106 to 108

To make the chart easier for readers to understand, put the *=primary cavity excavators at the top, rather than at the bottom on the second page of the chart.

Pgs. 109 to 123, a few editing comments.

Deer Wintering Areas, pages 124 to 128

Much more succinct than first version.

Pgs. 129 to 140, a few editing comments.

Natural Communities and Protected Plants, pages 141 to 143

This chapter still does not conform in style and layout with the rest of the manual by singling out rich woods and Small Whorled Pogonia. Why?

Pgs. 144 to 146, a few editing comments.

Vernal Pools, pages 147 to 150

Portions of this chapter are problematic. Although vernal pools are defined by the plants and animals that grow in them and use them and by the hydrology – no minimum size of a vernal pool is stated. For instance, does a vernal pool need to be a certain size to be used by turtles?

Specific distances are cited from edge of vernal pools – 200 feet and 950 feet. It would appear that none of the research cites New Hampshire specifically. Only two references refer to Maine, one is from the northeast. The chapter also says that: “*Available research suggests within the core habitat:*”

This would indicate that no research currently exists that corroborates this information for New Hampshire.

For discussion purposes, if you multiply 950 feet by 950 feet times 3.14 and divide by 43,560, the result is 2,833,850 square feet – or +/- 65 acres – the square footage if you treat the space as a circle. This does not include the square footage of the vernal pool. If a landowner has five vernal pools, this would mean that roughly 325 acres would be impacted. For a landowner with a 500-acre woodlot, this would impact 65 percent of the property.

Furthermore, if specific distances are stated in the document, it could open up the opportunity for those measurements to become regulatory in the future, even though those numbers apparently are not supported by research data from New Hampshire.

Pgs. 151 to 159, some editing comments.

Steep Slopes, pages 160 to 161

Define steep slope – perhaps from the soil map information available for each county?

Include information about checking for local ordinances as a general comment at the start of the manual, rather than singling out one issue that landowners should check for ordinances.

This chapter is a first draft. It should emphasize that with careful planning and execution, harvesting on steep slopes is feasible and can be very successful.

Pgs. 162 to 174, some editing comments.

Glossary, pages 175 to 181

A good start.

Wildlife Species of Greatest Conservation Need

The species of most concern already have been addressed in the text of the manual. This is superfluous. The space might be better used for the text of RSA and administrative rules that are cited throughout the document.

Second draft: *Good Forestry in the Granite State*

Review March 15 through April 15, 2010

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- Wildlife Species of Greatest Conservation Need 185-188
- References** - you already have this @ the end of each chapter section.

Good Forestry in the Granite State: Draft - Message from the State Forester

A MESSAGE FROM THE STATE FORESTER,

Thank you for reading the revised "Good Forestry in the Granite State". If this is your first time using this document, I hope you find the information ~~herein to be~~ valuable, and that it provides you guidance as you identify and implement your forest management objectives. If you have been using the original document published in 1997, this revision expands and builds ~~upon~~ the principles and practices ~~conveyed~~ in the first document.

The purpose of "Good Forestry in the Granite State" continues to be providing "educational tools" for "ecologically sensitive" or "unique natural features". These recommended practices, or "educational tools" are intended to be voluntary. The state law that requires the production of this document is RSA 227-I:4, which states:

Recommended Forest Management Practices. – *The director (division of forests and lands) shall coordinate an effort to produce educational tools that identify recommended voluntary forest management practices for sites or practices which are ecologically sensitive due to soils, wildlife habitat, and other unique natural features such as high elevations, steep slopes, deer wintering areas, riparian zones, sensitive soils, and clearcutting.*

This revision seeks to incorporate new approaches to forest management practices and advances in science and technology that have developed over the past decade, while ~~remaining~~ a practical guide for a diverse audience. Although this revision is longer than the original, it is not an all-inclusive document on forest management. Rather, "Good Forestry in the Granite State" is a foundation and users are encouraged to supplement their knowledge through literature review or discussions with resource professionals to build upon that foundation after considering specific landowner objectives and land characteristics.

Just as this publication has a diverse audience, it has many suitable applications. For example, many conservation easements reference "Good Forestry in the Granite State". Forest management practices on conservation easements held by the Division of Forests and Lands are conducted in accordance with, or guided by, goal-specific recommendations in "Good Forestry in the Granite State". Timber harvesting operations on state-owned lands are conducted in concurrence with this document. In addition, following the suggested practices in various ~~parts~~ ^{chapters} of Good Forestry serves as a reference for the harvesting of biomass as well as all other forest products. – on state-owned lands? or in general??

"Good Forestry in the Granite State" is a voluntary guide to forest management practices in New Hampshire. As such, it is not intended to be used by local or county governments or state agencies to regulate or restrict timber practices. Recommendations in one chapter may

conflict with those of another chapter. This is not a mistake, but rather by design in recognition of the objectives and goals selected by the landowner in consultation with natural resource professionals relative to a given situation on a particular piece of property. In addition, site-specific characteristics may require modifying some recommendations. Attempts to adopt "Good Forestry in the Granite State" as a land use regulation, in part or in its entirety, are not in accordance with the intent and spirit of the law establishing the document (RSA 227-I:4). Furthermore, the State, through the Division of Forests and Lands, takes a primary role in the regulation of timber harvesting in New Hampshire (RSA 227-J). Moreover, the State Legislature has made clear the importance of practicing forestry through what is known as the "Right to Harvest" law (RSA 672:1), which states in part:

state

Forestry, when practiced in accordance with accepted silvicultural practices, constitutes a beneficial and desirable use of New Hampshire's forest resource...the State of New Hampshire has declared that it is in the public interest to encourage preservation of open space by conserving forest and other natural resources. Therefore, forestry activities, including the harvest and transport of forest products, shall not be unreasonably limited by use of municipal planning and zoning powers or by the unreasonable interpretation of such powers.

The continued management of New Hampshire's working forests for multiple objectives and goals is critically important to the environmental, economic, and social well-being of our state. Our forests provide jobs, forest products, wildlife habitat, clean water and air, recreation and tourism, and an overall high quality of life to our citizens and visitors. Our forests will play an even bigger role in the future, as we face challenges such as climate change and renewable energy development. New Hampshire's number one forest management goal is keeping forests as forests. To that end, the Division of Forests and Lands, and others as evidenced by their use of "Good Forestry in the Granite State" support and encourage responsible management of working woodlands and forests.

In closing, our forests and woodlands have played an integral part in our state's history, and undoubtedly will play a vital role well into the future. More than ⁸⁰ percent of New Hampshire remains forested, and much of that forest that looks untouched by human activity has, in reality, been managed as working forests for generations. This long history of management is a testament to the long tradition of practicing good forestry in the Granite State. Whatever you decide for your individual goals and objectives on your woodlands, I hope this document provides you the foundation to make wise decisions. Most importantly, I thank you for expressing interest in being a good steward, ^{because} a well-managed forest provides many benefits, both tangible and intangible, far beyond the boundaries of your property.

Brad W. Simpkins

Title:

date:

include language referencing difference between recommended best mgt practice(s) and law.

Good Forestry in the Granite State: Draft Introduction

- Setting the Stage - Using this Manual

A MESSAGE FROM THE GOOD FORESTRY IN THE GRANITE STATE STEERING COMMITTEE

contractions?

The purpose of this guide is to provide landowners, and the professionals who work with them, voluntary, practical recommendations and information on a range of forest resources to help them make informed decisions that sustain the forest for today and the future.

Though we give the background needed to support decision-making, this manual doesn't attempt to give a full treatment of all topics. Its focus is operational. What do you need to know to harvest trees, build a recreational trail or access road, protect water quality, improve wildlife habitat, or create a plan to guide your activities?

bold face
 This ~~isn't~~ ^{is not} a regulatory document. It is a voluntary guide ^{boldface} not intended to be converted into town ordinances or state regulation. The recommendations are too intertwined with the notion that on-the-ground implementation is site-specific, requiring professional judgement and landowner input. Conservation commissioners and other town officials can help protect natural resources by disseminating this book, or parts of it, to landowners. It is available for free at www.goodforestry.org or for a fee as a cd or book. *This manual is not not*

As you use this manual, keep these caveats in mind, especially about the recommendations:

- This manual is objective-driven. If you know your objectives, going to the relevant chapters will help you learn more. If you aren't sure of your objectives, we hope this manual will help you develop them. Crafting a vision for your land will help guide what happens on the ground.
- Where recommendations are based on state law, the RSA ^{*} is noted. Except for those based on state law, recommendations aren't mandatory and are suggestions made to move the land towards a desired outcome as stated in each chapter's objectives. They represent options to consider. The specifics of what is done, when, where, and how is best based on the site conditions and the landowner objectives and any number of other factors. We give guidance in the form of recommendations, considerations and background information to help landowners and natural resource professionals to use their judgement.
- It will be impossible to follow all the recommendations in this manual. No woodlot has all the natural resources covered in this book and even if a resource is present, managing for it may not be in keeping with the landowner objectives, or it may be impractical to implement the recommendations, especially on small properties.
- Because recommendations are made to achieve the objective as stated in a given chapter, a recommendation in one chapter may conflict with that in another. A clear understanding by the landowner of their own objectives, knowledge of the property, and the assistance of a natural resource professional will help resolve conflicts and develop a course of action. Land management of even small properties requires

** Include RSAs cited in documents as an appendix.*

3/15/2010 8:11 A

balancing competing uses, trade-offs and compromises.

- This guide doesn't replace the use of professionals.
- To make them as clear as possible, most recommendations are devoid of much qualifying language such as "when possible," "as appropriate," "if practical." Read all recommendations as if these words were there. A given recommendation may not always be possible, practical, or appropriate. Consider the recommendations in light of landowner objectives and site conditions.
- Recommendations and other considerations are based on the best available science and consensus professional judgment. In certain areas, ~~there remains both~~ differences of opinion and scientific uncertainty, *remain*.
- Unless otherwise noted, information in this manual is about New Hampshire forests, wildlife, plants, and other natural resources.
- Some towns have regulations pertaining to forest management and readers are advised to check before harvesting.

CONSERVATION EASEMENTS AND GOOD FORESTRY IN THE GRANITE STATE

Many conservation easements refer to *Good Forestry in the Granite State*. For easement holders, it establishes a framework to evaluate forest management practices for consistency with easement purposes and terms. For landowners, it is a guide to acceptable forest management goals, objectives and practices.

