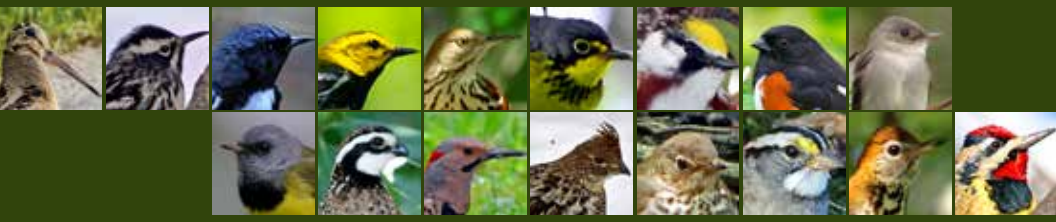
Managing Forests for Trees and Birds in Massachusetts

A Guide to Habitat Assessments and Silvicultural Practices



Adapted from Vermont's *Foresters for the Birds* Project

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INTRODUCTION AND PURPOSE

Massachusetts has more than 3 million acres of forested land, and about 75% of that land is privately owned (*Thompson et al. 2014*). This means that private landowners are positioned to be the most significant contributors to creating and maintaining habitat for forest birds and other wildlife.

Given the scale and rapid pace of development and suburbanization in Massachusetts, our existing forest resources are becoming increasingly valuable to the Commonwealth and our wildlife. Thoughtful management of our undeveloped lands can create forests that work for both landowners and wildlife, help buffer the Commonwealth from the anticipated effects of climate change, and also serve as shelter for species that are at risk of decline.

The nature of this work is continual. Forest composition and structure change over time, and as a stand ages it provides habitat for different wildlife communities. In this document we present the basic principles of evaluating forest habitat for birds, and provide suggestions on how to utilize silviculture in managing for that habitat. We approach silviculture through not only the lens of timber production, but also the lens of forest bird production.

The age composition of forests in Massachusetts is decidedly skewed toward older trees, with only a small percentage of forests younger than 30 years old (Figure 1). The underrepresentation of young forests comes at a cost to the wildlife that depend on them. This cost is reflected by declines in both the range and abundance of many species of young forest specialists across the state. For example, Chestnut-sided Warbler and White-throated Sparrow are two species that rely on young forest patches — and are two species that are declining in the state.

Not all landowners will be candidates for creating young forest habitat, perhaps due to their management goals or property size. Instead, they may want to create mature forest habitats that are beneficial for wildlife. There is a need to improve the understory and midstory structure in much of our older forests, which would enhance the habitat for mature forest birds. Many of these species, such as Wood Thrush and Eastern Wood-pewee, are also declining.

Last, it is important to remember that the goal is to create a diverse, healthy, and resilient ecosystem, and is not solely focused on just birds and forests. Much like the "canary in the coal mine" expression, birds are indicators of ecosystem health (*Niemi and McDonald 2004*). A forest with viable populations of White-throated Sparrows, Ruffed Grouse, or Wood Thrush is a forest that is supporting a large variety of other wildlife species as well.

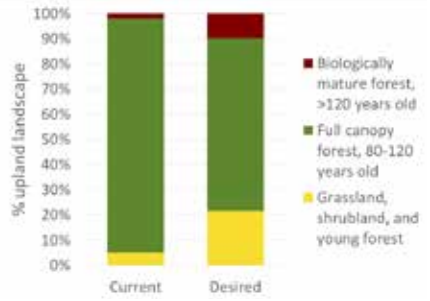


Figure 1. The age composition of forestland managed by the Massachusetts Division of Fisheries and Wildlife is generally representative of the entire state, with few areas of early successional habitat.

MASSACHUSETTS FOREST BIRDS

More than 200 species of birds breed in Massachusetts every year, and more than 100 of those species nest in our forests. Identifying all species by sight and sound — and knowing their respective habitat associations — is a daunting task, even for experts. To make the connection between forest birds and silviculture practices more clear, we have selected a suite of species for each ecoregion of the state. The birds in these groups, the Focal Birds, were chosen because they:

- Are a conservation priority in the region, or statewide
- Are relatively simple to identify by sight or sound
- Collectively use a wide range of forest types and habitat conditions
- Are likely to respond positively to some common silviculture practices

These species do not occur in our forests alone. Each species is likely to be found in conjunction with other declining species, so management for the Focal Birds will benefit other birds and wildlife.

Birds with Silviculture in Mind: A Pocket Guide to Focal Birds for Massachusetts Foresters is a quick-reference, full-color look at each of the Focal Birds. It is an essential companion document to this guide.

Creating a Foresters for the Birds Stewardship Plan is similar to assembling a typical plan, but there is additional emphasis given to creating habitat that will support species in need of conservation. It considers habitat at three scales, going from the largest to the smallest:

1. The context of the respective ecoregion
2. The landscape surrounding the parcel
3. The stand level characteristics

After evaluating the current habitat conditions, work with the landowner to assign and prioritize management activities based on combined timber and bird habitat objectives, and incorporate Bird-friendly Best Management Practices (BBMPs) during implementation (see page 23 for more details).

