Iowa's Forest Birds

Although Iowa's landscape is known primarily for its prairies and fields, its forests are teeming with bird life throughout the year. Forests and open savannas are thought to have covered about 18% of Iowa's land area prior to widespread clearing in the late 1800s and early 1900s. Today forests cover around 7% of the land area in the state. Despite this relatively small footprint, these forested areas are disproportionately important for biodiversity conservation, supporting a broad roster of plant, insect, and animal diversity found within Iowa's borders. Such is certainly the case with bird life, where we find more than 150 bird species use Iowa's forest at some time during a year. For many of these bird species, the prairies and fields of Iowa's countryside are of no concern, as they spend all their time in our wooded valleys and ridges. For some, this residence may be an annual visit from the far north, or a return to a natal home each summer from distant wintering sites in Central and South America. No less, the forested ecosystems of Iowa's river valleys, hillsides, and ridgetops are essential features to the birds, who for many Iowans set the soundtrack for enjoying Iowa's natural resources afoot, on trail, or afloat. Understanding forest birds and the impact of forest management requires an understanding of what birds are found in the forests, how they use the forest, and how management practices can impact the things they need. This article will explore those themes and offer guidance on making the most of forested acres for Iowa's birds.

Key Considerations

- **Understanding the many ways a diversity of birds use forests helps inform forest management strategies.**
- **A diversity of forest types, including young forests with saplings and shrubs through mature forested ridges, are important elements of Iowa's bird-friendly forests.**
- **Open-structure, oak-dominated woodlands and forests generally host the greatest diversity of forest birds.**
- **Managing invasive plants can be a crucial tool in improving the quality of forest habitat for birds.**
- **Thoughtful planning with the help of professional foresters and wildlife biologists can help forest managers make the most of their forest for birds and other uses.**

Yellow-billed cuckoo

How birds use forests

Forest-dependent birds rely on Iowa's forested environments to complete many different phases of their life cycle, including breeding and raising young, migration, and overwintering. We find many unique adaptations among birds that allow them to take advantage of a diversity of niches within the forest to complete their life cycle. From the tops of the tallest trees to the surface of the soil, birds take advantage of every dimension of the forest landscape. To manage a forest for birds, we must first understand how birds use the forest.

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Nest sites in the forest

Most birds found in Iowa forests breed and raise their young there. Nests of forest-breeding birds are found everywhere in the forest. The red-tailed hawk erects and maintains its large stick nests high in the canopy of trees to return to and improve upon annually – a sort of long-term investment in rearing young and connecting to place. In stark contrast, the eastern whip-poor-will, remarkable for its haunting nighttime song, is far from remarkable in its tendency to lay eggs directly on the leaf litter without constructing a recognizable nest. Not all ground-nesters go the way of the whip-poor-will; the ovenbird is so named for its construction of grasses and flowering plants on the forest floor into an intricate nest resembling an outdoor bread oven.

Baltimore oriole nests are woven baskets suspended from branches.

Above the forest floor, branches of all sizes and shapes provide the necessary support structure for many nests, and different species have affinities for different altitudes in the forest, ranging from branches of shrubs just off the ground for the Kentucky warbler to the peaks of the canopy for the blue-gray gnatcatcher. Although only an annual investment, the Baltimore oriole is perhaps the most gifted structural engineer in the forest, weaving pieces of vegetation, hair, wool, and even synthetic fibers into a gourd-shaped basket hung from the tips of branches high in trees where they lay their eggs in a lining of cotton from willow and cottonwood seeds. Grasses, sticks, and other vegetation are by far the most common media for nests constructed in forests, but other raw materials found there are used as well, such as the mud-lined nests of the American robin or the integration of lichens, wasp nest paper, and spider webs into the woven nests of the red-eyed vireo.

Eastern whip-poor-will nests are little more than eggs on leaf litter.

Woodpeckers do more removing than moving of nesting material, as they invest their time and energy into the excavation of custom holes sized differently by each species and lined only with the remnant wood chips from excavation. Woodpeckers are not the only excavators in the forest, as the black-capped chickadee is known for excavating holes in trees of their own. A nesting pair of chickadees will remove rotten wood from a branch to make a small cavity suitable for construction of a nest bowl made primarily of moss and hair. Tree swallows, house wrens, and many other so-called "secondary cavity users" are the beneficiaries of the hard work of woodpeckers, chickadees, or the natural decay process of a broken branch as they build nests in holes found opportunistically throughout the forest. These secondary cavity users bring twigs and grasses into the hole to make them "homier." Nests are indeed everywhere in the forest, and for many species, finding the right place – a suitable branch, a dead tree, an abandoned cavity, sufficient leaf litter, or even a suitable soil type – can be the difference in a hospitable forest and a non-hospitable one.

