Mass Audubon

Protecting the Nature of Massachusetts

Forest Bird Habitat Assessment

Ashland Town Forest

Ashland, MA

May 2016

Forest Bird
Habitat Assessment

Prepared for Ashland Town Forest Committee, Town of Ashland
By Jeff Ritterson, Forest Bird Conservation Fellow, Mass Audubon
Assessment Date: May 26, 2016; **Report Date:** May 31, 2016

Property Information

Town where land is located: Ashland, Massachusetts
Acres: 564.05 (plus 1.46 excluded)
Forester: Phil Benjamin
Forest Management Plan(s): Yes
Abutting property: Cowassock Woods (Sudbury Valley Trustees, 51.04 acres)

Introduction

The forests of Massachusetts are home to a high diversity of bird species, many which have a significant proportion of their global populations breeding in our region. Unfortunately, a lot of these species are experiencing long-term population declines. Conservationists recognize the need to manage our forests for the recovery and persistence of bird populations, and appropriate management actions can be achieved through common forestry practices. Because roughly 75% of the state's forests are private, these landowners are in a unique position to greatly affect the quality of habitat found in our forested landscape. Even a small property can be a critical linkage in a block of high-quality habitat. With this in mind, Mass Audubon partnered with the Department of Conservation and Recreation and the Mass Woodlands Institute to bring Foresters for the Birds to Massachusetts. This program provides technical assistance to private landowners in managing their forests for birds. We manage specifically for birds because they are well studied, and we largely know how their populations respond to environmental changes. These responses are often mirrored by other types of wildlife, so generally what is good for birds is also good for a multitude of other taxa.

The Foresters for the Birds program focuses conservation efforts on 40 forest birds, known as Responsibility Species (Appendix 1). These species are a conservation priority in the Northern Forest Biome and the Eastern Deciduous Forest Biome of the Atlantic Flyway, which comprise Massachusetts. A subset of these species make up the Focal Birds, which are presented in the Forester's for the Birds documents. The Focal Birds are relatively easy to identity by sight and/or sound and collectively use a wide range of forest habitat types. Being able to identify all 200 species of birds breeding in Massachusetts, and knowing their various habitat associations is difficult even for experts. Thus, the Focal Birds are a great starting point for landowners and foresters to become familiar with the forest birds of Massachusetts.

How to use this report

This assessment was conducted in order to (1) describe current forest bird habitat conditions on the property, (2) identify specific opportunities for protecting and/or enhancing habitat, and (3) suggest management options and/or considerations for improving bird habitat. Here are some suggestions for what to do with this report after you look it over:

- **Share and discuss this report with your forester.** Tell your consulting and/or state service forester that birds are important to you and that you want to prioritize protection of their habitat on your property. Ask your forester if they are already working with the Foresters for the Birds program. If not, suggest that they join.

- **Include information and recommendations in this report in your forest management plan** or attach the report as an appendix**.** This report is designed to supplement and inform a full forest management plan created by your forester in order to maximize positive impacts on breeding forest birds.

- **List protection and enhancement of forest bird habit as a management objective in your forest management plan.** Make your interest in birds clear and state it right up front. Example: *Protect and enhance habitat for breeding birds of conservation concern.*

- **Share this report with neighbors, family, and friends.** You can help spread the word about the importance of our forests for responsibility species and let others know about the services that Mass Audubon and the Foresters for the Birds program provides for landowners interested in making a difference for birds on their properties. When neighbors keep in touch about planning management activities across property boundaries they can increase the overall benefit to birds and forest health.

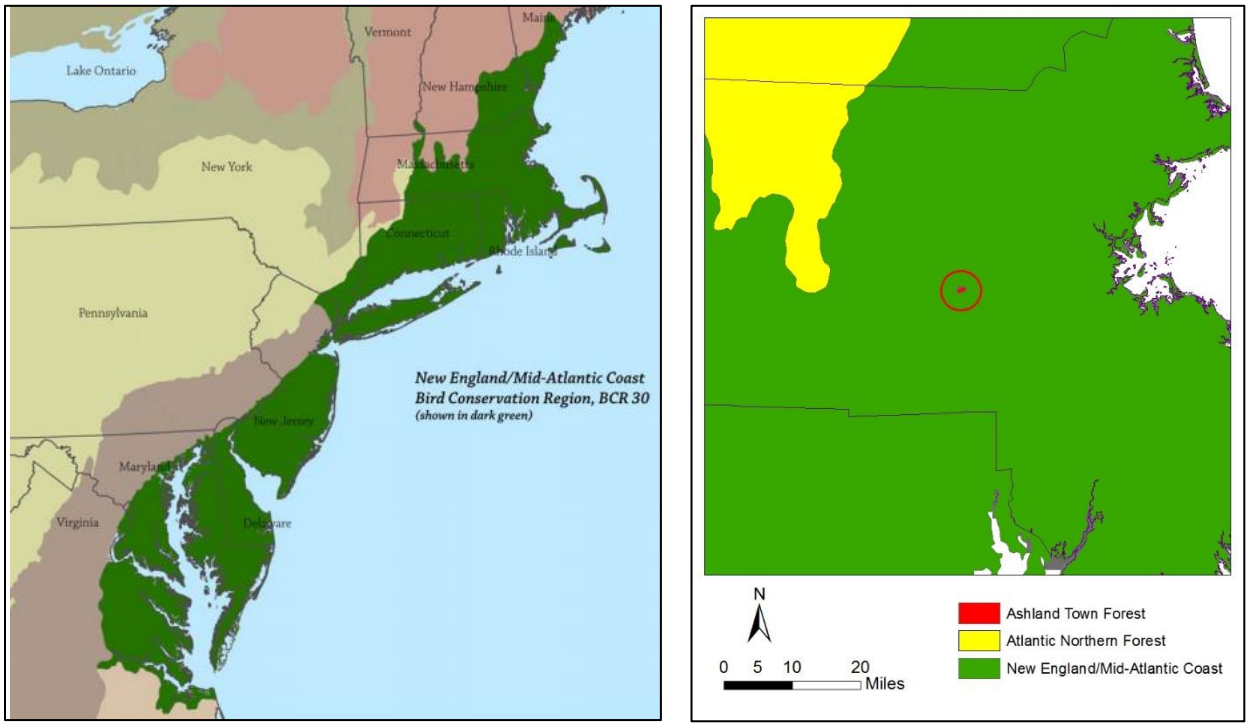
- **Learn more about birds and habitat on your property.** Whether you are a seasoned birder or only recognize a couple of songs, we hope that this report will show you something new about your property and leave you wanting to learn more.