STEP 1

IDENTIFY REGIONAL CONSERVATION NEEDS

Massachusetts hosts a broad diversity of natural forest communities across the state. These forest communities are commonly grouped into three ecoregions based on similar forest types, ecosystems, and wildlife communities (Figure 2). Each has a slightly different assemblage of birds, as well as different patterns of human land use:

Figure 2. The three ecoregions of Massachusetts with outlines of municipal borders. Each region has a slightly different bird community and different land use patterns and considerations.

Atlantic Coastal Pine Barrens

SE (SOUTHEAST)

Covering Cape Cod, the Islands, and much of Plymouth County, these are forests dominated by xeric site species like pitch pine and various tree oaks. Dense understories of scrub oak and huckleberry are common, and wetlands may contain Atlantic white-cedar. Fire and wind (e.g., hurricanes) have been important disturbances historically, and therefore these forests are considered to be disturbance dependent. Some recommended silvicultural practices mimic this disturbance.

Brown Thrasher and Northern Bobwhite are two important birds that can benefit from some silvicultural practices in the SE ecoregion

Northeastern Coastal Zone

C (CENTRAL)

Found in central and northeastern Massachusetts, this is perhaps the most heterogeneous region. These forests typically support oak-pine and oak-mixed hardwood stands. Soils are generally acidic and sandy but not xeric. This zone includes the more southern oak-hickory forest type, some elements of the northern hardwood forest, and all variations in between. Along with the Atlantic Coastal Pine Barrens, this zone has a high density of human settlement and cities, and forest birds are highly dependent on the remaining tracts of forest.

Canada Warbler and Wood Thrush are two important birds that can benefit from some silvicultural practices in the C ecoregion

Northeastern Highlands

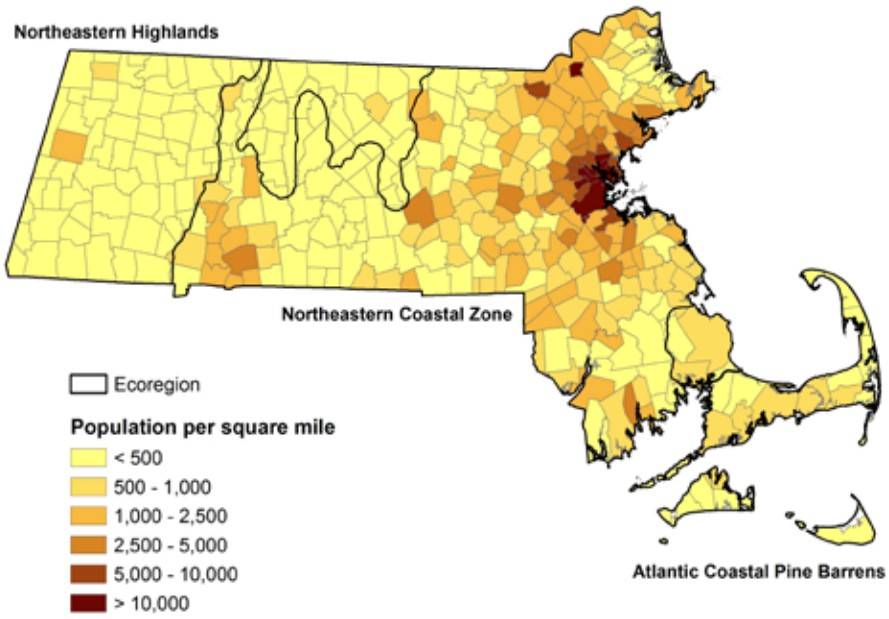
W (WEST)

This region, covering western and north central Massachusetts, contains some of the state's most productive forest soils — particularly in the limestone regions of Berkshire County — as well as some of its least productive sites, like those in the cold, boggy headwater regions where red spruce and balsam fir become significant components. The forests are principally northern hardwoods with varying components of oak and red spruce. A cooler climate, more rugged terrain, and higher elevations are important underlying habitat components in this zone. These forests are productive breeding grounds for a high diversity of birds.

Mourning Warbler and White-throated Sparrow are two important birds that can benefit from some silvicultural practices in the W ecoregion

When analyzing an ecoregion, consider the following:

- What are the resident Focal Birds (Table 1)? Some species are included in all three ecoregions; others are limited to only one or two. While some species occur statewide, they may only be designated as Focal Birds in one or two ecoregions where they are of particular conservation concern, and will benefit from habitat improvement.
- How densely populated is the region? For example, the Northeastern Coastal Zone and Atlantic Coastal Pine Barrens are more densely populated by humans, resulting in greater fragmentation of forest habitats. The effects of this are discussed in the next section of the document.



