

# MANAGING FORESTS FOR BIRDS

A Landowner's Guide



 Audubon | NEW YORK

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Cover: Cerulean Warbler. Photo: DJ McNeil/USDA

# CONTENTS

|  |    |
|--|----|
| INTRODUCTION.....                                      | 2  |
| New York Priority Forest Areas.....                    | 3  |
| Habitat for Forest Birds: A Conservation Concern ..... | 5  |
| What is Quality Forest Habitat? .....                  | 6  |
| HABITAT FOR FOREST BIRDS .....                         | 7  |
| Landscape-level Conditions .....                       | 7  |
| Forest Habitat in a Fragmented Landscape .....         | 8  |
| Stand-level Conditions .....                           | 10 |
| Table 1. NEW YORK PRIORITY FOREST BIRDS.....           | 14 |
| PLANNING FOREST MANAGEMENT TO IMPROVE HABITAT .....    | 19 |
| APPENDICES .....                                       | 21 |
| A. Audubon New York Priority Species Profiles .....    | 21 |
| B. Resources for Forest Owners.....                    | 24 |
| LITERATURE CITED.....                                  | 26 |

# INTRODUCTION

New York's forests provide important breeding, migratory stop-over, and wintering habitat for more than a hundred species of birds. One of their most important ecological functions is to provide breeding habitat for several dozen bird species, many of which are experiencing population declines due to a number of factors, including habitat fragmentation and the loss of quality habitat. Quality forest habitat for birds and other wildlife means intact, healthy, resilient, regenerating, and diverse forested landscapes. With 63% forest cover in New York State (NYS), the way we manage forestland can significantly influence bird populations.



**Evening Grosbeak**

Photo: davidehaas383/iStock by Getty Images

Sustainable forest management can create better forest bird habitat, while achieving timber management objectives and improving the ability of the forest to provide ecosystem services, such as enhancing water quality and reducing flooding. Audubon New York created ***Managing Forests for Birds: A Landowner's Guide*** as a resource for forest owners to learn about important habitat components for birds and how quality habitat can be created through forest management.

This document is part of Audubon New York's Healthy Forests Initiative, which is part of a larger program by the same name implemented by the National Audubon Society throughout the Atlantic Flyway, where Audubon connects with foresters and forest owners to provide information and assistance to improve forest habitat for birds in need of conservation and to help create healthy forested landscapes that meet other societal needs, including carbon sequestration, watershed protection, flood control, forest products, and recreation.

## New York Priority Forest Areas

Audubon has identified priority forest areas from Maine to Florida composed of large, contiguous tracts of forest that support rich and abundant populations of priority forest bird species (Figure 1). For breeding forest birds, these areas represent the most important habitats in the U.S. portion of the Atlantic Flyway, and they serve as focus areas for Audubon's Healthy Forests Initiative. In NYS, there are 25 priority forest areas distributed throughout the state (Figure 2).

Audubon New York concentrates its forest habitat conservation efforts within these priority forest areas by providing outreach, technical assistance, and habitat management recommendations to foresters, public and private landowners, and other partnering agencies and organizations, to improve forest habitat quality for birds.

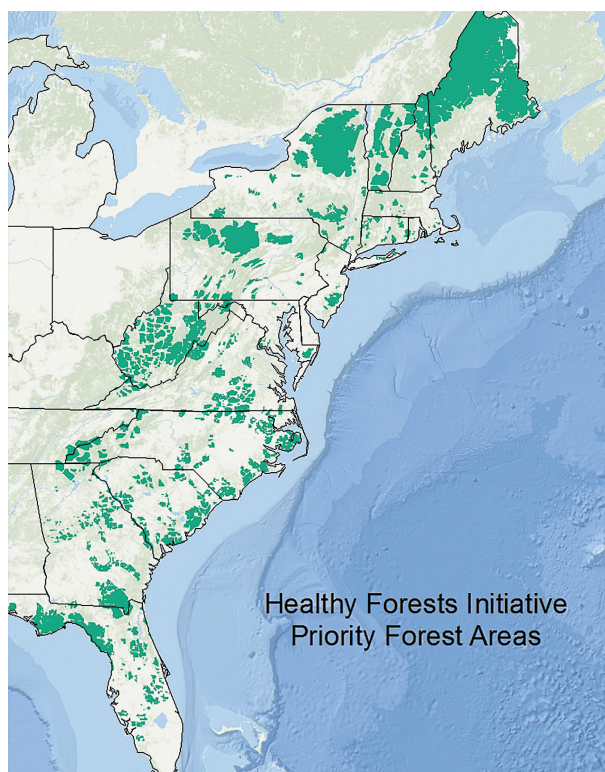


Figure 1. National Audubon Society priority forest areas.

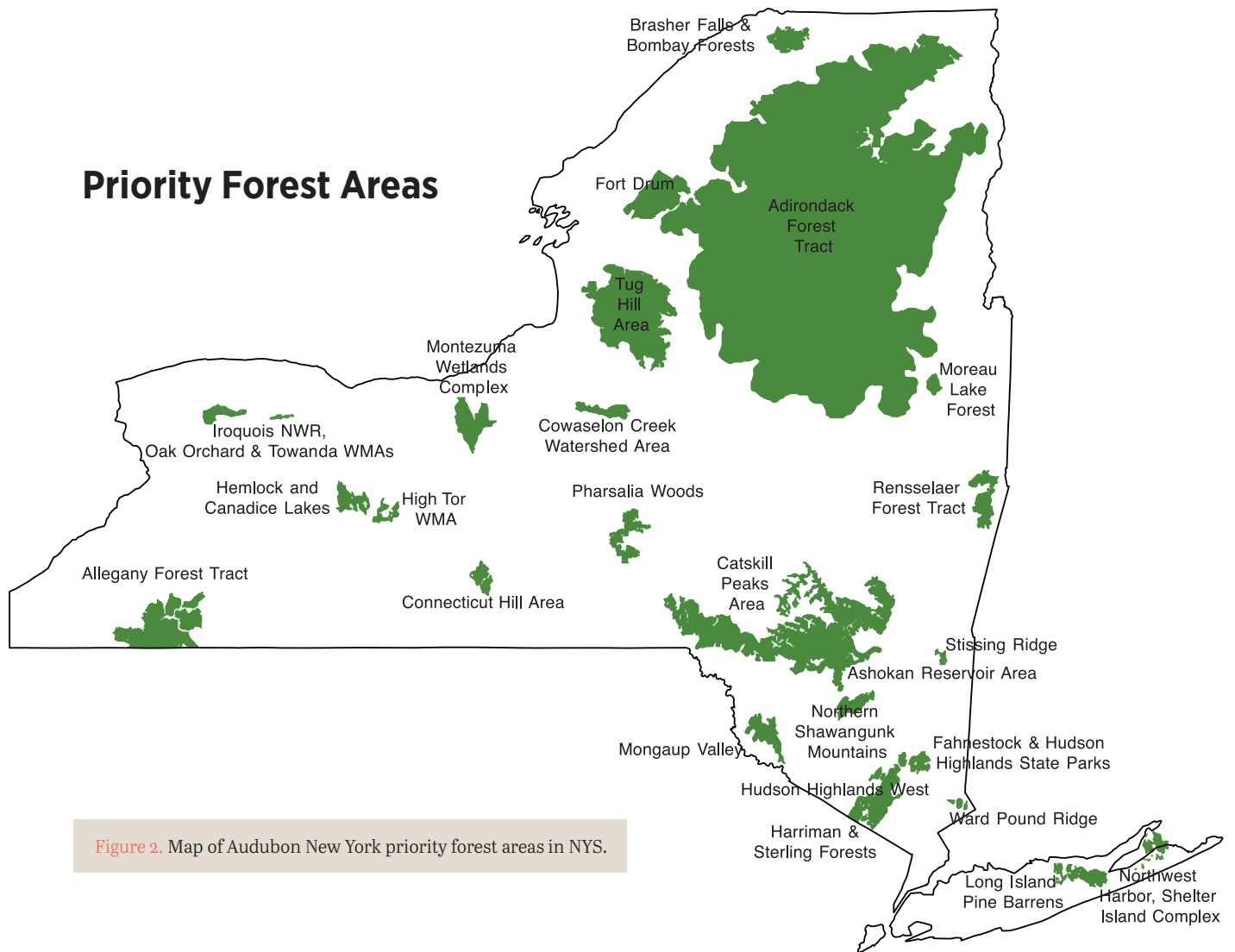
Esri, DeLorme, GEBCO, NOAA, NGDC, and other contributors



Mature forest habitat.

