

Focus Species Forestry in the Northeast

How to Integrate Biological Diversity with Timber Management and Other Landowner Objectives

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Overview and Workshop Exercise

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Introduction to Focus Species Forestry¹

Focus Species Forestry is a method to simplify the task of integrating timber management with conservation of biological diversity, including healthy and diverse plant and wildlife habitats. It accomplishes this by identifying and managing for a few *focus species* whose habitat needs cover those of many other species, and by ensuring that known rare species habitats and exemplary natural plant communities are conserved. A goal of managing for focus wildlife species is to also ensure that the natural plant diversity of the habitats they require is maintained, and that other habitats, such as dead and decaying wood used by insects and fungi, are also provided.

Details of this approach are outlined in the forest management handbook ***Focus Species Forestry, a Guide to Integrating Timber and Biodiversity Management in Maine*** (Bryan 2007) which was published by Maine Audubon in partnership with the Maine Forest Service, Maine Natural Areas Program, Professional Logging Contractors of Maine, and the Small Woodland Owners of Maine. This overview is an adaptation of the Maine guidebook concepts and species to a broader region that includes the Northeast states and adjacent regions of Canada.

Focus Species Forestry includes a group of focus species for each the region's major forest types. This approach helps forest managers and owners develop habitat targets (i.e., amount and location of habitat over time) for specific species, like the fisher, northern goshawk, and chestnut sided warbler, which are associated with these forest types. By providing adequate habitat for a suite of focus species that represent the range of habitats and stages of forest maturity in the region, many other components of biodiversity will benefit as well.

¹ Information in this document adapted from ***Focus Species Forestry, a Guide to Integrating Timber and Biodiversity Management in Maine*** (Bryan 2007). Illustrations Copyright Mark McCullough except where noted. Refer to the Focus Species Forestry guidebook (see references) for additional details and citations of source materials.

Focus Species Forestry Ecosystems and Stand Development Stages

Focus Species Forestry uses a combination of forest ecosystem type and stand development stage to identify general plant and wildlife habitat conditions on a forest. **Forest ecosystem types** are broad forest types that may include many variants based on the mixes of tree species found on a particular site. **Stand development stages** are broad categories that indicate the relative ecological maturity of a forest stand. Using aerial photographs and forest inventory data collected for general forest management, foresters should be able to classify the forest stands into one of these ecosystem type/development stage combinations (see Workshop Exercise map and data).

Table 1. Focus Species Forest Ecosystems and Special Habitats

Ecosystem	Description
Aspen-Birch	Aspen and/or paper birch are the dominant species. Typically develops in small to large patches (up to several hundred acres) after heavy disturbance (fire or clearcutting). Early successional, often followed by one of the other types listed below.
Northern Hardwoods	Various mixes of sugar maple, beech and yellow birch are dominant; mixed stands may include up to 50% hemlock, red spruce, or balsam fir. In northern New England this is typically a "matrix" forming ecosystem that covers large areas of the landscape where better soils are found.
Oak-Pine	Includes stands ranging from pure oak to pure white pine as well as mixes with red maple, hemlock, or northern hardwoods. This is the dominant matrix-forming ecosystem in southern Maine and central/southern New England.
Hemlock	Stands with >50% hemlock dominance; often an inclusion within larger matrix-forming forest plant communities.
Spruce-Fir	Stands ranging from pure red spruce to pure balsam fir, sometimes with a significant white pine, hemlock, or hardwood component. Matrix-forming ecosystem in northern New England on cool, moist, and /or lower-fertility sites.
Northern White Cedar	Includes both northern white cedar swamps found in level basins or cedar-spruce seepage forests on gentle slopes.
Riparian and Wetland Forest	Forest areas of any type bordering intermittent and perennial streams, rivers, lakes, non-forested wetlands, and coastal waters. May include one of the preceding ecosystem or other more specialized wetland or riparian community types.
Vernal Pool	Fishless seasonal pools or small ponds that provide breeding habitat for wood frogs, yellow or blue-spotted salamanders, or fairy shrimp.