- **Contact us and/or your forester with any questions or when you're planning management activities.** We'll be happy to follow up with you and provide additional assistance if and when you implement any of our recommendations.

Regional Context

The Ashland Town Forest falls within the New England/Mid-Atlantic Coast Bird Conservation Region (BCR) as delineated by the North American Bird Conservation Initiative. This region has a high density of human population, large cities along the eastern seaboard, and has an extensive amount of land dedicated to agriculture. The forest bird species of this region are highly dependent on large tracts of the remaining forest. This highlights the importance of the Ashland Town Forest and the large forested area that it is a part of.

Figure 1. Regional Context. The New England/Mid Atlantic Coast Bird Conservation Region is shown in green (left). Ashland Town Forest is shown on the right, in the red circle.



Landscape Context

The composition and configuration of the 2,500 acre landscape that includes and surrounds Ashland Town Forest affects how wildlife will use the property and the quality of the habitat they find there. Understanding the landscape context can inform management decisions on the property.

Figure 2. The landscape is moderately forested, with other coverage shown in color. The 'Other' category includes residential and commercial areas.

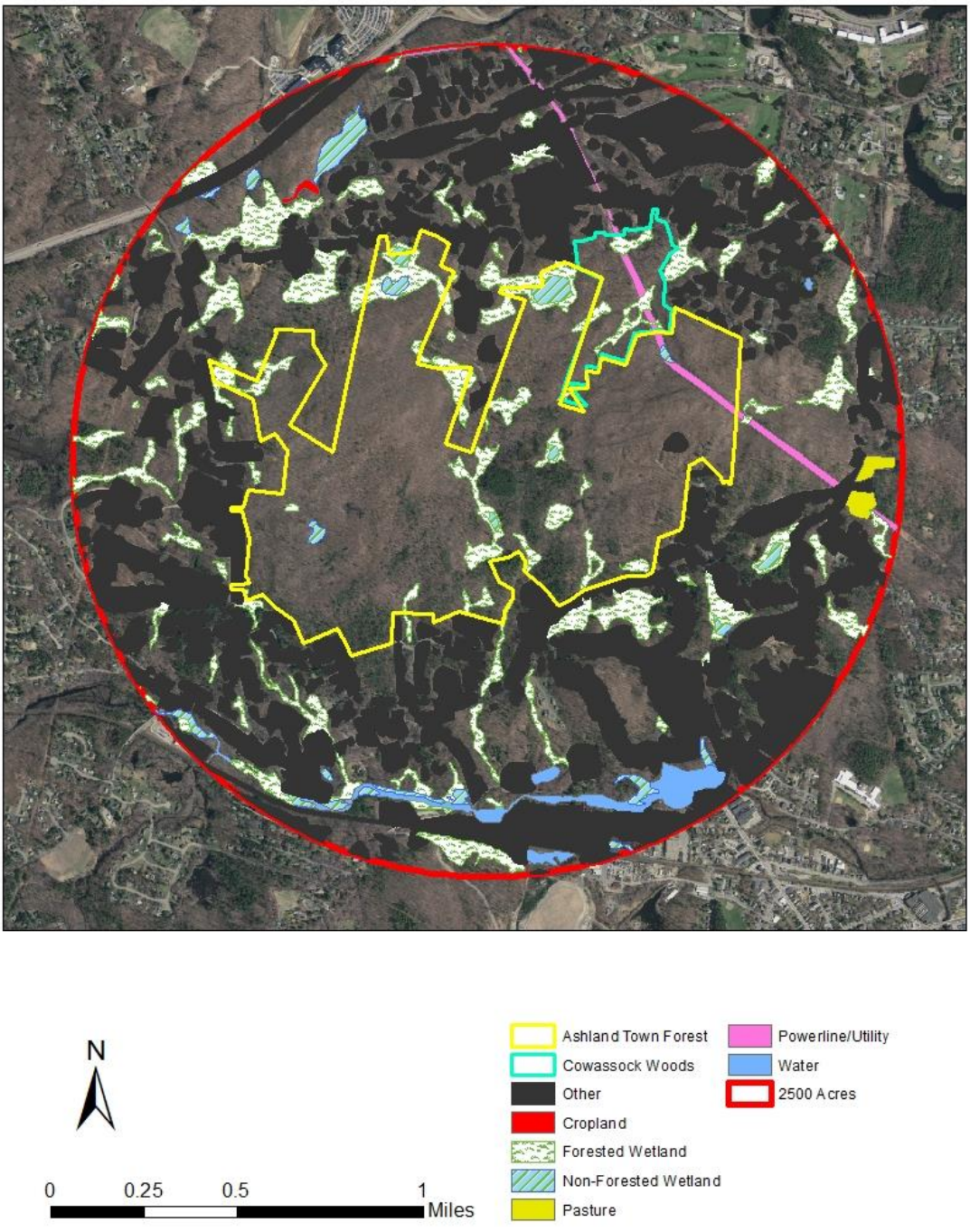


Table 1. Current Landscape Composition. The following table summarizes the composition of the 2,500 acre landscape and its value for the suite of responsibility birds:

	Current Condition	Current Value for Birds
% Mature Forest	56.5%	**Med -** Heavily forested landscapes (≥70% forest cover) provide the greatest quantity, diversity, and quality of habitat for responsibility birds compared to fragmented and/or developed landscapes. Such a high percentage of forest is rare in the immediate area, stressing the importance of the long-term conservation of this land.
% Young Forest	0%	**Low –** 2.5+ acre patches of young forest are important sources of early successional breeding habitat for several responsibility birds such as the Chestnut-sided Warbler, as well as post-breeding habitat for mature forest breeding birds. Mass Audubon recommends that ~10% of existing forest in a landscape be in an early successional condition at any point in time.
Non-forest Wetlands	1.22%	**High** – The 30.4 acres of non-forested wetlands can provide similar low, shrubby habitat for early successional birds, though this represents <2% of the landscape.
Powerline Right-of-way	13.3 acres	**Med** – utility rights-of-way can also provide early successional habitat. At about 125 feet wide, the one running through the landscape is a bit narrow for these birds, which tend to avoid the edges. Also, it is currently not managed as a shrubland, but instead is mowed with enough frequency to exclude a lot of woody growth. However, this could be managed for more shrubby conditions (selecting against tall tree species) and/or be widened by creating young forest along the edges.
Forest Patch Size	>300 acres	**High** - In low to moderately forested landscapes, large patches (>300 acres) of contiguous forest can provide high quality habitat for interior-nesting birds, like Wood Thrush, that reproduce more successfully away from edges and development. These large forest patches also provide habitat for source populations of birds that may recolonize smaller forest patches if they lose their original populations.

Recommendations:

- **Keep forest on the property as forest.** The greatest threat to habitat for forest nesting birds is the conversion of it to a non-forested condition. Long-term conservation strategies can minimize the potential for this to occur.

- **Protect interior forest conditions.** Avoid creating new permanent openings or wide (> 20 feet) linear roads.

- **Create some young forest early successional habitat.** Consider creating a one or several patches of young forest through application of appropriate silviculture, which would contribute to the landscape goal of having 10% of forests as young forests. Specific details are discussed below.

Habitat Units

For the purposes of this report, a habitat unit is an easily defined area that is relatively uniform in general cover type (e.g. hardwood, softwood, or mixed forest), canopy height and closure, and supports a particular suite of birds. See Appendix 2 for additional explanation of habitat types in general. Habitat units usually correspond closely to the forest stands delineated by a consulting forester. This report is primarily focused on the forest birds identified as our region's responsibility birds. Many other bird species will also be found in these same habitat types.

Habitat Unit 1: Mature Upland Mixedwood Forest – about 513 acres

Unit 1 corresponds to just about every Stand not designated as a red maple swamp (RM) in the Forest Management Plan. Most of these stands were prescribed an individual selection harvest/improvement thin. However, some were included in the 'none – allow to develop' category, mostly due to poor accessibility. This is the primary habitat type on the property and is characterized by a mix of hardwood species as well as some white pine and hemlock. From a bird habitat perspective, the age of the trees in this unit represent a more-or-less mature forest habitat. However, the complex vertical structure associated with true old growth conditions is absent throughout much of the unit, limiting the quality of bird habitat. High stem and foliage densities of woody plants in the mid and understory provide nest sites, foraging substrates, and protective cover for many species of forest birds. That said, this lack of structure can be remedied with silvicultural practices.

While much of this unit does have a relatively well developed midstory, a common theme is the lack of an understory. A Black-throated Blue Warbler was singing in one of the few areas that had a thick understory, a testament to their need for such conditions. Several Wood Thrush were also detected – a species that requires a developed midstory for nesting, but also likes to have at a bit of an understory. Large, dense areas of witch hazel and other midstory species were noted, perhaps shading out anything below and preventing much of an understory to develop. The overall plan of creating a multi-aged forest will certainly be beneficial to forest bird species. As previously stated, many of the stands in this unit were prescribed an individual selection harvest or light thinning. This may allow enough light to

reach the forest floor to stimulate regeneration and the development of an understory. However, a bit more aggressive of a treatment may be needed, such as creating larger gaps in the canopy with group selection practices, even at the detriment of the developed midstory in some areas (leaving 'midstory reserves' may be wise). Specific practices to accomplish this should be determined and explained by a licensed forester. The current conditions and the ideal future condition of this unit and are described in Table 2 below.

Table 2. Desired habitat conditions – Unit 1.