Although forestry easement language is variable, the following are variations of two commonly-used approaches:

- (1) "forestry shall be carried out, to the extent practicable, in accordance with the recommended practices contained in *Good Forestry*." - 4 periods if end of sentence
- (2) "forestry shall be carried out, to the extent reasonably practicable, in accordance with then-current, generally accepted best management practices for the sites, soils, and terrain of the property", and then lists *Good Forestry* as one of several reference publications. *should be . . . w/ a space between*

In some cases, easements also include language that provides for future versions of *Good Forestry* (and other documents) to be substituted in place of the version current at the time the easement was executed. For example, in referencing *Good Forestry*, an easement may state: "or similar successor or other publications." *1st or 2nd period*

What do these references mean to an easement holder, and what do they mean for a landowner? The Good Forestry Steering Committee suggests the following guidelines when an easement specifies that forestry shall be conducted "to the extent reasonably practicable, in accordance with" *Good Forestry*:

- (1) This indicates that forestry practices will be designed and conducted in a manner consistent with the background, objectives, considerations, and recommendations presented in *Good Forestry*. To the extent reasonable and practicable, the easement landowner and forester should follow the recommendations.
- (2) The easement holder should reasonably expect that the easement landowner and forester will reflect *Good Forestry* in management planning and practices.

(3) The easement holder shouldn't expect that it will be appropriate or possible for a landowner to adhere to every recommendation contained in *Good Forestry*. This publication explicitly recognizes that forest management practices on the ground are influenced by landowner goals, local site conditions, and other considerations. It further recognizes that it may not be possible to follow all recommendations, and that some recommendations are based on specific objectives that may conflict with other recommendations based on a different and equally valid objective.

(4) Where forest management practices substantially deviate from, or conflict with, practices recommended in *Good Forestry*, there should be a rationale for why the management action is a sensible and appropriate practice that accomplishes the general objectives in *Good Forestry*.

The forest management plan is ^{subject/pronoun agreement - his/her} an important part of the easement compliance process, because it allows the landowner to carefully think through and present their intended forest management activities. The management plan allows the easement holder to review the proposed management for consistency with the easement terms, including references to *Good Forestry*. Proposed management that substantially adheres to or differs from Good Forestry recommendations can be addressed and reviewed in the plan. Thoughtful discussion between the easement holder and landowner will result in shared goals, objectives and strategies for forest management activities on the property that meet the purposes of the easement. *Italic*

Ultimately, the actual management actions that occur when a harvest is laid out and implemented will determine compliance with the easement terms.

ORGANIZATION OF THE MANUAL

Chapters are grouped in sections by broad topic categories. Each section begins with **ADDITIONAL READING** which includes the most important documents broadly applicable to multiple chapters in the section. Each chapter contains background, an objective, considerations, recommended practices, cross references to other chapters, and in most cases additional information specific to that chapter.

BACKGROUND

The background explains why a certain activity or natural feature is important to forest sustainability.

OBJECTIVE

The objective describes the desired outcome of specific forest management activities.

CONSIDERATIONS

Considerations are factors that can affect implementation of recommended practices. The considerations, along with the site conditions and landowner objectives, can help determine if the recommended practices are appropriate. They may describe legal issues that influence how practices are applied, or highlight areas where there isn't complete agreement by

professionals.

RECOMMENDED PRACTICES

These are on-the-ground steps that landowners, and the professionals who work with them, can take to achieve the chapter objectives. They are designed to meet the chapter objectives while factoring in the considerations. When site conditions make it difficult or impractical to implement the practices, managers should take actions consistent with the objective.

CROSS REFERENCES

Cross references lead the reader to additional relevant information in the book.

ADDITIONAL INFORMATION

A short list of documents and websites specific to the chapter topic for those interested in learning more.

GLOSSARY

A glossary defining technical terms appears at the conclusion of the manual.

APPENDICES

Several appendices provide additional detailed information.

REFERENCES


Organized by chapter, these are the sources from which information for the chapter is drawn. If a reference is listed in the additional reading part of the chapter it isn't repeated in this listing.

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Good Forestry in the Granite State: Draft Getting Started - Additional Reading

Working with Your Woodland: A Landowner's Guide

Mollie Beattie, Charles Thompson, and Lynn Levine. University Press of New England
1993. 2nd ed.

Positive Impact Forestry.

McEvoy, Thom J. 2004. Island Press. Washington D.C.

Legal Aspects of Owning and Managing Woodland

McEvoy, Thom J. 1998. Island Press. Washington D.C.

Topics in this section:

First Steps in Forest Management

Setting Objectives

Forest Management Planning

Estate Planning and Land Protection

Staying Safe Working in the Woods

Good Forestry in the Granite State: Draft Getting Started - First Steps in Forest Management

FIRST STEPS IN FOREST MANAGEMENT

BACKGROUND

The recommended practices in this manual address a variety of forest management goals and objectives. Many of the practices are interrelated, but not all can be applied on every acre. Application of specific practices depends on the site and the landowner's priorities. Successful application of these practices requires a combination of sensible goals, clear objectives, and careful preparation.

Owning forest land can be a financial investment as well as a way to leave a legacy. The key to protecting your investment and legacy is working with a team of professionals: foresters, loggers, and other natural resource professionals, as well as financial and legal advisers.

CONSIDERATIONS

- Knowing your boundaries protects you from your neighbor mistakenly cutting your trees and protects your neighbor from you making such an error. Foresters are allowed to re-mark known boundary lines in order to carry out forest management and also to establish new interior boundaries. Foresters also can research deeds and help determine whether a survey is required. Only licensed land surveyors are allowed to establish boundaries common to another owner when the corners or lines aren't known (RSA 310-A: 74). Some foresters are also licensed land surveyors. More information is available from the NH Land Surveyors Board.
- Current use assessment (RSA 79) is a taxing strategy aimed at making it easier for landowners to keep their land undeveloped. Instead of taxing land at its real estate market value, land is taxed on its income-producing capability as a woodlot or a farm, not as a potential site for houses. Current use is voluntary. Parcels must be at least 10 undeveloped acres or meet an annual minimum income level. Forest land categories are white pine, hardwood and all other types. Assessments are made within ranges established by the state. Assessments within the ranges are determined by the local assessor based on the severity of the terrain, accessibility of the forest products and the ability of the site to grow trees. Certified Tree Farms or land with a management plan prepared by a licensed forester can qualify as "forest land with documented stewardship," which further lowers the assessment. Though current use doesn't require land stay open to the public, an additional recreation adjustment is available for landowners who allow hunting, fishing, snowshoeing, hiking, skiing, and nature observation. Once land is accepted, there are no buy-out provisions and the status stays with the land until the land is changed to a non-qualifying use. At the time of change in use, there is a land use change tax due, which is 10% of the full and true value (not the current use value) of the changed portion as assessed by the town. The *Current Use Criteria Booklet* is revised yearly and is a good source of information. **I** and is available from the NH Department of Revenue Administration or your County

99% of the phrase in order is superfluous.

include RSAs as an appendix.

spell out percent

Extension Forester.

- An important component of management is setting clear short- and long-term goals and objectives that are realistic and based on the forest's current condition and its potential capability. Good management requires an understanding of what resources exist on your property. Knowing as much as possible about the property and its history can save time and money when developing and implementing a management plan. It also is important to consider a piece of land in relation to its surroundings, especially if managing for wildlife is important to you.
- Careful planning is much more likely to bring results that adhere to the recommendations in this publication. Planning may be as simple as setting goals and objectives and accumulating inventory information, or as detailed as a written management plan prepared by a licensed forester. The more care and preparation taken before timber harvesting begins, the better the results will be (x.x Forest Management Planning).
- New Hampshire has a well-established network of public and private organizations to help guide private forest landowners.
- County Extension Foresters employed by UNH Cooperative Extension (UNHCE) can answer landowner questions. The Natural Heritage Bureau and Fish and Game Department are good sources of information about plants, wildlife, and habitats. Other natural resource professionals (e.g. wetland scientists, wildlife biologists) can help identify special habitats.
- Licensed foresters are available to assist with an array of management activities. They can plan roads and trails, manage wildlife habitat, write management plans including for current use, and plan and supervise timber harvests. Services typically involved with a timber sale include marking trees, estimating harvest volumes, filing necessary permits, contracting with loggers, supervising harvesting, handling finances, and marketing wood products. UNHCE can provide a list of licensed foresters.
- Selling timber is a complicated matter that involves knowing about markets, tree values, future tree potential, ground conditions, laws, and silviculture. You have many options when selling timber. One option is to hire a forester to act as your agent in a timber sale; another is to sell directly to a buyer. A forester who acts as your agent provides you with a work order or some other agreement specifying the type and cost of the services to be performed. Foresters may be paid by the hour, or as a percentage of the standing timber or log sale receipts. A separate timber sale contract is entered into between you and the buyer of the trees.
- Loggers harvest and buy the trees. Certified professional loggers participate in voluntary certification offered by the New Hampshire Timber Harvesting Council's Professional Logger Program. Certified loggers take courses in first aid, safe and productive felling, fundamentals of forestry, and timber-harvesting law. (NH Timberland Owners Association) or UNHCE can provide a list of certified loggers.
- A written contract is an important tool to make sure the harvest goes as planned and is required by state law (RSA 227-J:15). Information about timber sale contracts, including a sample, is available from your County Extension Forester.
- Professional forestry advice and supervision during timber harvests makes a difference. Carefully prepared and supervised timber harvests often return more income and help landowners achieve their goals more effectively than unmanaged harvests.

(NHTOA)

- Income from selling timber products is subject to federal income tax and the New Hampshire yield tax (timber tax).
- Planning for the long-term ownership of forest property is important to the overall sustainability of the forests of New Hampshire. Will the property be sold and developed, or passed on to family members? Careful estate planning includes consideration of future ownership. Conservation easements are one tool that can ensure that the property remains as forest land in perpetuity and can be part of estate planning (x.x Estate Planning and Land Protection).