Table 2. Generalized Stand Development Stages for Northeastern Forests

Ecological Development Stage		Typical characteristics ¹
Early Successional	Regeneration and Seedlings	<ul style="list-style-type: none"> • Most trees <1 inch DBH. • Typically 0-10 years, even-aged or may include a partial residual overstory.
	Saplings and Small Poles	<ul style="list-style-type: none"> • Trees 1-5 inches DBH occupy more of the forest than smaller or larger trees. • Typically 10-30 years old, even-aged or with a residual overstory.
Intermediate		<ul style="list-style-type: none"> • Trees 5-12 inches DBH (5-9 inches for spruce-fir) occupy more of the forest than other sizes. • Overstory typically 30-70 years old, even-aged or multi-aged. • Limited understory development, except in areas subject to partial harvesting.
Maturing		<ul style="list-style-type: none"> • Trees > 12 in DBH (>9 inches for spruce-fir) occupy more of the forest than other sizes, but not meeting the definition of "late successional." • Overstory typically 70-100+ years depending on forest type, even-aged or multi-aged. • Increasing complexity of understory, stand structure, and species composition.
Late Successional		<ul style="list-style-type: none"> • Roughly thirty or more trees > 16 inches DBH (northern hardwoods and upland spruce-fir in Maine)². Other species and sites will vary. • Large dead and downed wood accumulating, structurally complex; late successional species common • Transition from mature to late successional generally begins at 100-125-years. Typically multi-aged.
Old-Growth		<ul style="list-style-type: none"> • Generally >150 years old

¹ DBH: diameter at breast height (4.5 ft.). Diameters and ages are general guidelines only and will vary based on species, site characteristics, stand history, and forest type.

² See Manomet Late Successional Index: <http://www.manometmaine.org/LSForest.html>

A Sampler of Focus Species

Following is a short list of focus species that cover most forest ecosystem types and development stages. Other species are included in the *Focus Species Forestry* guidebook. The mix of species and habitats selected to help guide management will vary with landowner objectives as well as surrounding landscape conditions. Refer to the Focus Species Northeast Region Map.

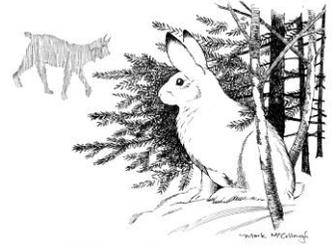
Early Successional Forest

Identification: Regeneration and small trees <5 in. diameter

Recommendations: On a portion of the forest consider using group selection harvests, shelterwood, or small patch cuts to create early successional habitat conditions.

Snowshoe Hare

Optimum habitat has abundant snowfall, over 50% conifers for protective cover, and regeneration over 5,000 stems per acre. Snowshoe hare is a key prey species for lynx, bobcat, and other predators. Spruce-fir and mixed forests in Region 1, locally in Region 2.



Ruffed Grouse

Optimum habitat is patches of dense regeneration interspersed with more mature hardwoods and mixed stands. Use harvesting to create habitat patches up to 5 acres in size and maintain 3 age classes in a 20 to 50-acre area. Regions 1, 2; locally in Region 3.

Chestnut-sided Warbler

Nests in dense young hardwood saplings up to 10 ft. tall in openings >1ac. with overstory <35% canopy closure. Prefers forest patches >250 ac. Moose, mourning warblers, and other early-successional forest species will benefit from management for this species. Regions 1, 2, and 3.



Mature and Late-Successional Forest

Identification: Mature forests are generally over 70 yrs. old; late successional forest characteristics begin developing at about 100 years.

Recommendations: Single-tree and group-selection management can be used to maintain mature or late successional forest conditions. Maintain the majority of the forest in older intermediate and mature development stages, with up to 10% in late successional stages.

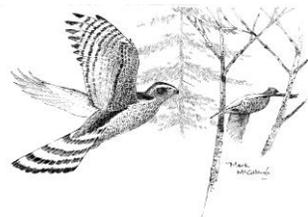
Fisher

Generally associated with intermediate and mature forests, but may use a variety of habitats in areas of extensive forest. Home range 6-20 square miles. Fishers are tolerant of human settlement if corridors exist between habitat patches and if prey habitat cover such as dead trees and downed logs are available. Regions 1, 2, and 3.



American Marten

Prefers well-stocked conifers and northern hardwoods >30-40 ft. and >80 sq. ft. of basal area, with abundant snags, downed logs, stumps, to provide cover for prey. Maintain an average of 7 habitat units of 1,200 ac. per township (36 square miles), with 75% of the each unit meeting the preceding height and density recommendations. Region 1.