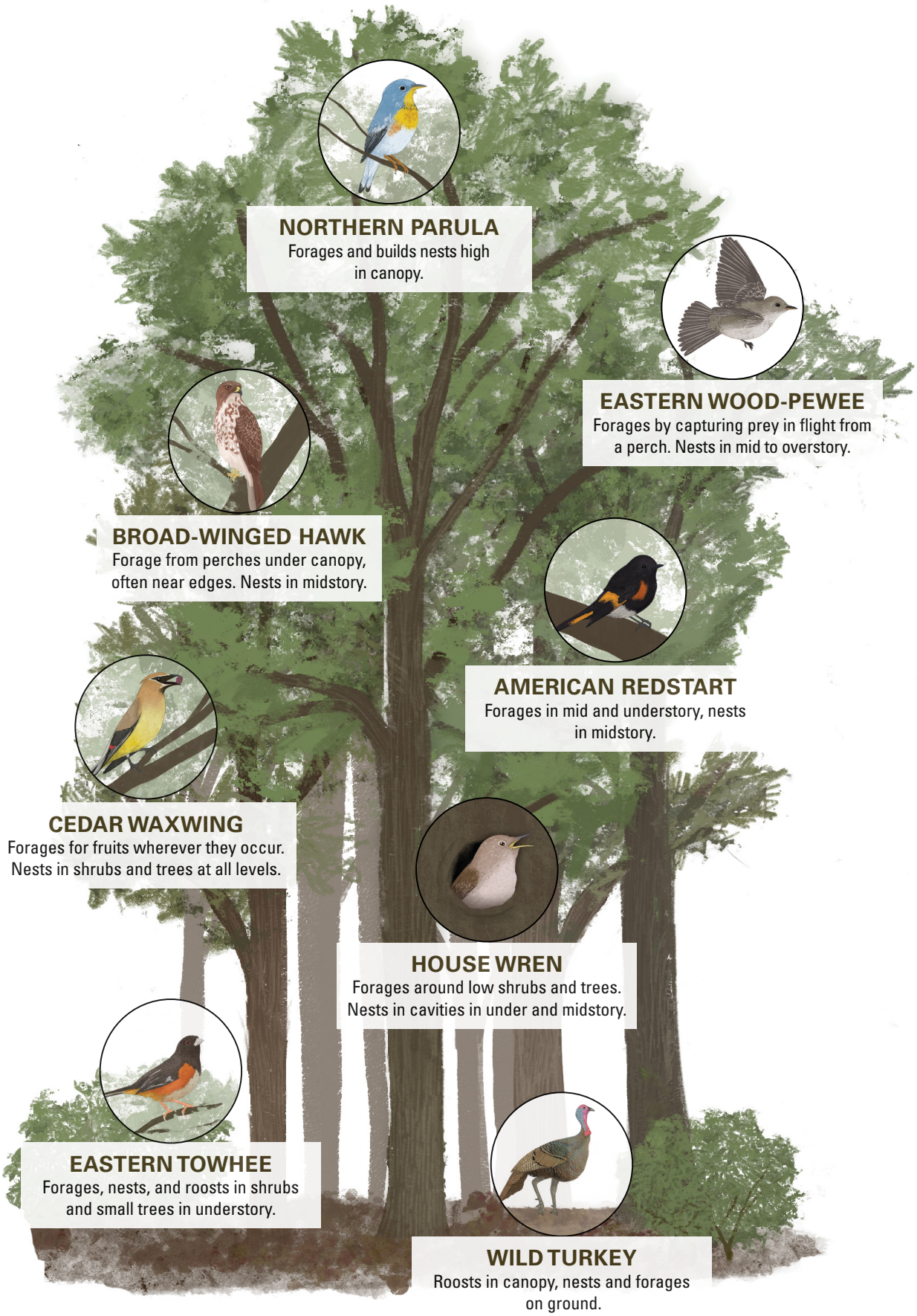
Finding food in the forest

All forest birds must find food to fuel their daily lives, be it to stay warm on cold winter days through consumption of fatty foods that turn to insulation or finding protein-rich insects to produce eggs and feed growing young. Forest birds have a wide diversity of diets and preferred foraging locations to find food in the forest throughout the year.

OVERSTORY

MIDSTORY

UNDERSTORY



NORTHERN PARULA
Forages and builds nests high in canopy.

EASTERN WOOD-PEWEE
Forages by capturing prey in flight from a perch. Nests in mid to overstory.

BROAD-WINGED HAWK
Forage from perches under canopy, often near edges. Nests in midstory.

AMERICAN REDSTART
Forages in mid and understory, nests in midstory.

CEDAR WAXWING
Forages for fruits wherever they occur. Nests in shrubs and trees at all levels.

HOUSE WREN
Forages around low shrubs and trees. Nests in cavities in under and midstory.

EASTERN TOWHEE
Forages, nests, and roosts in shrubs and small trees in understory.

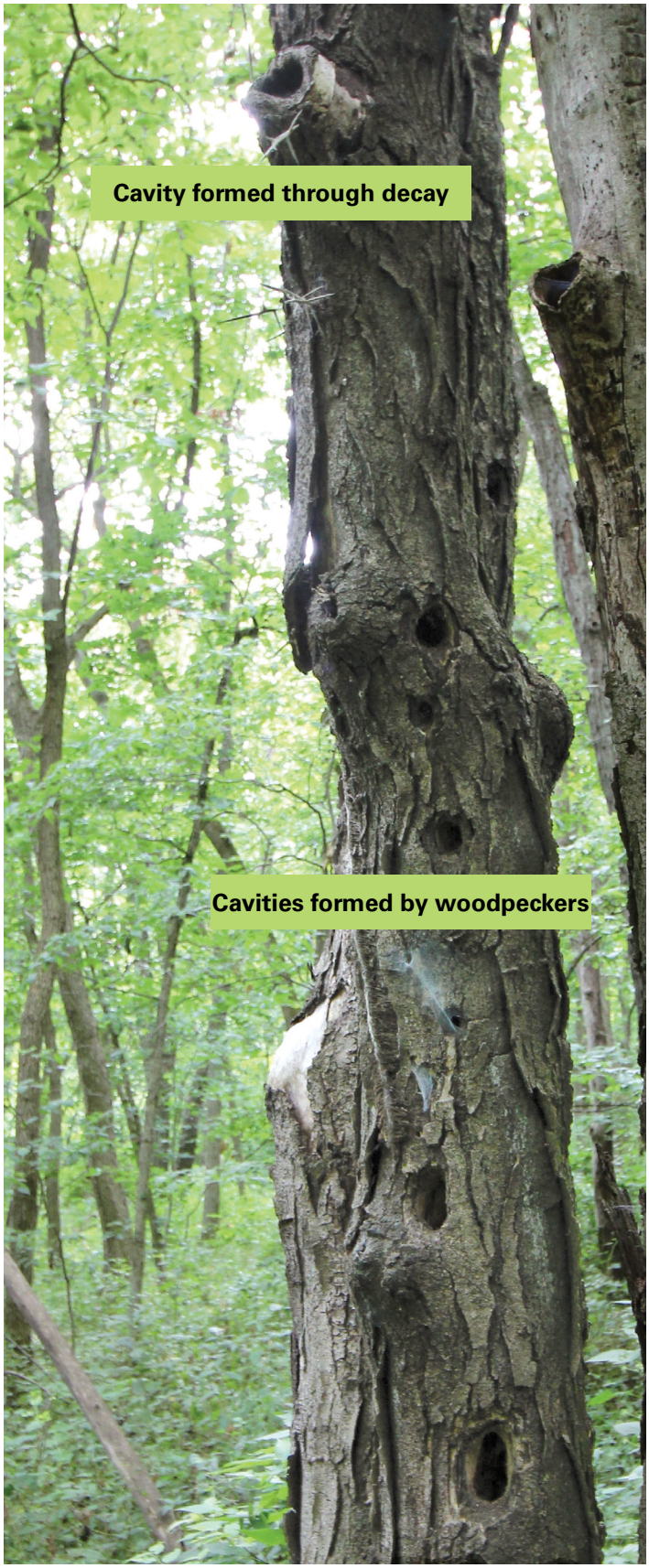
WILD TURKEY
Roosts in canopy, nests and forages on ground.

Forest birds distribute in the forest in 3-dimensions, with some occupying only the canopy, others dwelling almost exclusively in the understory, and many moving among the different levels of the forest to find food, roosts, or nest sites.

The foods birds consume depends on many factors. Some factors are internal, such as how the species' digestive tract functions to break down the fibrous compounds of plants or to guard against infection from eating other vertebrates like snakes, small mammals, carrion, or even other birds. Many forest birds are specially adapted to eating certain prey, with their bodies reflecting their specialization, such as specialized wing shapes for quick flight maneuvers among tree branches or specialized bills for cracking seeds, probing soils, or tearing into flesh.

Insects and other invertebrates such as spiders and earthworms are the life of the forest bird food web during summer. Insects, like adult beetles and moths or their larval forms like caterpillars, are rich in protein and readily available in the forest for birds to find and eat. Birds find insects everywhere in the forest. Woodpeckers extract them from dead and dying trees. The white-breasted nuthatch and brown creeper find them hidden in the bark of tree stems. Migrating canopy-dwelling birds, like Tennessee, Blackburnian, and black-throated green warblers, glean them from the surfaces of leaves, where researchers have found that leaves with shorter stems, called petioles, including oaks, elms, and ashes are preferred to those with longer petioles, like maples and basswood, for the ease of accessing surface-dwelling insects. Ground dwelling birds like wild turkeys glean insects from plants on the forest floor. Aerial acrobats like the aptly named flycatchers sally out from branches and capture airborne insects. The American woodcock uses its long probing bill to sense and extract insects, earthworms, and other invertebrates below the soil's surface. Both yellow-billed and black-billed cuckoos primarily eat caterpillars, especially tent caterpillars in the genus *Malacosoma* when they are available, and some evidence suggests they may even produce more young during caterpillar outbreaks.

