

The State of New Hampshire's **BIRDS** A Conservation Guide



2020

The current status of
New Hampshire's birds,
the challenges they face,
and the actions we can
take to help them.



The State of New Hampshire's Birds – A Conservation Guide 2020

The current status of New Hampshire's birds,
the challenges they face, and the actions we can take to help them.

Written by
Pamela D. Hunt

Acknowledgements

A special thank you to those who reviewed this publication for clarity, usability, readability, and general applicability: Rebecca Suomala, Dyanna Smith, Susan MacLeod, and Haley Andreozzi. We very much appreciate the many photographers who allowed us to use their work throughout the publication.

We are grateful to the Biber Foundation, the Sally Sanderson Cutler Wildlife Conservation Fund, Clara Butler, and Robert S. and Peg Ridgely for their financial support of this publication. The NH Fish and Game Department provided funding for the initial compilation of data, habitats, threats, and conservation actions. This funding was through a State Wildlife Grants contract in cooperation with the US Fish and Wildlife Service's Wildlife and Sport Fish Restoration Program.

This guide is also available on the web at www.nhaudubon.org

The State of New Hampshire's Birds – A Conservation Guide should be cited as follows:
Hunt, P.D. 2020. *The State of New Hampshire's Birds – a Conservation Guide*. New Hampshire Audubon, Concord, NH.

This publication is a revision of the 2011 edition by Pamela D. Hunt, Margaret B. Watkins and Rebecca W. Suomala, funded by the Biber Foundation and the Butler Foundation.

Printed in New Hampshire using soy-based inks on recycled paper with
30% post-consumer waste and manufactured using renewable biogas energy.



Copyright © November 2020 New Hampshire Audubon
No part of this publication may be reproduced in any way without
the written permission of New Hampshire Audubon.

Front Cover: The diminutive Winter Wren can be found statewide. It nests from treeline to the coastal plain, and while rare as a breeder in the southeast, it is increasingly common as a winter **resident**. Photo by Susan Wrisley.

Back Cover: The “Twitchers in the Rye” birding team at sunrise on the Superbowl of Birding. Photo by Pam Hunt.

Publication design and production by Dyanna Smith.



New Hampshire Audubon – protecting New Hampshire's natural environment for wildlife and for people.

The Society provides educational programs for children and adults, protects wildlife habitat, conducts conservation research and monitoring, and is a voice for sound environmental policy.

84 Silk Farm Rd. • Concord, NH 03301 • (603) 224-9909 • www.nhaudubon.org

The State of New Hampshire's BIRDS

A Conservation Guide

Written by Pamela D. Hunt

CONTENTS

Introduction to the New Edition.....	2
A Bird Population Primer	3
Why Pay Attention to Birds	3
Some Bird Basics	3
Knowledge is Power	4
How Are Our Birds Doing?	5
Overview of Current Trends	5
Interpreting the Graphs.....	6
Findings and Recommendations by Breeding Habitat	7
Spruce-Fir Forest.....	8
Hardwood-Mixed Forest	10
Shrublands	12
Grasslands.....	14
Coastal Habitats.....	16
Lakes and Rivers.....	18
Marsh and Shrub Wetlands	20
Developed Areas.....	22
Rocky and Alpine	24
Findings and Recommendations by Species Groups	25
Waterfowl	26
Birds of Prey	27
Shorebirds	28
Aerial Insectivores	30
Ocean Birds	32
Threats to New Hampshire's Birds	33
Habitat Loss and Degradation	33
Threats During Migration and Winter	33
Disturbances	34
Human-Related Mortality	34
Pollution.....	35
Climate Change.....	36
Birds in Migration and Winter	39
What You Can Do to Help Conserve New Hampshire's Birds	43
As an Individual.....	44
As the Owner or Manager for Forest Land, Farmland, or a Wetland Habitat	46
As a Community Official.....	46
As a Business Owner/Leader.....	47
Resources for More Information	48
Appendix: Species and Habitat Data Reference Tables	51
Breeding species	52
Non-breeding species.....	54
Glossary	55
Words in bold are defined in the Glossary	
A Note on Data Sources	56



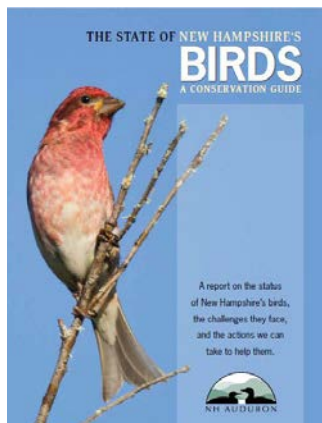
PAM HUNT

Population trends are often unknown for many secretive marsh birds like this American Bittern.

