Forest Bird Habitat Assessment

Great Mountain Forest
Norfolk & Falls Village, CT

6,045 Mapped Acres




Assessment Date: June 9, 2015

Report Date: March 15th, 2016

Prepared for: Great Mountain Forest

Prepared by:
Audubon Connecticut
Ferrucci & Walicki, LLC
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Bird photos courtesy of Patrick Comins, Audubon Connecticut and AJ Hand (left to right): Black-throated Blue Warbler, Scarlet Tanager, Wood Thrush, and Black-throated Green Warbler.
All other photos are from this property and are courtesy of Ferrucci & Walicki, LLC unless otherwise noted.

Background

Breeding bird surveys have shown that the forests of New England are globally important for bird populations. Connecticut's **forests are home to some of the highest concentrations of bird species breeding in the continental United States;** they are a "nursery" for approximately 70 species of neo-tropical migratory birds. Although some of these birds are still common in our area – **many are experiencing long-term population declines and have been identified by Audubon Connecticut as *Priority Species*.** Audubon Connecticut's Forest Bird Initiative focuses its conservation efforts on ***Priority Species*** giving us an opportunity to keep these species common before they become threatened or endangered.

Since 85% of our region's forests are privately-owned, large blocks of forest may be owned by hundreds of individual landowners with different priorities. Even the smallest properties can be critical parts of large forested landscapes that provide high-quality habitat for breeding birds. **Small actions by individual forest landowners can have a significant impact on maintaining large blocks of high quality habitat for future bird populations.** Audubon Connecticut is partnering with foresters, the Department of Energy and Environmental Protection, and the Connecticut Agricultural Experiment Station, to provide **technical assistance and educational opportunities for landowners** who want to make a difference for birds in their forests. If you are interested in taking the next steps in improving and diversifying your woods with birds in mind, specific activities may be eligible for cost-share through the USDA Natural Resources Conservation Service (NRCS). The NRCS is a federal agency whose mission is to help farmers and landowners complete activities that improve conservation values on their properties.

Habitat assessments and bird surveys are provided to qualifying landowners free of charge due to generous support from the U. S. Forest Service, the Northeast State Foresters Association and individual donations.

Purpose

Information in this report is presented from the landscape level to the property level. This assessment was conducted by Audubon biologists, Connecticut Agricultural Experiment Station technicians, and a Connecticut licensed forester in order to:

- Determine what birds are currently utilizing the habitats on the property.
- Describe and assess current forest bird habitat conditions on the property.
- Make recommendations for protecting and improving habitat for a suite of priority forest birds.

Birds and Habitat Types

The Bird Watcher's Dozen, listed on page 3, is a representative subset of Connecticut's Priority Birds. These species are relatively common in CT and were the birds we focused on during your habitat assessment. A forest with suitable habitats for these species likely provides habitats for a wide range of additional species.

The Birdwatcher's Dozen - Connecticut

American Woodcock
Call: Peent
Habitat: Deciduous woods with a dense understory. Requires some open areas for courtship display.

Black-throated Blue Warbler
Song: Beer, beer, beer, bee
Habitat: Deciduous or mixed woodlands with 50-80% canopy cover and a dense shrub understory. Sensitive to forest fragmentation.

Black-throated Green Warbler
Song: Zee, zee, zee, zoo, zee
Habitat: Strongly associated with Hemlocks. Prefers a closed canopy and uneven-aged woodlands.

Chestnut-sided Warbler
Song: Please, please, please to meetcha
Habitat: regenerating deciduous woods of 5-10 years old.

Eastern Wood Pewee
Song: Pewee or wee ooh
Habitat: Prefers deciduous woods with a nearly closed canopy and an open mid-story. Snags serves as foraging perches.

Louisiana Waterthrush
Song: Hey, hey, hey, watch where your going
Habitat: Forages along woodland streams, nests adjacent to stumps and other woody debris, prefers a nearly closed canopy.

Pileated Woodpecker
Song: Key, key, key, key, key....loudest in the middle
Habitat: Requires large trees for nesting and roosting cavities. Forest block size and the presence of snags are also important.

Red-eyed Vireo
Song: Here I am, where are you
Habitat: Requires moderate understory vegetation. Forages in the mid-story and canopy. Often found near canopy gaps.

Scarlet Tanager
Song: A scratchy cheerily, cheerilo; the call sounds like chick burr.
Habitat: Uneven aged deciduous woods (oaks and maples) with a mostly closed canopy.

Veery
Song: a descending spiral of notes
Habitat: Deciduous woods with a moderately closed canopy and a dense understory. Uses woody debris for nest sites and shelter. Often found in riparian areas.

Wood Thrush
Song: Eolay, ching, ching
Habitat: Deciduous or mixed woods with a closed canopy and a moderate mid-story and shrub layer. Likes a fairly open forest floor with damp soil.

Worm-eating Warbler
Song: an insect like trill
Habitat: Found on slopes with mature deciduous or mixed trees. Prefers a closed canopy and a shrubby understory.

Developed by Audubon CT with support from NEFA and USFS. Photos by AJ Hand, P Comins, and C Folsom-O'Keefe.

Priority Birds

We share our northern forests with as much as 90% of the global breeding populations of dozens of species of migratory birds, including the Scarlet Tanager, Wood Thrush, Black-throated Blue Warbler, and Worm-eating Warbler (Partners in Flight). We have a responsibility to look out for the future of these birds because our forests are the core of their breeding range. Audubon Connecticut refers to these birds as **Priority Species**. Fortunately, because these birds are still common in our region, we have the opportunity to protect and enhance their breeding habitat now before they become threatened or endangered. Knowing which species are or may be nesting on your property is a great way to ensure that you're making a positive difference. A full list of species observed on your property during the habitat assessment can be found in Appendix A. With your permission, we may also conduct more thorough bird surveys on your property in 2016 which will supplement this report and increase our collective knowledge of forest bird species distribution in CT.

Connecticut Priority Birds					
Mature Hardwoods/Mixed Forest	Confirmed	Potential	Young Hardwoods /Mixed Forest	Confirmed	Potential
American Redstart	X		Canada Warbler		X
Black-and-white Warbler	X		Chestnut-sided Warbler	X	
Blackburnian Warbler	X		Eastern Whip-poor-will		
Black-throated Blue Warbler	X		Northern Flicker		X
Blue-gray Gnatcatcher		X	Ruffed Grouse *	X (L/O)	
Blue-headed Vireo	X		Forest Edges/Dense Shrubs		
Broad-winged Hawk	X		Baltimore Oriole		X
Brown Creeper		X	Black-billed Cuckoo		X
Cerulean Warbler			Blue-winged Warbler	X	
Eastern Wood Pewee	X		Brown Thrasher		
Hairy Woodpecker *		X	Eastern Towhee	X	
Hermit Thrush		X	Gray Catbird	X	
Hooded Warbler			Indigo Bunting	X	
Northern Goshawk			Orchard Oriole		
Ovenbird	X		Prairie Warbler		
Pileated Woodpecker *		X	Rose-breasted Grosbeak	X	
Purple Finch	X		Yellow-billed Cuckoo		X
Red-eyed Vireo	X		Riparian Corridors or Wetlands		
Red-shouldered Hawk	X		Barred Owl *	X (L/O)	
Ruby-throated Hummingbird		X	Eastern Kingbird	X	
Scarlet Tanager	X		Eastern Screech Owl *		X
Sharp-shinned Hawk		X	Great-crested Flycatcher		X
Veery	X		Least Flycatcher		X
Winter Wren		X	Louisiana Waterthrush		X
Wood Thrush	X		Willow Flycatcher		X
Worm-eating Warbler			Mature Softwood Forest		
Yellow-throated Vireo			Pine Warbler	X	
			Black-throated Green Warbler	X	

* denotes year-round residents.
L/O indicates species noted by landowner

How the Assessment Was Done

For the purposes of this report and our visit, Great Mountain Forest's property was broken into eight areas on the stand map (page 12) with distinct land use and land cover types after superimposing the property boundaries over an aerial photograph. We then used a three-pronged approach to evaluate each stand: biologists from Audubon Connecticut observed which birds were present, a consulting forester [from Ferrucci & Walicki] conducted a qualitative assessment of vegetation and natural features, and a team from The Connecticut Agricultural Experiment Station (CAES) completed a quantitative inventory of vegetation and structural attributes by sampling one point approximately every 5 forested acres[1]. A total of 27 sample points were taken. These observations and data were combined into the assessment of your entire property. The Audubon Connecticut bird observations can be found in Appendix A and the CAES quantitative assessment can be found in Appendix B.

Property Summary

Overall this property provides a rich variety of high quality habitats for many species of birds. Habitat variety is a key attribute of this property. Many species of interior forest breeding birds, some of which are considered species of conservation concern, were noted during our visit to the property. The mixture of upland and wetland hardwood, mixedwood and softwood dominated forest, along with many drainages, ponds, perennial streams/brooks, open areas, regenerating forest, and some small developed areas all provide important potential food and nesting resources for many species.

Size class and age class diversity of trees throughout the property also provide structural characteristics that allow for many species of birds and other wildlife to use this area for a variety of purposes.

Invasive plants are an issue in places on the property and should be addressed in a phased approach. Invasive plants can provide habitat structure that can be beneficial to some nesting and migrant birds so some invasive plants could be allowed to persist over time until native plants can be re-established in treated areas.

Ash trees on the property are declining and will continue to succumb to mortality or are already dead. Where safety is not an issue these trees could be left standing so they can help provide habitat as snags and downed woody material.

Right: The ash in this picture taken on Canaan Mountain Road is showing signs of stress and decline. Many of the roadside ash appeared to be in this condition.

Landscape Context

The composition of the landscape that immediately surrounds your property affects how wildlife will use the property. Heavily forested landscapes, with large connected blocks of mature forest, will likely contain the suite of forest priority birds. The value in each category highlighted in **color** in the chart on page 6 is the value that best describes this area. The values below are for the 2500 acres surrounding your property.

[1] For the purposes of this project 138 acres were examined by CAES for to develop the quantitative data provided in this report.