Although insects are the most important food source for forest birds in Iowa, they are far from the only food source. The fruits of flowering plants can be an important food source for many species. These fruits come in two broad categories: soft, fleshy fruits called "soft mast," and "hard mast," such as nuts and acorns. During the summer, species such as the American robin and the gray catbird feast on soft mast from mulberries and blackberries, leaving characteristic purple "evidence" behind. During fall migration, soft mast reaches peak importance for Iowa's forest birds that seek out the fleshy fruits of trees, shrubs, and vines. For migrating species, fruit-eating is akin to "carbo-loading" in human marathon runners. Birds making a long voyage need a lot of energy to sustain their voyage and the natural sugars and fats found in soft mast satisfy



Dead and dying branches or trees provide ideal places for cavities to form through decay or by woodpeckers. These cavities then become nesting locations for many birds like house wrens, woodpeckers, or eastern bluebirds.

that demand. Many migratory species, like the red-eyed vireo, almost exclusively eat insects during the breeding season and will supplement their late summer and fall diet with fruit before switching to an entirely fruit-based diet in their tropical wintering grounds. The cedar waxwing is the only species in Iowa that eats fruit almost exclusively year-round. In winter, they consume cedar fruit and ornamental fruits such as crabapples. Only during spring, when fruit is scarce, do they switch to consuming insects for a short period until a new growth of soft-mast ripens in June. American robins will occasionally decide to spend their entire winter in Iowa instead of migrating further south if the overwintering fruits of native viburnums, hawthorns, and ornamental crabapples allow.

Oaks, hickories, and some shrubs like American hazel produce "hard mast" that is critical for species like blue jays, wild turkeys, and red-headed woodpeckers. Like soft-mast, these foods are most important in fall and winter. Hard mast production among some species like the oaks can vary among years, with some years creating lean crops of acorns that can hurt overwinter survival or even reproduction in the following year of some acorn-dependent wildlife like wild turkeys. In bumper crop years, wild turkeys and others will change their movement patterns to take advantage of productive trees or forest patches, storing up energy critical to producing young the following spring. Other plant-based foods are also important for a handful of forest birds, including seeds of flowering plants and some grasses, buds on trees that are taken by ruffed grouse and rose-breasted grosbeaks, and in rare cases other vegetative material, like leaves or flowers, on the plants themselves. Nectar of flowers is another plant-based diet item used by some birds primarily as a supplement to an insect-rich diet. Ruby-throated hummingbirds are most well-known for their affinity for nectar of flowers, but other species such as Baltimore and orchard orioles visit the most mature flowers in the forest to consume their nectar, often grabbing a few flower-loving insects during their visit.

Snakes, mammals, frogs, toads, fish, and even other birds or their eggs are the final notable food category among forest-dwelling birds. We ordinarily think of vertebrates that eat other vertebrates as the birds of prey and indeed, many hawks and owls inhabit Iowa forests. These predatory birds, called raptors, coexist by spreading out to feed on forest edges or forest interiors and, day or night, to take advantage of the bounty of forest wildlife. Most raptors, for example, broad-winged hawks, long-eared owls, and barred owls, eat primarily small mammals, like mice, voles, and shrews and supplement those diets with other prey taken opportunistically like frogs, toads, and even insects. The Cooper's and sharp-shinned hawks differ from most forest raptors in their affinity for birds, having specialized adaptations for swift maneuvering flights in thick vegetation that allow for them to outmatch flying prey. Although these raptors are indeed the vertebrate specialists in the forest,

Oak-hickory forests are attractive to a wide diversity of birds.

Table 1: Native soft mast producing woody plants in Iowa forests.

Species/scientific name	Value[1]	Timing of fruit availability[2]				
		June	*July*	*August*	*September*	*Winter*
VINES						
Honeysuckles *Lonicera dioica, L. reticulata*	**					
Grapes *Vitis aestivalis, V. cinerea, V. riparia, V. vulpina*	***					
Greenbriers *Smilax tamnoides, S.* spp.	**					
American bittersweet *Celastrus scandens*	*					
Virginia creeper *Parthenocissus quinquefolia, P. vitacea*	***					
Moonseed *Menispermum canadense*	*					
Poison ivy *Toxicodendron radicans*	***					
SHRUBS						
Raspberries, blackberries *Rubus* spp.	***					
Blueberries *Vaccinium angustifolium, V. myrtilloides*	**					
Gooseberries *Ribes missouriense, R. americanum*	**					
Elderberry *Sambucus canadensis, S. racemosa*	***					
Cherries and plums *Prunus virginiana, P. americana, P.* spp.	***					
Dogwoods *Cornus drummondii, C. racemosa, C.* spp.	***					
Prickly ash *Zanthoxylum americanum*	*					
Buckthorns *Rhamnus lanceolata*	**					
Viburnums *Viburnum lentago, V. rafinesquianum, V.* spp.	**					
Sumacs *Rhus aromatica, R. glabra, R.* spp.	*					
Roses *Rosa blanda, R. carolina, R. palustrus, R.* spp.	**					
Canada yew *Taxus canadensis*	**					
Eastern burning bush *Euonymus atropurpureus*	*					
Coralberry *Symphoricarpos orbiculatus*	*					
Winterberries *Ilex verticillata*	**					
Ground junipers *Juniperus horizontalis, J. communis*	***					
SMALL TREES						
Juneberries *Amelanchier arborea, A.* spp.	***					
Mulberries *Morus rubra, Morus alba**	***					
Hawthorns *Crataegus mollis, C.* spp.	*					
Crabapple *Malus ioensis, M.* spp.	*					
Pawpaw *Asimina triloba*	*					
TREES						
Cherries *Prunus pennsylvanica, P. serotina*	***					
Eastern redcedar *Juniperus virginiana*	**					
Persimmon *Diospyros virginiana*	*					
Hackberry *Celtis occidentalis*	*					

[1]Value as a food source for birds; * = consumed, ** = preferred, *** = highly preferred.