Introduction to the New Edition

Almost a decade has passed since New Hampshire Audubon first released *The State of New Hampshire's Birds: A Conservation Guide* in 2011 (hereafter *Conservation Guide*). In that publication, we summarized population trend and threat data for all the species that breed in the state and presented actions that people could undertake to help with bird conservation. The original *Conservation Guide* is now out of print, and a lot has changed in ten years so it was time to update the publication and add new material.

Trends, threats, and conservation actions still form the core of this revised *Conservation Guide*. A key impetus for an overhaul was the 2015 revision of the *New Hampshire Wildlife Action Plan (WAP)*, by NH Fish and Game and its partners. The new **WAP** provides a solid framework on threats and actions that can be tailored more specifically toward birds, and has informed much of this document. In addition, the most recent analysis of Breeding Bird Survey data now covers the first 50 years (1966-2015) of this critical program, and additional data from other sources allow us to determine population trends for more birds than ever before. We have expanded the threats section to include more detailed coverage of climate change and direct mortality, and added information for common New Hampshire species that do not breed in the state.



This revision also comes on the heels of the 100th anniversary of the Migratory Bird Treaty Act (MBTA). Originally passed in 1918, this was the first law to recognize the importance of protecting birds across their full annual cycle, and thus a milestone in the realm of international conservation agreements. It paved the way for other significant accomplishments of the 20th Century, including the Duck Stamp, expansion of the MBTA to additional countries, the birth of partnerships and

monitoring programs, and the Endangered Species Act in 1973.

But it's sobering to realize that, despite a century of conservation, birds are arguably just as threatened today as they were in 1918. A study published in the prestigious journal *Science* in 2019 reported that North America has lost roughly three billion birds

since 1970 – over a quarter of its **avifauna**. Some dangers, such as widespread commercial slaughter and indiscriminate pollution, have largely been eliminated in the US, but these have been replaced by rapid loss or degradation of natural habitats, a host of new causes of mortality such as cats and windows, and the specter of climate change. We lack historical data on bird population trends, but the growth of citizen science and applied research since the 1960s have provided us with a wealth of information with which to assess the state of

our birds and devise solutions to their plight.

In the spirit of the Migratory Bird Treaty Act, and the host of broad conservation partnerships that have appeared in recent decades, NH Audubon is proud to present a new and improved *The State of New Hampshire's Birds: A Conservation Guide*. We hope it informs your thinking and actions with regard to conserving some of the roughly 300 species that call New Hampshire home at some point during the year.

A handwritten signature in black ink, appearing to read 'Pam Hunt'.

Pamela Hunt, PhD
Senior Conservation Biologist
NH Audubon



Author Pam Hunt, birding at Ponemah Bog Wildlife Sanctuary in Amherst, NH.

A Bird Population Primer

Why Pay Attention to Birds?

We can see wild birds virtually everywhere in New Hampshire. They are a familiar, highly visible part of our urban, suburban, rural, and wilderness landscapes. They are also an integral part of our ecosystem. Birds can tell us about our environment, and what the birds are telling us may be important, not only to their survival but to ours. How New Hampshire's birds are faring reflects on our stewardship of the earth and our impacts on it, both positive and negative.

More specifically, birds offer us potentially life-saving information about the environment we share with them. We learned, for example, from canaries in coal mines when deadly gases were life-threatening and from thin shelled eagles' eggs the extent to which DDT permeated our environment. Birds help keep insect populations under control, safeguarding agricultural crops and forests, and even us. The habitats birds rely on – forests, wetlands, lakes, and fields – provide us essential services by filtering pollutants, helping to control climate change, containing flood waters, providing water supplies, food, and wood products. Plus, people like birds. We like protecting them, watching them, feeding them, hearing them, and we anticipate their return in the spring and their fall exodus. For many of us, birds bring joy. And for many people, the fate of birds and other life forms on earth is a responsibility that we humans are uniquely qualified to assume.