Desired Future Habitat Condition	Satisfactory	Needs work	Birds that may benefit	Notes
Generally closed canopy (about 70-80% cover on average)	X		Black-throated Green Warbler, Blue-headed Vireo, Ovenbird, Wood Thrush	Strive to maintain this metric when conducting future forestry. However, sometimes removing a larger percentage of the canopy is necessary to accomplish long term goals, and the canopy will reclose over time.
Abundant small canopy gaps (≤ ¼ acre each)		X	American Redstart, Eastern Wood-pewee	Putting in small ≤¼ acre cuts will help keep the understory vibrant and also be an important habitat feature for some mature forest bird species which associate with these gaps.
Moderate to high understory and mid-story density		X	American Redstart, Black-throated Blue Warbler, Veery, Wood Thrush	Strive to have an understory and midstory ≥50% cover. This can be accomplished by applying silvicultural practices.
Abundant current and future snags and cavity trees (6 per acre with 3 larger than 16 inches DBH)		X	Northern Flicker, Yellow-bellied Sapsucker	Small diameter snags are abundant, but less so are large snags. They can be created and managed for by allowing the decline individual trees, or through active girdling.
Abundant downed dead wood including large logs and branches, as well as tree tops and brush piles		X	Ruffed Grouse, White-throated Sparrow, Ovenbird	Not only is the abundance of coarse woody debris important, but having large piles (>1m wide) of fine woody material provides cover for some species.

Vigorous canopy trees	X		Scarlet Tanager	During any planned forestry, some large trees should be favored to remain as a prominent feature of the canopy. These will eventually will be replaced through natural processes.
Diversity of native plants; lack of invasive, non-native plants		X	All	There is a good diversity of native plant species. There are some invasive woody plants. They should be treated before becoming even more established.

The Black-throated Blue Warbler was detected in part of Stand 6 near (42.28238, -71.47478). This was a small area with some understory which could certainly be expanded upon. One of the Wood Thrushes was detected in part of Stand 6 near (42.28131, -71.47659), and looked like decent habitat.

Figure 3. Many areas of Habitat Unit 1 lack an understory. The photo on the left shows a decent midstory, but with no understory beneath. The photo on the right has a developed understory and was where a Black-throated Blue Warbler was singing.

Habitat Unit 2: Red Maple Swamps – about 46.0 acres

Unit 2 represents areas that are at least seasonably wet and dominated by red maple, including Stands 2, 5, 8, 10, 11, 14, 15, 17, 20, 23, 25, 27, 32, 34, 35, 38, 42, 46, 47, 49, 51, 54, and 55. Many of these stands have somewhat of a developed understory and an uneven forest floor, which may provide good habitat for the declining Canada Warbler. Although it is uncommon in this part of the state, breeding pairs do exist, and it is important to have habitat in place to help stem recent declines. Other bird species who use this habitat type are Veery, Red-shouldered Hawk and Barred Owl. It is largely recommended to leave these areas alone. However, it may be worth exploring opportunities to thicken the understory in stands where it is lacking. Of course, best management practices for operating in wetlands should be observed.

Figure 4. Stand 27 is a red maple swamp with a relatively thick understory. This may provide good habitat for Canada Warbler.

Habitat Unit 3: Potential Early Successional Habitat

The areas of this unit are not grouped together based on what currently exists, but rather as a suggested future condition – early successional habitat. The corresponding Stands are 9 and 21, as well as any other area that may be good for creating early successional habitat.

Many species that are dependent on early successional habitat have exhibited strong declines over the past 40 years. These declines correspond directly with the loss of habitat as the forests of abandoned farms mature past the age needed for early successional species. Because many natural causes of disturbance no long occur on the landscape, conserving these species require creating early successional habitat, and forestry is a good option for doing so.

Stands 9 and 21 are sections of the powerline right-of-way that runs through the landscape. Currently, it appears as though it is managed by mowing it quite frequently – enough to preclude any significant woody vegetation from establishing itself. Also, it is only about 125 feet wide, and many early successional species tend to avoid edges. An alternative way to manage rights-of-way is to develop a thick shrub layer by selectively using herbicide or other methods to control the growth of tall tree

species which may interfere with the powerline. This type of management has been shown to be valuable for early successional bird species. Although the ideal width varies by species, >160 feet wide really begins to increase the conservation value. Furthermore, adding a soft edge to the interior forest (Figure 5) of 20-30 feet wide on each side will help protect interior forest birds. So, all or parts of Stands 9 and 21 could be managed as a shrubland, could be widened by pushing the mature forest edge back, and a soft edge could be created. Alternatively, another area could be identified to create a young forest. The following guidelines can help in that process:

- To be of benefit to these species patches should be ≥2.5 acres in size and <30% canopy cover, which would benefit species such as the Chestnut-sided Warbler.
- Increasing the patch to ≥ 5 acres may accommodate more than one breeding pair, and also more area-sensitive species like the Eastern Towhee.
- Patch shape should be close to a circle or square (avoid irregular shapes) to reduce edge/area ratio and negative edge related effects.
- Avoid disrupting contiguous mature forest by creating young forest at an existing edge, or near an open wetland
- Create soft edges of early successional habitat to protect interior forest birds (Figure 5)
- Building off of existing early successional habitat, such as powerline corridors or abandoned beaver ponds, with large forest blocks nearby will enhance the value of the habitat
- Consider a gradient of age classes by creating new young forest adjacent to sapling/pole stands
- Consider clearing a stand of high-graded or otherwise low-quality trees to create young forest
- Consider creating young forest on poor growing sites, which will extend its longevity