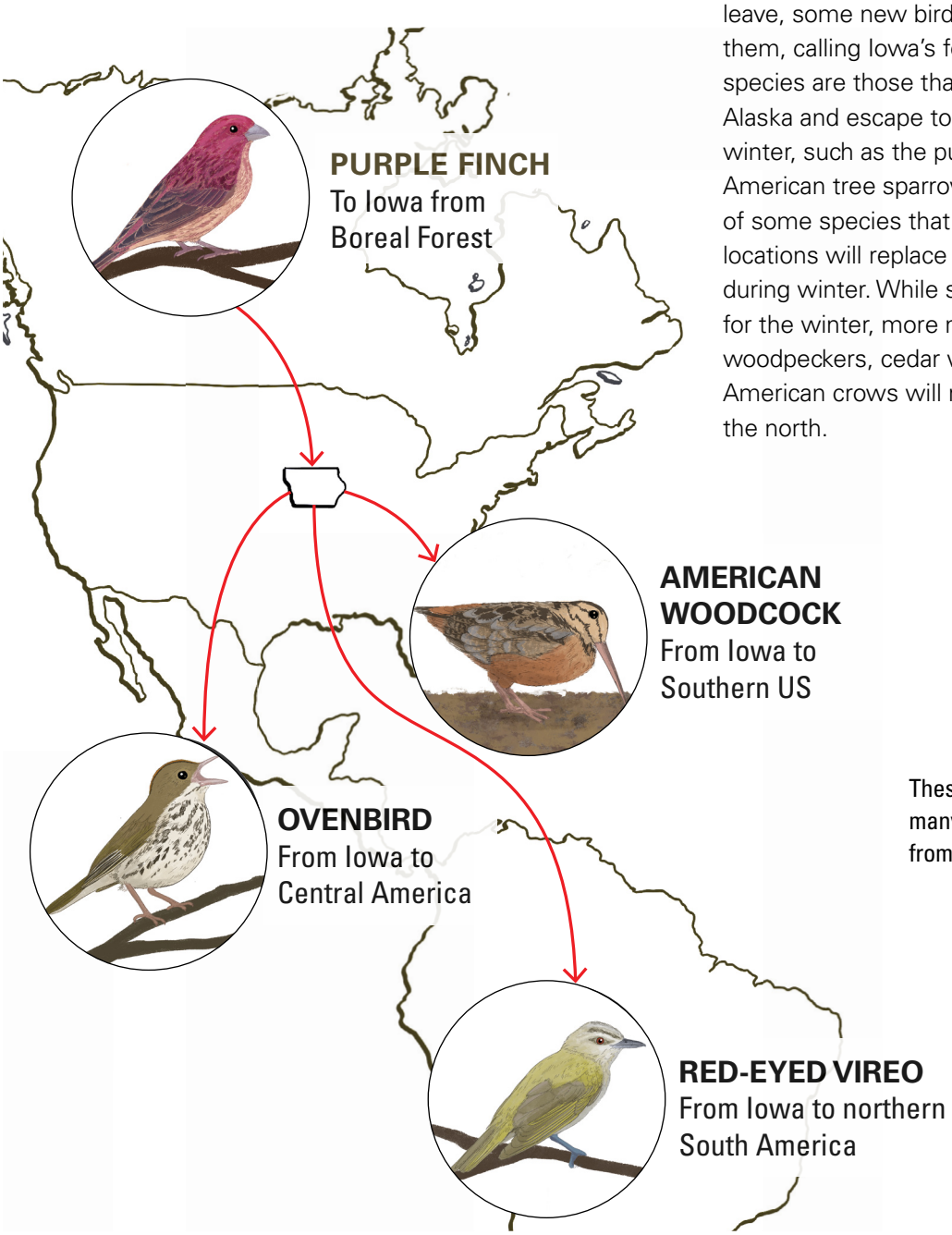
[2]Timing of mast availability. Lighter color indicates increasing or decreasing abundance, darker color indicates peak abundance. Winter column represents fruits that persist on the plant through late fall and winter.

* White mulberry (*Morus alba*) is the only exotic species included in the table. It is mostly naturalized and highly used soft mast.

many species of birds will take advantage of the easy meal afforded by the nest of another species when available. A long list of egg-eaters could be created that would include some unlikely suspects such as black-capped chickadees, but the most notable nest raiders in Iowa are our two members of the crow family, blue jays and American crows.

Forest birds in winter

The cast of characters found in Iowa's forests varies with the seasons. The most diverse assemblages of birds occur during two distinct periods each year, coincident with the migratory movements of birds from north to south in fall and back again each spring. These periods, ordinarily falling during six weeks in April and May and ten weeks in August, September, and October, can yield birds like the ruby-crowned kinglet, magnolia warbler, or palm warbler as they use Iowa's forests in transit between northern Canada or Alaska and the southern US, Central America, and South America. Iowa's forests are used extensively by a cadre of birds known as Neotropical migrants that spend their winters in the tropic or sub-tropic regions of Central and South America and their summers here in the heartland. Birds like the red-eyed vireo, yellow-billed cuckoo, eastern wood-pewee, and cerulean warbler all call Iowa home in summer and South America home in winter. The ovenbird, American redstart, wood thrush, and many others are content to migrate to the isthmus of Central America for winter. Other less adventurous birds, like the American woodcock and eastern whip-poor-will, stay closer in winter, migrating to the Gulf Coast of the US and Mexico. As these migrant breeders leave, some new birds from the north fill in behind them, calling Iowa's forests home during winter. These species are those that breed far north in Canada and Alaska and escape to Iowa's relatively mild climes for winter, such as the purple finch, northern saw-whet owl, American tree sparrow, and dark-eyed junco. Individuals of some species that breed in Iowa and in more northern locations will replace their locally breeding relatives during winter. While some local breeders move south for the winter, more northerly breeding red-headed woodpeckers, cedar waxwings, American robins, and American crows will move into Iowa for the winter from the north.



These are just four examples of the many movements birds make to and from Iowa's forests during winter.

Finally, many species of Iowa's birds are simply year-round residents, using Iowa's forests for breeding and surviving the winter. Some species on this list are known for being relatively immobile, like ruffed grouse and wild turkeys. Other species may seem capable of long migratory flights to flee winter, but instead stay put, such as the white-breasted nuthatch, some species of woodpecker, northern cardinals, the tufted titmouse, and the state bird – American goldfinches. Among the birds who spend their winters and summers here, notable shifts in their behavior and diets occur that can change the way they use forests. American crows, for example, shift from a mostly solitary lifestyle of breeding pairs raising young to a highly gregarious behavior, using communal roosts in forests and cities that can number in the thousands. Similarly, many birds that were segregated into lone breeding pairs and established territories during summer come together to form mixed species flocks to find foods and escape cold winds and snow.

Forest types and bird distribution

To a bird, a forest is not just a forest. Rather, throughout Iowa we find a diversity of forest types that change with characteristics of the land and its management. Along with this variation in forest types, we find variation in bird communities. Bird distributions within forest stands is ultimately driven by forest structure at the varying layers of the forest. Canopy cover, the type, size, or growth form of trees and shrubs, stand age, and degree of disturbance are interconnected factors that influence forest structure and thus influence bird communities. Canopy cover is the amount of ground shaded by tree leaves. "Open" canopies let more light in, allowing shrubs and saplings to grow, while forests with more "closed" canopies have fewer shrubs but an abundance of leaf litter. Different species of trees grow into different shapes and heights and offer different bark textures and leaf shapes from which birds can forage. Very young forest stands are often similar to shrublands and support a very different community from mature forests with tall, closed canopies. Disturbances, such as tree harvest, severe storms, fire, or grazing, can act to open the canopy and in extreme cases "reset" the age of a forest. Collectively, these factors, along with site-specific characteristics like soil properties, moisture, and sunlight exposure, combine to create a diversity of forest types that host a diversity of bird species. Here we will explore the major forest types found in Iowa and highlight the diversity of birds found in each.

Foresters and ecologists refer to the diversity of forest types found in Iowa as resulting from a process called "succession." Although not a perfect chronology of the growth and development of all forest types, the concept is an important term in understanding differences between forest types and the birds that use them.

Early successional forests are those that are young in age (0-20 years) transitioning from grassland or shrubland ecosystems into a more recognizable forested or woodland environment with mature trees. Early successional forests can be large tracts, such as those created by large scale timber harvests or resulting from the abandonment of fields or pastures. Early successional forests can also be small patches within forests created by smaller-scale forestry operations, wind, tornadoes, floods, or even pest infestations. Although not commonly recognized as a forest ecosystem to an outside observer, early successional areas can be critical habitats for many forest birds that use them for reproduction or foraging. Many bird species that nest in older forests, such as ovenbirds, wood thrushes, and scarlet tanagers, seek out early successional areas in forests to find foods like soft mast or insects. Some forest bird species are uniquely tied to early successional areas for nesting and feeding and without them would not survive in a forested landscape, such as the ruffed grouse, brown thrasher, Bell's vireo, and field sparrow.