Photo: Nicholas A. Tonelli/Flickr (CC BY 2.0)

## Priority Forest Areas

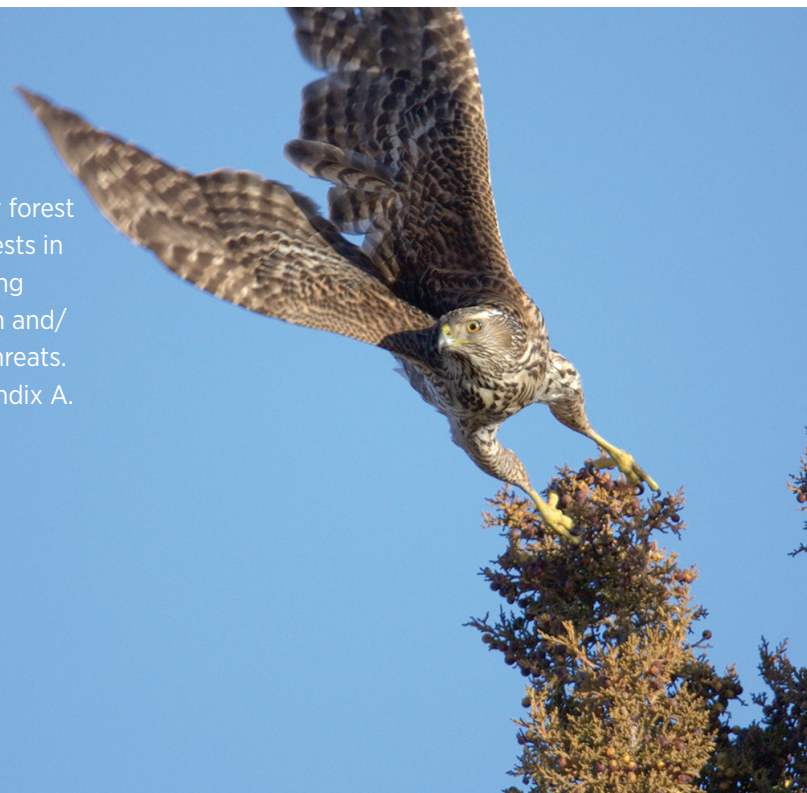


## New York Priority Forest Birds

Audubon New York has identified more than 45 priority forest bird species that would benefit from well-managed forests in New York (Table 1). A significant portion of their breeding populations use forests within the Eastern Forest region and/or are experiencing population declines or significant threats. Profiles of several priority species are included in Appendix A.

### Cooper's Hawk

Photo: Beth Carpel/Audubon Photography Awards



## Habitat for Forest Birds: A Conservation Concern

Suitable habitat for wildlife provides sources of water and food, places to breed and raise young, and cover from weather and predators. Depending on the time of year, habitat needs may change, as is the case with many forest birds that migrate long distances to and from their breeding and wintering grounds. Known as Neotropical migrants, these forest birds typically leave New York in September and spend October through March in warmer climates in Central and South America. In April and May, they return north to forests in New York and beyond to breed. Once here, birds will find a mate, locate suitable nesting habitat and build a nest, produce and incubate eggs, raise nestlings until they fledge, and then continue to rear their young until the fall migration in September.

The quality of forest habitat can greatly impact breeding success of birds. In general, large, contiguous tracts of forests (i.e. landscapes) that include a diversity of tree species and forest types and both young and old forests are needed to conserve the entire forest bird community. For most of New York State, a young forest age class is a regenerating forest that is 0–10 years in age, but can be upwards of 15–20 years depending on growing and site conditions. Mature forest is typically 50 years or older, and is the prominent age class found throughout the state, with much of New York's forests falling between 80–90 years of age. For this publication, we have included the intermediate age class (10–50 years) with mature forest because during this period fewer young forest birds and more mature forest birds are using these habitats.



Photo: Linnea Rowse

**What is young forest habitat?** Young forest habitat includes regenerating forests (seedlings, saplings, etc.), shrub lands, shrub swamps, and old fields with woody encroachment.

Historically, natural disturbances such as beaver impoundments, wind, fire, ice, and flooding events helped to maintain diverse forest conditions by creating openings in the forest canopy and initiating new forest growth in the gaps. Changes in land use, most notably the abandonment of farmland throughout the 1900s, coupled with the suppression of many natural disturbance events, have created abundant forest cover in New York, much of which is now relatively mature and similar in age, with little young forest in some parts of the state. There are additional factors that can further compromise the quality of forest habitat, including forest fragmentation, homogeneous structure, over-browsing of tree seedlings and saplings by white-tailed deer, interfering vegetation, and poor timber harvesting in the form of high grading. The purpose of this guide is to explain how forest management can improve forest habitat conditions for birds by restoring a more diversified balance among age classes and creating other desirable habitat characteristics.

## What is Quality Forest Habitat?

Because each bird species has different habitat requirements, healthy and diverse forested landscapes are critical to meet the habitat needs of an entire suite of forest birds. A healthy forest is intact; diverse; composed of multiple age classes; provides ecosystem services such as carbon sequestration, flood control, and water filtration; and supports forest birds and other wildlife. Some birds prefer to nest in mature forests with a relatively closed canopy, while others prefer to nest in young forest habitat that has shrubs and sapling-size trees with high stem density, thick foliage cover, and few overstory trees. In addition, there are forest birds that will use both mature and young forest habitats for nesting (Hartley et al. 2004). Bird species build their nests in different “layers” of the forest – some build their nest high in the canopy while others nest on the forest floor. Tree and shrub species diversity provides a variety of fruits and seeds and support numerous insects that forest birds consume and feed to their young. Some birds have particular forest habitat associations, like Magnolia and Blackburnian Warblers, which tend to breed in forests with a significant conifer component, whereas Wood Thrushes and Cerulean Warblers utilize deciduous forests.

A mixture of forest age classes and forest types in the landscape provides nesting habitat for birds with different needs. This mixture also provides a diverse array of habitats where birds can raise their young after they fledge the nest. Mature forest birds that typically nest within the forest interior will frequently move their fledged young to areas with a dense forest understory or to younger forests, where they can seek cover and forage in dense foliage and stems (Anders et al. 1998, Vega Rivera et al. 1998, DeGraaf et al. 2006, Vitz and Rodewald 2006, Vitz and Rodewald 2007, King et al. 2011, Vitz and Rodewald 2011, Chandler et al. 2012, Stoleson 2013).

To benefit the greatest number of forest birds, quality habitat is needed at both the local level of the stand and the broader landscape level. A variety of successional and developmental stages within the forested landscape and a diversity of key habitat features at the stand-level will meet these needs and can be created and maintained through forest management. The following section explains landscape and stand-level forest habitat conditions that benefit birds.



Photo: Nicholas A. Tonelli/Flickr (CC BY 2.0)

# HABITAT FOR FOREST BIRDS

## Landscape-level Conditions

Forest birds thrive in landscapes dominated by forest cover (i.e. with forest cover  $\geq 70\%$  of the total landscape) and that have different forest types and age classes present - a condition called horizontal structural diversity or "patchiness." Some species, like Eastern Towhees and Indigo Buntings, prefer young forest habitats for nesting and raising young. Other birds, like Wood Thrushes and Scarlet Tanagers, nest primarily in the interior of large tracts of mostly mature forest. A number of species, like Downy Woodpeckers and Hooded Warblers, will use both young and mature forest if specific habitat features are present (Hartley et al. 2004, DeGraaf et al. 2006). Further, certain species will breed in forests dominated by hardwood tree species, while others prefer a mixed composition of deciduous and coniferous trees, and some species need coniferous forest stands exclusively for breeding.

For scale, a landscape can be considered to be about 2,500 acres in size (i.e. 3.9 mi<sup>2</sup>, 1,012 hectares, 10.1 km<sup>2</sup>), based on studies that examined forest bird habitat use in relation to landscape conditions (Rosenberg et al. 1999). Forested landscapes that are composed of approximately 5–10% young forest (0–10 years in age, on average) and predominantly of mature forest (>50 years in age), provide a suitable mix of habitat for a suite of forest birds (Rosenberg et al. 1999, King et al. 2001, Dettmers 2003, Becker et al. 2011). Percentages apply only to forest cover within the landscape, and do not include acreages of non-forest cover such as agricultural areas or urban, suburban, or other developed areas.