Some Bird Basics

Bird Populations Fluctuate in Nature

Bird populations are constantly changing, with natural upward and downward swings. An extraordinarily cold spring may result in more baby birds dying of starvation. An unusual abundance of caterpillars will benefit the birds that eat them. A year of high maple and beech seed production provides rich food supplies for chipmunks and squirrels, swelling rodent populations. This provides food for hawks and owls, but the following spring these rodents seek food themselves, including the eggs of birds. Weather, food supplies, and predator populations on the breeding grounds regularly affect wild bird numbers.

As distinguished from these short term natural fluctuations, *population trends* reflect more general increases or decreases in populations over time. The longer time periods captured in trends tend to minimize yearly ups and downs and focus on the bigger picture. A decreasing population over the long term is of concern, since it is less likely to be part of a normal pattern, and more likely to be a threat to that species.

Habitat is Key to Breeding Success

Approximately 80 percent of our state is forested, and these forests support about half of our breeding bird species, providing a relatively safe, productive environment for raising young. Yet not all forests offer equally good habitat. From the perspective of supporting and sustaining



PAMI HUNT

wild forest birds, many of our forests are already compromised. Roads, houses, office complexes, athletic fields, and other alterations interrupt the tree canopy, creating smaller patches of forest. Such forest **fragmentation** can in turn affect the availability of food, access to shelter, and freedom from predators and **brood parasites** such as cowbirds. Birds breeding in these small forest fragments are often less successful and produce fewer young. Many birds will persist, but ultimately, their populations will not be self-sustaining and one day we will notice a favorite forest bird has disappeared from our backyard.

With so much forest in New Hampshire, our forest-breeding birds are usually considered common, so why should we be concerned about them? New Hampshire is in the heart of a large forested landscape extending from New York and western Massachusetts to the Maritime Provinces of Canada. Here is found some of the best quality breeding habitat for forest songbirds. New Hampshire's unfragmented forests provide "source" habitats that produce more young birds than small fragments of forested habitat. These birds in turn can disperse into other, less ideal habitat throughout their ranges. Without New Hampshire's forests, certain forest-dependent species may disappear from backyards in other states, not just in ours.

Just as bird populations rise and fall, so does the composition of the New Hampshire landscape: nothing in nature is static. Trees grow in abandoned fields. Beavers build dams that flood forests, creating wetlands. One habitat type succeeds another. Introduce people into the mix, and the picture changes even more dramatically. As a habitat changes, the mix of bird species occupying it also changes. Good habitat for one species isn't necessarily good for another. Here in New Hampshire, finding an appropriate balance between fields, shrublands, and forests will mean managing for certain habitats without compromising others.

Migrating Birds Face Additional Challenges

Among our breeding species, about 15 percent are year-round **residents**, including most owls and woodpeckers, crows, ravens, grouse, Wild Turkey, Northern Cardinal, chickadees, and titmice. Most others usually migrate south for the winter. **Short-distance migrants** like Eastern Phoebe,

Hermit Thrush, Yellow-rumped Warbler, and Chipping Sparrow don't travel very far to reach their winter grounds: typically in the southern United States. **Long-distance migrants** like Wood Thrush, American Redstart, Scarlet Tanager, and Baltimore Oriole make amazing flights each fall to Central and South America or the Caribbean and return again in the spring.

For birds that migrate, conditions on the breeding grounds tell only part of the story. Migrating birds are highly vulnerable, since they cover long distances and encounter many different habitats and challenges along the way. Roughly half the individuals that migrate south never make it back to nesting sites. Obstacles faced by migrating birds include severe weather, collisions with manmade structures, and habitat loss anywhere along their routes. Migrants may also return to their wintering grounds only to find their habitat cleared for agriculture or development. Conservation throughout the full annual cycle of migratory birds is an increasingly recognized need, and in this revision of the *Conservation Guide* we have expanded the section on threats during migration and winter.