Soft mast, like that produced by eastern redcedar, is an important food source for migrating and wintering birds like these American robins.

A central-Iowa oak savanna.

Savannas and open woodlands are an ecosystem defined by the scattered distribution of trees with plant communities that are transitional between grasslands, early successional forests, and the more closed canopy forested environments commonly found in Iowa today. Open woodlands and savannas would share many characteristics similar to early successional forests, only they add interspersed mature trees that create a canopy of leaves in summer that takes 10-70% of the overhead sunlight. Researchers estimate the open woodlands, maintained by frequent, low-intensity fires set primarily by Native Americans, were once quite common in Iowa and neighboring states to the south and east. Today, however, with the suppression of fire from most of Iowa's forested environments, they are rather rare and the focus of extensive restoration efforts for the diverse assemblage of birds found in them. The bird community in savannas and open woodlands can overlap with birds found in early successional areas, but the addition of widely spaced larger trees in these habitats attracts species such as red-headed woodpecker, yellow-billed cuckoo, orchard oriole, and eastern towhees.

Toward the higher end of the forest canopy cover spectrum, with cover ranging from nearly 50% up to about 80% canopy cover, is the most common forest type in Iowa, **oak and hickory forests**. Along the transition between open oak-hickory woodlands to oak-hickory forests we find the greatest diversity of forest birds in Iowa. Oak-hickory forests grow from open woodlands and savannas

Monitoring and studying forest birds. Any experience in the forest can be enriched by learning the calls and habits of the birds found there. But when it comes to managing forested land, knowing who's there and who's not is a critical starting point and means of assessing outcomes of management practices. Wildlife biologists have many different techniques to survey birds, but the simplest and most accessible are simple, careful observations made throughout the year. During the May and June breeding seasons, short listening sessions in the morning to document the territorial calls of males can yield a precise list of most breeding species. The list can be supplemented by extra surveys, for example early-morning gobble counts for wild turkeys in March and April and late-night listening sessions for eastern whip-por-wills and owls that call in the dark. After the listening is done, careful observation of birds throughout the year will reveal their habits and behavior. Note who is carrying nesting material in their bills, and when, to reveal the timing and location of nest construction. Note who is carrying food in their bills in flight, and when, for a hint when the young are being fed before fledging. Adult songbirds seen carrying fecal sacs from the nest are a clear sign of young in nests. Note what fruits disappear first and last for an indication of food preferences throughout the season. Look for tracks in the snow or regurgitated pellets of owls under roosts. Each of these behaviors and observation techniques can help a land manager understand better what is going on in the forest and how management can improve conditions for birds.

Scarlet tanager

that go undisturbed or can be maintained through active forest management that creates conditions suitable for oak and hickory regeneration in existing oak-hickory forests. Because oak and hickories require relatively high amounts of sunlight for growth, these forests prevail on sites that are either relatively young (less than 100 years since disturbance) or actively managed with forestry practices, fire, or grazing. Oak-hickory forests are the most abundant forest type in Iowa today because they grew from extensive land clearing following European settlement and have developed closed canopies from the general absence of active forest management practices needed to maintain a more open structure. The species list of forest birds found in oak-hickory forests is long and includes many common species and more notable forest-specialists like eastern wood-pewees, red-eyed vireos, scarlet tanagers, ovenbirds, and Acadian flycatchers.

As forests age and closed canopies prevail for a long period of time, shade-tolerant species of trees grow from the understory and into the canopy, eventually creating **maple and basswood forests**. The process favoring persistence of these shade-tolerant trees is called mesification. In the absence of disturbances from active forest management or harvest, forest stands in this state tend to persist with a canopy closure at or exceeding 80%. These forest types were historically uncommon in Iowa but are increasing in their abundance as time since major forest disturbances increases and active forest management like fire and harvest become uncommon. Some species of birds, including wood thrushes and red-eyed vireos, can thrive in these environments, which have large trees and little understory vegetation. However, bird species reliant on mid-story trees or shrubs like eastern wood-pewees and Kentucky warblers become less common in the closed canopy environments of maple-basswood forests and overall bird diversity is lower in these forest types.

Bottomland and floodplain forests are a special type of forest community that is found adjacent to rivers and streams in Iowa. In these communities, we find early successional forests, along with a range of other ages and forest compositions reminiscent of those discussed previously on more upland sites. But, the unique combination of soil types, soil moisture, and frequent flood disturbance foster different tree communities and vegetation structure. Therefore, these ecosystems have their own unique assemblages of trees and other plants that have evolved adaptations to the frequent flooding and resulting sediment deposition that can occur in the flat floodplains adjacent to major rivers. Species like cottonwoods, willows, and silver maples are uniquely adapted to these environments to establish and grow quickly on newly deposited sediments and can withstand months of inundation with flood waters. Just as the trees and plants have unique adaptations, we find many bird species uniquely adapted to floodplain forest ecosystems, like the willow flycatcher that, as the name implies, are

Canopy cover limits the amount of sunlight hitting the forest floor, which influences plant growth and food production, and ultimately bird habitat in forests. These photos show canopy cover of around 80% (A) and around 100% (B).

closely associated with young willow stands. Uncommon species like Louisiana waterthrushes, prothonotary warblers, and red-shouldered hawks favor mature forests along clean, flowing rivers and streams. Baltimore oriole nests are a common sight hanging from cottonwoods in riparian areas. Many floodplain trees are prone to forming cavities that are attractive to nesting wood ducks and hooded mergansers. Mature bottomland forests are also critical for tree-nesting waterbirds like the great blue heron, whose colonies of nests called rookeries can number in the hundreds while towering over rivers and streams. Finally, the closely-coupled forest and aquatic environments found in bottomland forests are important for species who split their time between aquatic foraging sites and terrestrial roosts, like green herons and belted kingfishers.

Using the forest landscape

Birds often perceive and respond to forest conditions at scales much larger than individual property boundaries or forest tracts. The simplest illustration of this behavior is to consider a single tree. In a forested environment, the crotch of that tree may provide an ideal place for an eastern wood-pewee to perch its nest, or a dead branch high in its canopy may serve as the right place for a hairy woodpecker to probe for food. But imagine this one tree is alone, isolated in a city lot, one half mile or more from the nearest other tree. It would be deemed unsuitable by our eastern wood-pewee and hairy woodpecker. Just as the conditions around this single tree determine whether it gets used by forest-dwelling birds, the conditions around any patch of land or forest have strong bearing on what birds may occur there. Some notable forest birds of conservation concern, like pileated woodpeckers, Acadian flycatchers, and scarlet tanagers, demonstrate a behavior known to ecologists as "area sensitivity" where they occur only in large continuous tracts of forest habitat, such as those found along major river corridors. At the opposite end of the area sensitivity gradient we find generalist species like the American robin and northern cardinal, that are just as content to nest in a shelterbelt surrounding a farmstead as they are in a large forest tract along the Mississippi River. Forest birds also use forest landscapes to find different habitat types they need throughout their life. For example, American woodcocks use a wide diversity of habitat types as they complete their breeding cycle in Iowa's forested landscapes. They seek out grassy or shrubby fields in forested landscapes to engage in courtship and eventually build nests. While using these grassy or shrubby areas for nesting, they will often forage in young forests or riparian areas. Soon after their chicks hatch they move off the nest with their

Sometimes the things that make a forested environment most unique or useful to birds do not look like forests at all. Special features within a forest, such as a bluff or "goat" prairie (A), a wetland (B), or a river or stream (C) can have disproportionate impacts on the types of unique birds and other wildlife that use a forested parcel. Learning to recognize and manage these unique features can be good for birds and provide an enriching special feature to any piece of forested land.

mothers to feed in young forests and seek out evening roosting sites in shrubby or grassy areas nearby. Thus, the woodcock needs many different types of forest habitat to complete its life history. Many other examples of shifting habitat needs within and among seasons are common in forest birds in Iowa and thus the availability or size of diverse forest habitat types will often have a substantial impact on the roster of bird species found in any one place or year.