Feature	Value for forest birds			Comments
	Good	Fair	Low	
% Forest Cover	**>70% of area**	50-70% of area	<50% of area	
Forest Block Size	**>2500 acres**	500-2500 acres	<500 acres	Continuity with other large forested properties increase the size of this forest block
% Established Forest >20 years (with some old forest >100 years)	**>80% of forest**	70-80% forest	<70% forest	Based on the aerial photo it appears as though most of the forest in this area is established forest
% Young Forest <20 years	3-5% of forest	5-10% of forest	**<3% or >10% forest**	There appears to be minimal amounts of young forest in this area (<3%), but forest management on Great Mountain Forest and adjacent DEEP properties is increasing the percentage of young forest

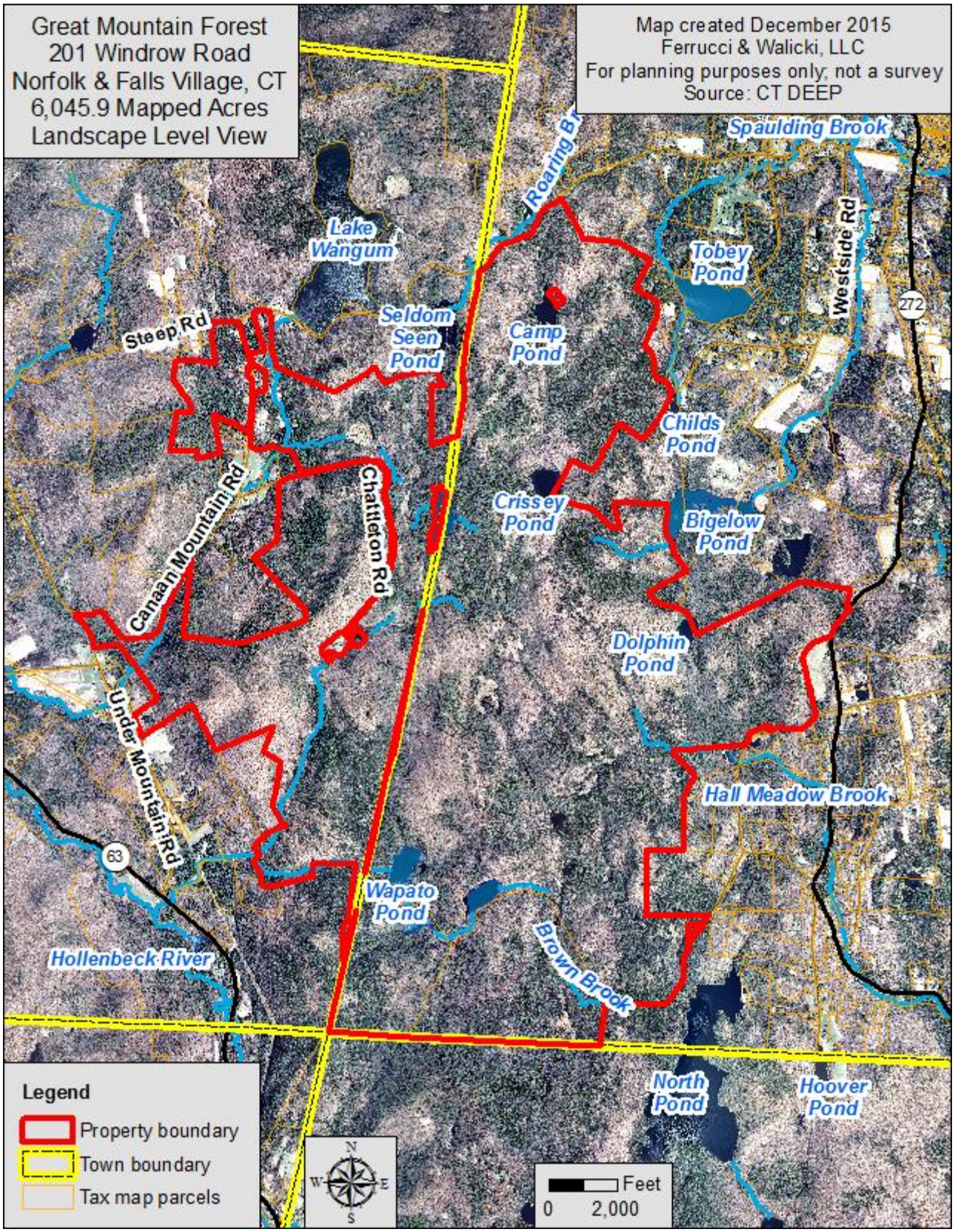
Landscape Description

As seen on the maps on pages 7 and 8, this property plays a critical role on a landscape level. It is the largest contiguous area of forest within a heavily forested landscape. The location and size of the property in the context of its surroundings are important features. The property is a large "green" space, which can help it act as a magnet for wildlife – particularly for migrating and/or nesting birds which can see it from the air. In addition to the size of the property, the fact that it contains many watercourses, and some open water provides additional habitat opportunities. The open areas and extensive presence of softwood here are also valuable on a landscape level.

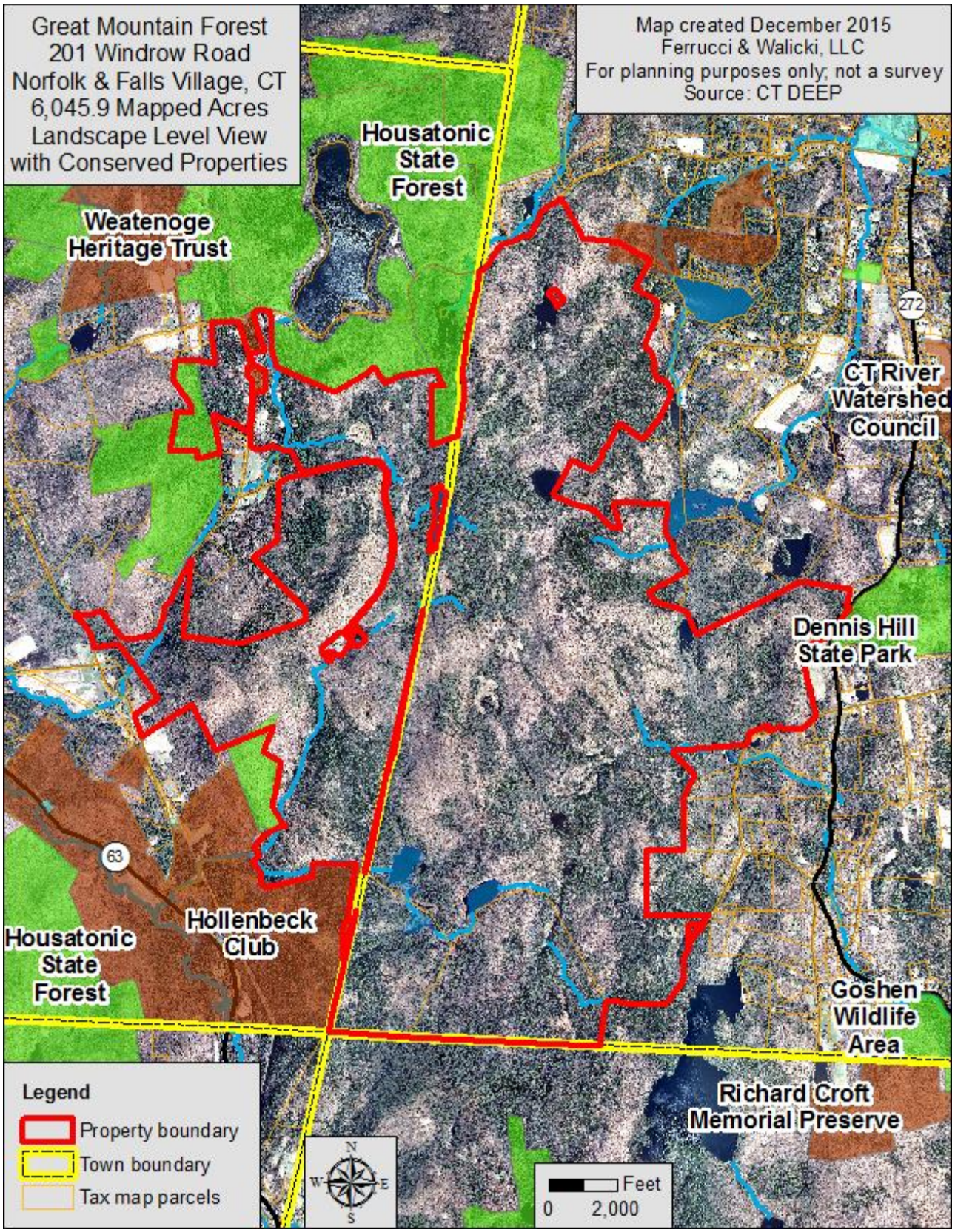
The water features, open areas, softwood habitats, and young forests on this property are important on the micro and macro landscape levels. Continuing to protect water quality and soil integrity while maintaining and enhancing the health, diversity and structural complexity of native vegetation on this property will enhance habitat quality.

Above: This recently clearcut area along Steep Road will soon provide excellent early successional habitat. Additionally, the brush piles may enhance cover.

Landscape Context Maps



Nearby Conserved Properties



Property Narrative

General Description

This +/- 6,045 acre property is located near the four corners are of Goshen, Cornwall, Norfolk and Canaan, Connecticut. The property is found in both Norfolk and Falls Village (a village of Canaan). This property exhibits a long use of history by people as evidenced by stone walls, various ages of stumps and maintained open areas. The land's history of human use has helped to shape this property into what we see today.

This property has a mix of habitats with several features that are beneficial for a variety of birds. Our visit took place at the beginning of June, during breeding season. Many of the birds noted during our visit to Great Mountain Forest are likely breeding on the property as opposed to utilizing the habitats during migration while heading further north to breed. The mixture of upland hardwood, softwood and mixedwood forests, forested wetlands, riparian areas, open water, open fields, open wetlands, regenerating forests, and intermittent and perennial streams all help to provide a diversity of cover, nesting sites, and foraging areas for breeding birds.

Snags (standing dead trees), cavity trees, and coarse and fine woody material were found scattered throughout the property. Continuing to recruit these features by leaving snags and cavity trees where safety is not a concern, by continuing to cut trees and, where feasible, leave their tops whole or mostly whole will help provide additional habitat diversity.

The quality of the vertical and horizontal structure on this property varies, but overall provides excellent habitat.



Above (all pictures from Area 3 on map on page 12): The recently excavated trunk of a dying hemlock (left), a large diameter standing dead snag with a fallen top (center), and a large piece of coarse woody material all provide different and important habitat features. The recently fallen top (center) with its fine tips and branches can provide quality cover for a short time before it begins to decompose.

Buildings, Roads, and Yards

Habitat loss and degradation caused by human development are some of the leading threats to Connecticut's wildlife. Forests become fragmented when they are broken into small, unconnected patches. Causes may include residential and commercial development, roads, houses, and lawns. Think about the following features to keep your forest intact and functioning for birds.