It is equally important to recognize that New Hampshire is habitat for migrating birds. Each year hundreds of thousands if not millions of birds representing more than 200 species pass through New Hampshire en route to or from breeding grounds farther north. Sandpipers, plovers, and other shorebirds stop to feed in New Hampshire's coastal marshes each fall, and migratory ducks and geese follow the Merrimack and Connecticut Rivers north each spring. For several northern species, the Granite State is as far south as they ever go. Species such as the Common Redpoll and American Tree Sparrow are familiar visitors to backyard bird feeders,

Snow Buntings flock to snow-covered fields, and our coastal waters host a diversity of arctic-nesting birds like Black Scoters and Red-necked Grebes. Efforts we in New Hampshire take to protect our nesting birds will also help migrating and wintering birds in our state.

Knowledge Is Power

Birds respond to environmental change. Sometimes the changes are obvious: roads and buildings, for example, in what were once forests or fields. Many other changes are much more subtle, like a shift in the timing of insect hatches due to climate change, or the leaching of calcium from the environment as a result of acid rain. Both these changes, and others like them, can profoundly impact bird survival and reproduction.

If we know there is a problem, we understand its source, and we invest the necessary resources, we can bring imperiled birds back. The recovery of Bald Eagles, Peregrine Falcons, and Osprey after DDT and other harmful pesticides were banned in the United States is among the most familiar bird conservation success stories. Intensive predator control actions initiated in 1997 at Seavey and White Islands in the Isles of Shoals have restored Common Terns to the Isles, from which they had disappeared. Today, this colony is once again one of the most significant tern colonies in the Gulf of Maine.

If we don't know there is a problem, or we ignore the trends, or we fail to get to the root of the problem, we are powerless to do anything about it. **This publication summarizes what we do know, and provides information on what you can do to help New Hampshire's birds.**

Migrating herons, egrets, and shorebirds gather in a New Hampshire salt marsh pool to feed in late summer.



PAM HUNT



REBECCA SUOMALA

Populations of the Purple Finch (our state bird) have declined by over 80% since the 1960s.

How Are Our Birds Doing?

Roughly 275 species occur regularly in New Hampshire. Of these, 193 have been documented breeding (or suspected of breeding) since 2000, although more than 20 of these are irregular or limited to only a handful of locations. Another 85 species can be found annually during migration or winter, and many more occur as rare migrants or vagrants. Each breeding and regularly-occurring non-breeding species has been assigned to a trend category. Whenever possible, scores are based on Breeding Bird Survey and other data from New Hampshire (see p. 56), sometimes in comparison to our neighboring states. For rare, hard-to-detect, and non-breeding species it was necessary to look farther afield and/or at less rigorous data sets. Trends were determined for the last 50 years, although more recent and shorter-term trends had priority if they were significantly different.

Overview of Current Trends

The trend categories in this edition have been adapted from Partners in Flight's "Avian Conservation Assessment Database," but modified when local patterns were clearly different from those at the continental level. The categories are as follows:

Strong increase: The population has approximately doubled (or more) over the previous 50 years. This category is reserved for widespread species that are not recent colonists to the state.

Moderate increase: The population has shown consistent increases but of lesser magnitude than a strong increase. This category includes recent colonists (e.g., Sandhill Crane, Least Tern) and species that have recently (e.g., last 10-15 years) increased after long-term declines, suggesting some level of recovery.

Stable: Any increases or decreases are so small as to be within the expected range of variation.

Moderate decrease: The population has shown consistent decreases but of lesser magnitude than a strong decrease. This category includes species that have recently (e.g., last 10-15 years) declined after long-term increases (e.g., Northern Mockingbird), suggesting a change in population trajectory.

Strong decrease: At least 50% of the population has been lost over the previous 50 years.

Unknown: There are not sufficient data to determine a trend. This may be because the species is rare, nocturnal, or occurs in hard-to-survey habitats. Many migratory species that breed in arctic or boreal Canada are in this category, although every effort was made to seek out at least general trend information in these cases.

For most purposes, the six categories above were condensed into the three below:

Stable or Increasing: These species do not appear to be in trouble, although it is often important to continue monitoring their populations.

Declining: These species are in long-term decline, and should be the focus of most conservation activity.

Unknown: Insufficient data are available to fully evaluate the conservation status of these species. Collecting better data on their population trends is a critical first step in prioritizing them for future conservation.