Human population density in Massachusetts (2010 Massachusetts census)

Table 1. Focal Bird species by ecoregion. **SE** – (Southeast) Atlantic Coastal Pine Barrens **C** – (Central) Northeastern Coastal Zone **W** – (West) Northeastern Highlands

	Species	Regions		
Mature Forest	Black-and-white Warbler	SE	C	W
	Wood Thrush	SE	C	W
	Black-throated Green Warbler		C	W
	Black-throated Blue Warbler		C	W
	Veery	SE	C	W
	Eastern Wood-pewee	SE	C	W
	Canada Warbler	SE	C	W
Young Forest	Eastern Towhee	SE	C	W
	Chestnut-sided Warbler	SE	C	W
	Brown Thrasher	SE		
	Mourning Warbler			W
	White-throated Sparrow		C	W
Mosaic of Habitat Types	American Woodcock	SE	C	W
	Ruffed Grouse	SE	C	W
	Northern Bobwhite	SE		
Cavity Nests	Northern Flicker	SE	C	
	Yellow-bellied Sapsucker			W

STEP 2
DETERMINE LANDSCAPE CONDITION FOR BIRDS

Moving inward from the ecoregion, the next level to consider is the landscape immediately surrounding the property, which can have implications for stand level habitat quality. A rule of thumb for thinking about the landscape from a bird perspective is to consider an area of approximately 2,500 acres. This is about the area of a circle with a 1 mile radius.

Consider the composition (proportion of different land uses and forest ages) and configuration (size, shape, arrangement, and relative positon of different land uses and forest ages) of the landscape surrounding the parcel in question. While landscape conditions are difficult to address through stand level management, examining the existing landscape can help decide what management practices to perform — or not perform — and which bird species can be effectively managed for.

A full explanation of landscape effects on habitat quality is beyond the scope of this document. However, some general concepts are described in this section.

Representation of Forest Age Classes

A landscape of predominantly mature forest punctuated by patches of young regenerating forest will provide a diversity of age classes for species with different habitat requirements. In most cases, a given landscape is lacking early successional habitat. Early successional habitat should exist in both small (<2.5-5 ac) and large (>5 ac) patches, comprising about 10% of the forested landscape (*Litvaitis 2006*).

The long-term goal is to create a mosaic of successional stages across the landscape, while also allowing some forest to naturally mature to true old-growth conditions. This diversity of forest ages, combined with the presence of wetland complexes and riparian areas, will help support all of the Focal Birds.

Amount of Forest Cover and Large Patches

Large (>1,000 acres) swathes of contiguous forest provide the highest quality habitat for interior nesting birds that reproduce more successfully away from edges and development. Area-sensitive species are known to avoid any forest that is within 330 feet from the edge (*Rosenberg et al. 2003*), and instead prefer the inner core of a patch. The minimum size of a forest patch needed to provide high-quality habitat depends on the amount of forest cover in the landscape.

For example, Wood Thrush in a heavily forested landscape (>70% cover) can find high-quality habitat in medium-sized patches (~200 acres). In landscapes with little forest (40% cover), Wood Thrush need patches of more than 350 acres for good habitat. That said, the reported minimum sizes for a particular species should not necessarily be used as management targets — generally speaking, the bigger the better.

Other Focal Birds sensitive to patch size include Black-throated Blue Warbler and Black-throated Green Warbler.

Proximity of Patches and Surrounding Land Use

The proximity of forest patches to each other matters too, especially in a fragmented landscape. A bird's reproductive success is often higher in a patch located close to other forest. Also, dispersal movements can occur among patches, where individuals from a growing population (especially young birds) can supplement a declining population, or recolonize a patch where a local extinction occurred. Thus, small isolated patches are less valuable than large patches in close proximity.

The maximum distance for patches to still be considered close will vary by species. For example, the rather sedentary Ruffed Grouse may only move a maximum of 3 miles to appropriate habitat (*Small and Rusch 1989*), whereas highly mobile migratory species can disperse tens of miles between habitat patches (*Tittler et al. 2009*).

Finally, consider the surrounding land uses. A bird will more readily move through a low-intensity residential area with scattered trees than an expansive parking lot.

Wood Thrush nest

Fragmentation is an umbrella term used to describe the loss of habitat, leading to smaller patches and increased isolation by areas of dissimilar habitat. A landscape with few forest patches that are isolated by areas of nonforest is considered fragmented. Some of the Focal Birds may not occur in heavily fragmented landscapes. Or, they may be present but unable to find high-quality habitat. Even if you are unable to greatly affect landscape conditions, you can still manage for quality bird habitat at the stand level, as discussed in the next section. This will improve conditions for forest birds in general, and help the species in question to persist in an otherwise less-than-ideal landscape.

STEP 3

ANALYZE STAND LEVEL CONDITIONS

Moving further inward from the surrounding landscape, the last thing to consider is the habitat complexity and structure within a stand. A bird's ability to survive and successfully reproduce is related to the presence of specific structural features such as nest sites, food and foraging substrates, singing perches, and cover from predators. The mere presence of a particular species does not necessarily indicate high-quality habitat.

Managing forest conditions to develop appropriate structural features can increase the habitat quality of a stand, and make it more likely that a given species is not only present, but can also successfully survive and reproduce. Of course, not all birds require the same habitat conditions, and it is rarely possible to manage for all species in the same space. Be sure to consult the Focal Birds document when making management decisions for each species or habitat type.

The following habitat attributes are important to keep in mind when managing for mature forest habitat. Special considerations for young forest habitats are discussed on page 14.