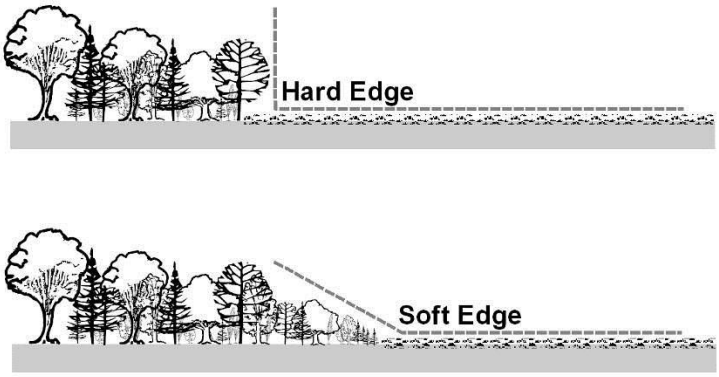


Figure 5. A soft edge is a gradual change in vegetation height moving into the forest. This gradual transition buffers interior forest specialists like the wood thrush from the incursions of nest predators (such as raccoons and skunks) and nest parasites (brown-headed cowbird) that are frequently found in open and developed areas, and shields their nests from a direct view into the forest.

Figure 6. The powerline right-of-way is currently mowed, but could instead be developed into an early successional habitat.

Summary and Further Recommendations

A trend throughout the property is the lack of a developed understory. Silvicultural practices such as group selection can help generate an understory and enhance the habitat for mature forest nesting birds while simultaneously improving the timber. Also, any creation of early successional habitat will help move the landscape towards a desired amount of habitat, which is currently severely lacking. The following are general property-wide recommendations:

- Maintain and encourage the presence of soft mast producing plants such blueberry and black cherry.
- Maintain softwood inclusions, which are important for Black-throated Green Warbler, Blackburnian Warbler, and Blue-headed Vireo.
- Control of invasive plants, and consider a management strategy before conducting any forestry. Early detection and rapid treatment is key to keeping them at bay.
- A Sharp-shinned Hawk was observed in Stand 29 behaving as though it had a nest. This a listed as a Species of Special Concern by the State of Massachusetts. While the trends in landscape changes tend to be benefitting this species, and populations are increasing, it would be wise to check with Natural Heritage before doing any management in this stand.

Table 3. List of birds incidentally detected in Ashland Town Forest and the adjacent Sudbury Valley Trustees Property Cowassock Woods. Note, this was not a systematic survey nor is this a complete species list.

Species	Notes
Sharp-shinned Hawk	Species of Special Concern (State of Massachusetts)
Red-shouldered Hawk	Responsibility Species
Red-tailed Hawk	
Mourning Dove	
Yellow-billed Cuckoo	
Barred Owl	
Red-bellied Woodpecker	Responsibility Species
Downey Woodpecker	
Hairy Woodpecker	
Northern Flicker	Responsibility Species
Pileated Woodpecker	
Eastern Wood-pewee	Responsibility Species
Great-crested Flycatcher	
Red-eyed Vireo	
Blue Jay	
Black-capped Chickadee	
Tufted Titmouse	Responsibility Species
White-breasted Nuthatch	
House Wren	
Swainson's Thrush	Migrating through
Wood Thrush	Responsibility Species
American Robin	
Gray Catbird	
Black-throated Blue Warbler	Responsibility Species
Blackpoll Warbler	Responsibility Species, migrating through
American Restart	Responsibility Species
Ovenbird	Responsibility Species
Common Yellowthroat	
Scarlet Tanager	Responsibility Species
Chipping Sparrow	
Song Sparrow	
Northern Cardinal	
Rose-breasted Grosbeak	
Red-winged Blackbird	
Common Grackle	
Brown-headed Cowbird	

Baltimore Oriole
American Goldfinch
House Sparrow

Appendix 1: Responsibly Birds

This list contains forest bird species that have been determined by the National Audubon Society to be of conservation priority in the Northern Forest Biome and the Eastern Deciduous Forest Biome in the Atlantic Flyway. These species are included because they have a large proportion of their global population within one of the biomes and many are declining in their breeding range. Massachusetts is part of both the Northern Forest Biome and the Eastern Deciduous Forest Biome. The Focal Birds (asterisked) represent a range of habitat characteristics, and are a good starting point to learn about bird identification, habitat requirements and management.

Young Hardwood and Mixedwood Forest

American Woodcock*
Canada Warbler*
Chestnut-sided Warbler*
Magnolia Warbler
Mourning Warbler*
Nashville Warbler
Northern Flicker*
Ruffed Grouse*
White-throated Sparrow*
Eastern Towhee*
Least Flycatcher
White-eyed Vireo
Blue-winged Warbler
Carolina Wren

Mature Hardwood and Mixedwood Forest

American Redstart
Blackburnian Warbler
Black-throated Blue Warbler*
Black-throated Green Warbler*
Blue-headed Vireo
Chimney Swift
Eastern Wood-Pewee*
Northern Parula
Ovenbird
Purple Finch
Scarlet Tanager
Veery*
Wood Thrush*
Yellow-bellied Sapsucker*
Black-and-white Warbler*
Northern Saw-whet Owl
Dark-eyed Junco
Red-shouldered Hawk
Tufted Titmouse
Red-bellied Woodpecker
Pine Warbler

Boreal/High Elevation Forest

Blackpoll Warbler
Yellow-bellied Sapsucker*

Wetlands and Watercourses

Alder Flycatcher
Swamp Sparrow
Louisiana Waterthrush

*Focal Bird species - Foresters for the Birds program

Note: Northern Bobwhite is also a Focal Bird, but not included on the Responsibility Birds list.

Appendix 2: Terms and Explanations

Area-sensitive Bird Species: A bird species such as the wood thrush and scarlet tanager that increases in abundance and/or achieves higher nesting success with increasing forest patch size. A similar phenomenon occurs for birds breeding in young forest habitats.