Northern Goshawk

Found in extensive intermediate-aged to mature forests with a core habitat consisting of >1 sq. mile of forest. Maintain mature forest conditions near nest tree, avoid harvest in nest season. Maintain relatively mature forest with small openings. Regions 1, 2, and 3.



Pileated Woodpecker

Found in forest-dominated landscapes, including suburbs; typically excavates cavity in tree >20 in. DBH. Maintain mature forest and large decaying trees. Excavates a new cavity each year. Old cavities are used by barred owls, four species of ducks, marten, fisher, bats, flying squirrels, and other species. Regions 1, 2, and 3.

Late-Successional Forests

Late-successional forests are associated with a unique group of lichens, mosses, and liverworts. Late successional stands, which occur in Region 1 and parts of Region 2, are rapidly disappearing. Use careful management to maintain late successional stands and legacy trees where they exist. In all regions allow some areas to reach this stage where late successional stands do not exist.

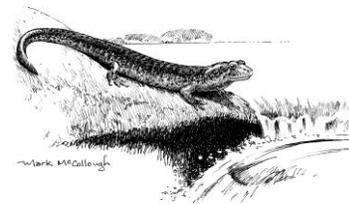
Intermittent Streams and Seeps

Identification: Intermittent streams have a defined channel but may be dry in summer. Seeps are wet drainages that do not have a defined channel.

Recommendations: Use Best Management Practices (BMPs; AMPs in Vermont) within a 25-75 ft. zone (or more, depending on slope) to avoid sedimentation and maintain shade. Check state and local regulations.

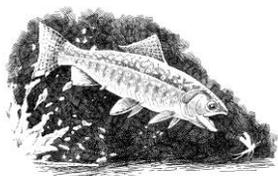
Northern Dusky Salamander

Lives under rocks at edge of intermittent streams, seeps, and small perennial streams. Travels in uplands. Requires cool, clean water. Regions 1, 2, and 3.



Perennial Streams, Rivers, and Lakes

Recommendations: Maintain clean water, shade, and cavity trees within a management zone at least 75 ft. wide. Apply BMPs. Larger rivers and lakes should have a 250 ft. minimum riparian management zone. Check state and local regulations.



Brook Trout

Requires cool, clear water below 65o F. Maintain shade in the riparian zone and use BMPs to protect water quality. Regions 1, 2, and 3.

Vernal Pools

Identification: Vernal pools are fishless ponds generally over 12 inches deep in early spring that often dry by late summer. Vernal pools provide critical habitat for several species of amphibians and invertebrates that are intolerant of fish predation.

Recommendations: Maintain shade on pool, over >75% canopy cover in trees over 20-30 feet tall for the first 100 ft., >50% canopy cover from 100-400 ft. Harvest dry or frozen ground only. See **Focus Species Forestry or Habitat Management Guidelines for Vernal Pool Wildlife** for details.

Spotted Salamander

Lives in upland forests adjacent to fishless vernal pools that serve as breeding habitat. Requires pools with a longer hydroperiod than the wood frog, another widespread vernal pool species. Regions 1, 2, and 3.