Forest Edge

Birds nesting close to the forest edge face a higher abundance of nest predators and the brood-parasitizing Brown-headed Cowbird (*Chalfoun et al. 2002, Howell et al. 2007*), especially in fragmented landscapes. These and other negative effects of edge can extend 150-300 feet into the forest interior.

Try to minimize the amount of forest edge. Circular forest patches are ideal because they have the least amount of edge relative to area. Square or rectangular patches are the next best configurations. A long, thin strip of forest is the least desirable for birds and other edge-sensitive wildlife. Consider regenerating areas between peninsulas and indentations to improve the shape. Regeneration can also connect smaller patches to form one large forest area.

Adult male Brown-headed Cowbird (left). Brown-headed Cowbird chick with its adoptive Song Sparrow parent (right).

Canopy Composition

For the purposes of forest bird habitat, a mature forest is greater than 30 feet high, and has a generally closed canopy (>80%) with relatively small gap openings throughout. This favors a suite of mature forest-nesting bird species, including Ovenbird and Black-throated Green Warbler.

When creating gaps with a low-intensity harvest, the diameter should not be more than two times the canopy height. For reference, a circle with a diameter of 120 feet — twice a 60-foot canopy – has an area of ¼ acre. These openings mimic small natural disturbances and create opportunities for regenerating intermediate- and shade-tolerant tree species. Patches can be much larger, say ¼ to ¾ of an acre, when conducting a moderate-intensity harvest.

Regeneration in these openings provides nesting and foraging habitat for birds such as Black-throated Blue Warbler, Wood Thrush, and Veery. The distribution of these openings may vary, but mature forest conditions should be maintained on the whole.

Midstory Vegetation

Defined as woody vegetation 5-30 feet high, this layer includes understory trees like striped maple and hophornbeam, young or suppressed canopy tree species, and taller shrubs, like witch-hazel. As with the understory layer, locally high stem and foliage densities distributed throughout a stand will provide nest sites, foraging substrates and protective cover. Structure is more important than species composition, though a diversity of species is ideal. While exact preference will vary by species, having coverage in 30%-70% of this layer is desirable.

HIGH FUNCTION

LOW FUNCTION

INCREASING HABITAT QUALITY

Understory Vegetation

For bird habitat purposes, understory is defined as live vegetation 0-5 feet high, including tree seedlings and saplings, shrubs, and herbaceous vegetation. High stem and foliage densities of woody plants in this layer provide nest sites, foraging substrates, and protective cover.

Some birds tend to associate with particular plant species. For example, Black-throated Blue Warblers are known to nest in dense clumps of hobblebush or mountain laurel (*Holway 1991*). However, in general the overall complexity of the understory vegetation plays a more important role than plant species composition (*Hagan and Meehan 2002*).

In many forests across the state, understory is thin or lacking, and enhancing this cover is often beneficial. Well-distributed patches of understory vegetation covering 50%-80% of the stand is desirable. Care should be taken to not disturb existing areas of thick understory, especially near wetlands including small wooded swamps or streams. Canada Warbler relies on nearly impenetrable understory and midstory near wooded streams or swamps. Disturbing that habitat can result in losing Canada Warbler from a site.

Soft Mast

Retain, release, and regenerate soft mast species such as black cherry, serviceberry, and apple. These produce food sources that are especially important in late summer when many species are preparing for a strenuous migration and undergoing energy-intensive molt. *Rubus* species that dominate openings are also important sources of soft mast for birds. In young forests, and in the understory of mature forests, shrubs like *Viburnum* spp., dogwoods, and blueberries are also desirable.

Non-native Invasive Plant Species

Consideration, control, and monitoring of non-native, invasive plant species is a management objective for improved habitat as well as a silvicultural objective. When non-native plants are present, strive to locate larger group/patch openings near already disturbed areas (e.g., agricultural lands) and away from interior sections. Use best practices to prevent spread of non-native invasive plants (refer to *Massachusetts Forestry Best Management Practices Manual)*.

Non-native, invasive plants, such as bush honeysuckles, buckthorn, autumn olive, and Japanese barberry, present a variety of threats to forest health in Massachusetts and the Northeast. Although some species of birds successfully use invasive plants as nesting sites and eat their fruits, the fruits generally have low nutritional value (I*ngold and Craycraft 1983*) and the arthropod diversity and abundance on non-native plants is often lower, providing less forage. Also, invasive plants reduce the diversity of other nesting and foraging substrates in forest ecosystems (*Schmidt and Whelan 1999, Ortega et al. 2006*).

Deciduous Leaf Litter

A thick layer of leaf litter is home to an array of insects, mites, and spiders — the prey of many birds. Some species, such as Veery, Wood Thrush, and Ovenbird, largely forage on the ground, searching the leaf litter for food. Ovenbirds also rely upon a deep layer of deciduous litter for constructing their ground nests. An abundant amount of leaf litter is a few inches thick with few, if any, bare spots on the forest floor.

While pine needles are used as material in nests, a leaf litter of pure needles is not desirable. Instead, the litter should include a large amount of deciduous hardwood leaves. Of course, this will not be this case in a softwood stand, and that's OK.