## Forest Habitat in a Fragmented Landscape

In areas where forest cover is less than 70% of the landscape due to fragmentation by development or agriculture, it is important to maintain existing forest in order to sustain forest-related benefits for forest birds and other wildlife. Large and intact forests, or core forest, are important because many forest birds, like Scarlet Tanagers and Wood Thrushes, are area-sensitive, meaning they require large habitat patches to successfully establish breeding territories, nest, and raise their young (Robinson et al. 1995, Rosenberg et al. 1999, Austen et al. 2001, Driscoll et al. 2005). In general, area-sensitive forest birds need a minimum of 200 acres of contiguous forest for suitable breeding habitat (Rosenberg et al. 1999). Land use decisions should discourage converting existing forests to another cover type, and encourage restoration of non-forest areas back to forest to benefit forest birds and other wildlife.



Wood Thrush adult and nestlings, with Brown-headed Cowbird nestling on left.

Forest “edge” occurs when there is an abrupt change from forest to non-forest. Edges unfortunately support predators like raccoons, cats, and skunks and are areas where nest parasitism from Brown-headed Cowbirds is common, which threatens the survival and reproductive success of forest interior breeding birds. The negative impacts of edges are more pronounced in landscapes where forest fragmentation is high and where remaining forest patches are relatively small and adjacent to agricultural operations or developed areas (Robinson et al. 1995, Donovan et al. 1997, Hartley and Hunter 1998, Driscoll and Donovan 2004). Within more fragmented landscapes, edge effects have been observed more than 300 feet from the forest edge (Brittingham and Temple 1983, Rosenberg et al. 1999, Austen et al. 2001, Dunford and Freemark 2004, Driscoll et al. 2005, Nol et al. 2005, Environment Canada 2013). Softening or feathering “hard” forest edges to reduce an abrupt transition from forest to another cover type can help reduce negative impacts to forest interior birds (Rosenberg et al. 1999, Rosenberg et al. 2003, DeGraaf et al. 2006).



Eastern Towhee

## Stand-level Conditions

The following section describes stand-level habitat components important to forest birds. All of these conditions apply to mature forest stands, and some also pertain to young forest stands. Many of the habitat features described in this section are similar to what you might find in late-successional Northern hardwood forests, also referred to as old growth forests, but much of NYS lacks this forest age class. Depending on landowner goals, forest can be set aside from management to become late-successional forest in approximately 100–200 years, but the complex structure that is characteristic of older forests can be achieved by mimicking natural disturbances, such as wind throw and beaver flooding, through forest management. This will enhance stand-level habitat features to increase forest birds' nesting success and rearing of fledglings.

Ask your forester to use the following descriptions of desired habitat features to compare against existing habitat conditions when performing timber cruises and forest inventories. The recommendations below can then be integrated into a forest management plan to create or improve key habitat features.

See Table 1 for information about forest habitat characteristics that are of particular importance to priority birds.

### Vertical Structural Diversity

Vertical structural diversity refers to the layering of vegetation at multiple heights in a stand. A stand with high vertical structural diversity has overstory, midstory, and understory vegetation layers composed of some combination of trees, shrubs, herbaceous plants, and vines. This vertical structural diversity provides different birds with places to nest, perch, forage, seek cover, and raise young. In general, creating or maintaining vertical structural diversity within a mature forest stand is highly beneficial to many forest breeding birds.

Structural complexity can be enhanced in mature forest by creating canopy gaps and stimulating the growth of understory vegetation, essentially mimicking late-successional forest through management (Newell and Rodewald 2011). Late-successional forests (typically made up of trees of different ages) tend to have high vertical structural diversity, exhibiting characteristics that include a tall overstory with small canopy openings (due to individual tree fall) that have allowed for several shorter canopy layers to develop, and substantial amounts of downed woody debris of larger logs and snags (DeGraaf et al. 2006, D'Amato and Catanzaro 2010).



Forest with high structural diversity.

Photo: Nicholas A. Tonelli/Flickr (CC BY 2.0)

## Species Diversity

Native vegetation provides the most habitat value to wildlife, and managing forests to provide a diversity of native trees, shrubs, vines, and herbaceous plants increases the suitable habitat potential for forest birds. Native plants support all or part of the life cycles of our native insects, which are the primary food source for the majority of forest bird species during the breeding season. In addition, native trees and shrubs produce more nutritious mast (fruits, seeds, and nuts) when compared to non-natives. However, some native species, such as American beech, can dominate a stand and reduce diversity.

Where interfering vegetation is prohibiting the growth of native tree and shrub species, apply control methods to the interfering vegetation to allow the native species to grow. In addition, you can increase the diversity of native trees and shrubs by managing your forest in a way that creates areas of varying amounts of sunlight, thereby creating conditions that foster the growth of shade intolerant, tolerant, and intermediately tolerant species (e.g., create a patch cut in one stand and create small canopy openings in another stand).



Blue-winged Warbler.

Photo: Jeff Nadler

### Controlling Interfering Vegetation

Interfering vegetation includes both native and non-native invasive plants that prohibit successful forest regeneration by shading seedlings and other plants and preventing sunlight from reaching them. Species such as common buckthorn, Japanese barberry, hayscented and New York ferns, and American beech, can dominate the forest understory thereby preventing forest regeneration, reducing diversity, and decreasing overall habitat value to wildlife. Management should control interfering vegetation so that tree regeneration and native, non-invasive understory plants regenerate.



Japanese barberry in a forest understory.

Photo: Eli Sagor/Flickr (CC BY-NC 2.0)

Managing for a diversity of native forest plants will ensure that birds have available food sources, including insects and mast, and having different species will increase the chances of having some mast production from one year to the next (DeGraaf et al. 2006).

## Large Diameter Trees

Hardwood trees of at least 24 inches diameter at breast height (DBH) and softwood species of at least 20 inches DBH offer nest sites, perches, and places to forage for a number of forest birds, including Red-shouldered and Broad-winged Hawks. Large trees with cavities and large dead branches enhance the habitat for many forest birds (see Dead Standing Trees and Cavity Trees). Where possible, retain a component of large diameter trees (DeGraaf et al. 2006, Newell and Rodewald 2011). If none are present, select some smaller ones to leave so they become large diameter wildlife trees in the future (DeGraaf et al. 2006).



Large diameter trees.

Photo: Nicholas A. Tonelli/Flickr (CC BY 2.0)



Forest with a small group of softwoods.

Photo: Nicholas A. Tonelli/Flickr (CC BY 2.0)

## Softwood Inclusions

Conifer, i.e. softwood, trees provide birds with cover and foraging habitat, and some birds preferentially select softwoods for nesting. In particular, there are a number of forest birds that are associated with eastern hemlocks, and some species, such as Blue-headed Vireos, Northern Saw-whet Owls, Hermit Thrushes, and Black-throated Green Warblers, are often found in areas with hemlocks (Yamasaki et al. 2000). To benefit forest birds, retain and/or promote at least some softwoods where they occur, especially within predominantly hardwood stands (DeGraaf et al. 2006). Even a cluster of softwood trees of less than an acre in size has high habitat value to forest birds (Yamasaki et al. 2000, DeGraaf et al. 2006).

## Dead Standing Trees and Cavity Trees

Dead standing trees or “snags” provide locations for nesting, roosting, and foraging for insects. Cavity trees of all sizes provide nesting and roosting sites for birds. Keeping a range of size classes of snags and cavity trees (living or dead) is desirable, but the larger the better (Tubbs 1987, Yamasaki and Leak 2006). For snags, large diameter hardwood species (well over 18 inches DBH) will provide the best long-term habitat value as dead standing wood, and eventually as coarse downed woody material when they fall (Yamasaki and Leak 2006). Where you can do so safely, retain at least six snags or cavity trees per acre, with one  $\geq 18$  inches DBH, and three  $\geq 12$  inches DBH (Tubbs et al. 1987, Hagan and Grove 1999, DeGraaf et al. 2006, Bryan 2007, Bennett 2010, Hagenbuch et al. 2011). In areas of young forest, keep some cavity trees and snags (Hagan and Grove 1999, Bennett 2010).