RECOMMENDED PRACTICES

- Contact your UNH Cooperative Extension County Extension Forester for a woodlot visit.
- Know where your boundaries are.
- Determine your goals and objectives.
- Develop a management plan.
- Contact your legal advisers and a local land trust to find out more about estate planning and land protection options.
- The following are steps you, your forester and your logger can take to ensure a successful timber harvest.
- Before the Harvest
 - Visit several completed harvests and check references.
 - Clarify expectations and objectives.
 - Determine the size and scope of the operation.
 - Know where the ownership boundary is and where the harvest boundaries are.
 - Identify areas of special concern such cultural resources, rare species and wetlands. Contact the N.H. Natural Heritage Bureau to consult for the presence of threatened or endangered species.
 - File an intent to cut and other permits. Refer to *Guide to New Hampshire Timber Harvesting Laws* for an overview of timber harvesting related laws.
 - Time the timber sale to avoid wet or poor logging conditions and conflicting uses and to optimize market conditions.
 - Designate trees to leave or those to cut.
 - # ~~Layout~~ ◦ Layout truck roads, log yards, and skid trails.
 - Use best management practices (BMPs) for erosion control
- During the Harvest
 - Supervise the job on a regular basis. Stay in contact with your forester and logger.
 - Avoid operating during wet or thawing conditions.
 - Make sure that BMPs are in place to prevent sediment from entering streams or wetlands.
 - Review contract timeline and provisions.
 - Protect the site from vandalism by limiting access.
- After the Harvest
 - Review contract provisions.
 - Review all mill slips for understanding and completion.

- o File the report of cut and pay the timber tax.
- o Seed landing, skid trails and other vulnerable areas.
- o Assess BMP effectiveness and plan for future maintenance to avoid degradation and sedimentation of streams, wetlands and other water bodies.

CROSS REFERENCES

x.x Setting Objectives, x.x Forest Management Planning, x.x Estate Planning and Land Protection

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Good Forestry in the Granite State: Draft Getting Started - Setting Objectives

X.X SETTING OBJECTIVES

BACKGROUND

Developing objectives is integral to managing forest land.

???

Your objectives should be driven by the reasons you own your land. Often we use the words goals, objectives, and goals and objectives interchangeably. The duration of most plans is 10 years- short when compared with the life of the forest. When setting your objectives think big and long term. List all your hopes and dreams for your property. Thinking long term will help you to develop short-term objectives that ensure you reach your long-term goals. What do you wish for your land 100 years from now? Talking with county extension foresters, other foresters, loggers, family, neighbors, and friends can help you develop your objectives.

Your objectives for the current and future use of your property should be specific. You will use your objectives to formulate recommendations that become a course of action to accomplish these objectives. The more specific and measurable your objectives are, the easier it will be to monitor and track whether you are achieve them.

subject
pronoun
agreement

Clear objectives help you decide what actions to take, and what actions to avoid. Often landowners tell foresters "I want to do what is right for the land, and make a little money." Foresters manage land based on a landowner's objectives. Without your specific ^{his/her} instructions, the forester (or logger) can only make decisions based on their own idea of "what is good for the land," which may not be the same as your intention. Consider your wishes for the use of your land- before talking with a forester. Be prepared to adapt or revise your objectives as you learn more about your land from your research and from working with your forester.

Setting objectives will help you:

- Invest your time, energy, and financial resources wisely.
- Communicate effectively with professionals who may help you achieve your objectives.
- Avoid undesired changes on your property.
- Think long term about your property and its resources.
- Avoid doing something that may not be in your best interest, or in the best interests of your land

Considering and writing down the answers to the following questions will help you develop objectives and priorities:

General

- Why do you own your property?
- How long do you expect to own your property?

- How would you like it to be used or managed when you no longer own it?
- How do you currently use your land?
- Do you want to use it differently in the future?
- What is most important to you about your land?
- Are you enrolled in, or interested in current use taxation, Tree Farm or a financial assistance program through the Natural Resources Conservation Service? Would you like to learn more about these and other programs?

Your interest and ability to work on the land

names of types should be capitalized

- Are you interested in working on your own land (pruning, clearing trails or vistas, cutting firewood, tapping sugar maples for syrup, etc.)? If so, how much time can you devote and what skills do you have or are you interested in developing?
- Do you have hand tools or power equipment such as a bow saw, pole saw, loppers, chainsaw, or tractor, etc?

Property Condition

- Are there any insect or disease problems?
- Have any natural disturbances, such as ice storms, wind, fire or flood affected your land?
- Are there special places on your property? A place may be special for sentimental reasons or because of an unusual geological formation, significant wildlife habitat, ~~and~~ ^{or} any other number of reasons.
- Are there plants or a particular tree or group of trees you want to protect?

Timber

- Do you want to improve the health or economic value of the forest?
- Are you interested in managing for income from wood products?
- Do you have specific goals for the amount or timing of income?
- Are you willing to cut trees to enhance the timber, aesthetic, recreational, wildlife, or other non-timber resources?
- Do some aspects about timber harvesting concern you?

Aesthetics

- Do you want to maintain views to or from the property?
- Do you want to open up a view?
- If your property has road frontage or other areas viewed by the public, how important is maintaining the appearance to you?

Recreation

- Do you or others walk, hike, camp, fish, hunt, snowmobile, birdwatch, swim, bike, ski, snowshoe, or enjoy on your land in other ways?
- Do you want to enhance the ability to enjoy these or other activities?
- Would you like to improve the existing trails and roads?
- Do you want to prohibit any activities?

Water and Soil

- Do you want to give special attention to vernal pools, bogs, swamps, seeps, small streams, and wet areas?

Wildlife

- Do you know what wildlife use your property?
- Do you want to enhance the habitat for any of these species?
- Would you like to encourage a broader variety of wildlife by improving habitat for species not currently present?

Diversity

- Do you want to encourage a broad variety of plants and animals?
- Do you want to protect unusual plants and animals?
- Do you want to discourage invasive non-native species?

Cultural Resources

- Do you want to protect cultural features such as stone walls, foundations, cellar holes, or wells?

Non-timber Uses

- Do you harvest maple syrup, Christmas trees or other non-timber forest products? Do you want to?
- Are you interested in growing and harvesting non-traditional products such as mushrooms, herbs, and greens?
- Are you interested in using your property for educating others about forests?

OBJECTIVE

Develop objectives to guide management plans and activities.

CONSIDERATIONS

- The University of NH Cooperative Extension has forms to help you think through and write down your objectives.
- **Your** **You** objectives might change as you learn more through personal exploration and interaction with professionals, as the land changes, or if your situation changes. Objectives often are general and brief and become more detailed and specific as you learn about your land.
- Your property is part of the larger landscape. Your goals, and the opportunity to achieve them, may be affected by the characteristics of the surrounding lands. Conversely, your actions can affect conditions in nearby lands. Adopting the landscape perspective is important when considering wildlife habitat. Different species need different forest types and ages to meet their needs. Most birds and animals require distinct habitats during different parts of the year or during various stages in their lives. Not all forest landowners own enough acres to meet all the habitat needs of many wildlife species. The benefits of managing for wildlife on smaller tracts may only be realized if this management complements conditions and management on neighboring

lands.

RECOMMENDED PRACTICES

- Determine your objectives and write them down.
- Involve family members in discussions about your land so they understand your goals and objectives especially if you plan to leave your land to them.
- Discuss your objectives with your forester and revise them as you learn more about your land and if your situation changes. Include written objectives as part of your forest ~~stewardship~~ *management* plan.
- When wildlife habitat management is an objective, examine your land within the larger context to determine the habitat management that may be effective and reasonable to pursue within your woodlot.
- Refer to the appropriate chapters in this manual to learn more about the resources that are of interest to you.

CROSS REFERENCES

x.x Management Planning, x.x Estate Planning and Land Protection

ADDITIONAL INFORMATION

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Good Forestry in the Granite State: Draft Getting Started - Forest Management Planning

x.x FOREST MANAGEMENT PLANNING

BACKGROUND

Most forest land in New Hampshire is privately owned and ownership of any piece of land is short compared to the life of a forest. Forests are complex mixes of resources deserving long-term care. Developing a plan can improve the outcome of forest management actions.

Nearly 80% of New Hampshire forest land is owned by private landowners. Individual actions contribute to the sustainability of the state's forest - one woodlot at a time.

The trees we see today are here because of climate, topography, soils, and past uses of the land. Today's owners influence what tomorrow's owners will see on the land. Forest management and silviculture (the art and science of establishing and tending trees and forests) give us the tools to help shape what our forests will look like in the future.

Managing a forest using this manual to meet current landowner objectives, without negatively affecting its use by future generations requires active involvement, a sense of responsibility, a knowledge of the opportunities, an awareness of the consequences of actions, and a clear set of objectives. The more known about the land, the better. Good stewards of the land consider water quality, aesthetics, fish and wildlife habitat, timber, recreation, soils, wetlands and other unique places, rare plants and unique natural communities, forest protection, and cultural and historical features.

A forest management plan is a working guide with recommendations. Developing objectives for the land is integral to planning (x.x setting objectives). The plan describes the natural resources of a property considering the landowner's interests and objectives. It normally includes maps and a written report and gives recommendations, prioritized with suggestions for timing.

The forest is mapped and described by stand, a grouping of trees similar in species, age, and soil. Maps can be hand drawn or computer-generated. They can be developed using remotely sensed information such as aerial photographs, based on field explorations, or some combination. A good map represents what exists on the land. Plans typically include the following composite or separate maps:

- Property - perimeter sketch or survey map with known boundary information such as stone walls or monuments, significant land features, access points, roads, landings, trails, or surface water
- Forest type - tree species and species groups, size classes, etc.
- Wildlife habitat - significant and critical wildlife habitats and features such as deer wintering areas, heron rookeries, wetlands, beech stands showing heavy bear use, and habitat for species in greatest conservation need

- Recreation, aesthetic, water, cultural and other resources - existing and potential sites for recreation, vantage points, trails, historic sites, natural heritage elements
- Soils - based on the Natural Resources Conservation Service (NRCS) soil survey information
- Property location (locus map)

Written stand descriptions and management prescriptions are based on field data collection. The level and type of inventory and field data gathered depends on the owner's objectives and budget. Stand descriptions include species, density, quality, accessibility, age class, understory vegetation, insect, disease and wildlife habitat such as snags, canopy closure, vegetative diversity, non-forest, wetland and other features. The recommendations, or management prescriptions, are based on objectives and the characteristics of the stand. They specify the likely results and consequences of suggested actions.

OBJECTIVE

Help landowners determine their objectives, assess the resources on their woodlot and develop a long-term plan. The desired outcome is a well-tended woodlot.