Ovenbird nest made out of leaf litter

Coarse and Fine Woody Material

Coarse woody material (CWM) is defined as downed logs and branches ≥5 inches diameter at the tip, and >5 feet long. Fine woody material (FWM) is composed of limbs and branches <4 inches diameter. Blowdowns and slash are the most common sources of CWM and FWM.

CWM may provide sites for singing and other behaviors, such as the Ruffed Grouse's familiar drumming. Additionally, the decaying wood provides habitat for insects and other arthropods that are a significant part of the diet for many birds.

Maintain a minimum of at least two cords per acre. When possible, leave large cull logs that will remain for long periods of time. Individual pieces of FWM have little value, but when it is aggregated into piles (e.g., slash piles), it can offer perches, nesting substrate, and protective cover for birds like White-throated Sparrow and Veery.

Coarse Woody Material

HIGH FUNCTION

LOW FUNCTION

INCREASING HABITAT QUALITY

Snags and Cavity Trees

Snags are standing dead or partially dead trees. Snags provide opportunities for nest cavity excavation by Yellow-bellied Sapsucker and Northern Flicker, which may be re-used in subsequent years by other species like Saw-whet Owl. As with CWM, the dead wood creates abundant forage for bole-feeding birds like Hairy Woodpecker and Brown Creeper. Branches on snags may be used as foraging perches and nest sites.

Retain all snags when possible, and strive for a minimum of 5 per acre greater than 10 inches diameter. Consider creating snags by girdling if there are particularly few.

Cavity trees may be alive or dead. Suggested targets for cavity trees are 1-3 trees >18 inches diameter per acre, and 4 in the 12-18 inch range. Managers should strive for a relatively even distribution of snags and cavity trees, as most cavity users are territorial, and clustering snags will result in fewer individuals using the nest holes. Aspen and paper birch make particularly good live cavity trees, as they are frequently chosen for cavity excavation, possibly due to their soft wood and vulnerability to various heart-decay fungi.

Pileated Woodpecker cavity nest with three young

Large Diameter Trees

Large-diameter cavity trees are critical for larger cavity nesting species including Barred Owls and Pileated Woodpeckers. Some large-diameter (24+" DBH) trees should be present in the forest. Some of these may be financially mature acceptable growing stock (AGS), and others may be senescent or declining unacceptable growing stock (UGS) that may be retained as legacy and wildlife trees. Structurally-sound, large-diameter trees are important stick nest sites for woodland raptors, such as the Northern Goshawk.

Native Species Diversity

Plant species composition should reflect the range of species that are part of the natural community type. Native species diversity is important for regeneration, overall forest health and resiliency, and for forest birds that tend to select specific vegetation types for foraging or nesting. For example, yellow birch provides preferential foraging substrates for many insect-eating bird species including Blackburnian Warbler, Black-throated Green Warbler, and Scarlet Tanager (*Holmes and Robinson 1981*).

Softwood Inclusions

Retain softwood inclusions in hardwood stands to provide increased structural complexity and species diversity, as well as varied foraging and nesting opportunities. Such components are particularly beneficial for species such as the Black-throated Green Warbler, Blackburnian Warbler, and Blue-headed Vireo.

Water and Wetland Features

Streams, ponds, and wetlands add to the diversity of habitats available for forest birds. For example:

- Rock- or gravel-bottomed streams within a forest matrix may support Louisiana Waterthrush, a warbler that nests in cavities under steep streamside banks or in upturned roots of a fallen tree over or near water.
- Forested wetland communities such as red maple, Atlantic white-cedar, and hemlock-hardwood swamps provide breeding habitat important to Canada Warbler. These forests tend to have a low canopy height and an abundance of ground cover — primarily ferns and shrubs. They also have structurally complex and uneven forest floors with hummocks, rootballs, and downed woody debris that provide concealment for nests and young.
- Shrub-dominated wetlands provide habitat for American Woodcock and Alder Flycatcher.

SPECIAL CONSIDERATIONS FOR YOUNG FOREST HABITAT

Creating a young forest patch on the landscape is one of the most beneficial actions a forester or a landowner can accomplish for wildlife. Young, regenerating forests are critical for a suite of birds that exclusively use early successional habitat for breeding and foraging. Many of these species have experienced severe population declines, largely due to loss of habitat (*Schlossberg and King 2007*). Additionally, some species that breed in mature forest, such as Black-and-white Warbler and Wood Thrush, move into these areas after the breeding period, but before migrating south (*Anders et al. 1998, Marshall et al. 2003, Vitz and Rodewald 2006*). Finally, early successional habitat is used by many other types of wildlife, like some mammals, reptiles, and pollinator species.

A reasonable goal is to have about 10% of the forest in a landscape in an early successional stage at any point of time (*DeGraaf et al. 1992*). If early successional habitat is lacking in the surrounding landscape, consider creating young forest patches.

For the purposes of bird habitat, a young forest is defined as an area of at least 2.5 acres with dense, regenerating forest, and an open canopy (<30% cover). These young forest habitats are ephemeral by nature, benefiting some bird species for a small window of time as forest succession proceeds for about 15-20 years (Table 2).