Forest management for birds

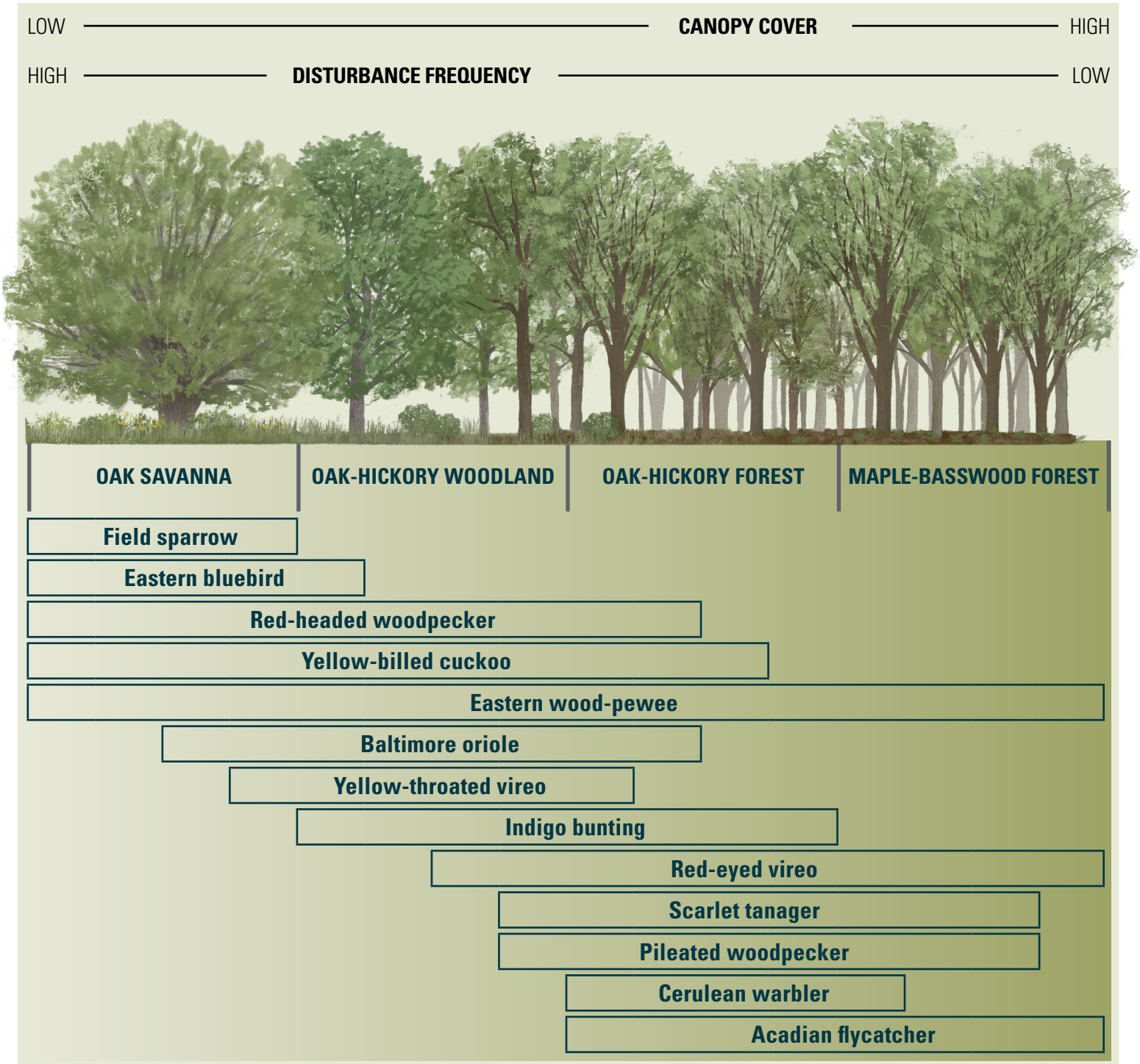
Understanding how birds use forests is critical to understanding how landowners and others with influence over forest lands can manage for birds. In this section we will apply the lessons from bird ecology learned above to practices applied in the forest to make conditions there better for bird life. In establishing the diversity of ways in which birds in Iowa use forests, we hope that it is already clear that for any given forest management practice, it is likely that some species will benefit and some will not. Forest management for any purpose involves a series of tradeoffs, and the case of managing for forest birds is no different. In presenting the range of important management practices that can be used to improve typical Iowa forests for birds, we focus primarily on promoting healthy forest environments that in turn are critical for the health of bird species of conservation concern in Iowa. In the end, though, the right forest management practices for any landowner or land manager should balance tradeoffs with competing interests of forest management for recreation, timber or non-timber forest products, or other land uses, along with long-term impacts of the practice on the health of the land for future beneficiaries.

Manage invasive plants

Exotic invasive plants found commonly in Iowa's woodlands threaten all aspects of bird life and habitat. Because exotic invasive plants have few natural threats from herbivores or disease to control their growth and spread they can take over a site. This takeover reduces native plant diversity, changes vegetation structure, and ultimately changes the abundance and diversity of insect and plant-based food sources for birds in the forest. Research in Midwestern forests have found that changes in bird diets resulting from invasion by exotic species can affect all aspects of bird life, right down to the color of a bird's feathers. Exotic invasive shrubs like bush and Amur honeysuckle or European buckthorn change the phenology, structure, and composition of forest vegetation, with each

Forest edges are a unique feature, combining elements of both forest and open areas. Species associated with early successional habitat and open woodlands, such as brown thrasher, eastern towhee, indigo bunting, and yellow-billed cuckoo, tend to frequent forest edges. Birds primarily found in open areas, such as eastern kingbirds and red-tailed hawks, will often nest in trees at forest edges. Though these species benefit from forest edges, species such as Acadian flycatcher, scarlet tanager, and ovenbird generally avoid forest edges, preferring the forest interior. Edges also expose forest species to "nest parasitism" by brown-headed cowbirds. Cowbirds forage almost exclusively in open areas, and are called nest parasites because they lay eggs in the nests of another bird species, hijacking the other bird's parental instincts and forcing it to raise the cowbird chick instead of its own young. Many species that live in more open areas have lived alongside cowbirds for thousands of years and can recognize cowbird eggs and dispose of them. Interior forest bird species, however, are unable to recognize cowbird eggs and are sometimes unable to produce young in areas with an abundance of cowbirds.