## Downed Woody Material (DWM)

DWM or coarse woody debris includes logs, stumps, and large branches (Bennett 2010). DWM enhances habitat for forest birds by providing places to seek cover, perch, nest, and forage. Larger downed logs (> 18 inches diameter) provide especially important habitat structure for birds and other wildlife that forage or nest on or near the forest floor, and larger logs are used for drumming displays by Ruffed Grouse (Bennett 2010, Hagenbuch et al. 2011). In areas where deer densities are excessively high, leaving slash (tree material left from a harvest) may deter deer browsing and benefit forest regeneration, as it provides an obstacle that prevents deer from reaching seedlings and saplings. Protect existing DWM during harvest operations and increase DWM by leaving poor quality logs and cull material, tree tops, or other slash scattered throughout the stand rather than left in a large pile (Hagan and Grove 1999). Providing DWM of different size classes and stages of decay is ideal (Hagan and Grove 1999, DeGraaf et al. 2006, Bennett 2010, Hagenbuch et al. 2011).



Red-bellied Woodpecker in a dead cavity tree.

Photo: Matt MacGillivray/Flickr (CC BY 2.0)



Downed woody material.



Maple seedling in deciduous leaf litter.

Photo: Suzanne Treyger/Audubon

Photo: Nicholas A. Tonelli/Flickr (CC BY 2.0)

## Leaf Litter and Duff

Leaves, needles, and other decomposing vegetative materials offer foraging habitat for macroinvertebrates, such as worms and beetles. Moist leaf litter has high habitat value to Wood Thrushes, Ovenbirds, and other ground foragers and nesters. To protect the leaf litter layer, limit trails to no more than 10% of the total stand area, and confine skidding and vehicle traffic to these carefully located trails (R. Nyland personal communication). When possible, avoid harvest operations during times with saturated soils, when rutting and soil compaction may compromise soil structure and drainage (Leak et al. 2014).

**Table 1.** Audubon New York Priority Forest Birds that may benefit from the forest management recommendations included in this guide, their preferred nesting habitat, post-fledging habitats used, and habitat descriptions and special habitat features of significance that foresters can influence through silviculture (see *Forest Habitat: Stand-level Conditions* for detailed information).

Species in orange are New York State Species of Greatest Conservation Need (for more information, please visit: <http://www.dec.ny.gov/animals/9406.html>).

| SPECIES                      | NESTING HABITAT      | POST-FLEDGING HABITAT             | HABITAT DESCRIPTION AND SPECIAL HABITAT FEATURES  |
|------------------------------|----------------------|-----------------------------------|---|
| Acadian Flycatcher           | Multiple age classes | Young forest/<br>dense understory | Wet deciduous thickets  |
| American Goldfinch           | Young forest         | Young forest                      | Open forest, thickets   |
| American Redstart            | Young forest         | Young forest                      | Canopy gaps in deciduous forest, thickets and shrubs  |
| American Woodcock            | Young forest         | Young forest                      | Wet thickets adjacent to clearings and intermediate aged forest                               |
| Baltimore Oriole             | Multiple age classes | Young forest                      | Deciduous and mixed open forest, large diameter trees   |
| Black-and-white Warbler      | Multiple age classes | Young forest                      | Deciduous and mixed forest, downed woody material, leaf litter                                |
| Black-billed Cuckoo          | Young forest         |                                   | Deciduous and mixed forest, thickets  |
| Blackburnian Warbler         | Mature forest        | Young forest/<br>dense understory | Coniferous and mixed forest, large diameter trees   |
| Blackpoll Warbler            | Multiple age classes |                                   | Coniferous, spruce-fir forest   |
| Black-throated Blue Warbler  | Mature forest        | Young forest/<br>dense understory | Deciduous and mixed forest, dense understory  |
| Black-throated Green Warbler | Mature forest        | Young forest/<br>dense understory | Coniferous and mixed forest, large diameter trees   |
| Blue-winged Warbler          | Young forest         | Young forest                      | Deciduous forest  |
| Broad-winged Hawk            | Mature forest        |                                   | Deciduous and mixed forest, large diameter trees, forest openings                             |
| Brown Thrasher               | Young forest         | Young forest                      | Deciduous and mixed forest, thickets, leaf litter   |
| Canada Warbler               | Young forest         | Young forest                      | Moist mixed forest, softwood inclusions, downed woody material, leaf litter, dense understory |
| Cerulean Warbler             | Mature forest        |                                   | Deciduous forest, large diameter trees, canopy gaps and understory layer present              |
| Chestnut-sided Warbler       | Young forest         | Young forest                      | Deciduous forest, thickets  |
| Cooper's Hawk                | Mature forest        |                                   | Deciduous and mixed forest, canopy gaps and other large forest openings                       |
| Downy Woodpecker             | Multiple age classes | Young forest                      | Deciduous forest, snags/cavity trees  |
| Eastern Towhee               | Young forest         | Young forest                      | Deciduous and mixed forest, leaf litter   |
| Eastern Whip-poor-will       | Multiple age classes |                                   | Deciduous and mixed forest, canopy gaps and other large forest openings                       |

| SPECIES                | NESTING HABITAT      | POST-FLEDGING HABITAT         | HABITAT DESCRIPTION AND SPECIAL HABITAT FEATURES   |
|------------------------|----------------------|-------------------------------|--|
| Eastern Wood-Pewee     | Mature forest        | Multiple age classes          | Deciduous and mixed forest, canopy gaps and other large forest openings                              |
| Evening Grosbeak       | Multiple age classes |                               | Coniferous and mixed forest, large diameter trees, softwood inclusions                               |
| Golden-winged Warbler  | Young forest         | Multiple age classes          | Deciduous forest, clumps of shrubs and perch trees   |
| Hooded Warbler         | Multiple age classes | Young forest                  | Deciduous forest, large diameter trees, dense understory, leaf litter                                |
| Least Flycatcher       | Mature forest        | Young forest                  | Deciduous and mixed forest, canopy gaps and other large forest openings, large diameter trees        |
| Louisiana Waterthrush  | Multiple age classes | Young forest                  | Deciduous forest, fast-moving streams and brooks, downed woody material, leaf litter                 |
| Northern Flicker       | Multiple age classes |                               | Deciduous and mixed forest, open forest, cavity trees  |
| Northern Goshawk       | Mature forest        |                               | Mixed forest, canopy gaps  |
| Northern Saw-whet Owl  | Multiple age classes |                               | Coniferous and mixed forest, snags/cavity trees  |
| Olive-sided Flycatcher | Young forest         |                               | Coniferous forest, open forest, snags  |
| Prairie Warbler        | Young forest         | Young forest                  | Coniferous and mixed forest, softwood inclusions   |
| Prothonotary Warbler   | Mature forest        |                               | Forested swamps or forests near ponds, lakes, or slow-moving rivers, snags/cavity trees              |
| Purple Finch           | Multiple age classes |                               | Coniferous and mixed forest  |
| Red Crossbill          | Mature forest        |                               | Coniferous forest  |
| Red-shouldered Hawk    | Multiple age classes |                               | Deciduous and mixed forest, large diameter trees, open understory                                    |
| Rose-breasted Grosbeak | Young forest         | Young forest                  | Deciduous or mixed forest  |
| Ruffed Grouse          | Young forest         | Young forest                  | Deciduous and mixed forest, downed woody material  |
| Scarlet Tanager        | Mature forest        | Young forest/dense understory | Deciduous and mixed forest, large diameter trees, canopy gaps, softwood inclusions, dense understory |
| Sharp-shinned Hawk     | Mature forest        |                               | Coniferous and mixed forest, softwood inclusions   |
| Veery                  | Young forest         | Young forest                  | Moist deciduous forest, leaf litter, dense understory  |
| Willow Flycatcher      | Young forest         |                               | Deciduous thickets   |
| Wood Thrush            | Mature forest        | Young forest/dense understory | Deciduous and mixed forest, large and small diameter trees, presence of midstory layer, leaf litter  |
| Worm-eating Warbler    | Mature forest        | Young forest/dense understory | Deciduous forest, dense understory, downed woody material, leaf litter                               |
| Yellow-billed Cuckoo   | Multiple age classes |                               | Deciduous forest, brushy thickets  |
| Yellow-throated Vireo  | Multiple age classes | Young forest                  | Deciduous forest, large diameter trees   |

See "Literature Cited" for Table 1 sources.