CONSIDERATIONS

- Foresters offering services to private landowners for compensation are licensed by the state of New Hampshire. Plan writing is among the many services they offer.
- Caring for the land can be complicated. Developing a long-term plan can help landowners realize their hopes and dreams for their land. A first step in developing a plan is to determine goals and objectives, at least what they are today. Other considerations include the size of the property, the condition of the resource, and the budget for planning. The plan should be scaled to suit owner needs and financial resources.
- A plan can be relatively inexpensive or a major investment, depending on the landowner objectives, which the plan should reflect.
- There are variations of plans depending on landowner interest and the intended use. Knowing the intended use helps determine the type and intensity of plan written and results in a plan that can satisfy multiple purposes.
 - Current use plan satisfies the requirement of the "forest land with documented stewardship" category of current use tax assessment (RSA 79-A). Current use plans include an updated map and:
 - A statement of forest stewardship objectives
 - Current forest stand descriptions
 - Current management prescriptions that address timber, fish and wildlife habitat, soil, water quality, recreation, aesthetics, cultural features, forest protection, wetlands, threatened and endangered species and unique natural communities
 - A boundary maintenance schedule
 - An access development and road maintenance plan, if applicable
 - The signature of a person qualified to write the plan, usually a New Hampshire licensed forester.
 - Forest stewardship plan or forest management plan: Federal financial assistance

may be available to help cover the cost of hiring a forester to write a plan.

Program requirements result in a comprehensive plan and the cost reflects this. It may be more cost-effective to develop a simpler plan.

- o Tree Farm management plan satisfies the requirements of the Tree Farm Program. Free inspections are provided to Tree Farmers, but plan preparation isn't included in this free service.
- o Conservation easements may require a plan before harvesting or other management activity. The easement deed gives specifics.

RECOMMENDED PRACTICES

- Contact your county extension forester for a woodlot visit. They can do a preliminary woodland exam with you, helping assess the resource, and relate the resources on your land to your interests. They can put you in touch with information, professionals and programs. As part of this visit, explore available financial assistance.
- Determine your objectives and share with your forester for inclusion in the plan. Refer to x.x Setting Objectives and a landowner goals and objectives assessment form referenced in additional reading.
- Involve family members in discussions about your land so they understand your goals and objectives, especially if you plan to leave your land to them.
- Determine the type of plan that will meet your needs and contract for a plan that meets your needs. Invest appropriately based on objectives, the size of the property, the value of the resource and your budget.
- Work with a forester. Refer to the *Directory of Licensed Foresters Providing Service to Forest Landowners in New Hampshire*.
- Implement your plan in a flexible and dynamic way, responsive to changing markets, natural occurrences such as ice storms or insect infestations, or changes in your interests and needs.
- Review the plan before timber harvesting, before undertaking other management activities and every 10 years.

CROSS REFERENCES

x.x First Steps in Forest Management, x.x Setting Objectives, x.x Estate Planning and Land Protection, chapters related to individual landowner objectives

ADDITIONAL INFORMATION

Bennett, K. P. 2010. *Directory of Licensed Foresters Providing Service to Forest Landowners in New Hampshire*. University of New Hampshire Cooperative Extension. <http://extension.unh.edu/forestry/dir/index.cfm> Accessed on January 28, 2010.

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NH Tree Farm Program plan template http://extension.unh.edu/resources/files/Resource001005_Rep1150.pdf Accessed on January 28, 2010.

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Good Forestry in the Granite State: Draft Getting Started - Estate Planning and Land Protection

x.x ESTATE PLANNING AND LAND PROTECTION

BACKGROUND

Putting a priority on estate planning and permanent land protection will help ensure future generations will have working forests to manage.

Good forestry requires planning and long-term commitment. The need for estate planning and land protection has never been greater than it is now because of three pressing issues – population growth, development and aging landowners. New Hampshire has been the fastest growing state in the northeast for more than four decades. Population growth and development are exacerbated by an aging landownership. The average age of private landowners is increasing. Without careful estate planning and more emphasis on land protection, the outcome will be a fragmented forest landscape with permanent loss of forest.

OBJECTIVE

Use estate planning and land protection as an important part of good forest stewardship.

CONSIDERATIONS

- This chapter discusses issues that have legal implications and shouldn't be construed as legal advice. Landowners interested in estate planning and land protection should contact their own legal advisers and conservation professionals.
- **Family Dynamics** - Deciding who to involve and how decisions will be made about the family estate is an important first step. It is difficult enough for individuals or couples to make these decisions. Considering the typical situation – aging owners with children, grandchildren and extended family members and feelings of entitlement and fairness – it is no surprise decisions are put off. Keeping to a minimum the number of individuals involved isn't always possible and may not yield the best decisions. Outside help is available through trained facilitators and legal counsel with expertise in estate planning.
- **Wills** - Wills are often the least expensive and most easily completed part of estate planning. Basic wills are essential to just about everyone, but are critical for individuals and families who own valuable assets such as land. Without wills, forest landowners may commit their heirs to a lengthy estate settlement process. More highly valued estates, estates with significant landholdings and more complex family structures often require more detailed wills and refined estate planning. Periodic reviews and updates to wills may be in order to reflect changes in land ownership or family structure.
- **Equal Division of Property** - Most of us have an overriding desire to do the fair thing, sharing estates equally among heirs. This may work with many assets and material possessions, but land is different. Dividing up land may:

- Result in an unequal allocation.
- Reduce the ability to manage forest land.
- Result in land fragmentation.

Other options allow the property to remain largely intact providing shared benefits of more extensive acreage to the next generation. The options can be fairly simple, such as a family trust, or complex such as family limited partnerships (FLP), s-corporations and limited liability companies (LLC). All of these require that the family use the services of an experienced legal professional, preferably with experience in estates with landholdings.

- **Permanent Land Protection** - Permanent land protection measures often are a routine component of estate planning, particularly if there are financial needs and strong emotional and family ties to the land. Permanent measures can offer ways to accomplish financial and emotional goals. Options include:
 - Giving or selling land to an entity that will carry on long-term stewardship.
 - Retaining the land, but giving or selling a conservation easement.
 - Combinations of these.

These options, alone or combined, can provide opportunities for reducing value to minimize state or federal estate taxes and provide income tax benefits to the current generation of landowners, enabling management to continue, and restricting development on key segments of the property.

- **Conservation Easements** - A conservation easement is a flexible and effective tool to permanently protect land. A conservation easement may allow a family to:
 - Retain ownership, but permanently restrict certain uses of the land – conservation easements typically only affect development and mineral rights. Fee ownership is retained.
 - Continue good stewardship of the land – most conservation easement language in our region encourages continued forest and farm management, including harvesting wood products.
 - Allow some level of development, while restricting development from occurring on the most important portions of the property – some portions of properties may be left “unrestricted” so that limited, appropriate development can take place.
 - Provide income or estate tax benefits – the value of a given property’s development rights can be appraised by a qualified appraiser. This value can be used to provide income tax benefits to the current owners or to reduce the value of an estate to reduce or avoid potential federal or estate taxes. In some cases development rights can be sold to help generate income.

RECOMMENDATIONS

- **Get help.** Seek an adviser with experience in estate planning, real estate and land conservation. Landowners can find help by contacting one of the approximately 40 private, non-profit land trust organizations operating in New Hampshire. The Land Trust Alliance is a national organization that provides training, guidance, accreditation and coordination for land trusts and lists them at www.lta.org (<http://www.lta.org/>). UNH Cooperative Extension offices in each county have staff that can provide further advice

and guidance.

- **Plan ahead.** It is never too early to begin the estate planning or land conservation process. It is the best way to assure that your long-term goal for good forest stewardship is realized.

CROSS REFERENCE

x.x Setting Objectives, x.x Forest Stewardship Planning

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Levite, Robert. Estate Planning for Private Landowners: University of Massachusetts Cooperative Extension and the Green Valley Institute http://www.rifco.org/Estate_Planning_for_Private_Landowners.pdf Accessed January 28, 2010.

Forest Stewardship Series - Estate Planning, Penn State College of Agricultural Sciences, Agricultural Research and Cooperative Extension.

Preserving the Family Woods, USDA Forest Service, Northeastern Area, State and Private Forestry http://na.fs.fed.us/pubs/stewardship/preserving_family_woods_lr.pdf Accessed January 28, 2010.

Siegel, William and Harry Haney and John Greene. Estate Planning for Forest Landowners: What Will Become of Your Timberland?, USDA Forest Service, Southern Research Station, General Technical Report SRS-112 http://www.srs.fs.usda.gov/pubs/gtr/gtr_so097.pdf Accessed January 28, 2010.

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Good Forestry in the Granite State: Draft Getting Started - Staying Safe Working in the Woods

X.X STAYING SAFE WORKING IN THE WOODS

BACKGROUND

If good safety practices aren't followed, working in the woods alone with chainsaws and other equipment can result in swift and serious injuries or even death. Expensive equipment can be damaged or destroyed if operated in an unsafe or improper manner. Loggers and others whose occupation is associated with tree cutting take courses on safety and are generally expected to conform to certain safety practices. Private landowners seldom have similar requirements or opportunities, but are encouraged to attend chainsaw and other safety classes or orientations and hands-on training. A few basic practices can make the difference between a productive and exhilarating (even if tiring) session in the woods and possible serious personal injury, damage to equipment, or damage to residual trees.

OBJECTIVE

Avoid personal injury, damage to equipment and damage to residual trees by practicing good safety as a matter of routine.

CONSIDERATIONS

- This chapter addresses two important aspects of woods safety for landowners:
 - Staying safe when working in the woods, for example when cutting firewood.
 - Staying safe when others are working in the woods and you are visiting.
- Other safety considerations exist beyond the scope of this chapter.
- Hearing protection may seem unnecessary or unimportant, but frequent exposure to high decibel noise can result in premature hearing loss.
- RSA 508:14 limits the liability of landowners in the absence of intentionally caused injury or damage and unless willful, wanton, or reckless conduct is shown.
- Safety equipment may be costly, but the reduction in medical expenses, lost work days and even funeral costs is well worth it.
- Heavy equipment operating in the woods is dangerous for onlookers. Equipment operators are concentrating on their machine. They aren't likely to expect, and consequently not likely to see, people in the vicinity. Feller bunchers or shears throw pieces of wood 100 feet or more and can throw rocks, a broken metal tooth or other metal, 300 feet or more.
- A commercial operation can pose other safety concerns. New skid trails and truck roads can be unstable, slippery, have deep mud and holes, sharp branches or other surprises. There may be sizeable quantities of fuel and lubricants on the site that could pose a fire danger or spill potential. Logs may be stacked in large piles. Such piles can be unstable and should they roll a child or an adult could suffer injury or death.