Red-tailed hawk.



A wide diversity of forest types occur in Iowa and breeding birds are adapted to the whole range of conditions. Shown here is a gradient of upland forest types with increasing canopy cover and decreasing disturbance frequency, such as fire, from left to right. Some bird species that use each type of forest for nesting are shown below the gradient. The greatest diversity of forest birds in Iowa occurs in sites with intermediate canopy cover and disturbance frequency found in open oak-hickory woodlands and forests. Bird species diversity is also high in savannas where grassland and forest birds will often overlap. Other types of forests, like riparian forests, early successional young forests, and even forest edges are also unique forest habitat types used by breeding birds in Iowa.

factor having ripple effects among the birds adapted to natural forest environments. Many invasive shrubs are first to leaf-out in the spring, which invites some early nesting birds like northern cardinals to concentrate nests there, making each nest an easy mark for predators seeking out a meal of eggs or young. The dense growth of exotic shrubby plants in the under- and mid-story changes forest structure and robs species like the ovenbird of places to nest or raise their young. Native species of moths and butterflies, whose larval caterpillars are the base of the bird food chain, are less adapted to eat the leaves of exotic species and thus less abundant on exotic plants. Further, exotic plants not only change the structure and composition of the forest for birds present there today, but they also change the way trees of the future generation establish and grow, ensuring an altered ecosystem for years to come.

Some native trees can take on invasive characteristics in the absence of disturbance or management. A prime example of a native tree with invasive potential is the eastern redcedar, which, when allowed to become overabundant, can set the stage for a forested environment that will have less diversity and fewer individuals of Iowa's forest-dependent birds. Altogether, the threat of exotic and invasive trees, shrubs, and even herbaceous plants like garlic mustard is perhaps the most pressing challenge for landowners or managers to address on their forest parcel, regardless of its size. Careful observation of the plant species thriving in a forest is critical to identify invasive species early and often in order to work to remove them following forester-recommended practices to enhance the quality of any forest for forest birds.

Invasive plants like bush honeysuckle and European buckthorn often keep their leaves well into fall, giving them a competitive advantage and changing the structure and function of forest habitats.

Promote diversity in forest plants

A diversity of plant species often attracts a diversity of bird species as they search out plant and insect foods and places to build nests, raise their young, or overwinter. Thus, forest management practices that promote plant diversity are poised to improve forest habitat for many bird species. In general, sunlight is the factor most limiting plant diversity in forested environments, so practices that create more open structure for more sunlight to hit the forest floor are most likely to create the diversity of forest microhabitats needed by birds. As we discussed earlier in this article, the greatest diversity of birds found in Iowa's forests tend to occur in forests with intermediate amounts of open canopy structure and dominated by oaks and hickories. These open forest types were once very common in Iowa's landscape and birds evolved special adaptations to take advantage of the plants and animals found there.

However, because of decades of little active management in forests, many of Iowa forests today have closed canopies where little sunlight penetrates to the forest floor and thus few plants produce foods or provide places for birds to thrive. Forest management practices that promote openings in the forest canopy and steward healthy, native plant communities underneath, are poised to increase the quality of a forest for birds. Practices like prescribed fire or even light grazing can create more open forest structure. Selective harvesting practices and targeted removal of trees through timber stand improvement practices can also increase sunlight in the forest and promote plant diversity. In open areas or along forest edges, plantings of a diversity of mast-producing shrubs and trees can improve bird habitat. Similarly, along forest edges where sunlight is more abundant, selective felling of trees high in the canopy can allow for light to penetrate further from the forest edge, "softening the edge" and promoting more woody plant diversity for feeding or nesting among edge-dependent birds like the field sparrow or eastern towhee. At a landscape scale, practices that create a diversity of forest types, ranging from early successional areas to mature, closed-canopy forests, will foster the greatest diversity of birds year-round.

To have the greatest impact on bird diversity and forest types, careful consideration of available forest types in a landscape and coordination with neighbors and public land managers can have the greatest long-term impact on all

birds. Efforts to do just that are underway throughout the state, such as the Iowa Department of Natural Resource's work with Bird Conservation Areas in strategic landscapes of importance to forest birds, such as those in southern and northeastern Iowa. Private landowners can make a big difference by coordinating efforts to maximize the diversity and ultimately the quality of a forested landscape for birds.

Reduce forest fragmentation

Forest habitat fragmentation occurs when many small patches of suitable habitat are separated by inhospitable areas, like human dwellings, crop fields, or even grasslands. For forest birds, habitat fragmentation can reduce the total area of forest available in any one patch and thus limit quality for area sensitive species like pileated woodpeckers, Acadian flycatchers, ovenbird, scarlet tanagers, and red-shouldered hawks. Forest fragmentation can also degrade the quality of a forest patch even for birds that do not demonstrate area sensitivity by, for example, increasing risk of invasion of exotic plants or by increasing the chances nests are parasitized by brown-headed cowbirds that lay their eggs in the nests of other species, commonly on forest edges. Fragmentation can also limit movement between suitable habitats by species that are less mobile, such as wild turkeys and ruffed grouse. Therefore, practices that try to promote forest patch size, or those that try to connect adjacent forest fragments with trees or early successional corridors can improve habitat quality and promote a greater diversity of birds. In some landscapes, there may be a tradeoff between practices that promote forest connectivity and those that create a diversity of habitat patches, like those provided by early successional areas. In these landscapes, landowners and managers can create early successional areas along forest edges or by creating small (0.1-0.5 acres) canopy openings within forest patches that are over 20 acres in size while minimizing the negative effects of forest fragmentation.

Manage for future forests

A popular saying goes, "the best time to plant a tree is 30 years ago; the second-best time is today." This principle applies to many aspects of forest bird management and conservation in Iowa. Improving forest conditions for birds is rarely something that occurs overnight, or even over the course of a single year. Indeed, many forest management practices taken today will have bearing on birds and the people that enjoy them far into the future. The simplest way to create forest habitat for the future is to plant new forests in places that today are unforested. Anywhere suitable soil and moisture conditions for forests are found, such as riparian areas along rivers and streams, odd areas

Forest birds of conservation concern. Many of Iowa's forest birds are quite common, seen in near equal proportions in rural woodlands, wooded city neighborhoods, and natural areas. These birds, like the American robin, northern cardinal, downy woodpecker, black-capped chickadee, gray catbird, and blue jay are thriving in Iowa's forests despite their many changes and challenges. However, a cadre of forest birds less adaptable to the changes in Iowa's forests are less abundant and designated as Species of Greatest Conservation Need. Some species of conservation need are quite rare in Iowa, either because of their restricted distribution in the state or because of their narrow habitat preferences. The cerulean warbler is an example of a rare bird found only in a small part of eastern Iowa, where its range barely crosses the Mississippi River before extending east to the Appalachian mountains. The black-billed cuckoo could conceivably be found state-wide, but their narrow habitat preferences and overall low abundance make them a rare sight in brushy hedgerows near forest and water across the state. More common species of conservation need include the eastern wood-pewee, yellow-billed Cuckoo, Acadian flycatcher, red-headed woodpecker, northern flicker, wood thrush and Baltimore oriole. A sighting of any of these birds is a welcome one and a sign that the right specialized forest habitats they need are in place.