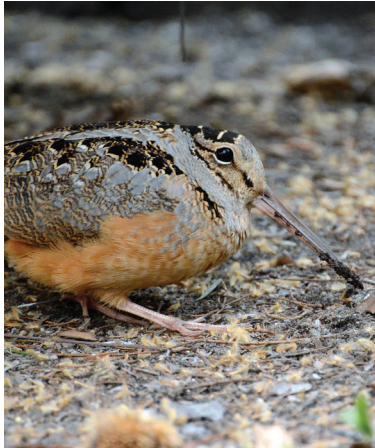


Photo: Deborah Rivel

**American Woodcock**



Photo: Shayna Hartley/Audubon Photography Awards

**Black-billed Cuckoo**



Photo: Kelly Colgan Azar/Flickr (CC BY-ND 2.0)

**Black-throated Blue Warbler**



Photo: Gary Robinette/Audubon Photography Awards

**Cerulean Warbler**



Photo: Tom Murray/Flickr (CC BY-NC 2.0)

**Eastern Whip-poor-will**



Photo: Kelly Colgan Azar/Flickr (CC BY-ND 2.0)

**Louisiana Waterthrush**



Photo: Linda Steele/Audubon Photography Awards

**Prothonotary Warbler**



Photo: David Rosenthal/Audubon Photography Awards

**Red-shouldered Hawk**



Photo: Francine Ouellette/Audubon Photography Awards

**Ruffed Grouse**



**Blue-winged Warbler**

Photo: Tom Murray/Flickr (CC BY-NC 2.0)



**Brown Thrasher**

Photo: Brian Kushner/Audubon Photography Awards



**Canada Warbler**

Photo: Dale Bonk/Audubon Photography Awards



**Northern Goshawk**

Photo: KazKuro/Flickr (CC BY-NC-ND 2.0)



**Olive-sided Flycatcher**

Photo: Andy Reago & Chrissy McClarren/Flickr (CC BY 2.0)



**Prairie Warbler**

Photo: Will Stuart



**Scarlet Tanager**

Photo: Linda Steele/Audubon Photography Awards



**Wood Thrush**

Photo: Kelly Colgan Azar/Flickr (CC BY-ND 2.0)



**Worm-eating Warbler**

Photo: Steven Kersting/Flickr (CC BY-NC-ND 2.0)





## NEXT STEPS: PLANNING FOREST MANAGEMENT TO IMPROVE HABITAT

For forest owners interested in managing their land to increase habitat value for birds and other wildlife, there are a few initial steps to take. The list below may be helpful to follow if you are not sure where to start. It is important to keep in mind that managing your forest to provide quality habitat is not a quick process and requires careful planning.

### Develop Property Goals

Consider your forested property and what goals you may have for it. You may have many goals for your forest, including timber production, wildlife habitat, recreation, enjoying nature, among other interests. It may be helpful to write these goals down. Be sure to think long-term!

### Connect with Professionals

Work with a professional forester to have a forest management plan developed for your property. A professional forester has the education and experience to inventory the current conditions of your forest and provide long-term planning recommendations to ensure the health and resiliency of your forest. A forest management plan is a helpful resource because it provides information about your forest, such as: tree species and ages; maps and descriptions of different forest stands; forest health concerns, such as forest pests, diseases, overabundant deer, or invasive plants; and, types of soils. Forest management recommendations that are included in the plan are developed to help the landowner achieve their goals for their forest. Even if you are not planning to manage your forest for the foreseeable future, a forest management plan will provide you with information and guidance. For more information on how to find a forester, see Appendix B.

Photo: Nicholas A. Tonelli/Flickr (CC BY 2.0)

If birds and other wildlife are on your list of goals for your forest, you may consider working with a wildlife biologist or a forester with special wildlife training from an organization like Audubon. A wildlife professional may be able to visit your property and provide a forest habitat assessment and management recommendations to improve habitat. Wildlife biologists can work in conjunction with your forester to integrate habitat management recommendations into a forest management plan. For more information on how to find a wildlife biologist, see Appendix B.

## Implement Habitat Management Recommendations

If you are at the stage where you are ready to begin implementing forest management recommendations that improve habitat for birds, continue to work with a forester to plan any harvests that might occur. The forester can coordinate different phases of the harvests, such as marking trees to be cut in accordance with management recommendations included in the forest management plan, and finding a logger to perform the harvest. When possible, avoid any forest management activities during the bird breeding season (April – August).

## Check for Cost-share Programs

Depending on where your property is located and the type of forest management you are seeking to implement, there may be various cost-share programs to help you achieve your goals for your forest. Cost-share programs can range from technical assistance from professionals to financial assistance to implement on the ground management. In some instances, financial assistance may be available to develop a forest management plan for your property. For more information about where to check for available incentive programs, see Appendix B.

### Audubon Forest Habitat Demonstration Site: Rheinstrom Hill Sanctuary and Center

Rheinstrom Hill Audubon Sanctuary and Center has more than 1,000 forested acres in Columbia County, NY. Several areas of the sanctuary are being managed to improve habitat for a suite of forest birds, including Ovenbirds, Scarlet Tanagers, Rose-breasted Grosbeaks, and American Woodcock. This forest habitat demonstration area is open to the public to view different forest management techniques that improve habitat conditions, diversify forest age classes, and improve forest health. Several areas have deer fence installed to ensure successful forest regeneration despite high deer densities. Vegetation and bird surveys are conducted pre and post-harvest to monitor response to the management activities. For more information about the Audubon Forest Habitat Demonstration Site, please visit: [ny.audubon.org/demo-rheinstrom](http://ny.audubon.org/demo-rheinstrom)



Chestnut-sided Warbler. Photo: Shirley Donald/Audubon Photography Awards

# APPENDICES

Photo: Nicholas A. Tonelli/Flickr (CC BY 2.0)

## Appendix A: Audubon New York Priority Species Profiles



### American Woodcock (*Scolopax minor*)

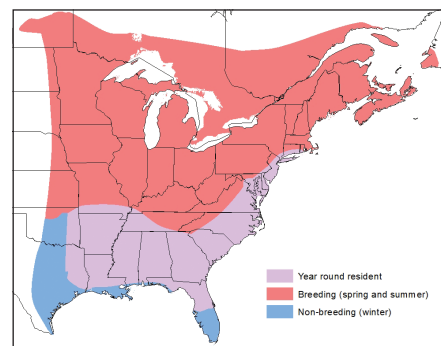
**Habitat:** Early-successional woodlands or grown-in fields, forest with openings

**Trend:** Declining in New York and across its range

**ID Tips:** A plump bird with a long bill, no neck and short legs; mottled cryptic coloration

**Song:** A nasal beeping peent mostly at dusk; also twittering wing sound when in flight

**Management:** Retain early-successional habitat; maintain thick alder and aspen stands for cover



Map by Audubon New York. Species distribution data provided by BirdLife International.  
Photo: Deborah Rivel



### Black-throated Blue Warbler (*Setophaga caerulescens*)

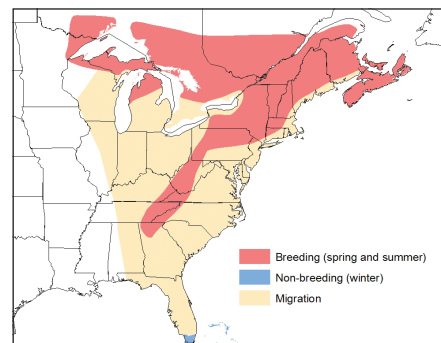
**Habitat:** Interior hardwood and mixed deciduous-coniferous forests, dense understory

**Trend:** Stable in New York and increasing across its range

**ID Tips:** Deep blue on top with black mask and throat; white wing patch “handkerchief”

**Song:** A thick and buzzy I’m-so-la-zeee with end note rising up to the “blue” sky

**Management:** Minimize linear openings (roads) and maximize forest interior; needs dense understory for nesting hobble-bush and saplings of striped/sugar maple saplings, hobblebush, and other native trees and shrubs



Map by Audubon New York. Species distribution data provided by BirdLife International.  
Photo: Kenneth Cole Schneider, Flickr (CC BY-NC-ND 2.0)