Feature	Condition			Comments
	Good	Fair	Needs Work	
Building Envelope	**Small**	Moderate	Large	Though there are several building sites throughout the property, they are all relatively modest, particularly when compared to the amount of forest
Lawn	**Small**	Moderate	Large	
Landscaping	Lots of native plants and nectar sources	**Some native plants**	Few or no native plants	Some good native plants in places. Increasing native sources of nectar, mast and potentially structure in the landscaping will improve habitat offerings.
Forest roads and trails	All <20' wide	**Most < 20' wide**	Many >20' wide	Some main access roads may be over 20' wide, but most we saw were less than 20'.
Forest edges	All soft edges	**Some soft edges**	No soft edges	Currently there are minimal soft edges, but there is likely potential to create more.

Plant Diversity

Forest birds rely on a diversity of native plants for food, cover, and as nest sites. Maintaining a variety of native plants and controlling non-native, invasive plants benefits birds in your woods.

Feature	Condition			Comments
	Good	Fair	Needs Work	
Native plant diversity	**High**	Moderate	Low	This property has a good diversity of native species
Invasive plant infestation	None	**Low**	Moderate to severe	Invasive plants aren't everywhere, but they do occur
Soft mast native fruits and berries	Abundant	**Some**	Absent	Black cherry, spicebush, rubus, lowbush blueberry, apple & shadbush are found in various places on the property, but are not uniformly distributed.
Softwood pockets in hardwood stands	**Present**		Absent	Significant portions of both of the area we looked at and the property in general contain softwood

Forest Structure

Well-developed forest structure can be a signature of a healthy forest and key to supporting a wide diversity of living things in your woods. It's not mess; it's structure!

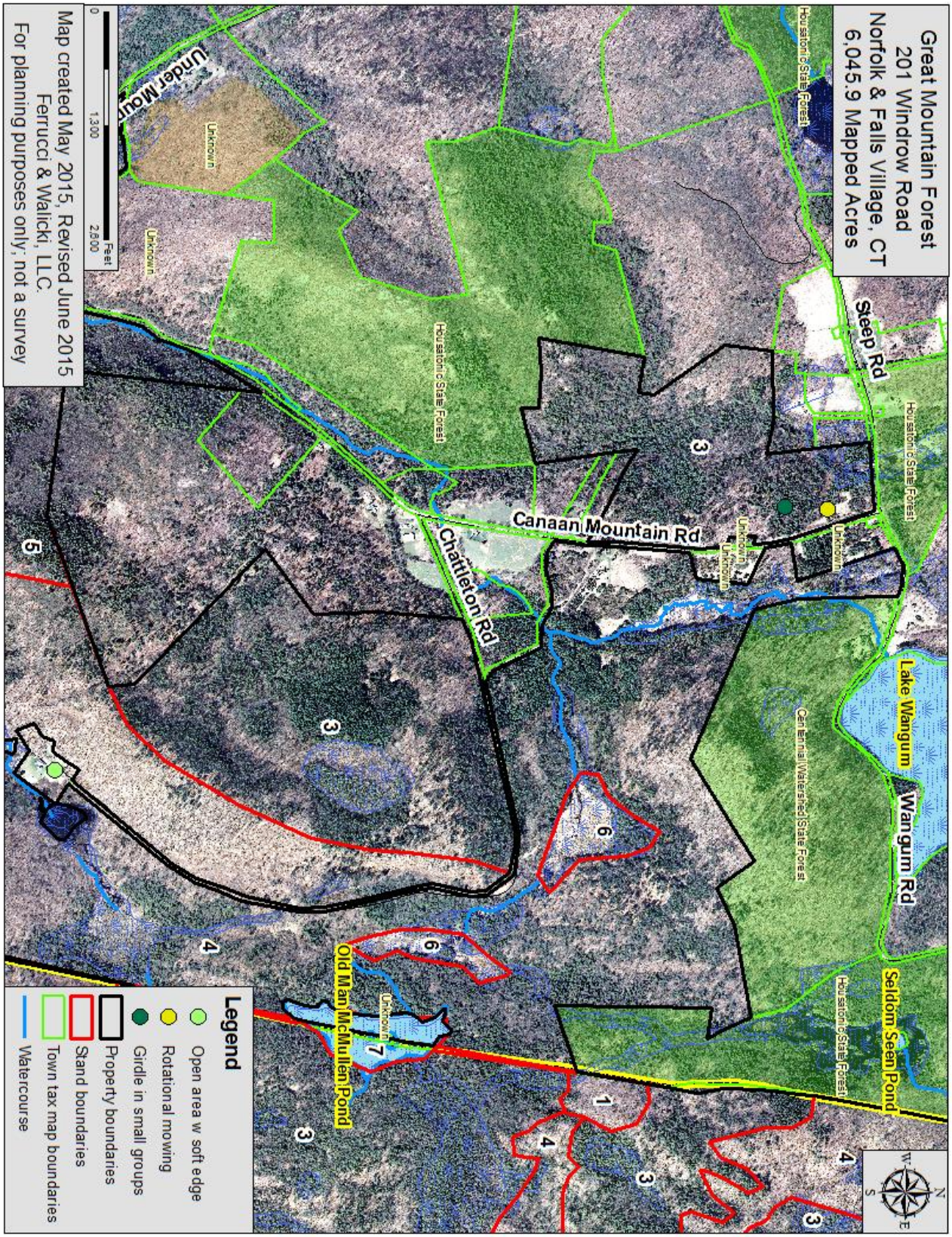
Feature	Condition			Comments
	Good	Fair	Needs Work	
Understory	Dense	Moderate density	**Sparse**	A well-developed understory of desirable native species is missing in the parts of the property we looked at
Midstory in mature forests	Dense	**Moderate density**	Sparse	The midstory is moderately dense in places, particularly near edges
Canopy gaps in mature forests	**Present**		Absent	Ferns have successfully colonized many of the gaps. There are minimal invasive plants in gaps
Leaf litter	**Present**		Absent	
Snags and cavity trees	Many	**Some**	Few or none	Snags are fairly common, but cavity trees were less common
Downed dead wood	Many	**Some**	Few or none	Some coarse and fine woody material is present, but it is not uniformly distributed
Big trees	**Present**		Absent	

Other Habitats

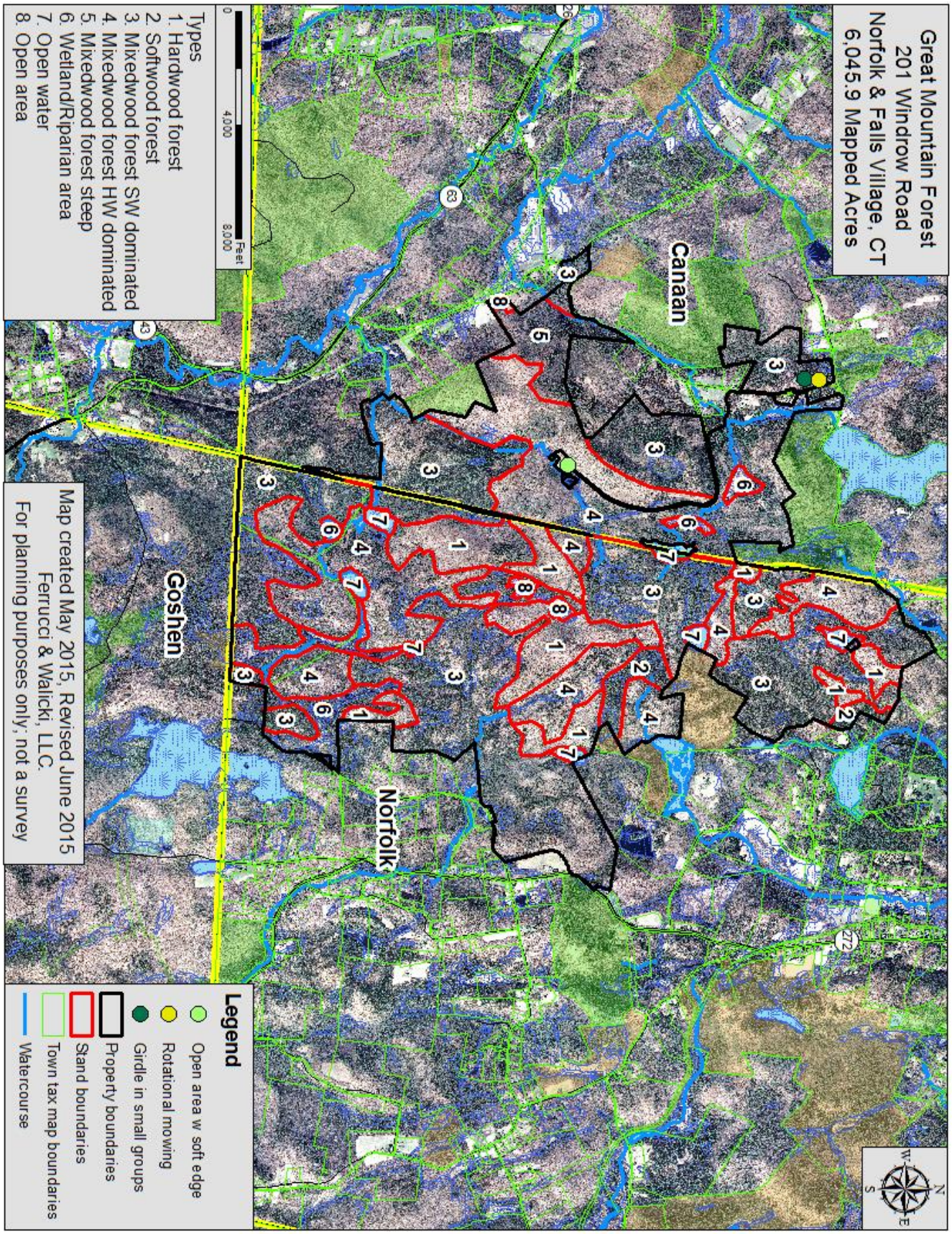
These habitats add diversity and habitat value for birds within forested landscapes.

Feature	Condition			Comments
	Good	Fair	Needs Work	
Waterways and riparian areas	**Good condition**	Fair condition	Poor condition	
Wetlands	**Good condition**	Fair condition	Poor condition	Again generally good and with limited invasive plants
Meadows	**> 1 acre AND mowed every 2-3 years**	> 1 acre OR mowed every 2-3 years	< 1 acre AND mowed every year	Continue to mow meadows every 2-3 years to provide structure for longer than 1 year at a time
Hayfields	Grassland bird-friendly		NOT Grassland bird-friendly	

Property Features Maps (portion of area visited on 6-9-15) See legend on page 13 for stand information



Map of entire property



Stand Descriptions and Recommendations

For the purposes of providing recommendations, a small section in the northwest corner of the property was examined. This report is intended to describe current conditions in terms of bird habitat and describe some desired conditions and outcomes that can be used to manage various forest types with birds in mind. The Property Features Maps on page 12-13 shows some of the locations we visited (page 12) as well as the entire property (page 13). Each area is special and can offer unique habitat opportunities.