Canopy: The combined cover of individual tree crowns.

> *Importance for Forest Birds:* Canopy height influences nesting site potential for responsibility birds in both young and mature forest habitats. For birds that nest in young forest habitats – such as Chestnut-sided and Mourning Warbler – once the regeneration attains a height of approximately 20 feet, overall conditions are no longer suitable as nesting habitat. For mature forest nesting birds, including Wood thrush and Blackburnian Warbler, nest site selection is strongly associated with increasing canopy height. Forest stands ≥ 1 acre in size with an open canopy (<30% closure) are likely to provide young forest habitat conditions. An intermediate canopy (30-80% closure) often promotes advance regeneration and shrub development suitable for understory and midstory-nesting birds. Canopy closure tends to be inversely proportional to understory development.

Downed Deadwood: Coarse woody material (CWM) is downed logs and branches >4 inches diameter. Fine woody material (FWM) is limbs and branches <4 inches diameter including slash.

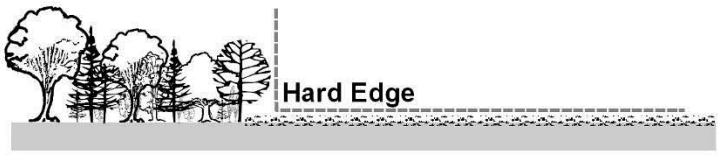
> *Importance for Forest Birds:* CWM provides perch sites for singing (e.g. by Ovenbird) and other male courtship displays, and provides habitat for the insects and other arthropods that are a significant part of the breeding season diet of many birds. Ruffed Grouse tend to use CWM >8 inches diameter as drumming perches. When aggregated in piles (e.g. tree tops or slash piles) FWM offers a nesting substrate and cover for White-throated Sparrows and Veeries. Scattered individual pieces have minimal habitat value.

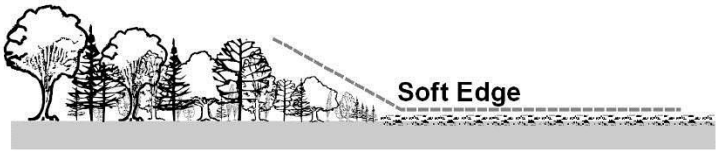
Early Successional Habitat: Areas regenerating after disturbance that provide dense low cover.

> *Importance for Forest Birds: See Young Forest.*

Edge: The boundary between forest and open land, such as a field or backyard.

> *Importance for Forest Birds:* The transition from low herbaceous vegetation to tree canopy can be considered either a "soft" or "hard" edge. A soft edge is a gradual change in vegetation height moving into the forest. This gradual transition is important for buffering interior forest specialists like the wood thrush from the incursions of nest predators (such as raccoons and skunks) and nest parasites (such as the brown-





headed cowbird) that are frequently found in open and developed areas. A gradually increasing canopy height helps to shield interior-nesting birds from view by predators and parasites. Additionally, the brushy conditions that often develop in a soft edge may provide breeding habitat for young forest habitat bird species including Chestnut-sided Warbler and White-throated Sparrow.

Fragmented Forest: Forest that is broken into small, unconnected patches primarily due to some form of development (e.g. residential, commercial, or major roads).

Importance for Forest Birds: A fragmented forested landscape is more likely to support "generalist" wildlife species, such as raccoons and skunks, which can decrease nesting success of interior-nesting forest birds through predation.

Hardwood Forest: A forest dominated by broad-leaved trees which lose their leaves in the fall.

Importance for Forest Birds: Some breeding birds are associated with hardwood forests, such as Chestnut-sided Warbler, Eastern Wood-pewee, and Scarlet Tanager.

Horizontal Structure: The arrangement of different habitat types across the landscape.

Importance for Forest Birds: A landscape with mature and young forest habitats, open fields, and wetlands would be rich in horizontal diversity. Landscapes with greater horizontal diversity support a greater diversity of breeding forest birds and other wildlife.

Interior Forest: Forest condition that occurs with increasing distance from a forest edge.

Importance for Forest Birds: As perceived from a bird's perspective, interior forest conditions begin to occur approximately 200-300 feet from a forest edge. At this distance, negative edge-associated effects such as nest predation and parasitism generally no longer occur. Interior-nesting species, such as Scarlet Tanager, Wood Thrush, Ovenbird, Black-throated Blue Warbler, and Blue-headed Vireo, have greater reproductive success when they nest away from forest edges.

Invasive Plant: A plant that is able to establish on many sites, grow quickly, and spread to the point of disrupting native ecosystems. Often non-native.

Importance for Forest Birds: Non-native, invasive plants, such as bush honeysuckles, buckthorn, and Japanese barberry, present a variety of threats to forest health in Vermont and the northeast. Although some species of native forest birds successfully use these shrubby, woody plant species as nesting sites and eat their fruits, the fruits generally have low nutritional value and the invasive plants reduce the diversity of other nesting and foraging options in forest ecosystems. Overall, non-native, invasive plant species degrade the quality of native forest bird habitat in our region.

Leaf Litter: Dead plant material such as leaves, bark, and twigs that has fallen to the ground.

Importance for Forest Birds: An abundant layer of moist leaf litter is home to an array of insects, mites, and spiders. These arthropods make up a significant component of Ovenbird, Veery, and

Wood Thrush diets during the breeding season. Ovenbirds also rely upon a deep layer of deciduous litter for constructing their ground nests, and nest site selection is strongly associated with this habitat variable.