Table 3. Focus Species Habitat Summary Table¹

Development Stage	Focus Species	Region ²	Forest Ecosystem																					Special-Value Habitats		Preferred Habitat Features										
			Aspen-Birch				Northern Hardwoods					Oak-Pine					Hemlock			Spruce-Fir				N. White Cedar			Riparian & Wetland Forest	Vernal Pool	Extensive Forest	Snags, Cavities, Decay						
			R	S	I	M	R	S	I	M	L	R	S	I	M	L	I	M	L	R	S	I	M	L	I	M					L					
Early Succession	Snowshoe Hare	1	Mx	Mx	Mx	Mx	Mx	Mx	Mx	Mx	Mx	Mx	Mx	Mx	Mx	Mx	U	U	U								U	U	U	U	U	U	Mx, U			
	Ruffed Grouse	1,2																																		
	Chestnut-sided Warbler	1,2,3																																		
	Eastern Towhee	3															U	U	U																	
	Magnolia Warbler	1					Mx	Mx	Mx	Mx	Mx						U	U	U								U	U	U							
Mature	Fisher	1,2,3																															X	X		
	Marten	1																															X	X		
	White-tailed Deer	1																																		
	Northern Goshawk	1,2,3																															X			
	Pileated Woodpecker	1,2,3																																	X	
	Black-backed Woodpecker	1																															?	X		
	Barred Owl	1,2,3																															X	X		
	Wood Thrush	1,2,3																															X			
	Pine Warbler	3										WP	WP	WP	WP											WP	WP	WP	WP							
	Black-throated Blue Warbler	1,2			U	U			U	U	U																Mx	Mx					X			
	Northern Redback Salamander	1,2,3																																		Forest Floor
LS	Late-successional Lichens	1,2,3																																		
Riparian & Wetland	Beaver	1,2,3																																		
	Northern Waterthrush	1,2																																X		
	Wood Turtle	1,2,3																																X		
	Northern Dusky Salamander	1,2,3																																		
	Brook Trout	1,2,3																																		
VP	Wood Frog	1,2,3																																		
	Spotted Salamander	1,2,3																																		

Development Stage

- R Regeneration
- S Sapling & Small Poles
- I Intermediate-aged forest
- M Mature
- L Late Successional

Habitat Modifiers

- Mx Mixed deciduous-conifer
- WP White pine required
- U Understory cover preferred
- ? More research needed

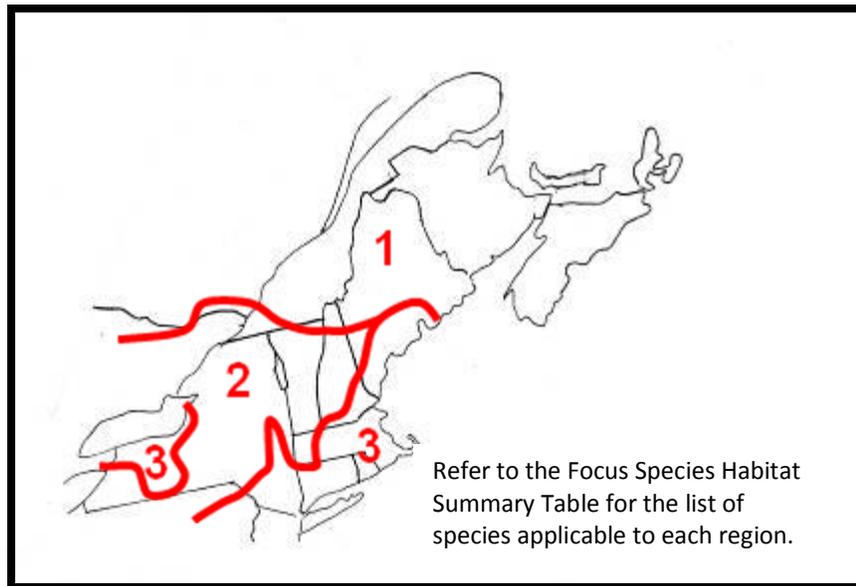
Habitat Use

-  Focus species for this habitat type
-  Utilizes these habitats
-  Low frequency use or absent

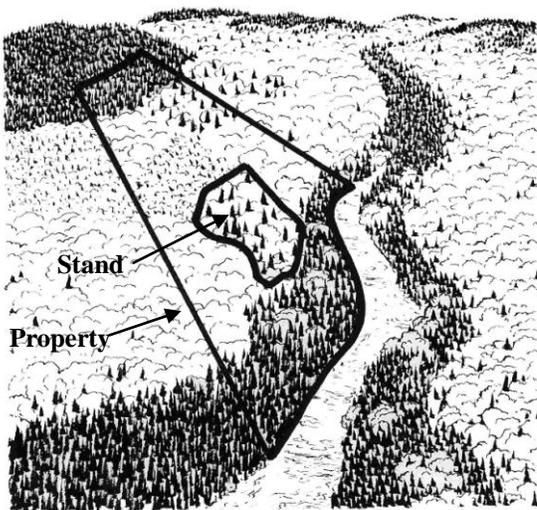
¹ Chart format adapted from the US Forest Service Publication **New England Wildlife: Habitat, Natural History, and Distribution** (DeGraaf and Rudis 1986). Habitat uses in this chart and elsewhere in the guide represent the author's synthesis of current literature and input from advisory committee.