Young forest patches of all sizes will benefit birds in Massachusetts, from small 2.5 acre openings distributed throughout a forested matrix, to large openings in excess of 25 acres (*Litvaitis 2006, Askins et al. 2007, Schlossberg and King 2008, Shake et al. 2012*).

Low canopy cover makes this young forest suitable for birds that breed in early-successional habitat.

Staggering the creation of adjacent patches can extend the utility of a site, and the maintenance of young forest should be included in forest and wildlife management planning.

Young forest birds are also sensitive to edge. Create square or circular patches of young forest rather than rectangular or irregularly shaped patches to reduce the amount of edge. Both early successional and mature forest birds (during the post-breeding period) have been found to prefer interior young forest habitat (≥ 164 feet from the edge) compared to edge habitat (*Rodewald and Vitz 2005, Vitz and Rodewald 2006, Schlossberg and King 2008, Shake et al. 2011*).

The previously mentioned concepts of soft mast, coarse and fine woody material, snags and cavities, and invasive plant species apply to both mature and young forest habitats.

Soft edges between mature and young forest openings are also better than abrupt hard edges. Soft edges provide a buffer against predators and Brown-headed Cowbirds entering deeply into the forest, and obscure their view of nesting birds (*Hagenbuch et al. 2012*).

Table 2. Number of years after clearcutting an eastern deciduous forest that breeding, early successional birds first appear, become common, and then decline.

Species	First Appear	Become Common	Decline
Ruffed Grouse	10	15	20
Veery	3	10	20
Northern Flicker	1	1	7-10
Chestnut-sided Warbler	2	4	10
Black-and-white Warbler	3	10	*
Mourning Warbler	2	5	10
Canada Warbler	5	15	*
White-throated Sparrow	1	2	*

It is assumed that some residual stems (snags and live trees) remain
** Present until next cutting cycle*
Excerpt of a table from DeGraaf and Yamasaki 2003

ADVERSE IMPACTS OF DEER

Many regions in Massachusetts have high densities of deer, which can have significant adverse ecological impacts. For example, large numbers of deer can overbrowse a forest interior, affecting the abundance, species composition, and density of understory vegetation and regenerating canopy trees. In turn, this can negatively affect the abundance and diversity of birds that nest and forage below the canopy (*McShea and Rappole 2000, DeCalestra 1994*).

While deer densities are particularly high in eastern Massachusetts, this issue is worth discussing statewide. Writing a bird plan is a great time to speak with landowners about the importance of deer densities on their forestland, and implications for bird species that they may be trying to promote.

MOVING FORWARD

Once you have evaluated a property by completing steps 1-3, ask yourself the following questions before making your management decisions:

- What are the bird habitat strengths and deficiencies across the ecoregion, landscape, and property?
- What birds are presently benefiting? What birds could or should be here?
- Is there unique habitat on the property? In the landscape? A stark lack of certain habitat, like young, early successional forest?
- Are there opportunities to leverage existing quality habitat to improve nearby deficiencies?
- Are there timber management priorities that can be used to leverage habitat creation, or that can be adjusted to maintain habitat elements?
- Does the habitat need to be enhanced? Doing nothing may be the most appropriate action.

Considering these and other questions can help identify areas of important habitat, prioritize stands for treatment, or help justify a complex management decision. All decisions involve a balancing act between habitat goals and timber objectives, so assigning value to particular habitat elements based on the assessment and the landowner's priorities is a critical consideration.

Every silvicultural application will have its pros and cons for a given bird or related group of birds. For practical purposes, the effects of management can be generalized into the following four categories of harvest intensity, each of which typically creates a forest condition that will benefit slightly different suites of birds. This content may be used to help select a harvest intensity to create specific habitat, or it may be used to identify the resulting habitat attributes likely to be created by a proposed harvest.

Snags are especially valuable to birds as foraging sites and potential nest cavity sites.

MANAGEMENT OPTION 0.
Let It Grow

When supported by current stand conditions, appropriate landscape context, and a landowner's objectives, "let it grow" can sometimes be the best option to promote bird habitat. When present, closed-canopied stands with well-developed midstory and understory layers — perhaps as the result of past management practices — are likely already providing quality forest bird habitat, and will continue to function without a harvest. Letting it grow shouldn't, however, mean "do nothing." In the absence of an impending timber harvest, there are many less intensive management activities that can serve to maintain or enhance the habitat quality currently provided by the stand, such as:

- Creating snags and future cavity trees throughout stands by girdling
- Increasing dead woody material on the forest floor
- Controlling invasive plant populations
- Supplemental planting of mast-producing shrubs
- Identifying legacy or wolf trees (e.g., trees with especially large size, cavities, shaggy bark, etc.)

MANAGEMENT OPTION 1.
Low-Intensity Harvest

A low-intensity harvest maintains a closed-canopied forest (>80%) while enhancing timber quality of existing stems. Understory and midstory layers may also be enhanced, favoring shade-tolerant tree species and understory plants. These types of harvests are meant to mimic small and infrequent natural disturbances, like wind-throw or ice storm damage, which create small scattered gaps in the canopy and increase growing space for residual crowns. Natural events would create snags and woody material, so these are appropriate considerations during harvest as well.