## Canada Warbler (*Cardellina canadensis*)

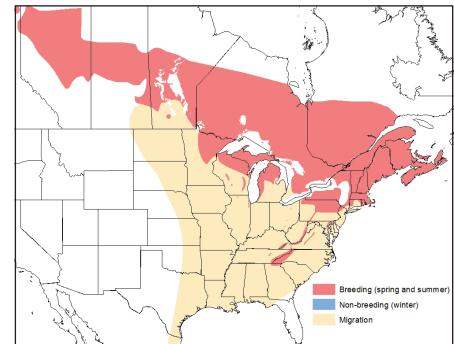
**Habitat:** Mixed, often young, forests, cedar swamps  
riparian forests with dense shrubs

**Trend:** Declining in New York and the Northeastern U.S.

**ID Tips:** Necklace of black stripes on bright yellow throat and belly, complete white eye-ring

**Song:** Often has soft introductory chips, then I'm-IN-here, but-you-CAN'T-SEE-ME

**Management:** Improve riparian buffers, protect cedar swamps and red maple/conifer swamps



Map by Audubon New York. Species distribution data provided by BirdLife International.  
Photo: Deborah Rivel



## Cerulean Warbler (*Setophaga cerulea*)

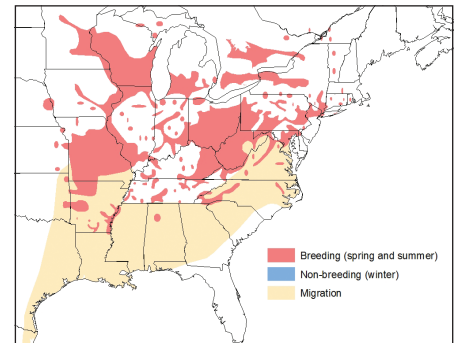
**Habitat:** Mature, deciduous forests with tall canopy that is partially open, with an open midstory and well-developed understory

**Trend:** Declining across its range

**ID Tips:** Sky-blue head and back, white throat and belly, two white wingbars

**Song:** Series of short buzzy notes, followed by a higher pitched buzz

**Management:** Retain large diameter trees (> 16 inches DBH), create canopy gaps 400–1000 ft<sup>2</sup>, improve vertical structure in mid and upper canopy layers, retain native grapevine



Map by Audubon New York. Species distribution data provided by BirdLife International.  
Photo: Jeff Nadler



## Golden-winged Warbler (*Vermivora chrysoptera*)

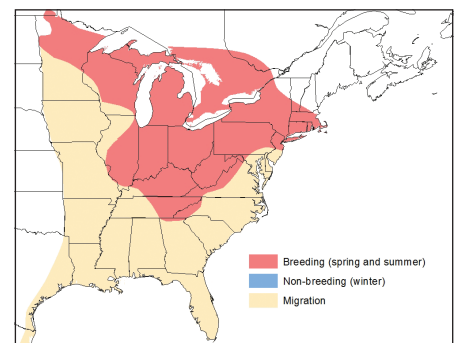
**Habitat:** Young, deciduous forest with scattered mature perch trees, within a forested landscape

**Trend:** Declining in New York and across its range

**ID Tips:** Yellow “cap” and patches on wings, black throat and eye mask

**Song:** Slow and insect-like seeee-bzzz, bzzz

**Management:** Create young forest patches ≥5 acres within mature forest, retain 5–15 mature trees per acre in young forest patches



Map by Audubon New York. Species distribution data provided by BirdLife International.  
Photo: Arni Stinniss/Audubon Photography Awards



## Prairie Warbler (*Setophaga discolor*)

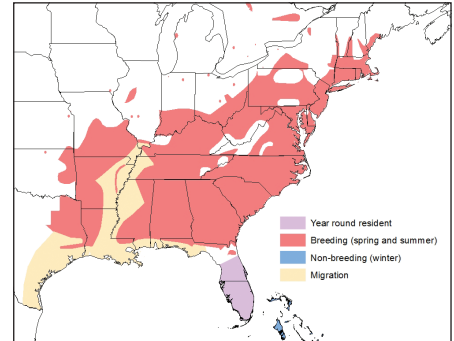
**Habitat:** Young forest with high densities of shrubs and saplings

**Trend:** Stable in New York although declining across most of its range

**ID Tips:** Yellow belly with black streaks on sides, olive green head and back

**Song:** Series of buzzy, ascending zee zee zee notes

**Management:** Create young forest habitat composed of a diverse mix of native shrubs and saplings



Map by Audubon New York. Species distribution data provided by BirdLife International.  
Photo: Jeff Nadler



## Wood Thrush (*Hylocichla mustelina*)

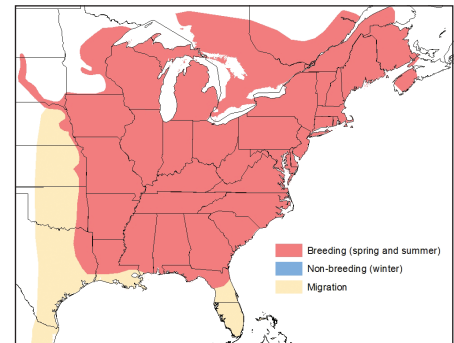
**Habitat:** Mature, moist deciduous woods with dense understory and heavy layer of leaf litter

**Trend:** Declining in New York and across its range

**ID Tips:** Brown back, heavily spotted on white breast; large thrush a little smaller than a robin

**Song:** A flute-like ee-oh-layy, ending in a sound like shattering glass

**Management:** Improve vertical structure/understory with small canopy gaps



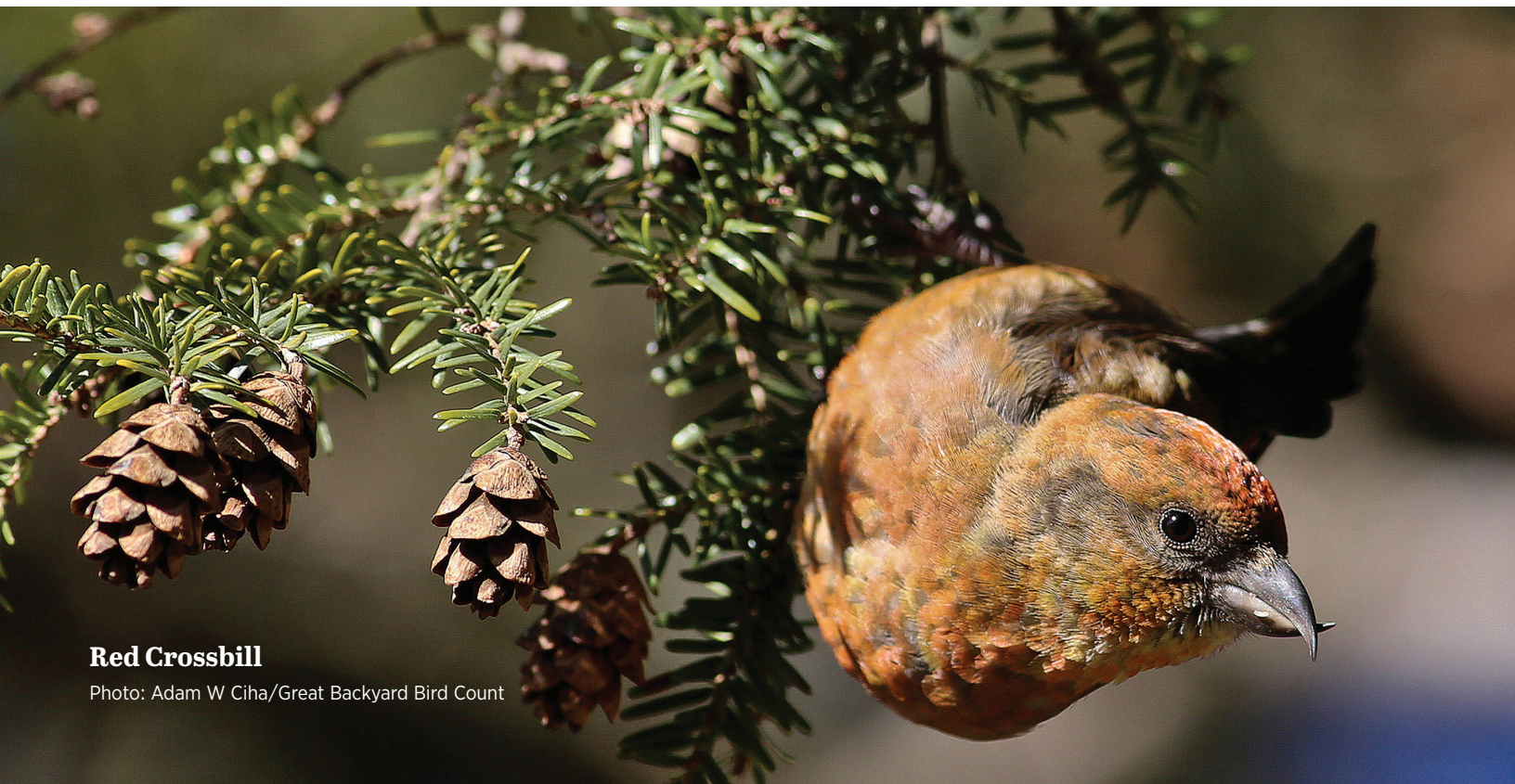
Map by Audubon New York. Species distribution data provided by BirdLife International.  
Photo: Jeff Nadler