² See Focus Species Northeast Region Map. Range limit of wood turtle and northern dusky salamander within Region 1 extend north to southern Quebec and southern New Brunswick.

Focus Species Northeast Region Map



Ownership Size and Landscape Context



← Landscape →

Focus species management considers the habitat conditions surrounding the ownership when developing property-wide management plans.
 Drawing: Andrea Sulzer

Large Ownerships (thousands of acres). On large ownerships the goal would be to try providing sufficient habitat for the full range of focus species. .

Small Ownerships (tens to hundreds of acres). On small parcels (tens to hundreds of acres) it may not be possible to provide habitat for both young and mature-forest species at the same time. On these woodlots the goals should be to 1) protect the values associated with unique and/or special value habitats such as late successional forest, vernal pools, riparian areas, dead and decaying wood, and known special value habitats and 2) consider the character of the surrounding landscape while deciding on management for young and old forest habitat. For example, if young forest is lacking in the area, a goal might be to create some patches of young forest habitat. The character of the existing forest and the landowner's other objectives will also play an important role. A general approach suitable to many small ownerships is to manage primarily for mature-forest character while occasionally making small openings in the forest (1/10 to 1/2 acre or more) that will provide patches of early-successional habitat.

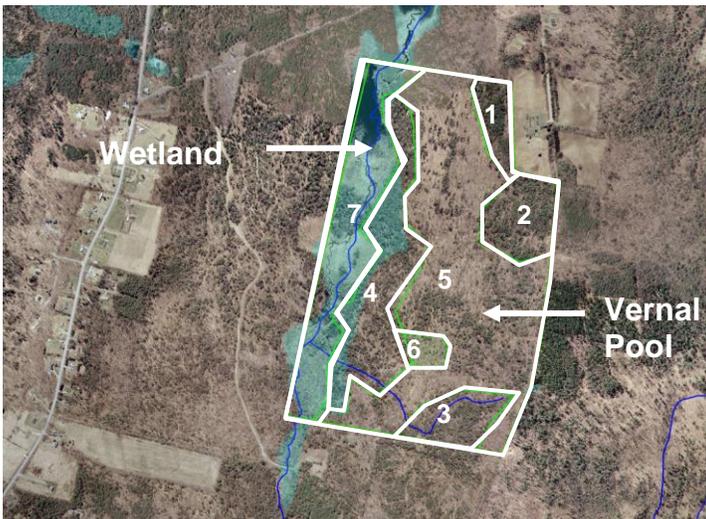
Table 4. Focus Species, Habitats, and Possible Management Objectives