The decision to conduct a low-intensity harvest may represent a balance between managing for timber and mature forest habitat. Periodic harvests may occur while maintaining and gradually enhancing the habitat quality. These types of treatments favor birds that require mature, closed-canopied forests for breeding, such as Black-throated Green Warbler, Eastern Wood-pewee and Wood Thrush. Other important elements to consider are understory and midstory layers, snags, woody debris, and the softwood component.

Black-throated Green Warbler with nesting material

Attribute Enhancement

- Locate gaps to release advance regeneration, remove clusters of high-risk, low-vigor, or low- value trees, and avoid sensitive sites
- Expand crop tree definition to include:
  - Tree species with special bird value (e.g., yellow birch and soft mast)
  - Trees with novel features (e.g., cavities or large crowns for perching)
  - Underrepresented species (e.g., soft mast producers, softwood inclusions)
- Maintain or enhance an understory tree and shrub component for forage and cover (e.g., striped maple, hophornbeam, mountain laurel, hobblebush)
- Retain cavity and den trees

Compatible Silvicultural Treatments

- Small Group (<0.3 ac) and Single Tree Selection
- Shelterwood with Reserves
- Variable Retention Thinning
- Patch Selection

MANAGEMENT OPTION 2.
Moderate Intensity Harvest

When managing for birds, the moderate-intensity harvest category encompasses a broad range of silvicultural practices, all of which generally involve a regeneration event and a deliberate canopy retention somewhere between 30%-80%. Specific retention and regeneration systems will vary based on timber quality, markets, overstory species, regeneration target species, and myriad other factors. In terms of bird habitat, what these treatments all share is a marked increase in understory vegetation and widespread creation of gaps and openings of various sizes. This type of harvest may mimic a range of natural events to which birds have adapted, including widespread tree mortality due to pests or pathogens, which would create a significant number of snags and woody debris over time.

Depending on canopy retention and opening sizes, these types of treatments will benefit different birds. At the higher end of canopy retention, benefits may be kept intact for birds requiring closed-canopy forests for breeding, such as Black-Throated Green Warbler and Wood Thrush, and may in fact create optimal habitat for gap feeders like Eastern Wood-pewee. At the lower end of canopy retention, or with removals focused in larger groups or patches, young forest-obligates like Chestnut-sided Warbler will likely start to appear.

Eastern Wood-pewees flit out into canopy gaps when hunting for flying insects

Attribute Enhancement

- Locate gaps and patches to release advance regeneration, remove clusters of high-risk, low-vigor, or low-value trees, and avoid sensitive sites
- Expand crop tree definition to include:
  - Tree species with special bird value (e.g., yellow birch and soft mast)
  - Trees with novel features (e.g., cavities or large crowns for perching)
  - Underrepresented species (e.g., soft mast producers, softwood inclusions)
- Maintain an understory tree and shrub component for forage and cover (e.g., striped maple, hophornbeam, mountain laurel, hobblebush)
- Retain cavity and den trees

Compatible Silvicultural Treatments

- Small Group (<0.3 ac) Selection
- Shelterwood with Reserves
- Expanding Gap Shelterwood
- Patch Selection

Table 3. Modified Attributes and Bird Species That May Benefit from a Low- to Moderate-Intensity Harvest

Modified Attributes	Duration Post-treatment	Focal Bird Species That Benefit
Improved foraging gaps in midstory	1-30 years	Eastern Wood-pewee
Increased understory density	3-15 years	Black-throated Blue Warbler
		Canada Warbler
		Ruffed Grouse
		Veery
		Wood Thrush
Enhanced softwood component	5+ years	Black-throated Green Warbler
		Canada Warbler
		White-throated Sparrow
Increased growth and vigor in canopy trees	5+ years	Black-and-white Warbler
		Wood Thrush
Increased midstory density	15+ years	Canada Warbler
		Wood Thrush
Retained or created snags/cavity trees	5+ years	Northern Flicker
		Yellow-bellied Sapsucker

MANAGEMENT OPTION 3. HIGH-INTENSITY HARVEST

Clearcut 1 year post cut. What initially appears extreme will become great habitat for early successional bird species as the understory regenerates.

Either a lack of young forest habitat on the landscape, or the lack of an alternative management option for a degraded stand, may lead to the decision to conduct a high-intensity harvest. This treatment is designed to create a large area of young forest, reducing the canopy cover to 0%-30%. This option approximates stand-replacing natural events like tornadoes and forest fires, and it also replicates a historically widespread cutting practice that benefited a suite of birds that are now categorically in decline.