The following descriptions and recommendations contain language that you may wish to become more acquainted with. Unfamiliar terms can be looked up in the glossary at the end of the report and may include words used by foresters to describe woodlands or different management activities. Becoming more accustomed to this language will help you in communicating your property goals.

We looked at several different kinds of habitats during our visit. These included open fields, water bodies, hardwood forest, mixedwood forest, semi-open areas and developed areas (i.e. near the sawmill). The numbers on the maps on pages 12 and 13 correspond to the forest types and other areas outlined in the legend on page 13. Due to variability in characteristics, the size of this property, and a likely incongruence between GMF stand/area boundaries and our numbers, the areas described below are described by type and are mostly not associated with a number.

Open/developed areas

The open field we looked at is located east of Canaan Mountain Road near the Great Mountain Forest administrative offices. This field is actually two small fields that meet at a narrow pinch point. Together the fields make up 3.4 acres, approximately 1 acre in long narrow area adjacent to the road and about 2.4 acres behind the buildings. This area is not maintained as hay land, and is periodically mowed to keep it open. Areas such as these provide valuable sources of potential nectar for insects which are themselves valuable, but are also a critical food source for many bird species during the breeding season. Even forest interior birds will sometimes venture into areas like this to feed on the protein rich insects found here.

Above: The field near the administrative offices and barn provides excellent habitat for a variety of pollinators, birds and other wildlife. Continuing to allow the area to develop for a year or two prior to mowing can help ensure the maintenance and potentially the enhancement of this feature.

In addition to potential sources of nectar, this field provides potential cover and nesting areas for a variety of species including Song Sparrow, Field Sparrow, and Catbirds along the edges. Currently, the transition to forest from the open area is fairly abrupt from field to relatively tall forest. This creates a "hard edge" condition. Ideally, portions of this forest-field boundary can be "softened" by cutting groups of trees along the edge and allowing the cut areas to regenerate. The vegetation that grows back in these areas (i.e. rubus and tree seedlings) frequently provides a source of nectar, mast and structure. Prior to doing this treat any invasive plants in the area to discourage their spread.

Above: The relatively "hard edge" or abrupt transition from open area to relatively mature, tall trees is evident along the field boundary north of the barn on Canaan Mountain Road. If feasible, cutting groups of trees and allowing the cut areas to regenerate can create additional cover and can "soften" the edge.

Recommendations for open/developed areas

Continue to soften edges.

Above: The saplings along the forest/field boundary across the road from the Yale Camp provide a good example of an edge that has been softened. The "stadium effect" is more clearly evident here than in the photo at top which contains a harder edge. This provides additional cover and potential nesting areas.

In some developed areas consider planting additional flowers, shrubs and small trees that can provide nectar, mast and structure for birds and other wildlife.

Continue mowing the field on a regular basis to keep it open. If feasible mow every other year and consider mowing only a portion each year to provide a greater diversity of size and structure in the field.

Hardwood forest

The hardwood forest we saw adjacent to the west side of Canaan Mountain Road near the administrative offices is a two-aged to uneven aged stand dominated by sugar maple and other northern hardwood species. The canopy contains gaps from a recent harvest in which small groups of trees were removed. If sugar maple or other tree species are able to successfully germinate, become established, and outcompete the ferns, this area will provide quality habitat for a variety of species. Gaps such as these attract species like Eastern Wood-Pewee and Scarlet Tanager, which are considered forest interior species. Elsewhere in this stand, the canopy is relatively closed. The midstory is a mix of hardwood poletimber-sized trees, and is fairly dense in places. The understory is somewhat lacking and is composed of a mix of some hardwood seedlings, fern and herbaceous species.

Above: Recent activity in the hardwood poletimber stand we noted during our visit to the property. This crop tree release created canopy gaps as well as coarse and fine woody material. Both of these features will provide conditions that can benefit birds and other wildlife, in addition to having improved conditions for the residual trees.

A dense midstory and understory are important features for forest nesting birds in our area because the vast majority of these birds nest between ground level and 30 feet above the ground. Continuing to provide regeneration, native shrubs, and other features that occur in these layers can help provide quality habitat for a variety of species of birds and other wildlife. Snags, cavity trees, and coarse and fine woody material also provide useful habitat for birds.

If this area is to be managed as a sugarbush, consider attempting to retain at least 25% non-sugar maple species. This 25% can include red maple. For information developed by Audubon Vermont for Bird-Friendly Sugarbush Management Guidelines please visit:
http://vt.audubon.org/sites/default/files/documents/bird_friendly_sugarbush_management_guidelines_final.pdf.

Invasive plants in this area along the roadside included garlic mustard, Asiatic bittersweet and Japanese barberry.

Recommendations for hardwood forest

Treat invasive plants.

Continue to create canopy gaps.

Retain snags, cavity trees and recruit coarse and fine woody material.

Diversify species, size and age classes.

Consider creating brush piles with slash.

Mixedwood forest

The majority of the forest we walked through during our visit was mixedwood. Species present here included hemlock, pine, and a mix of hardwoods including some oak and an occasional black cherry. The overstory is tall with a relatively closed canopy. Midstory species include hemlock and pockets of black birch, and varied from moderately dense to sparse.

A functional[2] understory is frequently missing from this area. Understory species in open areas frequently is comprised of hay-scented fern, some rubus, occasional invasive plants including barberry and multiflora rose.

Continuing to diversify the species mix and size and age classes here in spite of dense stands of fern will improve habitat conditions.

Left: The southeastern portion of the mixedwood stand we walked through contained a limited understory in places. In addition, there are some pockets where dense fern has become established. Though this condition does provide ground cover, it provides limited benefits for birds. Lastly, the red circled plant is a Japanese barberry. This and other invasive plants were found in scattered populations in this stand.

Recommendation for Mixedwood area

Treat invasive plant species.

A crop/mast tree release in this area would allow more growing space for desirable species including oak, cherry, and any hickory, yellow poplar, and sugar maple that may be found here. Increasing the growing space for these species can maintain and/or enhance the vigor of individual trees, which in turn can lead to an increase in production of flowers and mast. This is beneficial for birds because they can eat some of the additional mast, or feed on insects that may be feeding on the flowers. Sunlight reaching the forest floor may also stimulate the growth of an understory that attracts some species such as the Veery, particularly in wet areas. Release the

[2] "Functional" in this case refers to bird habitat. Usually it refers to the ability of a certain feature to provide cover, forage, nest location or other requirements for breeding.

crowns of crop/mast trees on at least three sides removing vegetation within 10 to 15 feet around the existing crown. If this is to be done, attempt to avoid areas with heavy infestations of invasive plants and/or treat invasive plants prior to cutting trees in the overstory.

Consider creating additional canopy gaps and/or expanding existing gaps to increase the structural diversity in the stand. Again, if this is to be done, attempt to avoid areas with infestations of invasive plants and/or treat invasive plants prior to cutting trees in the overstory. If a safe area can be found, consider girdling trees in small groups where indicated on the map on page 12 with the dark green circle. If successful, this can simultaneously create snags and potential cavity trees and open growing space for understory vegetation, ideally leading to a new cohort of trees and diversification of structure.

Encourage the development of hobblebush were it is currently found. This is a preferred nesting substrate for species such as Black-throated Blue Warbler.

Consider removing declining white ash while leaving some for future snags as long as doing so will not compromise safety for visitors to the property.

Release vigorous looking hemlocks from overtopping competition where it makes sense to do so based on overstory composition and condition. Maintaining and enhancing a softwood component within a hardwood forest, especially when there can be groups of softwood as opposed to scattered individuals can be beneficial for a variety of species including Black-throated Green Warbler and Blackburnian Warbler.

Right: This Blackburnian Warbler (a.k.a. “fire throat”) taken during our visit. This bird is in the top of a hemlock tree which is appropriate given it’s propensity to nest in softwood areas within a larger hardwood forest matrix. Photo courtesy of Corrie Folsom-O’Keefe of Audubon CT.

Where feasible, retain snags, cavity trees, and some large diameter/wolf trees. If necessary consider felling some competing trees to ensure continued vigor of wolf trees.

In the portion of Area 1 that is adjacent to the semi-open area (Area 2), consider treating the invasive species then softening the edges along the forest/semi-open area boundary by cutting groups of trees along the edge and allowing the cut area to regenerate. If feasible, consider planting some native shrubs in areas cleared of invasive species.

If trees are to be cut, consider leaving the tops of felled trees whole or mostly whole to provide additional fine woody material. Where possible, periodically pile 2-3 tops together to enhance the functionality of that feature.

Semi-open area

There is a small semi-open area at the toe of the slope headed west in this stand. This area contains some soft mast producing trees including apple and hawthorn. In addition there are widely spaced pitch pine with a patchy

understory of shrubs including some invasive plants and fern. This patchy semi-open condition, with islands of vegetation, is valuable for a wide variety of birds, both young and mature forest nesting species.

Recommendations for semi-open area

Treat invasive plants.

Monitor and prune and release apple trees. Release hawthorn if they appear to be getting overtopped by hardwood competition.

Above: The semi-open area at the toe of the slope in the area we walked is kept open through periodic brush hogging. Continuing to reduce invasive plants, maintain the open character of the area and encourage the development of additional diverse native sources of nectar, mast and structural features can keep this area productive for birds and other wildlife.

To keep the area open consider a 2-3 year brush hogging rotation. Cut the area either in early fall or early spring (March or April) as soon as ground conditions allow. An early fall cutting would allow some regrowth prior to winter. An early spring mow would allow the vegetation to persist over winter which can provide some structure, cover, and source of food in the form of seeds for our year round residents and winter visitors. Alternatively, a controlled burn of the area in early spring would encourage vigorous growth and additional pitch pine.

Periodically cut the grey-stemmed dogwood to retain vigor. Consider cutting small groups to provide some age and size class diversity.

Forest birds that were present in the hardwood, mixedwood and semi-open areas include Warbling Vireo, Veery, Gray Catbird, Ovenbird, Blue-winged Warbler, Black-and-white Warbler, Blackburnian Warbler, Common Yellowthroat, American Redstart, Magnolia Warbler, Chestnut-sided Warbler, Black-throated Blue Warbler, Pine Warbler, Yellow-rumped Warbler, Black-throated Green Warbler, Indigo Bunting and Purple Finch among many others.