RECOMMENDATIONS

- Seek advice from your insurer or lawyer to ensure adequate coverage.
- Know your physical condition. Don't risk injury. Stop working when you are tired.
- Know proper felling techniques, chain saw maintenance and safety. Seek answers to equipment and safety questions from county extension foresters, consulting foresters, loggers or equipment dealers.
- Keep a first aid kit near where you are working.
- Work with a partner at a safe distance.
- Be sure someone knows your location or leave a note where it will be easily found with a good description of where you will be.
- Carry a well-charged cell phone and check for reception.
- Check for hazards. Be careful when working around dead or dying trees. Look for "widow makers" (dead or broken branches) that could fall when least expected.
- Wear eye protection and good leather gloves when sawing, cutting brush, weed-whacking, splitting wood or when operating any logging equipment.
- Wear sturdy leather boots at a minimum and, when chain sawing, steel-toed boots.
- Wear chain saw chaps or pants and gloves to protect legs and hands when using a chain saw.
- Wear a hard hat when felling trees or checking an active logging job. A protective face visor and built-in hearing protection provides safety and convenience.
- Don't chain saw over the head or from a ladder, stone wall, or other object as it can lead to serious injury in the event of a fall or chain saw kickback. (Kickback is when the teeth on the chain catch something as they rotate around the tip of the blade causing the blade to kick back violently towards the operator).
- Use extra caution when chain sawing in brush. It can cause a saw to kickback.
- Be able to identify poison ivy. Sawing or weed-whacking vines any time of the year can result in ivy poisoning.
- Talk with your loggers doing the work to learn of their safety concerns.
- Talk with an operator during a break when the machine is shut down. If you must talk with an operator immediately, get their attention at a distance by waving, flagging or by other means. Wait until the machine stops before approaching.
- Stay well away from operating equipment and don't permit children to play around machines even when not in operation.
- Minimize access to your property, or at least the area of active logging, to preclude a visitor being hurt.

CROSS REFERENCE

ADDITIONAL INFORMATION

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Good Forestry in the Granite State: Draft Silviculture - Additional Reading

Working with Your Woodland: A Landowner's Guide

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1993. 2nd ed.

Introduction to Forest Ecology and Silviculture, NRAES-126

Thom J. McEvoy. University of Vermont, School of Natural Resources and Extension
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Topics in this section

New Hampshire Forest Types

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Forest Structure

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Good Forestry in the Granite State: Draft Silviculture - New Hampshire Forest Types

X.X NEW HAMPSHIRE FOREST TYPES

BACKGROUND

Forest types are distinctive associations of trees, shrubs and herbaceous plants. They are named for the predominant tree species.

There are other ways to group and describe forests. Natural communities and wildlife habitat are commonly used. Natural communities describe current and potential vegetation in the absence of disturbance. A comparison between these three methods is available in the NH Wildlife Action Plan (see additional information below).

Forest types describe large expanses of land, or site-specific forest stands (grouping of trees similar in species, age and site). The common forest types in New Hampshire are white pine, northern hardwood, spruce-fir, red oak, hemlock, and aspen-birch.

Climate, elevation, soil conditions and land use history all play a role in determining which forest type is growing on a particular area. Forest type, in turn, influences the variety of wildlife inhabiting an area and the silvicultural options available.

A forest type may be dominated by a single tree species or by several species growing together. White pine often occurs as a pure, single species. Northern hardwood, which is composed of sugar maple, beech, yellow birch and smaller amounts of other species, is a multiple species type. Two types can blend together to form a mixed-wood type. Mixed-wood often occurs in transition zones between major types. Two common mixed types are the pine-oak and spruce-fir-northern hardwood combinations.

White Pine

This type is most common in southern New Hampshire. White pine occurs in pure stands or mixed with red pine, hemlock, red oak or other hardwoods.

White pine often colonizes abandoned agricultural land. On fertile sites it is gradually replaced by hardwood or hemlock through ecological succession. On less fertile sandy soils the type is more persistent.

On sandy soils, acid-loving plants such as blueberries, starflowers, and pink lady's-slippers are common on the forest floor. Associated wildlife include red squirrel, deer mouse, pine warbler, and red-breasted nuthatch. Owls often use the type for winter roost sites.

Northern Hardwood

Most common in central and northern New Hampshire, northern hardwood is usually a mix of sugar maple, beech, and yellow birch, red maple, and white ash. Sugar maple is typically the most abundant species on rich sites. Beech increases in abundance on drier sites and yellow birch becomes more prominent on moist sites.

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Northern hardwoods typically grow on the slopes of hills and mountains where the soils are fertile and well-drained. It tends to be a relatively stable and permanent type. Sugar maple and beech are shade-tolerant trees which can reproduce and grow in the shade of a forest canopy. Yellow birch and white ash are less tolerant of shade and require more sunlight to reproduce and grow.

Common understory trees and shrubs include striped maple, witch hazel, and hobblebush. Associated wildlife are gray fox, flying squirrel, red-eyed vireo, white-breasted nuthatch, and ovenbird.

Spruce-Fir

Most common in the north, red spruce and balsam fir dominate this type, which grows on poorly drained flats and the shallow, rocky soils of mountain tops.

Because of where they grow, the trees are susceptible to windthrow. The spruce budworm is a native insect which can impact vast areas during periodic outbreaks. Heart rot fungi can affect overmature balsam fir.

Bunchberry, goldthread, and trilliums are common wildflowers and associated wildlife include pine marten, snowshoe hare, spruce grouse, gray jay, black-backed woodpecker, and ruby-crowned kinglet.

Red Oak

The red oak type occurs in close association with white pine in southern New Hampshire. Stands of nearly pure red oak are common on ridge tops. On abandoned agricultural land, red oak mixes with white pine to form the pine-oak type. Red maple and black birch are common associates. Maple-leaved viburnum, bracken fern, and whorled loosestrife are common understory species.

Deer, turkey, gray squirrel, and many other species eat acorns. Blue jays, tufted titmice, scarlet tanagers, and rufous-sided towhees are some of the birds that commonly nest in red oak and pine-oak stands.

Hemlock

Hemlock occurs on wet flats, rocky ridge tops, and moist slopes in southern and central New Hampshire. Its ecological characteristics are similar to the spruce-fir type of the north.

Spotted wintergreen and downy rattle-snake plantain sometimes grow under dense hemlock. Hobblebush and maple-leaved viburnum may grow in small canopy openings. Red breasted nuthatches, solitary vireos, black throated green warblers, and hermit thrushes are typical breeding birds. Deer often use hemlock stands for winter cover.

Aspen-Birch

Aspen-birch is a pioneer type which is relatively uncommon in the state. The type is composed primarily of quaking and bigtooth aspen and white birch and occurs on a wide variety of soils.

Aspen and white birch require full sunlight to grow. Disturbances such as fire, windstorms, or clearcutting create the conditions necessary for reproduction. In the absence of disturbance, natural succession leads to aspen-birch stands being replaced by other types.

Common associates in young stands are raspberries and blackberries. Aspen-birch provides valuable habitat for ruffed grouse, woodcock, Nashville warbler, mourning warbler, and beaver.

OBJECTIVE

Manage a diverse forest to meet landowner objectives and for the environmental, economic and social well-being of the state.

CONSIDERATIONS

- New Hampshire is 84%^{percent} forested and most is privately owned. Forests provide a wide variety of goods and services to meet our everyday needs and comforts. Forests are a source of aesthetic and recreational enjoyment, a critical habitat for wildlife, and a natural filter assuring water quality. Maintaining a viable forest products industry with enough economic incentive for landowners to hold and manage forest land will help them implement many of the recommendations in this manual.
- Perpetuating each forest type poses its own challenges.
- Perhaps the most important sustainability issue facing all forest types is the conversion of forest land to urban uses. When forest land is converted to residential or commercial uses, its ability to produce timber products, wildlife habitat and other amenities is usually lost forever.
- High-grading is an important sustainability issue. High-grading occurs when the best trees are cut and poor quality trees are left to grow. Over time, a forest that is repeatedly high-graded will become dominated by low quality, low value trees.
- The current forest on a property may be there more because of past human and natural disturbance and may not be the type most suited for the site.
- White pine may gradually disappear from many former agricultural lands especially on better soils without active management.
- An important sustainability issue for spruce-fir concerns the forest age-class structure. Due to the cyclical nature of spruce budworm outbreaks and historic cutting patterns, the type tends to grow in a boom and bust cycle. Because of the 1970's budworm epidemic and the heavy salvage cutting that followed, there is a relative shortage of mature and middle-aged stands. This boom and bust cycle affects regional timber supply and wildlife habitat.
- The hemlock woolly adelgid, a non-native, exotic insect, poses a serious threat to hemlock. It is found in southern New Hampshire. To help prevent its spread ^{area} there is a quarantine ~~in the area where it is found~~. Any hemlock material from within the quarantine needs to be certified clean of adelgid before shipment out of the zone (x.x Insect and Disease).
- Other non-native insects and plants are potential threats to long-term forest health.
- The aspen-birch type is becoming less common as fire and clearcutting become less common (x.x Aspen Management).

where it is found is

RECOMMENDATION PRACTICES

- Use the silvicultural techniques and other recommended practices in the following

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chapters to manage for the mix of species most appropriate for the site and most appropriate to help you achieve your objectives.

CROSS REFERENCES

x.x Natural Communities and Protected Plants, x.x Aspen Management, Silviculture section, x.x Insect and Disease

ADDITIONAL INFORMATION

NH Wildlife Action Plan appendix C, Comparison between forest types, natural communities and wildlife habitat, http://www.wildlife.state.nh.us/Wildlife/Wildlife_Plan/WAP_pieces/WAP_App_C_Nat_Comm_Crosswalk.pdf Accessed March 5, 2010.


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Good Forestry in the Granite State: Draft Silviculture - Regeneration The Right Tree on the Right Site

5.1 REGENERATION: THE RIGHT TREE ON THE RIGHT SITE

BACKGROUND

Carefully designed regeneration practices help perpetuate desired tree species.

Regeneration means the seedlings and saplings that develop beneath a forest stand, in openings within a stand, or following the removal of a stand (grouping of trees similar in species, age and site). In younger stands with potentially valuable trees, the immediate goal may be to manage the existing trees for timber as described in x.x Managing for High-Quality Trees. If the stand is older or contains an abundance of poor-quality trees, the emphasis can be on a regeneration harvest using the techniques described in this section.

Successful regeneration involves analyzing the condition of the existing trees, advanced regeneration and seed source, and the site capability, and then choosing a silvicultural harvest practice that will regenerate species best meeting your objectives. Regeneration is one of the most important factors affecting the long-term value and productivity of a forest property.

Silviculture is art and science of establishing and tending trees and forests. Controlling the composition, health, structure, and growth of forest stands to help meet the landowner's objectives is at its foundation. Ownership objectives may include timber products, wildlife, aesthetics, recreation, or overall health and stability. Some owners may wish to develop a forest that appears completely natural or untouched. Keep in mind the importance of owner objectives in choosing an appropriate silvicultural approach from the following sections.