Size and Shape

- An area of 2.5 acres is a minimum to be of high value for early successional birds
- Larger areas are even better, upwards of 25 acres or more
- Minimize the amount of edge relative to area. Circles are best; squares are better than long, thin strips

Degree of Structural Complexity

- Include parts of vertical structure like snags and larger perch trees, evenly distributed Larger openings may retain groups of legacy trees
- Retain soft mast as this will contribute to structure as well as add to the diversity and temporal availability of forage
- Minimize non-native, invasive species
- Allow for advanced regeneration of timber species, shrubs, and herbaceous growth
- Retain similar levels of course woody debris, and piles of fine woody debris

Suggestions for a Strategic Location

- Avoid disrupting contiguous mature forest by creating young forest at an existing edge, or near an open wetland
- Build off of existing early successional habitat, such as powerline corridors or abandoned beaver ponds
- Consider a gradient of age classes by creating new young forest adjacent to sapling/pole stands
- Consider clearing a stand of degraded timber quality due to high grading, ice damage, disease, etc.
- Consider creating young forest on poor growing sites, which will extend its longevity. Regenerating old fields also last longer as young forest than a recently cut forest
- Cut aspen (quaking and bigtooth) to create dense thickets of root-sprouts that are particularly beneficial to Ruffed Grouse

Compatible silvicultural treatments

- Clearcut/Clearcut with Reserves
- Seed Tree
- Overstory Removal in 2-Cut Shelterwood

Focal Species Disturbance Associations

Table 4. Focal Species Disturbance Associations*

Natural Disturbance Regime	Management Objective	Canopy Cover	Deciduous to Mixed Forest	Coniferous to Mixed Forest
Stand-replacing disturbances >2.5 acres in size	Maintain patches of young forest, 5-15 years old, >2.5 acres in size	Open (0%-30%)	Eastern Towhee Chestnut-sided Warbler Mourning Warbler Ruffed Grouse American Woodcock† Brown Thrasher Northern Bobwhite† Northern Flicker	Mourning Warbler Northern Bobwhite†
Canopy gaps and pockets of regeneration 0.25-0.75 acres in size	Create canopy gaps to encouage dense regeneration in pockets 0.25-0.75 acres in size	Intermediate (30%-80%)	Black-and-white Warbler Black-throated Blue Warbler Canada Warbler Eastern Wood-pewee Ruffed Grouse Veery Wood Thrush Northern Flicker	White-throated Sparrow Canada Warbler
Small and infrequent disturbances that maintain an average of >80% canopy cover	Minimize gap size and frequency. Favor large, old trees and snags. Maintain >80% average canopy cover in the stand.	Closed (80%-100%)	Black-and-white Warbler Black-throated Blue Warbler Canada Warbler Eastern Wood-pewee Wood Thrush Yellow-bellied Sapsucker	Black-throated Green Warbler

* *Focal Birds are grouped according to habitat features they strongly associate with. They may be found in a wider variety of conditions than shown here.*

† *These species require other nearby habitat types in addition to early successional forest.*

Bird-friendly Best Management Practices

With or without bird-conscious practices spelled out in a forest management plan, there are Bird-friendly Best Management Practices (BBMPs) that may be implemented during any timber harvest that will benefit forest-breeding birds:

- *Time of Year* – If possible, operate outside of the breeding season (mid-April to late August in Massachusetts), as to not disrupt mating behavior, destroy nests, or alter quality habitat after birds have chosen their territories.
- *Roads and Trails* – Keep woods roads and skid trails <20 feet wide, and incorporate bends and twists on long straightaways. Wider roads have been shown to have a fragmentation effect to strictly interior forest species, such as the Wood Thrush and Ovenbird, and long stretches of straight roads are favorable corridors for Brown-headed Cowbird to travel into forest interiors.
- *Leave it messy* – Avoid a park-like condition; leave some tops, slash, and course woody material that can be used as cover, singing perches, and foraging substrates.
- *Follow normal BMPs* – A number of bird species rely on forested swamps and other wetland habitat such as stream banks for breeding. Following basic Forestry Best Management practices that protect wetlands will help these birds. Avoid disturbing existing tip-ups, stumps, and logs and snags during harvesting operations.

COMPANION DOCUMENTS AND ADDITIONAL RESOURCES

This and other Foresters for the Birds information, as well as any updates, will be available on the website at www.masswoodlandsinstitute.org/programs/foresters-for-the-birds.

The following resources are also of importance:

- *Birds with Silviculture in Mind: A Pocket Guide to Focal Birds for Massachusetts Foresters* – A quick-reference, full-color look at each of the Focal Birds.
- *Mass Audubon Breeding Bird Atlas 2* – www.massaudubon.org/birdatlas/bba2 Read all about each bird species, including our priority birds, and the science behind what is causing population declines.
- *Mass Audubon State of the Birds reports* – www.massaudubon.org/our-conservation-work/wildlife-research-conservation/statewide-bird-monitoring/state-of-the-birds A summary of the findings of the Breeding Bird Atlas, including case studies on a representative species of different habitat types.
- A sample management plan, habitat assessment forms, and inventory procedures can be found at http://bit.ly/2e6p4q0.

Credits

The Massachusetts Foresters for the Birds program, including this document, was adapted from the original program created in Vermont. This was done in consultation with Audubon Vermont.

Contact your DCR Service Forester or Mass Audubon with questions about how to become involved in the Foresters for the Birds program, or for further assistance, search online for "MA DCR Service Forestry" or visit http://masswoodlandsinstitute.org/programs/foresters-for-the-birds.

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