Clear-cut area

Just northeast of the semi-open area across the road is an area that was recently clearcut. Regeneration had not yet begun at the time of our visit but likely will within a couple of years. This area is narrow enough that trees will be able to seed in from the sides. Spread throughout the area are brush piles that were created during or just

after the harvest. This will likely become great bird habitat in the coming 2-10 years as viperous ground cover is established and these areas become important foraging areas for fledgling birds.

Left: This picture of a Chestnut-sided Warbler was taken during our visit to the property. This species among many others can benefit from the habitat conditions created by maintaining semi-open shrubby areas and allowing clear cut areas to regenerate. Photo courtesy of Corrie Folsom-O'Keefe of Audubon CT.

Recommendations for clear-cut areas

Continue creating patches of early successional habitat/young forest to improve the horizontal diversity in the area.

In larger clear-cuts, consider leaving individuals or small groups of trees spread throughout the cut area as a seed source and for structural purposes. Large left behind trees become obvious posts for raptors and songbirds that "hawk" for insects.

Continue creating brush piles. Consider using the model that Connecticut NRCS recently drafted, which describes the creation of brush piles with rabbit habitat in mind.

If feasible, consider having the logger fell some trees and leave them on site to provide a source of coarse woody material. This creates important micro habitats for salamanders and invertebrates and invertebrates are in turn important food resources for nesting birds.

For clear-cut areas near infrastructure (i.e. where it may be easily accessible), consider planting native shrubs and small trees that can provide nectar, mast and structure.

Recommendations for open water

Attempt to limit the amounts of invasive plants in these areas. Where feasible, consider creating small canopy gaps adjacent to open water to create softer edges and provide cover/potential nesting and forage.

Birds species noted at our open water stop at McMullen Pond include Blue-headed Vireo, Common Yellowthroat, Black-and-white Warbler, Chestnut-sided Warbler, Black-throated Green Warbler and Scarlet Tanager among others.

Recommendations for riparian areas

Attempt to keep steams mostly shaded.

Where streams are covered by hemlock, consider setting some of those areas aside and allowing them to develop as reserves toward old-growth characteristics.

If some riparian areas are to be managed, consider moving toward an uneven-age condition using single tree and very small group selection to diversify age classes. Encouraging dense understory vegetation in places along moving brooks with rocky bottoms and relatively closed canopies can benefit species such as Louisiana Waterthrush and Winter Wren.

Summary of Recommendations

Some of these recommendations may not be able to be completed without some cost (i.e. the activities may be non-commercial). In order to complete the treatments, there may be cost-share funding available through the USDA Natural Resources Conservation Service (NRCS) to help offset those costs. Additional information about some of these programs can be found at:
http://www.nrcs.usda.gov/wps/portal/nrcs/detail/ct/programs/farmbill/?cid=nrcs142p2_011038

All areas:

- Monitor for invasive plant species and treat them before they become widely established.
- In areas where trees will be cut, consider leaving the tops of felled trees whole or mostly whole to provide temporary structural components for birds and other wildlife.
- If any of these recommendations are attempted, consider incorporating the treatment as an educational/demonstration site with signage and descriptions of what is being done, why and what the desired outcomes are.
- Whenever possible, attempt to limit tree cutting during times of the year when birds may be nesting (i.e. April 15-August 15).
- Whenever possible, consider limiting the straight stretches of skid roads that extend from edges to reduce influx of Brown-headed Cowbird. If gaps are created near openings (aside from softening edges), consider limiting the amounts of gaps created within 300 feet of edges of existing gaps to reduce potential cowbird parasitism and or invasive plants dispersal.
- Continue diversifying species, size and age classes using varied silvicultural techniques where appropriate.
- Where feasible, create canopy gaps
- Retain and enhance healthy softwood components
- Retain and recruit snags and cavity trees
- Retain and recruit coarse and fine woody material
- Soften edges of open area/forest boundaries where appropriate
- Retain good canopy cover along riparian areas, while encouraging vegetative structural development
- Continue to maintain open and semi-open areas with periodic cutting, burning etc. Whenever feasible, limit management activities to outside the breeding season.

Additional Property Recommendations:

☒ Consider implementing some of the recommendations. Cost-share funds may be available through the USDA Natural Resources Conservation Service (NRCS) to help offset the costs of implementation. See description of NRCS in the **Terms and Explanations** section below.

☒ Update your existing forest management plan to include consideration for birds.

☒ Learn the *Birdwatcher's Dozen* by sight and sound.

☒ Continue bird monitoring on my property.

☒ Continue treating invasive plants and developing plans for monitoring and control.

☒ Continue talking and working with my neighbors about what I learned. Have a conversation about opportunities to coordinate management across property boundaries.

☒ Keep interior forest intact; avoid subdividing forest (or plan subdivisions that maintain maximum continuous forest cover), minimize construction of new roads or trails greater than 20 feet wide, and keep new buildings close to existing roads.

☒ Promote a diversity of forest age classes from very young (<20 years; <10% of the property) to very old (>20 years with some forest >100 years; >75% of the property) across the property and landscape.

☒ Promote a dense understory and midstory of native trees and shrubs.

☒ Retain biological legacies including large-diameter (24"+ DBH) living trees, snags, and downed deadwood.

☒ Retain tree tops on site during timber harvests and avoid or minimize lopping slash.

☒ Contact Audubon Connecticut for follow up assistance, to review a new or updated management plan, or to consult on the implementation of one of our recommendations.

Above: Strip cuts in the alder near the Yale Camp have resulted in great size and age class diversity of the alder. This in turn provides excellent cover and potential nesting areas for a variety of species including American Woodcock.

Left: An opening along Canaan Mountain Road that contains some aspen and apple trees. Continuing to encouragement the development and maintenance of these species can help provide quality habitat for a variety of bird and other wildlife species.

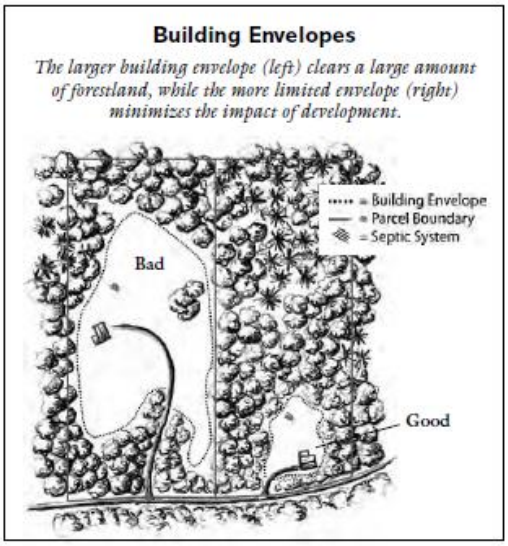
Terms and Explanations

Big Trees: Live trees greater than 19 – 24 inches diameter at breast height (DBH which is measured 4.5 feet above ground level).

Importance for Forest Birds: Big trees are a key characteristic of old forests and high-quality mature forest habitat for songbirds. Researchers in Wisconsin found priority birds were more abundant and successful in forests with >10% of the live basal area in big trees (19+ inches DBH) than in forests with fewer big trees (Managed old-growth silvicultural study (MOSS), Wisconsin Department of Natural Resources, 2013). Structurally-sound, large-diameter trees are important stick nest sites for woodland raptors, such as the Northern Goshawk. If retained as legacies, these large trees can also provide cavity nest sites for large woodland birds including owls and Pileated Woodpeckers.

Building Envelope: Open space cleared around a house or other building.

Importance for Forest Birds: The 200-300 feet into the woods surrounding clearings and openings associated with development, such as houses, are noisier, less sheltered, and vulnerable to invasion by domestic animals and nest predators and parasites. The impacted area also favors a new group of relatively tough, generalist omnivores such as raccoons, jays and crows that outcompete and may prey on more specialized mature forest priority species, such as Wood Thrush and Black-throated Blue Warbler. Keeping building envelopes small is one way to minimize this negative impact on surrounding forest habitat.



Source: *Community Strategies for Vermont's Forests and Wildlife: A Guide for Local Action. Vermont Natural Resources Council. 2013. Drawing by Jeannie Sargent.*

Canopy: The uppermost layer(s) of tree foliage in the forest. Many second or third growth stands in CT contain similar aged trees and have a relatively uniform canopy height.

Importance for Forest Birds: Forest birds have specific habitat requirements for breeding and nesting. Canopy density, height, distribution, and species mix all impact the quality of habitat the canopy provides and in turn can affect the species of birds that may use the area.

Canopy Gap: A canopy gap is an opening in the canopy of a mature forest ranging in size from one tree crown up to 1/4 acre.

Importance for Forest Birds: Birds such as the Eastern Wood-Pewee forage in canopy gaps, which also allow sunlight to reach the forest floor through the upper canopy stimulating new growth in understory and midstory. Gaps created where trees fall, blow over, or are cut down are a normal and important part of a healthy forest and high-quality mature forest habitat.

Crop Tree: A tree that has been selected as desirable to manage into the future.

Importance for Forest Birds: See description of *Importance for Forest Birds* for *Crop Tree Release* below

Crop Tree Release: A silvicultural treatment in which individual trees or groups of trees are given additional growing space and sunlight by removing competition from adjacent trees. Removing adjacent trees that are competing with the crowns of crop trees is important to maintain vigor of crop trees. Crop tree release frequently works best when the trees are released from competition on at least 3 sides of the crown (out of 4 sides that can be likened to the cardinal directions) and at least 10-15 feet of growing space is created.

Importance for Forest Birds: Crop tree release (CTR) is a relatively small scale treatment that increases the vigor of individual trees or small groups of trees, which in turn can provide additional mast, as well as additional vegetation for nesting, cover and forage. In addition, CTR can provide coarse and fine woody material and can stimulate regeneration on the forest floor, which can in turn enhance structural diversity providing additional habitat opportunities.

Downed Deadwood: Coarse woody material (CWM) are downed logs and branches >4 inches in diameter. Fine woody material (FWM) are limbs and branches <4 inches in 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 Louisiana Waterthrush and Veeries. Scattered individual pieces have minimal habitat value.

Forest Block: A large area of contiguous forest cover.