To facilitate comparison with the previous *Conservation Guide*, trends for breeding and non-breeding species are being summarized separately (Figure 1). Note, however, that most breeding species

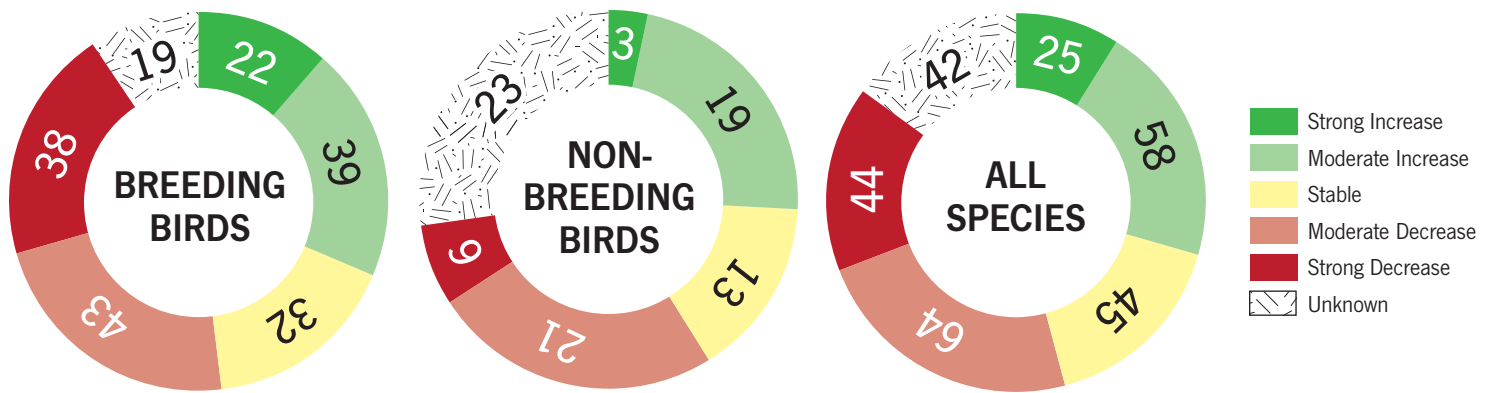


Figure 1. Proportion of New Hampshire's 193 breeding (left) and 85 non-breeding (center) bird species in each of six trend categories. Numbers represent the number of species in each trend category.

are migratory, and in many cases are more common in New Hampshire *outside* their breeding season (e.g., Green-winged Teal, Double-crested Cormorant). So while they are included in the appropriate habitat(s) in the habitat section, these species are far more likely to benefit from New Hampshire conservation initiatives focused on non-breeding habitat and threats.

For breeding species, the data show:

- 93** (48%) have increasing or stable populations (37% in 2011),
- 81** (42%) are in decline (35% in 2011), with 38 of those in strong decline, and
- 19** (10%) have unknown population trends (28% in 2011). Most species in this category inhabit hard-to-survey habitats (e.g., wetlands, offshore islands, and boreal forests) or are hard to detect using typical survey methodologies.

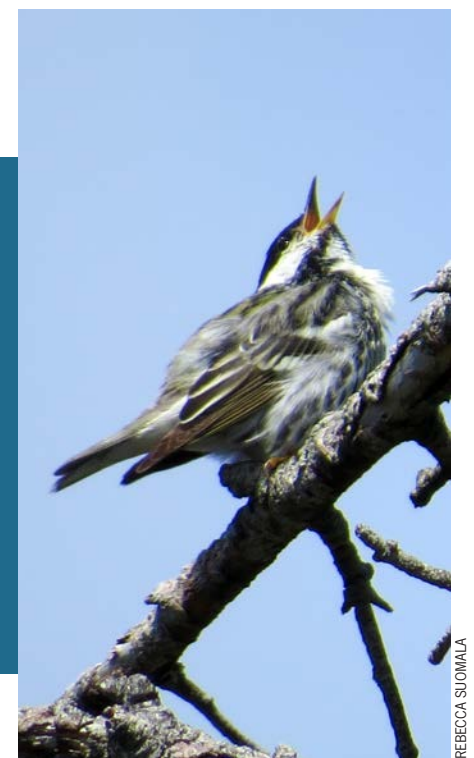
The differences from the 2011 *Conservation Guide* are primarily due to more data being available for species previously placed in the uncertain/unknown category. This has resulted in more than half of those species being reassigned to increasing/stable or decreasing.