Mature Forest Habitat: Forest with a canopy greater than 20 feet tall.

Importance for Forest Birds: Many responsibility birds breed in mature forest habitats where they find nest sites, cover, and food. Typically, the quality of mature forest habitat increases for forest birds as a forest ages and structure diversifies. Pole stands – the youngest type of mature forest habitat - are typically structurally simple and attract a small suite for forest birds including ruffed grouse and American redstart. Older stands with understory and midstory layers, canopy gaps, large trees, snags, and logs, attract a much greater diversity of birds including black-throated blue warbler, wood thrush, Canada warbler, and black-throated green warbler.

Midstory: Live, woody vegetation in the 6-30 foot height range including trees and shrubs.

Importance for Forest Birds: High stem and foliage densities of woody plants in this forest layer provide nest sites, foraging substrates, and protective cover for many forest birds. Stand-wide coverage is desirable but not necessary; well distributed patches are sufficient. The majority of responsibility bird species nest and/or forage within the first 30 feet of the forest. Nests of Wood Thrush, American Redstart, Black-throated Green Warbler, and Blue-headed Vireo are most commonly found in the midstory level.

Mixedwood Forest: A forest made up of hardwood and 25-75% softwood tree species.

Importance for Forest Birds: Some breeding birds are associated with mixedwood forests, such as Black-throated Blue Warbler, Canada warbler, and White-throated Sparrow.

National Audubon Society WatchList: An analysis by the National Audubon Society and American Bird Conservancy which uses the latest available research from the bird conservation community along with citizen science data to identify bird species in the continental U.S. and Hawaii that are in need of immediate conservation help. It is a call to action to save species fighting for survival amid a convergence of environmental challenges, including habitat loss, invasive species and global warming. Wood Thrush and Canada Warbler are Audubon WatchList species.

Snags and Cavity Trees: Snags are standing dead or partially dead trees that are relatively stable. Cavity trees may be alive or dead.

Importance for Forest Birds: Snags provide opportunities for nesting cavity excavation by Yellow-bellied Sapsuckers and Northern Flickers, and existing cavity trees provide potential nesting cavities for Chimney Swifts. Aspen and birch species are frequently chosen as trees to excavate. Cavities are often made in trees with the heartwood and sapwood decay fungi. Suggested targets for snags and cavity trees combined in are ≥ 6 per acre, with one tree >18 inches DBH and 3 >12 inches DBH. Branches on snags may be used as foraging perches and nest sites.

Soft Mast: Soft fruits.

Importance for Forest Birds: Fruits including cherry, apple, *rubus* species (e.g. blackberry and raspberry), dogwood, and others are important food sources for forest birds. In the late summer and early fall, after fledging and before migrating, many birds feed on these fruits and the insects that are attracted to them in order to build up critical fat reserves needed to endure long fall migrations.

Softwood Forest: A forest dominated by coniferous trees, usually "evergreen" (the exception being tamarack), with needles or scale-like leaves.

Importance for Forest Birds: Some breeding birds are associated with softwood forests, such as Magnolia Warbler and Blue-headed Vireo. Other birds, such as Blackburnian and Black-throated Green Warbler, are associated with small clusters of softwood trees called inclusions in hardwood stands. For this reason, maintaining or increasing the softwood component of hardwood stands increases their overall habitat value.

Understory: Live vegetation in the 1-5 foot height range, including tree seedlings and saplings, shrubs, and herbaceous vegetation.

Importance for Forest Birds: High stem and foliage densities of woody plants in the understory provide nest sites, foraging substrates, and protective cover for many forest birds. Stand-wide coverage is desirable but not necessary; well distributed patches are sufficient. Herbaceous plants may also be used by songbirds for foraging and nesting, but generally less so than woody plants. Species in this layer frequently used by birds include sugar maple, American beech, hobblebush, red spruce, *rubus* species, and striped maple. Black-throated Blue Warbler and Wood Thrush place nests in this layer, and Canada Warbler and Veery tend to nest on or near the ground, concealed by dense understory growth. The best breeding habitats for Mourning Warbler and Chestnut-sided Warbler are patches of dense, low growth with <30% overstory cover in patches >1 acre in size (young forest habitat conditions).

Vertical Structure: The complexity of vegetation and other structures as they are vertically arranged in the forest.

Importance for Forest Birds: A forest with a well-developed understory, midstory, and canopy exhibits complex or diverse vertical structure, which offers habitat for a greater array of bird species compared with a structurally simple forest. Non-living features, such as coarse woody material and the microtopography of the forest floor, add to the complexity of vertical structure as well.

Young Forest Habitat: Forest patches greater than one acre in size dominated by a high density of seedlings, saplings, and shrubs less than 20 feet tall.

Importance for Forest Birds: Several responsibility birds and many other wildlife species use young forests during all or part of their life cycle. Chestnut-sided Warbler, American Woodcock, and Magnolia Warbler all use young forests during the breeding season. Although these species may be found in patches smaller than one acre in size, research has shown that abundance and nesting success is greater in larger patches. Young forest habitats include regenerating patchcuts, clearcuts, and old fields. Early successional young forest habitats dominated by

intolerant species such as aspen and paper birch are particularly valuable for woodcock and grouse. Shrublands that will never mature into forest, such as those associated with beaver wetland complexes, can also attract species associated with young forest habitats since they have a similar vegetative structure. Recent research has also shown the importance of young forest habitats as post-breeding habitat for birds that nest in mature forest, such as Scarlet Tanager and Wood Thrush. Young forest provides dense, protective cover for juveniles, as well as abundant sources of soft mast, which are important pre-migration food sources. Young forest habitats are ephemeral; they generally only persist 10-15 years where forest regenerates after a patch or clearcut and slightly longer on old field sites. Due to natural forest succession and development, the amount of this habitat type is decreasing in our region, which is a threat to the species associated with it.