## Appendix B: Resources for Forest Owners

### FIND A FORESTER

It is highly recommended that forest owners work with a professional forester when considering any forest management activities. When deciding on a forester to work with, look for Society of American Foresters (SAF) certified foresters. SAF certification requires a forestry degree, ample work experience in the forestry profession, compliance with SAF work ethics, passing a competency exam, and participation in continuing education once certified. Working with an SAF certified forester means you are working with a qualified professional who must remain up-to-date in the field of forestry.

- **NYS Department of Environmental Conservation (NYSDEC):** For private forest owners, a NYSDEC Stewardship Forester may be available to assist you with questions and, in some locations, may be able to develop a Forest Stewardship Plan for your property. NYSDEC also maintains the Cooperating Forester Program for private forest owners. The program list includes private consulting foresters who are available to assist you. Visit [www.dec.ny.gov](http://www.dec.ny.gov) for more information about NYSDEC Stewardship Foresters and Cooperating Forester Program.
- **Society of American Foresters (SAF):** Professional society for those working in the field of forestry, maintains a directory of SAF certified foresters. Visit [www.eforester.org](http://www.eforester.org) to search for an SAF certified forester in your area.
- **Cornell Cooperative Extension's Master Forest Owner Program (MFO):** Contact an MFO to visit with you, tour your property, and answer your questions regarding forest ownership and management options. MFO's can provide recommendations for foresters and related services or programs to forest owners. Find your local Cornell Cooperative Extension office by visiting [www.cce.cornell.edu/localoffices](http://www.cce.cornell.edu/localoffices).
- **Additional organizations to contact for consulting foresters:**
  - o Association of Consulting Foresters (ACF): [www.acf-foresters.org](http://www.acf-foresters.org).
  - o NY Institute of Consulting Foresters (NYICF)



**Red Crossbill**

Photo: Adam W Ciha/Great Backyard Bird Count

## ADDITIONAL RESOURCES

The following organizations, agencies, and programs may be helpful to forest owners interested in wildlife habitat and sustainable forestry for their properties.

- **Audubon New York:** Audubon New York's Healthy Forests Initiative has wildlife biologists on staff who specialize in forest habitat and offer outreach events and technical assistance to forest owners. For more information about Audubon's Healthy Forests Initiative and contacting staff who may be able to assist you, please visit [www.ny.audubon.org](http://www.ny.audubon.org).
- **Catskill Forest Association:** Works with private forest owners throughout the Catskill region providing education, technical assistance, and forest management implementation, including timber and firewood marking: [www.catskillforest.org](http://www.catskillforest.org).
- **Empire State Forest Products Association (ESFPA):** ESFPA comprises businesses and individuals, and is dedicated to improving the business climate for the forest products industry while promoting management of New York's forests to meet the resource needs of today and for future generations: [www.esfpa.org](http://www.esfpa.org).
- **Land Trust Alliance:** Find your local land trust to learn about their conservation initiatives and programs, including easements: [www.landtrustalliance.org](http://www.landtrustalliance.org).
- **National Wild Turkey Federation:** Non-profit organization that works with landowners and other entities to improve habitat for Wild Turkeys and other game species, as well as nongame species that use similar habitat, including songbirds: [www.nwtf.org](http://www.nwtf.org).
- **NY Forest Owners Association (NYFOA):** An association for private forest owners with local chapters located throughout the state: [www.nyfoa.org](http://www.nyfoa.org).
- **NY Tree Farm Program:** Promotes renewable forest resources on private lands and increasing public understanding of all benefits of productive forestry. NY Tree Farm Program is part of the national organization, The American Tree Farm System, which is a program of the American Forest Foundation. For more information visit [www.nytreefarm.org](http://www.nytreefarm.org).
- **Ruffed Grouse Society:** Works with landowners, government agencies, and other organizations to improve habitat for Ruffed Grouse, American Woodcock, and other game and nongame species that use similar habitat: [www.ruffedgrousesociety.org](http://www.ruffedgrousesociety.org).
- **The Nature Conservancy NY (TNC):** TNC's initiatives and programs in NY include forest protection, conservation, and working forests; for larger ownerships, TNC can provide advice about connecting your forest to the carbon market: [www.nature.org/NY](http://www.nature.org/NY).
- **USDA Natural Resources Conservation Service (NRCS):** Administers federal incentive programs to landowners implementing qualifying conservation practices: [www.nrcs.usda.gov/wps/portal/nrcs/site/ny/home/](http://www.nrcs.usda.gov/wps/portal/nrcs/site/ny/home/).
- **Watershed Agricultural Council (WAC):** The Forestry Program works with forest owners within the Croton and Catskill/Delaware Watersheds that make up the NYC Watershed region: [www.nycwatershed.org/forestry](http://www.nycwatershed.org/forestry). WAC's Forestry Program also maintains MyWoodlot, an online community of forest owners and forestry professionals where information and resources are shared: [www.mywoodlot.com](http://www.mywoodlot.com).

## LITERATURE CITED

- Anders, A.D., Faaborg, J., Thompson, F.R. III. 1998. Postfledging dispersal, habitat use, and home-range size of juvenile wood thrushes. *The Auk*, 115(2), pp. 349-358.
- Austen, M.J.W., Francis, C.M., Burke, D.M., Bradstreet, M.S.W. 2001. Landscape context and fragmentation effects on forest birds in Southern Ontario. *The Condor*, 103(4), pp. 701-714.
- Becker, D.A., Wood, P.B., Keyser, P.D., Wigley, T.B., Dellinger, R., Weakland, C.A. 2011. Threshold responses of songbirds to longterm timber management on an active industrial forest. *Forest Ecology and Management*, 262, pp. 449-460.
- Bennet, K.P. (editor). 2010. *Good Forestry in the Granite State: Recommended Voluntary Forest Management Practices for New Hampshire*. 2nd edition, University of NH Cooperative Extension, Durham, NH.
- Brittingham, M.C., Temple, S.A. 1983. Have cowbirds caused forest songbirds to decline? *BioScience*, 33(1), pp. 31-35.
- Bryan, R. R. 2007. *Focus Species Forestry: A Guide to Integrating Timber and Biodiversity Management in Maine*. 3rd edition, Maine Audubon.
- Chandler, C.C., King, D.I., Chandler, R.B. 2012. Do mature forest birds prefer early-successional habitat during the post-fledging period? *Forest Ecology and Management*, 264, pp. 1-9.
- D'Amato, A., Catanzaro, P. 2010. *A Forest Manager's Guide to Restoring Late-Successional Forest Structure*. University of Massachusetts Extension.
- DeGraaf, R.M., Yamasaki, M., Leak, W. B., Lester, A.M. 2006. *Technical Guide to Forest Wildlife Habitat Management in New England*. University of Vermont Press.
- Dettmers, R. 2003. Status and conservation of shrubland birds in the Northeastern US. *Forest Ecology and Management*, 185, pp. 81-93.
- Donovan, T. M., Jones, P.W., Annand, E.M., Thompson, III. F.R. 1997. Variation in local-scale edge effects: mechanisms and landscape context. *Ecology*, 78, pp. 2064-2075.
- Driscoll, M.J.L., Donovan, T.M. 2004. Landscape context moderates edge effects: nesting success of wood thrushes in central New York. *Conservation Biology*, 18(5), pp. 1330-1338.
- Driscoll, M.J.L., Donovan, T., Mickey, R., Howard, A., Fleming, K.K. 2005. Determinants of wood thrush nest success: a multi-scale, model selection approach. *Journal of Wildlife Management*, 69(2), pp. 699-709.
- Dunford, W., Freemark, K. 2004. Matrix matters: effects of surrounding land uses on forest birds near Ottawa, Canada. *Landscape Ecology*, 20, pp. 497-511.
- Environment Canada. 2013. *How much habitat is enough?* Third Edition. Environment Canada, Toronto, Ontario.
- Hagan, J.M., Grove, S.L. 1999. Coarse woody debris: Humans and nature competing for trees. *Journal of Forestry*, 97(1), pp. 6-11.
- Hagenbuch, S., Manaras, K., Shallow, J., Sharpless, K., Snyder, M. 2011. *Silviculture with birds in mind*. Audubon Vermont and Vermont Department of Forests, Parks, and Recreation.