Species	Conservation Targets: Forest Development Stages and/or Special-value Habitats	Rationale for Selection	Habitat Management Objectives
Rare Species and Rare or Exemplary Natural Communities	Consult with natural heritage programs and state wildlife agencies and other conservation groups	Conserves ecosystem, species, and genetic diversity	Conserve species, critical habitats, and natural community character . Identify these and other special management areas prior to developing plans for common species, timber, and other natural resources.
Snowshoe Hare	Early successional softwoods (optimal) and mature/late successional forest and forested wetlands with conifer understory	Key prey species for carnivores and raptors; important game species.	Create snowshoe hare habitat as a by-product of regeneration harvests in softwood stands.
Fisher, Bobcat	Extensive forest blocks and connecting forest corridors. Fisher is generally associated with mature forests, but both are found in a variety of forest development stages.	Sensitive to habitat loss and fragmentation.	Small woodlots as well as larger ownerships can contribute to the connected habitat matrix needed by these species. Forest practices should maintain and recruit den trees, large downed logs, and other structural features and a diversity of age classes to maintain habitat for prey species.
White-tailed deer	Large stands of relatively mature softwood required for winter cover; edge/open areas for feeding. Region 1 and parts of Region 2.	Winter cover required by northern deer herds deer benefits many other species; culturally important game species.	Maintain and restore historical deer wintering areas and travel corridors and maintain cover and browse with periodic harvesting. Control overpopulation to protect plant diversity.
Ruffed Grouse & Chestnut-sided warbler	Early successional and intermediate hardwoods.	Important prey species for raptors; important game species.	Periodically regenerate 1-10-acre patches of deciduous forest.
Blackburnian Warbler	Mature mixed hardwood-conifer forests	Softwood inclusions of hemlock and spruce are key habitat elements within the northern hardwood ecosystem.	Maintain or develop patches of dominant and co-dominant conifers within hardwood-dominated areas.
Black-throated Blue Warbler	Intermediate and mature northern hardwoods with a developed shrub/sapling layer.	Uniquely associated with northern hardwoods.	Maintain mature northern hardwoods with well developed understory layers with uneven-aged management or a 2-aged shelterwood system.
Pileated Woodpecker, Wood Duck, and Barred Owl	Large snags, cavity trees, and live decaying trees.	Pileated woodpeckers require the largest cavity tree of any woodpecker. Management for this species will ensure that the habitat needs of smaller woodpeckers and secondary cavity nesters (e.g., wood duck, hooded merganser, and barred owls) as well as other organisms associated with dead, decaying, and downed wood will be met.	Implement Focus Species Forestry or other regional guidelines for wildlife trees, downed wood, and retention patches in riparian corridors, and in upland forests.
Northern Waterthrush	Shrubby habitat near water bodies and in forested wetlands with standing water.	Representative of important wetland and riparian habitats in the watershed.	Implement riparian management guidelines.
Brook Trout, Wood Turtle & Northern Dusky Salamander	Cool, well-oxygenated streams in forest-dominated watersheds.	Maintaining cool, clear water required by brook trout and northern dusky salamander (in intermittent streams) will ensure habitat needs of other stream species are met.	Implement riparian management practices for intermittent and perennial streams. Consider a 25-50 ft. no-harvest buffer to contribute to the large woody debris pool in streams.
Beaver, Wood Turtle	Low-gradient streams and associated riparian zones.	Beavers are “keystone” species that create habitat used by ducks, moose, herons, otter, and fish. Old beaver meadows are important non-forested wetland habitats.	Apply riparian management guideline. Maintain beaver colonies when feasible, avoid trout habitat conflicts, and use water control structures when necessary to maintain pond levels in sensitive areas.
Spotted Salamander, Wood Frog	Vernal pools and uplands within 800 ft., at minimum for pools with 2 or more indicator species or > 20 egg masses of one species	Uniquely dependent on fishless pools within an intermediate to mature forest patch that provides cool, moist leaf litter. Adults and tadpoles of the vernal pool-breeding wood frog are important prey for many reptiles, birds, and mammals.	Identify and map vernal pools prior to harvest and implement vernal pool habitat management guidelines.
-----	Late-successional forest	Non-vertebrate ecosystem elements (e.g., certain lichens) are typically absent or very limited in younger forests	Protect existing late successional and old growth stands and identify opportunities to allow some stands to develop into late successional condition.

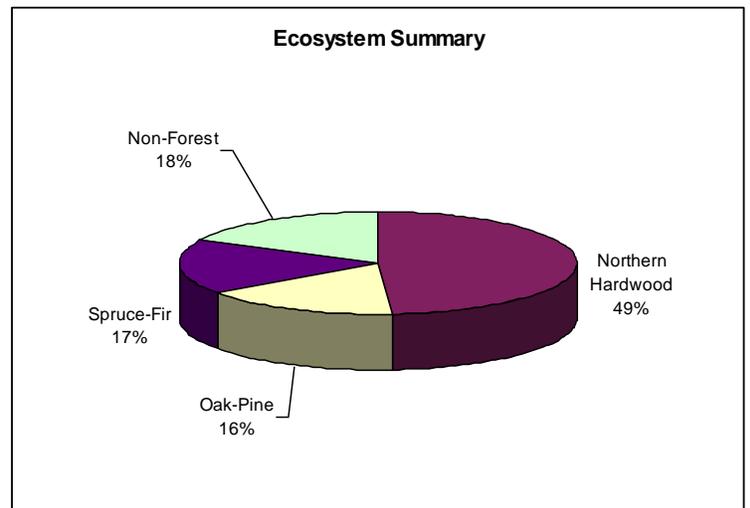
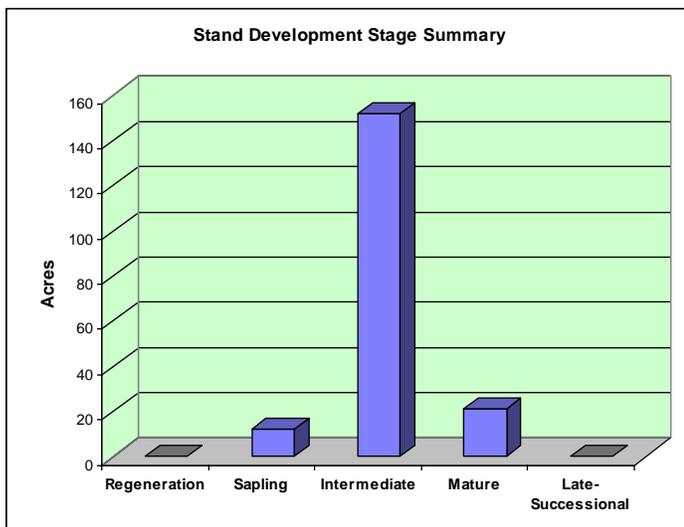
1. See **Focus Species Forestry** guidelines for details on management for Focus Species, forest ecosystems, and special habitats.