Appendix 3: Additional Forestry Terms

Adapted from Vermont Land Trust Forestry Glossary

Acre: A standard unit of area measure. One acre equals: 43,560 square feet; 4840 square yards; 10 square chains.

Advance regeneration: Natural regeneration that is established prior to a timber harvest.

Age Class: One of the intervals, commonly 10-20 years, into which the age range of trees are divided for classification.

Blowdown: A tree or trees that have been toppled by high winds. A common phenomenon along the edge of strip cuts and clearcuts.

Browse: Buds, leaves, and twigs of seedling and sapling regeneration that are utilized as a food resource by wildlife.

Clearcut: A silvicultural method which removes all trees from a designated area at one time for the purpose of creating a new, even-aged stand. This management system is usually used to regenerate shade-intolerant tree species. Variations include patch and strip clearcutting.

Crop Trees: Trees to be grown to the end of the rotation in even-aged management or trees to be favored for future growth in uneven-aged management.

Crown: The branches and twigs of the upper part of a tree.

Diameter at Breast Height (DBH): The diameter of a standing tree measured at 4.5 feet above the ground and expressed in inches.

Even-aged: An age class description of a stand in which the age of the trees is relatively close, usually within 20 years. Stands with two distinct age classes can also be referred to as even-aged.

Forest Management Plan (FMP): A long range plan designed to identify a landowner's goals and objectives and the silvicultural methods that will be employed to achieve those goals. FMP's in Vermont are typically written for a 15 year period and updated every 10 years.

Forest Type: A natural group or association of different species of trees which commonly occur together over a large area. Forest types are defined by one or more of the dominant species of trees in the type.

Forestry: The art and science of growing and managing forests and forest lands for the continuing use of their resources.

Girdle: To destroy the conductive tissue of a tree in a ring around the bole or trunk. A technique often used to create snags.

Harvest: A silvicultural treatment that is intended to establish regeneration. A harvest is generally a higher level of cutting intensity than a thinning.

High-grading: A liquidation cut in which only the best quality, highest value trees are removed. Cuts of this nature are short sighted and exploitative and result in the degradation of the forest ecosystem.

Individual Tree Selection: An uneven-aged harvesting method designed to favor tolerant species. Trees are removed individually to maintain a continuous and uniform crown cover. Also referred to as single tree selection.

Intermediate Treatments: The removal of trees from a stand between the time of establishment and the final harvest with the purpose of improving stand growth and/or species composition and/or health.

Intolerant Species: Trees unable to grow and develop in the shade of other species. Intolerant commercial species in Vermont include: paper birch and aspen.

Landing: Any place where logs are assembled for further transport.

Mast: Nuts, berries, and seeds utilized by wildlife as a food resource.

Overstory: Those trees making up the main canopy. The overstory is usually referenced as the larger trees in the stand.

Pole or Pole Timber: A tree or trees greater than 4.0 inches DBH and less than 10.0 inches DBH.

Prescription: A course of action to effect change in a forest stand (e.g. harvest, thinning, or planting).

Regeneration: Renewal of a tree crop by natural or artificial means.

Release: The freeing of well-established seedlings or saplings from surrounding growth.

Residual: Trees that are left to grow in a stand after a silvicultural treatment.

Rotation: The length of time required to grow an even-aged crop of trees to a desired age.

Rotation Age: The age at which an even-aged stand is considered ready for harvest.

Salvage Cut: The removal of dead, dying, and damaged trees after a natural disaster or insect or disease infestation to utilize the wood before it loses all of its commercial value.

Sapling: Trees taller than 4.5 feet but less than 5.0 inches DBH.

Sawlog: A log considered suitable in size and quality for producing lumber. Regional standards apply for diameter, length and freedom from defect. Sawlog is also used to refer to a tree that has reached sufficient size to produce a sawlog. Small sawlog trees are 12-16 inches DBH, medium sawlog trees are 17-20 inches DBH, and large sawlog trees are 22 inches DBH or greater.

Sawtimber: Trees that have obtained a minimum diameter at breast height that can be felled and processed into sawlogs. Typical minimum size limits for commercial species in Vermont are 8 inches DBH for softwoods and 12 inches DBH for hardwoods.

Seedlings: Trees that are less than 4.5 feet tall.

Shade tolerance: The ability of trees to reproduce and grow in the shade of other trees. Tolerance ratings are very tolerant, tolerant, intermediate, intolerant, and very intolerant.

Silviculture: Manipulation of the forest ecosystem to achieve specific goals and objectives.

Skid Trail: Any path in the woods over which multiple loads of logs are hauled, usually by a skidder or tractor. Primary skid trails are the main pathways that enter the landing.

Stand: A community of trees possessing sufficient uniformity in regards to composition, constitution, age, spatial arrangement or condition to be distinguishable from adjacent communities.

Stocking: An indication of the number of trees in a stand as compared to the optimum number of trees required to achieve some management objective, usually improved growth rates or increased timber values.

Tolerant Species: Trees that can grow satisfactorily in the shade of other trees. Tolerant species of commercial importance in Vermont include sugar maple, beech, red spruce, and hemlock.

Uneven-aged: An age class description of a stand of trees that contains more than two distinct age classes and a variety of size classe