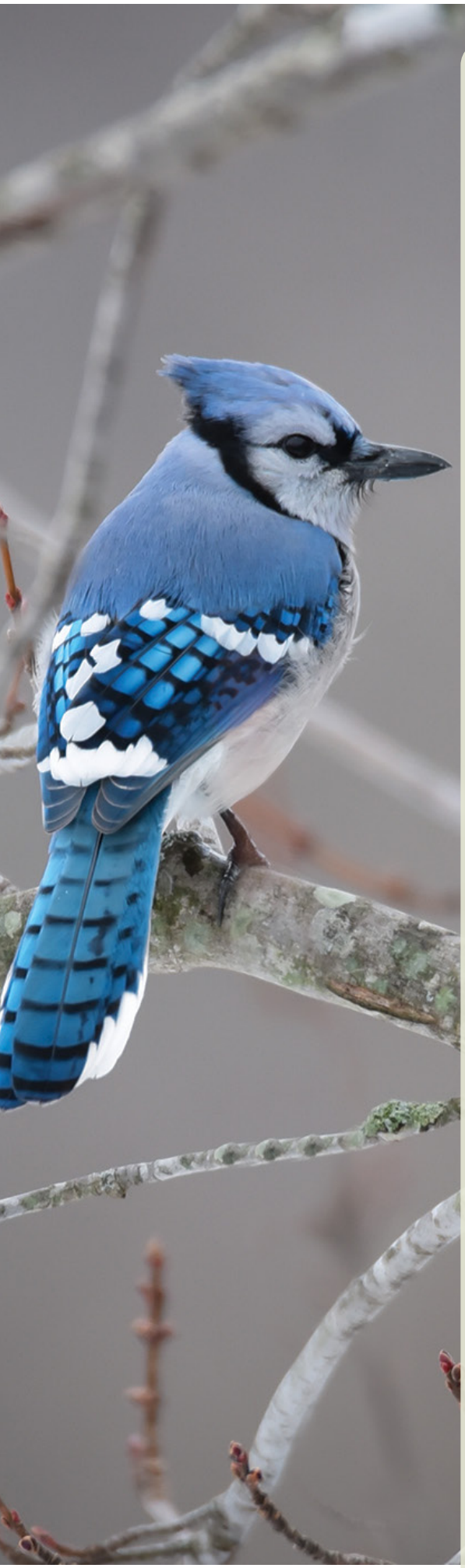
Barred owl in an oak-hickory forest.

on hillsides, retired pastures, or even city lots, could make an ideal place for the bird-friendly forests of the future. Active management within existing forest patches are also critical to creating future bird habitat. In forests, some practices, namely those promoting increased sunlight to the forest floor or removal of invasive species, can have shorter-term more noticeable impacts by promoting growth or regeneration of soft mast producing plants. Others, such as those intended to promote regeneration of oak through selective harvest or long-term prescribed fire regimes, may take decades to see impacts. Careful planning today with the support and knowledge of professional foresters and wildlife biologists can ensure forests are healthy and functioning for birds for many years.

Promoting oak and hickory regeneration in forests is critical for bird conservation in Iowa. These mid-successional, shade intolerant species need active management to remain common in Iowa forests. Forest management and harvest practices, such as shelterwood harvests that take up to 50% of trees and leave remaining trees to seed, or targeted, single-tree or group selection can strike a balance between today's mature forest-dependent birds and those of the future. Research in Ohio found that short-term responses to shelterwood harvests were complex, with some bird species benefiting immediately and others declining. In the long-term, however, practices that promote oak regeneration are most likely to benefit forest birds. These complex responses of birds to forest management reiterate the tradeoffs in any forest management practice for birds and bird habitat, but can be considered carefully against a range of alternatives in evaluating best practices for forest management to meet landowner or manager goals for the forest today and well into the future.

When playing the long game in bird conservation and forest stewardship in Iowa, a sequence of bird communities may emerge and thrive and then be replaced by a different community on the site. This process, repeated across a landscape by engaged forest landowners for many years, will improve the suitability of Iowa's landscapes for forest birds and ensure a rich diversity of bird habitats and bird populations for generations to come. In this way, each forest landowner or manager has a small role to play to promote diverse and healthy forests for today, tomorrow, and future generations of Iowa's birds and the Iowans who value them to enjoy.

Healthy forests, like this western Iowa open oak woodland, are good for birds and people.



Putting forest management for birds into practice

If you are lucky enough to own or have influence over a forest parcel of any size, there are a number of considerations to make in approaching the management of a forest to help birds, and help meet your own goals for the site. As is the case for any long-term investment or decision, intentional planning should be central to your approach to forest management. Such a plan should include an assessment of the conditions of the site at the start of the plan, an assessment of what is feasible on the property, and an accounting of your own goals and wishes for the land and the wildlife.

In assessing the suitability of the site, consider these questions:

- *What are the current forest types found there and how are birds using them?*
- *Are there any unique species of conservation concern using the site that deserve special attention and management?*
- *What invasive species exist on the site and how severe are the invasions?*
- *What unique features, like wetlands, bluff prairies, canopy openings, or streams on the site are in need of protection or enhancement?*
- *What type of forest habitat is found on neighboring properties that could influence birds on your site?*

Next, consider a number of factors that affect the feasibility of any one management goal or intended outcome for the management of your forested site. In conducting this feasibility assessment, consider these questions:

- *What sort of management practices are feasible for your site given its location, size, soils, and topography?*
- *What financial and time resources are available to conduct the work, including personal time, contractor availability, or cost-share programs?*
- *What time horizon do you have control over the land and can you work to achieve your goals in that time?*
- *What types of birds are found in your part of the state and may be likely to respond to management practices?*

Finally, after critically assessing your site and situation, it is time to develop management objectives and goals for your forest. In devising these goals, consider these questions:

- *What goals do you have for bird habitat types or species to use the land?*
- *What non-bird habitat goals or objectives do you have for the land, such as production of timber or non-timber forest products or recreation? How can you balance competing objectives for these uses?*
- *What timelines are feasible for achieving each individual goal?*
- *How can you work with your neighbors to achieve your goals together?*

In each step along the way, professional help and guidance provided by a wildlife biologist or consulting forester can help inform your decisions and options. Together, with the help of friends, family, neighbors, and professionals, you can put into action a plan to improve forested areas of any size for your own enjoyment, for the health of Iowa's land and wildlife, and for the future beneficiaries of the land and wildlife found there. Each action on the land leaves a legacy, with impacts to be enjoyed and learned from today and well into the future.

Additional references

- **Iowa State University Extension and Outreach – Forestry and wildlife resources**
  naturalresources.extension.iastate.edu
  Find more resources on wildlife habitat and forest management in Iowa as well as contact information for professional foresters and wildlife biologists

- **The Cornell Lab of Ornithology**
  www.birds.cornell.edu/AllAboutBirds
  Resources for learning about North American birds and to find articles about feeding strategies for birds and landscaping to attract birds. Also download their free bird identification app, called Merline Bird ID.

- **Birds in Iowa**
  The 1996 volume by Kent and Dinsmore is the definitive resource on the distribution and migration patterns of birds seen in Iowa based on historical records and experiences of the authors.

- **Birds Friendly Iowa**
  https://birdfriendlyiowa.org/Resources/Landscaping.aspx
  Find online resources that list native plants and bird species that use them, searchable by plant species or by bird species.

Acknowledgments

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