Workshop Exercise

Background information



Map #	Acres	Forest Ecosystem	Development Stage
1	9	Oak-pine (pine dominant)	Intermediate
2	15	Oak-Pine (mixed)	Mature
3	12	Oak Pine	Sapling
4	39	Spruce-fir	Intermediate
5	104	Northern hardwoods	Intermediate
6	4	Northern hardwoods - Rich	Mature
7	40	Shrub and emergent wetland	----
Total	223		



Streams: The main stream is a medium-sized perennial stream and the tributary is an intermittent stream.

Stand 6: Rich northern hardwoods. No threatened or endangered plants are known but this is a good example of the type.

History: Post agricultural stands typical of New England, with few trees over 100 years old. "High grading" under previous ownership has resulted in lower than desirable timber quality, but some areas that were cut heavily in the past have dense stands with sufficient numbers of stems with good quality.

Surrounding landscape: Several thousand acres of forest that has been cut fairly regularly; there is about 20% mature forest, 75 % intermediate, and <5% early successional forest. Moderate amount of farmland and rural development but not enough to limit wildlife movement.

Workshop Questions

1) List primary and secondary landowner values and goals:

2) Complete the following table by selecting a suite of Focus Species and habitats to help guide management. Long term goal should incorporate species diversity goals and other landowner values and goals.

Habitat	Current %	Long Term Goal (%) ¹	Focus Species ²
Early Successional	6%		
Intermediate	83%		
Mature Forest	11%		
Late Successional Forest	0%		
Extensive Forest			
Large decaying trees		#/ac. & Size	
Special habitats (vernal pools, riparian, rare species/communities)			
Other species not on Focus Species list (e.g., rare species or landowner-specific species)			

¹ Focus first on early successional and mature/late successional goals. The Intermediate goal is usually the remainder after of these other goals are established.

² Older intermediate stands often provide habitat for species in the mature forest group. See Tables 3 and 4)

3) In the table above, circle any species and habitats that may decline without specific management, and underline any that may not occur without specific management.

4) Develop a 20-year harvest plan to move the forest toward the desired future condition.

Map #	Type of Harvest and Range of Opening Sizes ¹	Approximate Area to Harvest Next 20 years
1		
2		
3		
4		
5		
6		
7		

¹ Harvest types: single tree selection, group <0.1 ac, group 0.1-0.25 ac., large group (0.25-2 ac.), shelterwood, clearcut. Consider a range of opening sizes.

Resources

Focus Species Forestry: A Guide to Integrating Timber and Biodiversity Management in Maine. Robert R. Bryan, 2007. Maine Audubon, Falmouth, ME, in cooperation with Maine Forest Service, Small Woodland Owners Association of Maine, and the Professional Logging Contractors of Maine. Applied silviculture/habitat management guides for the region's major forest types and special habitats and management guides for 25 focal species to benefit a wide range of plant and wildlife habitats. Hard copy 207-781-2330 x 222. Download PDF and associated summary spreadsheets and graphing tools from <http://www.maineaudubon.org/consERVE/forest/focusspecies.shtm>.