Financial and Biological Maturity

Is this more detail needed?

The need for income, promoting wildlife habitat or aesthetics are but a few reasons to regenerate a stand. Financial maturity is one indication of whether ~~or not~~ to harvest. A tree is financially mature when its rate of return becomes less than what alternative investments, such as stock or bonds, can yield. Trees growing on better sites become financially mature at larger diameters than the same species growing on average or poor sites since they grow faster and are able to deliver a higher rate of return for a longer period. Likewise, poor quality trees mature financially at much smaller sizes than high quality ones. Approximate diameters for financially mature, high quality trees are given below. Maturity varies depending on tree condition, site quality, and markets.

Except for paper birch and balsam fir, which are short-lived species, financial maturity isn't highly correlated with biological maturity. Most trees species can live for decades or centuries past their financial maturity. Biological maturity occurs later when a tree begins to

decline. Biological maturity may trigger a regeneration harvest, but these older trees provide benefits as described in other chapters. Approximate ages are listed below

Financial Maturity by DBH and Biological Maturity by Age

Species	Financial Maturity (DBH)inches	Biological Maturity years
Sugar maple, white ash, yellow birch, red oak	18 - 24	150 - 200
Red maple, beech	14 - 18	120 - 150
Paper birch, aspen	12 - 14	80 - 100
White pine	18 - 24	150 - 200
Red spruce	12 - 16	200 - 300
Balsam fir	10 - 14	60 - 80
Hemlock	16 - 18	200 - 300

Site Capability

Analysis of site capability gives insight into which species are best adapted to grow on a particular site. Some general guidelines are:

Species	Preferred Site and Soil Conditions
White ash, Sugar maple	Moderately well-drained and enriched fine-textured soils, especially with low acidity
Beech	Sandy tills, but common on a wide variety of soils
Red oak *	Sandy tills and outwash (where it may be poorly formed and defective)
White pine*	Outwash and to a lesser extent on sandy tills
Yellow birch	Moderately well-drained, fine textured soils; also on somewhat poorly drained pan soils in mixture with softwood
Red spruce, Hemlock	Shallow pan soils, often somewhat poorly drained
Balsam fir	Outwash and lakebed sediments; shallow-to-bedrock soils
Paper birch, Aspen, Red maple	Adapted to a variety of soils, but often on sites that supported tolerant softwoods.

*Currently found on a variety of soils due to agricultural history. They are generally difficult to regenerate on the better soils.

New Hampshire soils are complex and highly variable primarily due to their glacial origins. The Natural Resources Conservation Service (NRCS) categorizes site capability to correspond with county soil survey maps. These categories are referred to as Important Forest Soil Groups and can be used to evaluate the relative productivity of soils and to better understand patterns of plant succession and how soil and site interactions influence management decisions. All soils have been grouped into one of six categories. For a more complete treatment see the appendix. NRCS field offices can provide more information.

Site index is another way to categorize site quality. It is expressed as the height of a species at a given age, usually at age 50. The higher the site index, the taller the tree grew in the given amount of time, and the better the site is for that species. A poor site for one species may be adequate for another. In New England, a site index of 45 or lower is poor, 55 to 65 is average, and 80 is excellent.

Tolerance

Shade tolerance, a species ability to thrive and prosper depending on the amount of available light and competition from others, influences what will regenerate.

Sugar maple, American beech, red spruce, hemlock and balsam fir are shade tolerant. They can survive under heavy shade, including shade from the species itself, although growth is usually more rapid in the open.

White ash, red oak, white pine, and yellow birch are intermediate and can survive under partial shade or in small openings. Red maple is intermediate to tolerant.

Paper birch and aspen are shade intolerant and can best survive with full sunlight. They are called pioneer or early-successional species because often they are the first to inhabit openings after a disturbance.

In the absence of advanced regeneration, knowing about tree tolerance provides guidance as to which species may regenerate from a given harvest technique.

Advanced Regeneration

The presence of seedlings or saplings is advanced regeneration. Often it will determine what species will regenerate.

Some hardwoods such as beech and red maple are aggressive as advanced regeneration on certain sites. When crushed during timber harvesting they sprout profusely. Other hardwoods aren't as aggressive and may sprout from small stumps but their future in the stand is less certain.

Other species including most softwoods, may be persistent as advanced regeneration but may be easily eliminated from a stand if harvesting practices don't protect them. Most softwoods don't sprout. If advanced regeneration is destroyed during a timber harvest new stems must start over from seed. Many softwood species are slow starters, giving hardwoods a head-start.

Lack of advanced regeneration may provide opportunities to establish desired species suitable to the site. Measures may be taken to establish the desired species as advanced regeneration, or harvest practices may encourage regeneration at the time of harvest.

Seed Source

During all phases of management, it is important to maintain or increase a source of seed for the several species of most interest. The best seed producers are sawtimber-sized trees with well-developed crowns. However, there is great variation among individual trees and seed crops vary greatly from year to year. If the desired species aren't present as advanced regeneration, harvest during the fall or winter of a good seed year for those species. Most

seeds fall within a couple hundred feet from the seed tree, but some seeds, notably red and white oak, may be moved (and eaten) by birds and small mammals such as squirrels. In addition, both red and white oak are heavily consumed by wildlife.

Seeding Characteristics of Selected Trees

Species	Seeding Interval (good years)	Other Seeding Characteristics
Birches	1-2	wide dispersal on snow
Sugar maple	3-7	
Red maple	1-2	
Beech	2-5	occasional animal dispersal
White ash	2-5	most germination second year after dispersal
Red oak	3-5	two years to mature; look closely for small one-year acorns
White oak	3-5	one year to develop
White pine	3-10	two years to mature; look for one-year cones
Red spruce	3-8	
Eastern hemlock	2-4	

Regeneration Harvest Methods

Once management objectives are consistent with the site capability, an appropriate regeneration harvest method can be chosen as well as any incidental site preparation practices. Regeneration practices are applied in even-aged stands at the end of the rotation when the stand is mature and ready for final harvest. In uneven-aged stands, regeneration takes place after every harvest cut, but should be carefully evaluated during harvest planning and implementation.

Knowing landowner objectives, site capability, advanced regeneration and seed sources helps choose an optimum regeneration harvest method. The methods described below cover a wide range of disturbance levels, some approximating natural disturbances:

- Single-tree selection: About $\frac{1}{4}$ to $\frac{1}{3}$ of the trees are removed singly or in small groups, leaving a range of tree sizes (roughly one-third to half the basal area in sawtimber, and the remainder in pole-timber). Encourages tolerant species: beech, sugar maple (on good sites), red maple, red spruce, balsam fir, hemlock. Produces or perpetuates an uneven-aged stand (three or more age classes). If the tolerant understory that develops is undesirable (e.g. beech), choose a different system such as groups, patches or clearcuts.
- Group selection: Creates openings of $\frac{1}{4}$ to 2 acres centered on clumps of mature or defective trees. Encourages regeneration of intermediate shade tolerant species such as white ash, yellow birch, red oak, and white pine. In larger (> $\frac{2}{3}$ -acre) groups it promotes aspen and paper birch. Produces a patchy, uneven-age stand. For consistent timber flow, harvest in groups the equivalent of about 1 percent of the stand for each

- year between harvests. For example, for a 10-year entry period, about 10% of the stand is harvested in groups plus some partial removal of trees between groups. A good system for stands with patches of large trees intermixed with patches of immature trees.
- Shelterwood: A flexible system ranging from high-density shelterwoods (removing about 1/3 of the basal area) to encourage tolerant regeneration to low density shelterwoods (removing about 2/3 of the basal area) to encourage intermediate and some intolerant regeneration. A standard shelterwood harvest is followed by a removal harvest of the remaining overstory trees in 5-10 years, producing an even-aged stand. In a deferred shelterwood, the overstory is left in place for perhaps several decades, resulting in a two-aged stand. *even-aged*
 - Clearcut: Removes all trees (above 2 inches diameter). If necessary, submerchantable stems may be removed by a followup noncommercial operation. Clearcuts are commonly about 5 acres or larger. Smaller openings (2-5 acres) are often called patch cuts. Results in early-successional regeneration including paper birch, aspen, pin cherry, and rubus species together with intermediate and tolerant species. Useful in mature and overmature and defective stands, stands subject to windthrow, or to produce early-successional wildlife habitat. Not generally effective for softwood regeneration unless advanced regeneration of these species is present (sometimes called a natural shelterwood or overstory removal). The retention of uncut groups of trees can improve the appearance and provide diversity.
 - Strip Cutting: All trees are removed in strips ranging from perhaps 25 to 100 feet wide. A progressive strip cutting leaves 3-4 uncut strips, which are harvested at intervals over a rotation. Strip cutting (especially without snow cover) provides maximum ground disturbance and is useful for removing unwanted advance regeneration or other undesirable vegetation. A strip shelterwood consists of a clearcut strip and an adjacent strip harvested by shelterwood methods. During the next entry the shelterwood strip is harvested by overstory removal and another adjacent strip is shelterwood harvested, etc., until the cycle is complete and ready to be repeated.
 - Overstory removal: Removal of the larger overstory trees to release advanced regeneration.
 - Natural Disturbance and Natural Process Silviculture: Natural disturbance silviculture approximates natural disturbances from windthrow, disease, and natural mortality. Trees are harvested, sometimes in small groups, when they begin to decline, approaching biological maturity. The system resembles small-group or individual-tree selection, and provides for an abundance of large, old trees, dead woody material, and shade-tolerant regeneration. The similar natural process approach is concerned with maintaining ecological processes: natural succession, nutrient cycling, woody material production, forest floor maintenance and development, multiple age and size classes, and minimal aesthetic impacts.

Practices Not Generally Recommended

- Diameter-limit: Removes all trees above a fixed diameter or a limit that varies by species. It is considered a poor practice unless accompanied by precautions such as removing poor growing stock, releasing acceptable regeneration, and controlling residual basal area.
- High Grading: Removes the most valuable trees, usually the largest. It causes a progressive decline in stand value.

- Liquidation: Complete removal of all merchantable trees, usually without measures to protect the site or provide for future harvests. It may be associated with a land use change.

OBJECTIVE

Select a harvest practice that regenerates desired species rapidly and economically, consistent with landowner objectives and site capability.