For non-breeding species, the data show:

- 35** (41%) have increasing or stable populations,
- 27** (32%) are in decline, with six of those in strong decline, and
- 23** (27%) have unknown population trends. Most species in this category breed in northern Canada where fewer data are available. Many are also hard to survey because they occur in remote or inaccessible habitats including boreal forests and wetlands, tundra, or the open ocean.

Similar Species May Experience Similar Threats

Broad trends across all bird species, however, are rarely useful for guiding conservation. Closely related species, or those with similar habitats, food supplies, or migratory behaviors, are far more likely to respond to the same environmental factors. If a majority of birds in one of these categories is declining, it may be an indication that the same threat is affecting all of them in that category. This in turn, can stimulate research, more intensive monitoring, or implementation of actions designed to mitigate the threat.



REBECCA SIOMALA

Interpreting the Graphs

In the summaries that follow, trend information is presented in two ways. For most of them, there is a donut chart similar to that in Figure 1, but only showing the trends for that species grouping. The number of species included in each donut chart is indicated inside the chart. For a list of the State's breeding and regular non-breeding species, plus their habitat associations, see the table in the Appendix. In addition to the donut charts, there are often graphs showing population trends for representative species over the last 50 years. Unless otherwise stated, these graphs are based on Breeding Bird Survey (BBS) data for New Hampshire, and the lines represent an index of abundance over time.

Blackpoll Warbler singing on Cannon Mountain. This species is one of many declining long-distance migrants in New Hampshire.

Findings and Recommendations by Breeding Habitat

Many threats faced by birds are tied to the habitats where they breed, ranging from direct loss to management techniques to **invasive species**. To better understand the factors influencing populations, all species were assigned to the nine habitat categories presented on the following pages (see Figure 2). For each habitat there is a description of its characteristics, population trends among species that breed in the habitat, habitat threats,

conservation actions, and data needs. Only breeding species are considered in this section, and a given species may occur in more than one habitat (for example, Purple Finch is in the spruce-fir forest group and also the hardwood-mixed forest). Habitat is important during the non-breeding season as well, and the same breeding season threats are often likely to apply during migration and winter. Non-breeding species were not included in the habitat

analyses which follow, but their habitat is listed in the table in the Appendix (p. 54). Habitats were based on those used in the *New Hampshire Wildlife Action Plan (WAP)*, prepared by the NH Fish and Game Department in collaboration with conservation partners.

The numbers of increasing/stable and decreasing breeding species are roughly the same when all species are grouped together (Figure 1). This is not necessarily the case when species are grouped into habitats (Figure 2). For example, nearly all species dependent on shrubland and grassland habitats have declined. As New Hampshire's land use has shifted away from rural agricultural, the associated field and farmland habitats are disappearing. Today, these formerly common habitats often occur only when landowners manage their land specifically for wildlife dependent on early successional habitats. In contrast, birds in most other habitats are either doing well (e.g., lakes and rivers, hardwood/mixed forest) or more equally divided between increasing and decreasing species. In spruce-fir forests and wetlands, there are still significant numbers of species with unknown trends, marking these habitats as priorities for future work. Note also that while the prognosis for a habitat as a whole may be reassuring, there may still be species in serious trouble, or threats that pose a significant risk into the future. More detail on such issues is presented in the habitat and threat narratives that follow.