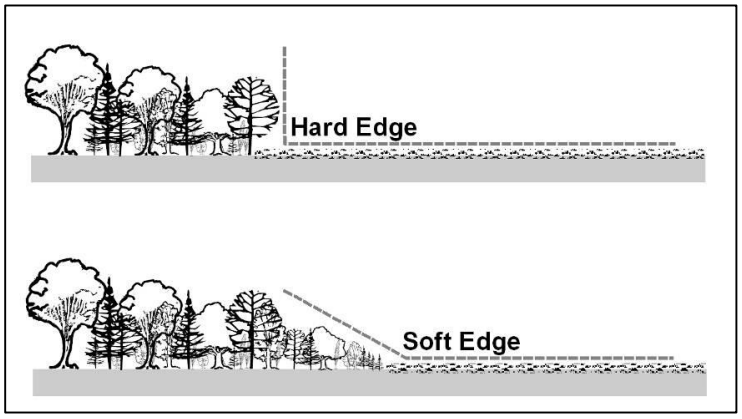
Importance for Forest Birds: Very large (>2500 acres) blocks of contiguous forest provide the highest quality habitat for interior-nesting birds like Wood Thrush that reproduce more successfully away from edges and development. Large blocks also likely contain the full range of habitat types and conditions required to support most or the entire suite of priority birds. Smaller forest patches >500 acres in size provide important habitat in more fragmented landscapes and can connect larger patches. Patches <500 acres in size can still support breeding birds in heavily forested landscapes and are important habitat during the migration season. Think about your land as it fits within a larger mosaic.

Forest Cover: Area of land that is forested or wooded.

Importance for Forest Birds: Heavily forested landscapes (70+% forest cover) provide the greatest quantity, diversity, and quality of habitat for priority birds compared to fragmented and/or developed landscapes with lower percentages of forest cover.

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 Blue-winged Warbler.

Forest Structure: The density and physical orientation of live and dead vegetative, woody, and herbaceous plants and trees in a forest. See horizontal structure and vertical structure for more in-depth descriptions of different views of forest structure.

Importance for Forest Birds: Diverse forest structure can provide many habitat requirements for forest birds. Increasing the complexity of the forest structure through the maintenance or enhancement of tree and plant species diversity, the creation of canopy gaps, the establishment of regeneration, and the retention and recruitment of snags, cavity trees and woody material on the ground can all help to improve not only ecological diversity and forest health, but also can improve bird habitat.

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: Fragmentation increases the occurrence of "generalist" wildlife species, such as raccoons and skunks, and the parasitic Brown-headed Cowbird both of whom decrease nesting success of interior-nesting forest birds. Fragmentation also decreases connectivity. Larger landscapes are better for forest interior birds and act as wildlife corridors for mammals and migrating bird populations. Isolated islands of habitats are at greater risk to loss of biodiversity.

Hardwood Forest: A forest dominated by broad-leaved (i.e. deciduous) 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, parasitism, and creep from invasive plant species generally no longer occur. Interior-nesting species, such as Scarlet Tanager, Wood Thrush, Ovenbird, Black-throated Blue Warbler, and Red-eyed 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, bittersweet, Autumn olive, burning bush, buckthorn, and Japanese barberry, present a variety of threats to forest health in Connecticut 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. Many invasive plants can form dense uniform stands that outcompete and can crowd out native plants. The threat is exacerbated by its impacts on native insect populations that may require certain plants for food and in turn pollinate these native plants. This can eliminate two forms of food

resources for bird populations. 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.

Mast Tree: A tree that produces seeds, nuts, or fruit eaten by wildlife. There are two general categories of mast: hard mast and soft mast. Hard mast includes oak acorns and nuts including hickory, beech, walnut, hazelnut and other nut producing trees and shrubs. Soft mast includes all fruits produced by shrubs and trees including blackberries, raspberries, blueberries, huckleberries, apples, shadbush, and black cherry among others.

Importance for Forest Birds: See description of *Importance for Forest Birds* for *Mast Tree Release* below

Mast Tree Release: This is basically the same silvicultural practice as described in *Crop Tree Release* toward the beginning of this section except it focuses on the release of mast trees specifically. The method of releasing the trees from competing vegetation is the same.

Importance for Forest Birds: Mast – both hard and soft – can be an important source of food for birds. Even trees that produce large nuts like acorns which many songbirds do not eat because the nuts are too large can still provide valuable food sources for birds due to the volume of insects that feed on leaves and flowers.

Mature Forest Habitat: For birds a forest is considered structurally mature when the forest canopy is greater than 30 feet tall.

Importance for Forest Birds: Many priority 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 priority bird species nest and/or forage within the first 30 feet of the forest floor. Nests of Wood Thrush, American Redstart, Black-throated Green Warbler, and Red-eyed Vireo are most commonly found in the midstory level.

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

Importance for Forest Birds: Some breeding birds are associated with mixed forests, such as Black-throated Blue Warbler, Wood Thrush, and Worm-eating Warbler.

Natural Resources Conservation Service (NRCS): An agency that is a branch of the USDA whose mission is to help farmers, ranchers and landowners achieve conservation goals on their properties.

Importance for Forest Birds: NRCS helps to fund on-the-ground activities to improve habitat conditions for wildlife, including birds.

Poletimber: Trees that are between 4.5 inches and 11 inches in diameter measured outside the bark at 4.5 feet above the ground.

Importance for Forest Birds: Frequently poletimber has foliage in lower canopy strata (i.e. in the midstory) than sawtimber-sized trees. If the midstory foliage is dense enough, forest breeding birds can use it for nesting, forage and cover. Species such as Wood Thrush use poletimber stands for nesting and as singing perches.

Sawtimber: Trees that are 11 inches or greater in diameter measured outside the bark at 4.5 feet above the ground.

Importance for Forest Birds: Sawtimber is often the largest and most mature trees in the forest and provide larger scale structure within a variety of forested habitat types. Sawtimber also tends to have greater capacity for seed/fruit production.

Silviculture: The art and science of growing trees. This is the study that forestry and forest management is based on.

Importance for Forest Birds: Many of the silvicultural techniques that are traditionally used in forestry are beneficial for creating and maintaining quality bird habitat when applied appropriately.

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 owls. Aspen and birch species are frequently chosen as trees to excavate. Cavities are often made in trees with the heartwood and sapwood decay fungi. Branches on snags may be used as foraging perches and nest sites. Suggested targets for snags and cavity trees combined are ≥ 6 per acre, with one tree >18 inches DBH and 3 >12 inches DBH.

Soft Mast: Soft fruits and berries.

Importance for Forest Birds: Fruits including cherry, apple, *rubus* species (e.g. blackberry and raspberry), dogwood, shadbush, 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 in hardwood stands increases their overall habitat value.

Stand: Forested area on a property with relatively uniform vegetation composition, age class, size class, density, and site quality so as to be considered relatively homogenous.

Importance for birds: Birds require a variety of habitat types depending on the species for different stages of life and activities throughout the year (i.e. breeding, nesting, foraging etc.). Having a diversity of stand types, and features within stands can help provide quality habitat for different species and needs within birds' life cycles.

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, mountain laurel, *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 Prairie 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.

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 priority birds and many other wildlife species use young forests during all or part of their life cycle. Chestnut-sided Warbler, American Woodcock, and Blue-winged 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 shade 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 Worm-eating Warbler and Red-eyed Vireo. Young forest provides dense, protective cover for juveniles, and can also provide 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 clear-cut 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 A - *Bird species observed during habitat assessment.*

Name: Corrie, Sean, Eric, Jody, Hans (director of non-profit), Jean (educator). Date:6/9/15 Property: Great Mountain Forest.	By the Saw Mill	Driving	McMullen Pond	Assessed Forest Stand	Other	Notes
Canada Goose						
Mute Swan						
Wood Duck						
American Black Duck						
Mallard						
Hooded Merganser						
Common Merganser						
Ring-necked Pheasant						
Ruffed Grouse						
Wild Turkey						
Great Blue Heron						
Green Heron						
Turkey Vulture						
Black Vulture						
Osprey						
Bald Eagle						
Sharp-shinned Hawk						
Cooper's Hawk						
Northern Goshawk						
Red-shouldered Hawk		x				
Broad-winged Hawk		x				
Red-tailed Hawk						
American Kestrel						
Peregrine Falcon						
Killdeer						
Spotted Sandpiper						
American Woodcock						
Rock Pigeon (i)						
Mourning Dove	x			x		
Black-billed Cuckoo						
Yellow-billed Cuckoo						
Eastern Screech Owl						
Great Horned Owl						
Barred Owl						

	By the Saw Mill	Driving	McMullen Pond	Assessed Forest Stand	Other	Notes
Eastern Whip-Poor-Will						
Chimney Swift						
Ruby-throated Hummingbird						
Belted Kingfisher						
Red-bellied Woodpecker						
Yellow-bellied Sapsucker						
Downy Woodpecker						
Hairy Woodpecker						
Northern Flicker						
Pileated Woodpecker						Excavating noted.
Eastern Wood-Pewee		1		1		
Acadian Flycatcher						
Alder Flycatcher						
Willow Flycatcher						
Least Flycatcher						
Eastern Phoebe				x	x	At House
Great Crested Flycatcher						
Eastern Kingbird						
White-eyed Vireo						
Yellow-throated Vireo						
Blue-headed Vireo			1			
Warbling Vireo	1	1		5	2	In woody opening.
Red-eyed Vireo						
Blue Jay						
American Crow						
Fish Crow						
Common Raven						
Purple Martin						
Tree Swallow					x	
N. Rough-winged Swallow						
Bank Swallow						
Cliff Swallow						
Barn Swallow	x				x	
Black-capped Chickadee				x		
Tufted Titmouse				x		
Red-breasted Nuthatch						
White-breasted Nuthatch						
Brown Creeper						

	By the Saw Mill	Driving	McMullen Pond	Assessed Forest Stand	Other	Notes
Carolina Wren						
Winter Wren						
House Wren				x		Opening
Blue-grey Gnatcatcher						
Golden-crowned Kinglet						
Eastern Bluebird						
Hermit Thrush						
Wood Thrush					SG	
Veery	1			3	1	
American Robin	x			x	x	
Grey Catbird				x	x	
Northern Mockingbird						
Brown Thrasher						
Europen Starling (i)	x			x		
Cedar Waxwing	x			x	x	Lots in opening.
Ovenbird		3		5		
Worm-eating Warbler						
Louisiana Waterthrush						
Northern Waterthrush						
Golden-winged Warbler						
Blue-winged Warbler				x		In opening
Black-and-white Warbler			x	x		
Nashville Warbler						
Connecticut Warbler						
Mourning Warbler						
Common Yellowthroat			x	x		At house
Hooded Warbler						
American Redstart	x			x	x	Many in opening.
Cerulean Warbler						
Northern Parula						
Magnolia Warbler				x		In hemlocks
Blackburnian Warbler				5		In hemlocks- all over the place.
Yellow Warbler			x	x	x	In opening
Chestnut-sided Warbler			1	5		In opening- lots
Black-throated Blue Warbler		x		SG		
Pine Warbler				x		
Yellow-rumped Warbler				x		

	By the Saw Mill	Driving	McMullen Pond	Assessed Forest Stand	Other	Notes
Prairie Warbler						
Black-throated Green Warbler			2	3		Hemlocks
Canada Warbler						
Eastern Towhee				3		Opening
Chipping Sparrow	x			x	x	Opening
Field Sparrow						
Savannah Sparrow						
Song Sparrow			X	x		
Swamp Sparrow						
White-throated Sparrow						
Dark-eyed Junco						
Scarlet Tanager			2			
Northern Cardinal				x		
Rose-breasted Grosbeak		x			x	
Indigo Bunting				2		Near road/house in opening.
Bobolink						
Red-winged Blackbird				x	x	
Eastern Meadowlark						
Common Grackle					x	
Brown-headed Cowbird						
Orchard Oriole						
Baltimore Oriole						
Purple Finch				x		Opening
House Finch						
American Goldfinch	x			x		
House Sparrow (i)						

Appendix B – *CAES Data*

The pages below contain summaries of quantitative data collected from your property by the CT Agricultural Experiment Station

Great Mountain Forest, West

138.1 acres of assessed forest land
27 sample points across property

Quantitative habitat descriptions

The following pages provide a quantitative assessment of habitat features found on your property. The assessments were completed using a series of systematically located points across all of the forested area on your property, but do not include open fields and wetlands without trees (e.g., marshes).