CONSIDERATIONS

- Natural regeneration in New Hampshire is prolific due to favorable conditions of climate, soil, and native species. Natural regeneration is usually the best option, although seeding or planting may be useful to meet certain objectives.
- Predation and browsing may impact regeneration success or cause the management objective or harvest method to be revised. Examples include predation on acorns and other seeds from small mammals, deer, turkeys, and insects; browsing from moose, deer, and rabbits; and defoliation of understory pine by gypsy moth.
- The success of regeneration practices can be clearly evaluated only after 5-10 years of observation after the regeneration is well established. There are no hard and fast rules that will result in successful regeneration of the desired species every time.
- Some common trees and shrubs may out-compete more valuable commercial trees. Hobblebush, striped maple, ferns and beech sucker growth are common competitive, non-commercial species.

RECOMMENDED PRACTICES

- Determine the species to regenerate, based on landowner objectives, site capability, the presence or absence of advanced regeneration, and biological and economic risks.
- Choose a regeneration method based on the general guidelines below :

SPECIES	HARVEST METHOD
Beech, sugar maple, red spruce*, balsam fir*, hemlock*	Single-tree/small group selection (< ¼ acre) or narrow strips (< 50 feet wide)
White ash, yellow birch, aspen and paper birch (> 2/3 acre groups), red oak, white pine.	Group selection (¼-2 acres) or medium strips (50-100 feet wide)
Red oak, white pine, red spruce, balsam fir, hemlock.	Shelterwood (natural or planned)**
Aspen, paper birch, yellow birch.	Clearcutting or wide strips (> 100 feet)

* On wet and shallow soils windthrow can be a problem if using single-tree selection.

**A natural shelterwood is a removal cut where ~~there is~~ advanced regeneration present.

- Plan for the following special features when regenerating the species listed below:

SPECIES	SPECIAL FEATURE

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Red oak, white pine, red spruce, hemlock, balsam fir, sugar maple	Advanced regeneration important
Red oak, white pine	Important to bury the seed through harvesting activity or site preparation
Aspen, beech	Sprout from roots of trees present in the stand
Red maple, red oak	Prolific sprouters from stumps of pole timber or small sawlog trees
Sugar maple, red oak, red maple, yellow birch	Browsed heavily by deer
Paper birch, aspen	Short-lived species that typify early succession with pin cherry and <i>Rubus</i> sp.

- Regenerate oak on better sites by encouraging small-stump sprouts, or shelterwood cutting during the fall-winter of a good seed year coupled with harvesting activity or special treatment to bury the seed.
- Minimize beech-suckering by avoiding damage to beech roots by cutting in winter, minimizing skidder traffic especially near cut stumps.
- Reduce unwanted shade-tolerant advanced regeneration through groups, clearcuts and heavy harvesting disturbance which converts the stand to earlier-successional species.
- Regenerate hemlock by releasing patches of advanced regeneration in the winter. To encourage advanced regeneration, apply very light harvests coupled with ground disturbance during late fall of a good seed year.
- Reserve clean beech trees that show resistance to the beech bark disease. Lightly harvest nearby to encourage resistant root suckers.
- In areas subject to heavy deer browsing (over 10-15 deer per square mile), use larger patches or clearcuts or regenerate species like black birch or softwoods or spot-plant with spruce or white pine. ~~undefined~~ delete
- Invasives (e.g. European buckthorn) may almost completely inhibit desired regeneration, especially in areas with intense deer browsing. Try patch or clearcuts, making sure there are adequate nearby seed sources, or obtain professional advice on chemical control. undefined of native vegetation nearby.
- Evaluate advanced regeneration by recording the species of the dominant (tallest) seedlings and saplings in a series of small circular plots about 3.7 feet radius (1/1000 acre). 50% stocked plots is adequate. Percent of stocked plots by species approximates predicted species composition following harvest.
- Retain snags and patches of mature live trees for wildlife habitat.
- Consider the aesthetic impact of the proposed harvest using the visual quality protection techniques described x.x logging aesthetics.
- When clearcutting:
 - Give consideration to the landscape in which the cut occurs as part of an overall forest management strategy to maintain a sustainable balance of forest structures, age classes, and habitats across the landscape.
 - Avoid the following areas:

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- Slopes > 35%
 - Thin organic soils on top of bedrock ("duff soils") and soils classified in Natural Resources Conservation Service soil surveys as having severe erosion hazard
 - Riparian management zones (except for specific wildlife management purposes)
 - In or around seeps, or vernal pools
 - In highly visible or aesthetically sensitive areas
- Separate clearcuts by a manageable stand of at least the width of the area being harvested.

CROSS REFERENCE

Erosion and Soil Damage 1.1; Soil Nutrients 1.2; Wetlands and Riparian Areas 2.1; Water Quality 2.2; Aspen Management 3.4; Cavity Trees, Dens and Snags 3.7; Dead and Downed Woody Material 3.8; Vernal Pools 4.2; Seeps 4.3; Regeneration: the Right Tree on the Right Site 5.1; Forest Structure 5.2; Managing for High Quality Trees 5.3; Controlling Logging Damage 5.4. Aesthetics of Clearcutting 6.5, x.x Mast

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Good Forestry in the Granite State: Draft Silviculture - Forest Structure

5.2 FOREST STRUCTURE

BACKGROUND

Managing forest structure can meet landowner objectives including a sustainable flow of forest products, habitat, aesthetics, clean water, and other benefits.

Forest structure is a function of the trees, shrubs, and ground cover. Structure looks at the proportion of small, medium, and large trees and is usually reported as trees per acre by diameter class. These age or size class groupings are further defined as seedling, sapling, pole, and sawlog.

Size Class Groupings

	Diameter in Breast Height (DBH) in inches
Seedling	up to 1
Saplings	1-4
Pole	5-11
Sawlog	12 and larger

Forests may have a simple structure or they can be very complex. Based on the range of age between the different levels of structure, forest stands are defined as either even-aged or uneven-aged.

Even-aged structure means a stand has either one or two distinct age and size classes. (An age class is comprised of trees within twenty years of age). They are less diverse and composed of few species and age classes. Most of the tree diameters come close to the average stand diameter. A plantation is an extreme example of an even-aged structure. Two-aged stands are often, but not always, a result of management or human intervention. Structure within these stands will often have patchy or partial overstory canopies with a well defined second story, or layer, of either pole timber or seedlings and saplings.

Uneven-aged structure means a stand has three or more age classes. This type of structure is a result of increasing species, age and size class diversity within a stand. Different species grow at different rates and a distinct overstory canopy may no longer be recognizable. Each species or age class exhibits an average stand diameter of its own, and smaller diameter classes may contain more trees per acre than the next larger one. Uneven-aged stands are considered balanced when they have three or more age classes occupying an approximately equal area. When this is achieved, the stand can be considered self-sustaining.

Wildlife biologists and foresters are often interested in structure because of its relationship to timber flow, biological diversity and wildlife habitat. Other chapters in this publication address habitat issues. The focus of this chapter is on the role of structure in maintaining a

flow of timber products over time.

OBJECTIVE

Maintain a sustainable flow of quality timber through control of stand and forest structure.

CONSIDERATIONS

- A thorough forest inventory is useful for analyzing and understanding structure.
- Maintaining a balanced stand structure is more practical on larger ownerships.
- Sustained production of quality timber is sometimes attempted by simple rules such as keeping harvest equal to growth. This is only possible after the stand structure becomes balanced at an optimum level, and may not account for other practices in this publication.
- Controlling stand structure requires appreciable effort, especially in uneven-aged stands, and will require professional assistance with stand inventory and timber marking practices.
- A true uneven-aged condition takes time to establish and can be difficult to implement when harvesting.
- While in theory uneven-aged management requires maintaining size-class balance at the stand level, in practice it may be more feasible to maintain this balance across larger management units, with individual stands managed for a multi-aged (though not perfectly balanced) structure.
- Stand and forest structure and density guidelines vary by species. See the recommendations for general guidelines to cover the likely range in conditions.
- Even-aged stands can provide horizontal diversity (i.e. a variety of forest types and age classes across the landscape).
- Advance regeneration are those young age classes that have become established naturally without the influence of harvesting. When present, they can simplify the silviculture needed to sustain the future forest.
- Uneven-aged stands often provide a variety of vertical structure (i.e. multiple canopy layers, for example; overstory, mid-story and shrub layers).
- Even-aged stands can provide some vertical structure, particularly when routinely thinned, and uneven-aged stands can provide some horizontal structure, especially when group selection is used.
- Site factors, such as soil, can influence stand structure.
- Stand growth and harvest yields will differ depending on any stand's existing structure and the intention of management.
- Rotation age will be fixed or nearly so for even-aged stands whereas uneven-aged stands have a continuum of harvests and regeneration and theoretically have no end of rotation date.
- Shade tolerance, a species ability to thrive and prosper depending on the amount of available light and competition from others, will often dictate what type of species will regenerate (x.x Regeneration).
- Forest structure within the understory also includes down woody material, shrubs,

forbs, grasses and other herbaceous species. They are an important part of the forest ecosystem and vital to habitat, forest soils and biodiversity.

- With the prevalence of mechanized harvest systems and the growing demand for biomass fuel, even-aged structure can be efficiently and profitably managed for.

RECOMMENDED PRACTICES

- Have a clear understanding of the goals and objectives for a stand and how the present structure can or can't be manipulated to achieve the stated goals.
- Inventory the stand to gather data on the species composition, trees per acre, average diameter, basal area, and stem quality.

Even-aged management

- Provide an array of even-aged stands over time using clearcut or shelterwood harvest practices.
- Use even-aged harvest techniques to regenerate intolerant or moderately tolerant species.
- Strive for the following percent of acres in seedling/sapling, pole and sawlog stands.

TREE SIZE	PERCENT OF ACRES
Seedling/Sapling	20-30
Pole-timber	25-35
Sawlog	35-55

These targets are based on rotation ages of about 80 to 120 years (shorter if there is a predominance of short-lived species such as aspen, white birch or balsam fir). They are most applicable at the landscape-scale or on large properties (several thousand acres or larger).

- Change the percents suggested in the above table in seedling/sapling stands and the percents in sawlog and mature stands, when rotation ages are extended or shortened for some biodiversity, wildlife or aesthetic goals.
- Identify, maintain, and regenerate wildlife habitat inclusions (e.g. aspen, soft mast, hemlock, oak raptor nesting trees).

Uneven-aged management

- Develop stands with a range in tree sizes using some form of partial cutting such as individual tree selection or group selection.
- Harvest trees to adjust stand conditions to within the recommended ranges below. Sustained yield is ensured by the ever increasing number of younger trees available in the stand.