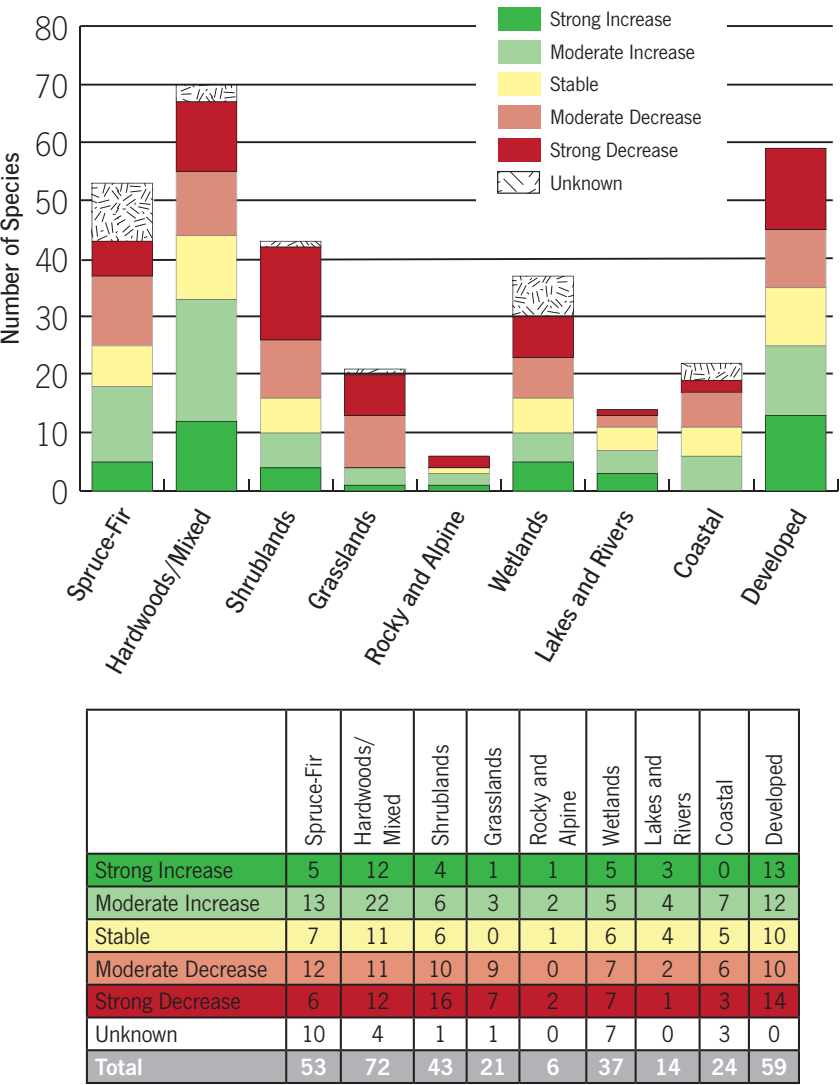


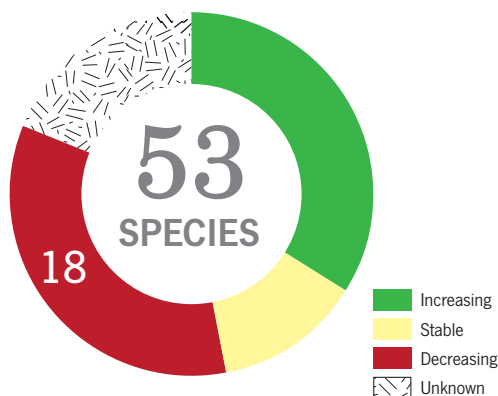
Figure 2. Comparison of bird population trends among nine New Hampshire habitats (breeding species only). Note that a species may occur in more than one habitat, as shown in the Appendix. Numbers in the table indicate the number of species in each trend category.

SPRUCE-FIR FOREST



PAM HUNT

Lowland spruce-fir forest edging a wetland in Bethlehem, NH.



Species of Greatest Conservation Need

Spruce Grouse
Northern Goshawk
American Three-toed Woodpecker
Olive-sided Flycatcher
Bicknell's Thrush
Purple Finch
Rusty Blackbird
Cape May Warbler
Bay-breasted Warbler
Canada Warbler