At each point, we evaluated a range of habitat features on a 1/20 acre plot using the criteria shown below. These values were pooled to capture the range of conditions found across the entire property (pages B2-B8).

Forested portions of properties are often composed of distinct stands (also referred to as "areas" in this report) with relatively uniform vegetation composition, age class, size class, density, and site quality so as to be considered relatively homogenous. For example, the vegetation and structural attributes in conifer stands usually differ greatly from adjacent hardwood stands. Each stand may provide unique opportunities for providing habitat for a distinct suite of priority forest birds. Final pages include summaries at the stand level.

2015 habitat assessment crew (l to r): Sarah Kucharski, Amanda Massa, Jamie Cantoni, Jacob Bongiovanni

Category criteria for 1/20 acre plots (26.33 ft or 8.03 m radius)

Vegetation cover, canopy closure, soft mast

Absent - covered <5% of plot
Low - covered 5-30% of plot
Medium - covered 30-70% of plot
High - covered >70% of plot

Canopy height

Short - trees <20 ft tall
Medium - trees 20-60 ft tall
Tall - trees >60 ft tall

Nesting and wetland features

Absent - not found within plot
Inside - observed within plot
Outside - observed outside of plot

Habitat features

Absent - not found within plot
Low - few leaves / one or two pieces of coarse woody debris
Medium - average leaf litter/several pieces of coarse woody debris
High - thick leaf litter / many pieces of coarse woody debris

Great Mountain Forest, West

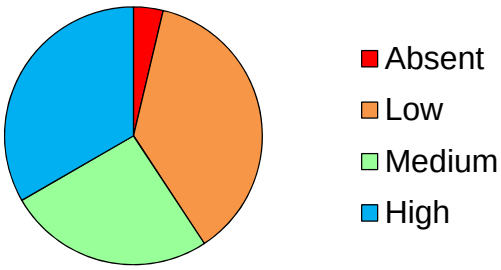
Property summary (138.13 acres, 27 sample points)

Groundlayer vegetation cover (0-5 feet tall)

	Absent	Low	Medium	High
Native herbaceous	4%	37%	26%	33%
Native shrubs	11%	74%	11%	4%
Non-native species	63%	15%	15%	7%

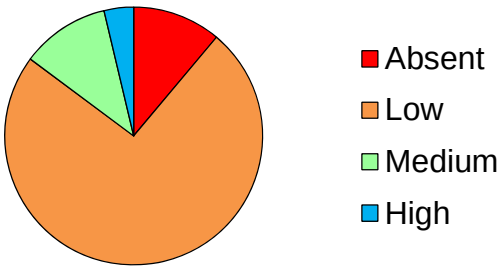
	Hardwood	Mixed	Conifer
Species mix	78%	15%	7%

Native herbaceous



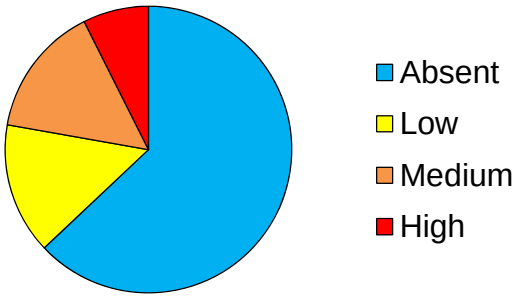
Native herbaceous plants are ideal for foraging and provide cover for species such as the Veery. Typical examples include: asters, mayflowers, goldenrods, skunk cabbage, sarsaparilla, and jewelweed. These plants should be encouraged as they serve as a food source for invertebrates that are consumed by some birds, as well as providing sources of nectar, seeds, and fruit.

Native shrubs < 5 ft tall



Native shrubs are relatively small woody plants that may bear fruit or host insects that provide seasonal forage for birds. Shrubs also provide a structural base for nests and cover from predators and weather for birds such as the Veery and Black-Throated Blue Warbler. Some examples of native shrubs are beaked hazelnut, brambles, mapleleaf viburnum, mountain-laurel, and witch-hazel.

Non-native species < 5 ft tall



Non-native plant species may provide nesting opportunities, but because they decrease the overall diversity and quality of native habitat, it is desirable to replace them with native species. In addition, they do not support as many insect as native plants. Common examples of non-natives are: Japanese barberry, Oriental bittersweet, multiflora rose, Japanese stiltgrass, and winged euonymus.

Great Mountain Forest, West

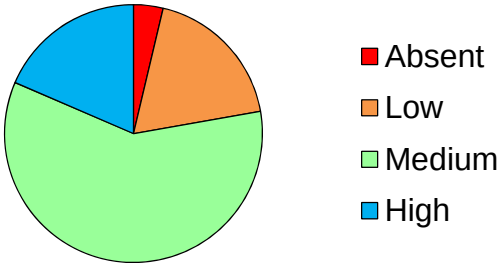
Property summary (138.13 acres, 27 sample points)

Midcanopy vegetation (5-30 feet tall)

	Absent	Low	Medium	High
Midcanopy cover	4%	19%	59%	19%

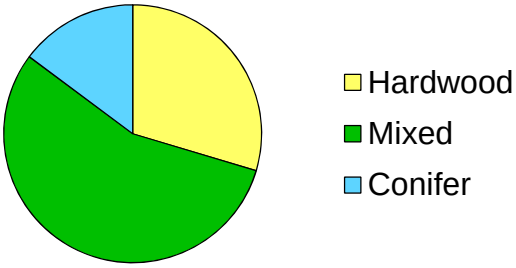
	Hardwood	Mixed	Conifer
Species mix	30%	56%	15%

Midcanopy cover



Midcanopy cover consists of all tree and shrub foliage within the 5-30 ft zone above the forest floor. High midcanopy cover (foliage density) provides cover, nesting, and foraging for species such as the Red-Eyed Vireo and Wood Thrush. Typical midcanopy species include: red maple, hemlock, birch, witch- hazel, and spicebush, and shadbush.

Midcanopy type



Midcanopy type is defined as the predominant type of trees and large shrubs found in the midstory (5-30 ft zone). Three types are recognized: hardwood (deciduous), conifer (evergreen), or mixed (hardwood and conifer). Seed or fruit producing species provide a seasonal food source and seeds for regeneration. Conifers provide important thermal cover during the winter months and cover from predators year-round.

Great Mountain Forest, West

Property summary (138.13 acres, 27 sample points)

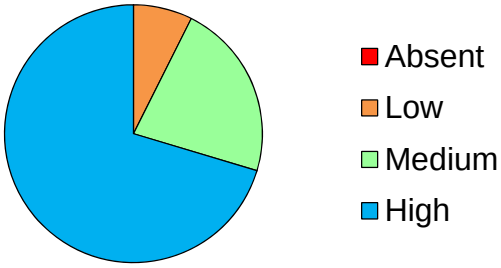
Upper canopy vegetation (>30 feet tall)

	Absent	Low	Medium	High
Upper canopy cover	0%	7%	22%	70%

	Short	Medium	Tall
Canopy height	0%	7%	93%

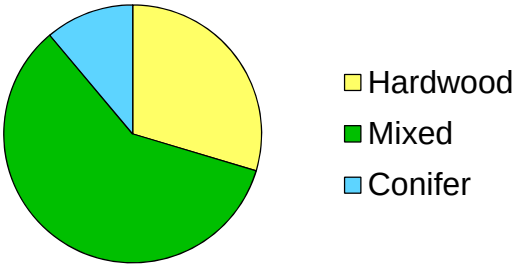
	Hardwood	Mixed	Conifer
Species mix	30%	59%	11%

Upper canopy cover



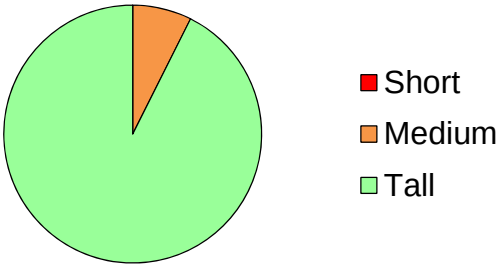
Upper canopy cover is an estimate of horizontal area covered by tree crowns, i.e., the shade cast by trees at high noon. Low cover allows abundant sunlight to reach the forest floor and often has dense herbaceous and shrub layers. Medium cover provides conditions for the maintenance of a midstory. Stands with high cover usually have sparse midstories with few, if any, herbaceous plants and tree seedlings.

Canopy type



Canopy type is defined as the predominant type of trees that are taller than 30 ft. To encourage diversity of food resources, and in turn a diversity of bird species, trees that produce soft mast should be maintained as a valuable food resource. Maintaining yellow birch is crucial for birds with an insectivorous diet. Conifers should be encouraged in hardwood stands and vice versa.

Canopy height



Canopy height influences nesting site potential in all forest stages. Increasing vertical stratification (any different heights) tends to increase diversity of bird species. Shorter tree heights favor species such as the Chestnut-Sided and Worm-Eating Warblers, while species such as the Scarlet Tanager and Pileated Woodpecker prefer taller woods with taller trees.