TREE DIAMETER	PERCENT BASAL AREA.	PERCENT NOS.
6-10	30-50	60-80
12-14	20-30	15-20
16-22+	25-50	5-20

Examples:

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(1) If a stand contained a basal area of 100 square feet per acre, 40 square feet per acre may represent trees 6-10 inches in diameter at breast height (DBH), 25 square feet may represent trees 12 to 14 inches DBH and 35 square feet may represent trees 16 inches DBH or greater.

(2) If the stand contained 100 trees per acre, those same classes may contain 70, 17.5 and 12.5 trees per acre respectively.

- Use uneven-aged management to favor those species that are shade tolerant e.g., northern hardwoods.
- The selection system, both group and individual, establishes an uneven-aged structure. Small group cuts are most often used and preferred over individual tree selection, which can lead to high-grading.
- Identify, maintain, and regenerate wildlife habitat inclusions (aspen, soft mast, hemlock, oak raptor nesting trees).

CROSS REFERENCE

Overstory Inclusions 3.1; Aspen Management 3.4; Cavity Trees, Dens and Snags 3.7; Dead and Down Woody Debris 3.8; Old Growth Forests 4.8; Regeneration: The Right Tree on the Right Site 5.1; Managing for High Quality Trees 5.3; Clearcutting 5.5.

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Good Forestry in the Granite State: Draft Silviculture - Managing for High-Value Trees

5.3 MANAGING FOR HIGH-VALUE TREES

BACKGROUND

Quality timber trees are important to the region's wood products industry.

Quality is a function of tree size and the amount of clear knot-free lumber the tree can produce. Both are heavily influenced by the density of the stand. Stand density also affects tree growth. When the density is too high, tree growth will slow. When the density is too low, individual trees may grow quickly, but growth per acre diminishes because there are too few trees. There may be problems with excessive branching because low stand density interferes with natural pruning. The excessive branching results in reduced lumber quality. Pruning excess branches is expensive but can lead to increased timber quality.

Stand Development: Tree diameter is not always correlated with age.

Many forest stands are even-aged because they developed following major disturbances such as agricultural abandonment or clearcutting. Although many stands ~~contain trees of~~ different diameters, most of the overstory trees are in fact the same age. Diameter isn't always correlated with age!

delete comma

Trees are grouped into four crown classes: dominant, codominant, intermediate and suppressed (see diagram). Dominant and codominant trees are the largest trees and form the main canopy of a stand. Dominant and codominant trees have larger crowns and grew faster than their neighbors. Intermediate and suppressed trees are the smallest trees and generally are overtopped by dominant and codominant trees. They have much smaller crowns than dominant and codominant trees.

The trees with largest crowns are the fastest growing and healthiest trees. In many stands, a 16-inch diameter tree and a 10-inch diameter tree of the same species are the same age. To improve the timber quality and growth of an even-aged stand focus on removing the weak competitors (intermediate and suppressed trees) and leaving the well-formed strong competitors (codominant and dominant). In an even-aged stand don't remove the large trees to favor the small trees.

Stand Density

Stand density, or crowding, is based on tree size (diameter) and the number of trees per acre, and how close they are growing. Stand density is calculated in terms of basal area. Basal area is a measure of the area of the cross-section of tree diameter at breast height (DBH).

Basal area is usually expressed in square feet. To picture basal area, imagine that all the trees in a stand were cut off at 4.5 feet above the ground (illustration 1). The area of the top surface of the stump (illustration 2) is measured to determine the basal area of that tree (illustration 3). If the basal area of all trees on an acre ^{is} added together, the result is square feet of basal area per acre. It takes several small trees to equal the basal area of a

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large tree. For example, the basal area of four 6-inch diameter trees equals the basal area of one 12-inch diameter tree.

A stand's density can be adjusted by cutting some of the trees and removing them for firewood (or some other use) or by girdling (cutting into the cambium in a complete ring around the tree) and letting them die in place. Different standards apply to even-aged and uneven-aged management. Thinning is the silvicultural tool most often applied to improve timber quality and growth. When done before the trees are ready to harvest, it is called precommercial.

Precommercial Treatments

Precommercial treatments, also known as timber stand improvement, refers to a variety of non-commercial practices that improve growth, value and regeneration of desired species. Focus timber stand improvement on the better growing sites, soils with a site index of 60 or higher for the desired species (see x.x Regeneration for a discussion of site index). Stands with shallow to bedrock soils or excessively wet soils are less of a priority due to the poorer growing conditions and increased probability of trees being in poor form or declining health. Stands dominated by one species, such as oak or white pine, benefit more from precommercial thinning than mixed species stands. For stands dominated by a single species, start releasing the crop trees when they reach 5-8 inch DBH. The sooner released, the faster they will grow in diameter.

Weeding controls the species composition by cutting or girdling unwanted species and favoring desired ones. Weeding is usually most needed in mixed stands of conifers and hardwoods when conifers are the crop trees. Release conifers by weeding out overtopping hardwood. Used in sapling stands (1-4 inches DBH and 10 to 20 feet tall). Bring the upper crowns of valuable stems into full sunlight. Stands remaining after treatment should be dense enough to assure self-pruning of lower limbs, straightness of stem, and protection against snow and ice damage.

The financial benefits of timber stand improvement are questionable especially if the costs per acre are too high. Often the increased growth provided by releasing crop trees at a young age is offset by the cost that is carried (and compounded) for decades. Generally, releasing fewer crop trees per acre and having a commercial harvest as soon as possible helps maximize the return.

Crop tree management

Crop tree management is a thinning technique where high-quality trees with vigorous crowns are identified as crop trees and competing trees are cut to release their crown. It encourages the fastest growing, highest quality trees to have as large a crown as possible by allowing increased amount of sun on the crown. The larger the crown, the faster the tree will grow in diameter. Focus crop tree release on those trees that are most likely to increase in volume and value.

A crown thinning releases one to four sides of the crop tree from trees that touch its crown. A crown thinning should provide 5 to 10 feet of free growing space for the crown of the crop tree by removing competing trees. When two crop trees grow in close proximity, treat them as one tree and remove all trees whose crowns touch those of the two crop trees.

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Timber crop trees have the following characteristics:

- dominant and codominant trees at least 25 feet tall.
- healthy, vigorous crown.
- high-quality butt log potential.
- no epicormic (sprouts) branches.
- no high-risk trees such as splitting forks or leaners.
- high-value commercial species (red oak, sugar maple, yellow birch, black birch, black cherry, white pine, red maple, white ash and red spruce).
- expected longevity of at least 20 years.
- species well-adapted to the site (see table in x.x Regeneration for site requirements by tree species).

Fully releasing the crown of a crop tree increases the possibility for epicormic branching which lowers its timber quality. Practicing crop tree management only on the best growing sites limits epicormic branching. Black cherry and red oak have strong tendencies to epicormic branch; red maple moderate; white ash and yellow birch low; and sugar maple has low tendencies on good sites.

Even-aged Management

When a forest stand is managed for only one or two distinct age classes, it is termed even-aged management. These stands are regenerated by clearcut, shelterwood, or seed tree cutting methods.

The best density for even-aged stands is reflected in stocking guides (see illustration). These guides assist the timber manager in determining if the forest is stocked too heavily with trees (overstocked), too lightly (understocked) or adequately (fully stocked).

Stocking guides provide at least two reference lines, an A-line and a B-line. In general, the A-line shows the upper density limit of a naturally developing uncut forest stand, although some stands do become more dense. The B-line estimates the best density for sawtimber growth in the stand. If the stand's density is higher than the B-line, the stand is too crowded and diameter growth will be slow. If density is lower than the B-line the stand is understocked, resulting in lower timber growth per acre and excessive branchiness resulting in knots in the timber).

When density has increased to halfway between the A-line and the B-line, foresters generally reduce the stand's density to the B-line level. This permits enough trees to be cut to provide for a commercial harvest, and increases diameter growth. The trees removed are often the poorest quality so the growth is concentrated on the best quality trees (crop trees). Crop trees may be chosen on the basis of commercial value, aesthetic quality or their contribution to desired wildlife habitat. Since crop trees are the stems most capable of achieving the desired goals, extra consideration should be used in deciding what the spacing around these trees should be and how much light these stems receive.

Uneven-aged Management

In uneven-aged management, forest stands are managed for three or more age classes. This

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technique simultaneously provides for regeneration, thinning competing trees and harvesting mature timber.

All diameter classes are in the stand. Since the relative proportions of the diameter classes to each other are the same, there is generally one best density range after the harvest. Foresters mark the trees to be cut in the stand to achieve a desired distribution of diameter classes. Diameter classes are used because age is difficult to determine in standing trees. Harvests can be considered when the basal area is at least 30 square feet above the desired distribution (see recommended practices for specifics).

OBJECTIVE

Control the growth and quality of forest stands through the maintenance of optimum stand densities.

CONSIDERATIONS

- Providing a sustainable flow of timber depends on maintaining density, stand structure, and providing for regeneration.
- Thinning is the silvicultural tool most often applied to improve timber quality and growth of a stand.
- Young stands, where most of the trees to be removed won't produce commercial products, may require non-commercial treatments. These stands may qualify for federal financial assistance. Pruning also may qualify.
- Markets for timber are variable, especially over the span of a couple of decades. What is a low-value species today, could be a high-value species in 20 years. Maintaining a diversity of tree species with good form and vigorous crowns accounts for our limitations in predicting future timber markets.
- The following conditions affect the optimum residual basal areas in uneven-aged stands:
 - The time between harvests (the cutting cycle which ranges from 10-25 years). When the cutting cycle is short the density of the remaining forest stand should be on the high end of the suggested density range. This is due to the shorter growing period until the next harvest. When the cutting cycle is long the density of the remaining forest stand after cutting should be on the low end of the suggested range. This is to accommodate the longer period of growth available and to prevent overcrowding within the stand toward the end of the cutting cycle.
 - Occasionally, the stand density must be decreased to the lower ranges of suggested density to accommodate harvesting trees that would otherwise die or deteriorate. There are many causes for this such as insect attack and diseases, ice damage and drought stress, or uneven distribution of age classes.
- A dramatic jump in value usually occurs as a tree grows into the sawlog class (greater than 8-10 inches DBH for softwood and greater than 10-12 inches DBH for hardwoods). An even greater jump in value may occur as a tree grows past the 10-18 inch DBH classes. The difference in value between a 12 inch DBH sawlog-grade tree and an 18 inch diameter veneer grade tree can be 400-500% (see illustration).
- The overall quality of a stand being considered for uneven-aged management may be