Hartley, M.J., Hunter, M.L. 1998. A meta-analysis of forest cover, edge effects, and artificial nest predation rates. *Conservation Biology*, 12(2), pp. 465-469.

Hartley, M. J., Sullivan, K. L., Burger, M. F. 2004. *Wildlife and Forestry in New York Northern Hardwoods: A Guide for Forest Owners and Managers*. Audubon New York, Albany, New York.

King, D.I., DeGraaf, R.M., Griffin, C.R. 2001. Productivity of early successional shrubland birds in clearcuts and groupcuts in an eastern deciduous forest. *The Journal of Wildlife Management*, 65(2), pp. 345-350.

King, D. I., Yamasaki, M., DeGraaf, R.M., Costello, C.A. 2011. Three decades of avian research on the Bartlett Experimental Forest, New Hampshire, U.S.A. *Forest Ecology and Management*, 262, pp. 3-11.

Leak, W.B., Yamasaki, M., Holleran, R. 2014. *Silvicultural guide for northern hardwoods in the northeast*. Gen. Tech. Rep. NRS-132. Newtown Square, PA: U.S. Department of Agriculture, Forest Service, Northern Research Station.

Newell, F.L., Rodewald, A.D. 2011. Role of topography, canopy structure, and floristics in nest-site selection and nesting success of canopy songbirds. *Forest Ecology and Management*, 262, pp. 739-749.

Nol, E., Francis, C.M., Burke, D.M. 2005. Using distance from putative source woodlots to predict occurrence of forest birds in putative sinks. *Conservation Biology*, 19(3), pp. 836-844.

Robinson, S.K., Thompson, III F.R., Donovan, T.M., Whitehead, D.R., Faaborg, J. 1995. Regional forest fragmentation and the nesting success of migratory birds. *Science*, 267, pp. 1987-1990.

Rosenberg, K.V., Hames, R.S., Rohrbaugh, Jr., R.W., Barker Swarthout, S., Lowe, J.D., Dhondt, A.A. 2003. *A Land Manager's Guide to Improving Habitat for Forest Thrushes*. The Cornell Lab of Ornithology, Ithaca, NY.

Rosenberg, K. V., Rohrbaugh, Jr., R.W., Barker, S.E., Lowe, J.D., Hames, R.S., Dhondt, A.A. 1999. *A Land Managers Guide to Improving Habitat for Scarlet Tanagers and Other Forest-interior Birds*. The Cornell Lab of Ornithology, Ithaca, NY.

Stoleson, S.H. 2013. Condition varies with habitat choice in postbreeding forest birds. *The Auk*, 130(3), pp. 417-428.

Tubbs, C.H., DeGraaf, R.M., Yamasaki, M., Healy, W.M. 1987. *Guide to Wildlife Tree Management in New England Northern Hardwoods*. Gen. Tech. Rep. NE-118. Broomfield, CO: U.S. Department of Agriculture, Forest Service, Northern Forest Experiment Station.

Vega Rivera, J.H., Rappole, J.H., McShea, W.J., Haas, C.A. 1998. Wood thrush postfledging movements and habitat use in northern Virginia. *The Condor*, 100(1), pp. 69-78.

Vitz, A.C., Rodewald, A.D. 2006. Can regenerating clearcuts benefit mature-forest songbirds? An examination of post-breeding ecology. *Biological Conservation*, 127, pp. 477-486.

Vitz, A.C., Rodewald, A.D. 2007. Vegetative and fruit resources as determinants of habitat use by mature-forest birds during the postbreeding period. *The Auk*, 124(2), pp. 494-507.

Vitz, A.C., Rodewald, A.D. 2011. Influence of condition and habitat use on survival of post-fledging songbirds. *The Condor*, 113(2), 400-411.

Yamasaki, M., DeGraaf, R.M., Lanier, J.W. 2000. Wildlife habitat associations in eastern hemlock — birds, smaller mammals and forest carnivores. *Proceedings: symposium on sustainable management of hemlock ecosystems in eastern North America* (editors K.A. McManus, K.S. Shields and D.R. Souto), pp. 135-143. USDA General Technical Report 267. Newtown Square, PA.

Yamasaki, M., Leak, W.B. 2006. Snag longevity in managed northern hardwoods. *Northern Journal of Applied Forestry* 23(3), pp. 215-217.

## TABLE 1 SOURCES

Anders, A.D., Faaborg, J., Thompson, F.R. III. 1998. Postfledging dispersal, habitat use, and home-range size of juvenile wood thrushes. *The Auk*, 115(2), pp. 349-358.

Annand, E.M., Thompson, F.R., III. 1997. Forest bird response to regeneration practices in central hardwood forests. *Journal of Wildlife Management*, 61(1), pp. 159-171.

Burger, M.F. "Birds of Conservation Concern in New York." Audubon New York. [https://ny.audubon.org/sites/g/files/amh406/f/birds\\_of\\_conservation\\_concern\\_in\\_ny\\_-\\_march\\_2017.pdf](https://ny.audubon.org/sites/g/files/amh406/f/birds_of_conservation_concern_in_ny_-_march_2017.pdf). Accessed June 27, 2017.

Chandler, C.C., King, D.I., Chandler, R.B. 2012. Do mature forest birds prefer early-successional habitat during the post-fledging period? *Forest Ecology and Management*, 264, pp. 1-9.

DeGraaf, R.M., Yamasaki, M., Leak, W. B., Lester, A.M. 2006. *Technical Guide to Forest Wildlife Habitat Management in New England*. University of Vermont Press.

Hartley, M.J., Beyea, J., M.F. Burger. 2003. Use of meta-analysis to assign bird species to assemblages indicative of responsiveness to logging intensity in northeastern, hardwood forests. Unpublished research.

King, D.I., Labbe, M.A., Collins, J. 2007. Habitat use of wildlife openings and clearcuts by birds during the post-fledging period. A Preliminary Report to MassWildlife.

Marshall, M.R., DeCecco, J.A., Williams, A.B., Gale, G.A., Cooper, R.J. 2003. Use of regenerating clearcuts by late-successional bird species and their young during the post-fledging period. *Forest Ecology and Management*, 183, pp. 127-135.

National Audubon Society. "Guide to North American Birds." <http://www.audubon.org/bird-guide>. Accessed January 20, 2017.

Porneluzi, P.A., Brito-Aguilar, R., Clawson, R.L., Faaborg, J. 2014. Long-term dynamics of bird use of clearcuts in post-fledging period. *The Wilson Journal of Ornithology*, 126(4), pp. 623-634.

Streby, H.M., Peterson, S.M., Kramer, G.R., Andersen, D.E. 2015. Post-independence fledgling ecology in a migratory songbird: implications for breeding-grounds conservation. *Animal Conservation*, 18(3), pp. 228-235.

Vitz, A.C., Rodewald, A.D. 2006. Can regenerating clearcuts benefit mature-forest songbirds? An examination of post-breeding ecology. *Biological Conservation*, 127, pp. 477-486.



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## Indigo Bunting

Photo: Jeff Nadler





**Northern Saw-whet Owl**

Photo: Kameron Perensovich/Flickr (CC BY-SA 2.0)