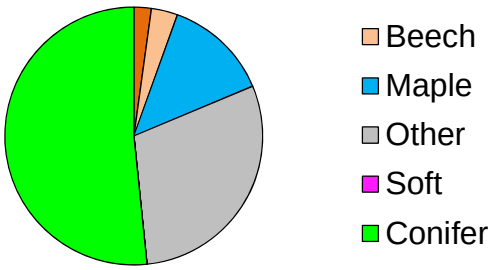
Great Mountain Forest, West

Property summary (138.13 acres, 27 sample points)

Forest composition - basal area (feet^2/acre)

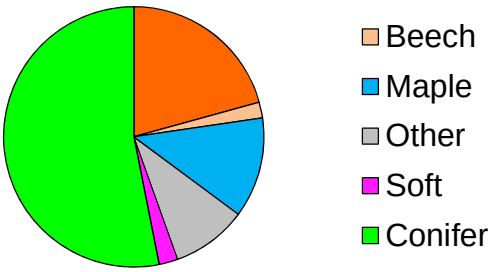
	Hard mast		Dry seeds				
	Oak	Beech	Maple	Other	Soft	Conifer	Total
Pole (5-11" diameter)	1	1	4	10	0	17	34
Saw (>11" diameter)	20	2	12	9	2	50	95
Total	20	3	16	19	2	68	129

Poletimber



Poletimber is a term used to describe trees four to ten inches in diameter. They often will the gaps when larger trees die - thus forming the upper canopy trees of future forests. Retaining higher proportions of hard and soft mast trees, while limiting dry seed trees, will promote a healthy, diverse mix of species.

Sawtimber



Sawtimber trees are 11 inches in diameter or greater. They are often the largest and most mature trees in the forest and have the greatest seed/fruit production. By varying the amount of sawtimber present in a woodland through active forest management, landowners can aid in providing diverse habitats for many priority bird species.

Hard mast - species that produce nuts such as oaks, hickories, and beech.

Soft mast - species that produce fruits such as cherries, shadbush, sassafras, and blueberries.

Dry seeds - species that produce small, dry seeds such as maples, birches, aspens.

Conifers - evergreen species that produce dry seeds and also provide thermal cover such as pines, hemlocks, and cedars.

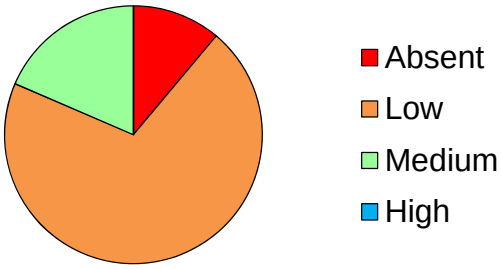
Great Mountain Forest, West

Property summary (138.13 acres, 27 sample points)

Habitat features

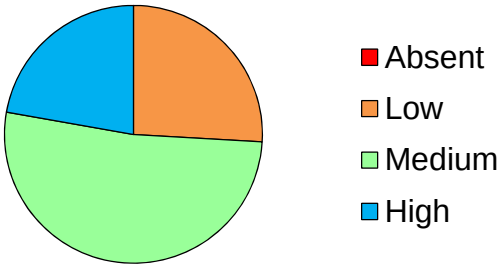
	Absent	Low	Medium	High
Coarse woody material	11%	70%	19%	0%
Leaf litter	0%	26%	52%	22%
Soft mast	56%	19%	22%	4%

Coarse woody material



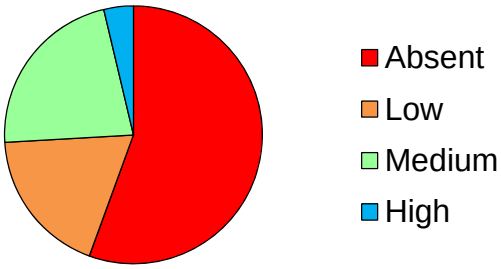
Coarse woody material (CWM) is comprised of downed trees and branches with diameters of 4 inches or greater. CWM may function as a perch site for singing birds, a substrate for wood-rotting fungi, and a habitat for insects and other invertebrates that provide a protein-rich diet for birds during the breeding season and when feeding their chicks.

Leaf litter



Leaf litter is the distribution, amount, and depth of deciduous leaves and needles that cover the ground. Leaf litter is an important habitat for insects and invertebrates. It is also important for ground nesters like the Ovenbird which makes its nest from leaves and downed materials. Equally important, litter leaf reduces the risk of soil erosion during periods of heavy rainfall.

Soft mast



Soft mast is an estimate of potential fruit production that includes berries and drupes. Soft mast trees produce a valuable food resource for not only small birds, but for many mammalian species. Examples of soft mast producing species include trees (blackgum, sassafras, cherry, dogwood), shrubs (blueberry, viburnums, spicebush, raspberries, blackberries), and vines (grape, Virginia creeper).

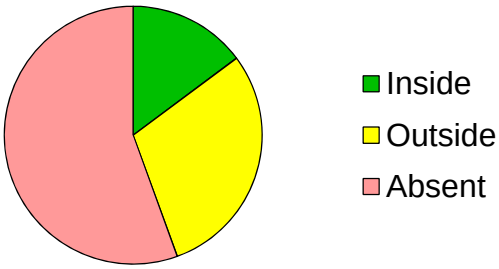
Great Mountain Forest, West

Property summary (138.13 acres, 27 sample points)

Nesting features

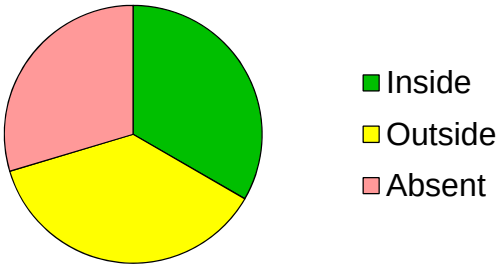
	Inside	Outside	Absent
Brush piles or tops	15%	30%	56%
Cavities	33%	37%	30%
Snags	56%	41%	4%

Brush piles or tops



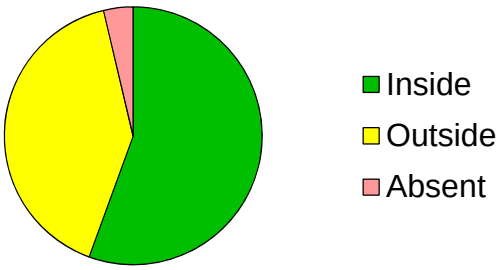
Brush piles or tops are either a large pile of woody material or a large section of a broken-off tree top with intact branches and twigs. It provides understory structure for nesting as well as habitat for insects and other small prey that provide food for birds.

Cavities



Cavities and larger hollows in tree trunks or branches provide good locations for nests because they provide some protection from weather and predators. Owls, Pileated Woodpeckers, and Nuthatches are among several species that utilize cavity trees.

Snags



Snags refer to a standing dead tree, often missing a top, and most of the smaller branches. Snags provide opportunities for excavating nests, perch sites, and possible mating rituals. The insect larvae in the decaying wood of snags provide an excellent food source for woodpeckers.

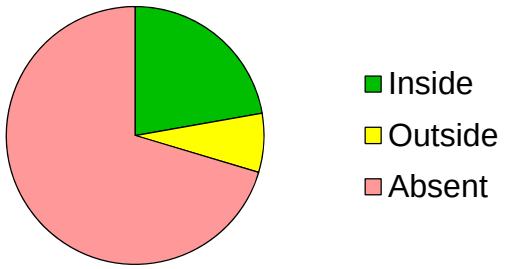
Great Mountain Forest, West

Property summary (138.13 acres, 27 sample points)

Wetland features

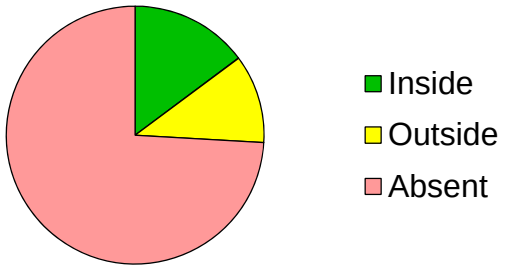
	Inside	Outside	Absent
Rocky stream	22%	7%	70%
Wetland	15%	11%	74%

Rocky stream



Rocky streams or streams with gravel bottoms within a forest provide an important water source for many wildlife species and potential nesting areas for bird species such as the Louisiana waterthrush. Tip-up mounds and root plates from fallen trees in close proximity to streams improve the quality of these areas for many species.

Wetland



Wetlands are defined as areas with water saturated soils. Forested and shrubby wetlands provide structure and frequently contain coarse and fine woody debris. They tend to have shorter trees with low canopy heights and dense shrubs and herbaceous plant communities. Wetlands add to the complexity of the landscape and diversity of the forest stands.

Great Mountain Forest, West

(Stand-1, 138 acres, Mixedwood)

Groundlayer vegetation cover (0-5 feet tall)

	Absent	Low	Medium	High
Native herbaceous	4%	37%	26%	33%
Native shrubs	11%	74%	11%	4%
Non-native species	63%	15%	15%	7%

	Hardwood	Mixed	Conifer
Species mix	78%	15%	7%

Midcanopy vegetation (5-30 feet tall)

	Absent	Low	Medium	High
Midcanopy cover	4%	19%	59%	19%

	Hardwood	Mixed	Conifer
Species mix	30%	56%	15%

Upper canopy vegetation (>30 feet tall)

	Absent	Low	Medium	High
Upper canopy cover	0%	7%	22%	70%

	Short	Medium	Tall
Canopy height	0%	7%	93%

	Hardwood	Mixed	Conifer
Species mix	30%	59%	11%

Forest composition - basal area (feet^2/acre)

	Hard mast		Dry seeds				
	Oak	Beech	Maple	Other	Soft	Conifer	Total
Pole (5-11" diameter)	1	1	4	10	0	17	34
Saw (>11" diameter)	20	2	12	9	2	50	95
Total	20	3	16	19	2	68	129

Great Mountain Forest, West

(Stand-1, 138 acres, Mixedwood)

Habitat features

	Absent	Low	Medium	High
Coarse woody material	11%	70%	19%	0%
Leaf litter	0%	26%	52%	22%
Soft mast	56%	19%	22%	4%

Nesting features

	Inside	Outside	Absent
Brush piles or tops	15%	30%	56%
Cavities	33%	37%	30%
Snags	56%	41%	4%

Wetland features

	Inside	Outside	Absent
Rocky stream	22%	7%	70%
Wetland	15%	11%	74%

Category criteria for 1/20 acre plots (26.33 ft or 8.03 m radius)

Vegetation cover, canopy closure, soft mast

Absent - covered <5% of plot

Low - covered 5-30% of plot

Medium - covered 30-70% of plot

High - covered >70% of plot

Canopy height

Short - trees <20 ft tall

Medium - trees 20-60 ft tall

Tall - trees >60 ft tall

Nesting and wetland features

Absent - not found within plot

Inside - observed within plot

Outside - observed outside of plot

Habitat features

Absent - not found within plot

Low - few leaves / one or two pieces of coarse woody debris

Medium - average leaf litter/several pieces of coarse woody debris

High - thick leaf litter / many pieces of coarse woody debris