Maine Audubon's Community Forestry Project

http://www.maineaudubon.org/consERVE/forest/community_forestry.shtml. This was a demonstration project with towns and land trusts that involved development of forest management plans with local foresters utilizing Focus Species Forestry concepts. Examples of management plans, which can be downloaded, are also applicable to private forests.

Biodiversity in the Forests of Maine: Guidelines for Land Management. Catherine Elliott, ed. 1999 and 2008. University of Maine Cooperative Extension, Orono, ME. Developed by a committee of private-land foresters, agency personnel, and conservation group representatives. General guidelines applicable to forests throughout the Northeast. Hardcopy (2008 edition) from U Main Extension: http://extensionpubs.umext.maine.edu/ePOS/form=robots/item.html&item_number=7147&store=413&design=413. A PDF of the original 1999 version (few if any changes in the 2008 printing) can be downloaded from http://www.forest.umaine.edu/education/livingston/fty111/Documents/BasicPrinciples/biodiversity_forest_s_me.pdf.

New England Wildlife: Habitat, Natural History, and Distribution by Richard DeGraaf and Mariko Yamasaki. University Press of New England, Hanover, NH. 482 p. This is the standard habitat reference for non marine New England birds, mammals, reptiles, and amphibians. Also by DeGraaf et al.: **Landowner's Guide to Wildlife Habitat** (2005, University of Vermont Press) and **Technical Guide to Forest Wildlife Habitat in New England** (2006, University of Vermont Press).

Forestry Habitat Management Guidelines for Vernal Pool Wildlife. Applied guidelines can be downloaded from: <http://www.maineaudubon.org/resource/index.shtml>. Call Maine Audubon at 207-781-2330 x 222 for a hard copy.. The Focus Species Forestry guidebook also includes a habitat management guide for vernal pools that covers the core recommendations in this guidebook.

Sustaining the Ecological Integrity of the Managed Forest: Principles and Practices for the Northeastern Forest Region is a pamphlet that gives an overview of ecological forestry concepts and recommended goals for ecological forestry. This is written for a general audience and is something that managers can provide to landowners. <http://www.maineaudubon.org/resource/documents/MAS.ManagedForest.pdf>.

Appendix 1. Vermont Natural Community - Focus Species Ecosystem Cross Reference

April 2009

The *Focus Species Forestry* Ecosystem Classification is a general classification system used to facilitate ecologically-based management planning. See *Focus Species Forestry* (Bryan 2007) for ecosystem descriptions and general management guidelines. The following table is designed as a cross-reference between the Focus Species Classification system and Vermont's natural community classification system described in ***Wetland, Woodland and Wildland: A Guide to the Natural Communities in Vermont***. (Thompson and Sorenson 2000). Users should consult ***Wetland, Woodland, and Wildland*** for community type descriptions, and management considerations and for a list of specific natural community types that occur within each of the forest formations listed below.

Focus Species Forestry Ecosystem Classification	Vermont Natural Community Classification
Aspen-Birch	Early successional , succeeded by Northern Hardwood Forest Formation or Spruce-Fir-Northern Hardwood Forest Formation, depending on site and region.
Oak-Pine	Oak-Pine- Northern Hardwood Forest Formation
Northern Hardwoods	Northern Hardwood Forest Formation
Hemlock	Hemlock Forest
Spruce-fir	Spruce-Fir-Northern Hardwood Forest Formation
Northern White Cedar	Northern White Cedar Swamp
Riparian Forest	As used in <i>Focus Species Forestry</i> , this classification represents position on the landscape (wetland or upland forests adjacent to streams, ponds, and non-forested wetlands) rather than a community type. Riparian forest may be one of the preceding forest types or one of the forested wetlands classified in <i>Wetland, Woodland, and Wildland</i> .
Vernal Pool	Vernal Pool

Thompson, E.H. and E.R. Sorenson. 2000. ***Wetland, Woodland and Wildland: A Guide to the Natural Communities of Vermont***. The Nature Conservancy and the Vermont Department of Fish and Wildlife. Available in hard copy from many sources or Download: http://www.vtfishandwildlife.com/books.cfm?libbase_=Wetland,Woodland,Wildland

Vermont Natural Community List:

http://www.vtfishandwildlife.com/library/reports_and_documents/nongame_and_Natural_Heritage/Natural_Communities/_List_of_Natural_Community_Types_and_Other_Classification_Systems.pdf