Other Representative Species

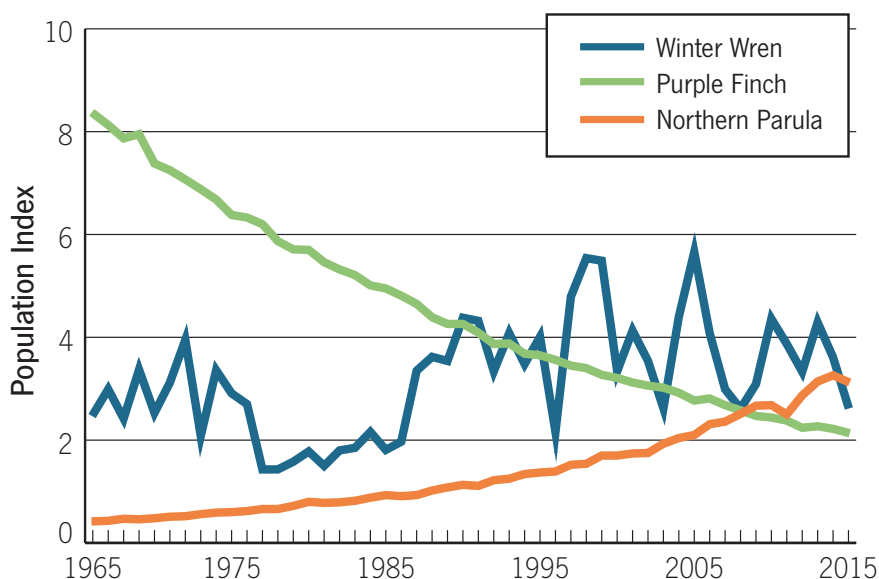
Yellow-bellied Flycatcher
Canada Jay
Boreal Chickadee
Golden-crowned Kinglet
White-winged Crossbill
Dark-eyed Junco
Blackpoll Warbler

Spruce and fir dominate the vast boreal forest zone that stretches from the Canadian Maritime provinces and northern New England west across Canada to the Rocky Mountains and beyond to Alaska. In New Hampshire, most spruce-fir forests are restricted to the north and west, with isolated pockets in highlands and peatlands in the southeastern third of the state. Spruce-fir forest includes four habitats from the **WAP**: lowland spruce-fir, high-elevation spruce-fir, northern swamp, and some peatlands. Roughly half the birds using this habitat in New Hampshire are spruce-fir obligates, meaning that they occur only in spruce-fir forests.



BOB BASILE

The Cape May Warbler is one of three warbler species that specialize on spruce budworm outbreaks.



Current Trends

Of the 53 species that breed in spruce-fir forests, roughly one third are declining. These include a mix of wetland and **edge** species, such as Olive-sided Flycatcher, Rusty Blackbird, and White-throated Sparrow, and forest species, such as Boreal Chickadee, Bay-breasted Warbler, and Purple Finch. The birds that are increasing or stable are primarily mature forest species such as Yellow-bellied Sapsucker, Yellow-bellied Flycatcher, and Northern Parula. Trends are still unknown for many birds in this habitat, including secretive year-round **residents** (Spruce Grouse, Black-backed Woodpecker) and irruptive species such as crossbills which can be present in high numbers one year and absent the next.

Primary Threats

Timber harvesting practices

Clear cuts in spruce-fir forests often produce hardwood stands that are less suitable or unsuitable for spruce-fir birds. Shorter rotations between harvests reduce the amount of older, mature forest that some species require, including birds that depend on periodic outbreaks of insect pests such as bark beetles and spruce budworm, which build up only in mature forests or extensive forested landscapes.

Invasive insects

Although our forests and birds have evolved alongside pests such as the spruce budworm, trees often have no defenses against non-native species such as the balsam wooly adelgid (an aphid relative).

As these insects spread there is risk of high tree mortality, with unknown trickle-down effects on the birds that use these habitats.

Climate change

Climate change has special implications for this boreal habitat, which could be restricted to smaller and smaller areas in New Hampshire as a warming climate makes growing conditions less ideal in southerly and lower elevation areas. For more detail see the Threats To New Hampshire's Birds section on this pervasive threat.

Acid deposition

New Hampshire's high elevation spruce-fir forests are particularly susceptible to **acid deposition**, which has caused high red spruce mortality. Although air quality regulations have significantly reduced this threat, there is evidence that it may be compounded when trees are under additional stress related to climate change.

Conservation Actions

Implement timber harvest practices that ensure a variety of different-aged stands with trees of various sizes and density, including mature spruce-fir forests. We are fortunate to have large protected areas in the White Mountain National Forest and Coos County that can function as reserves, where careful management and natural processes can maintain appropriate habitat conditions for this group of birds.

Data Needs

Many spruce-fir forest birds are secretive, rare, or in hard to reach areas. We need more information on where they

occur and in what numbers to better determine which additional species should be conservation priorities. There are opportunities for citizen-scientists like you to help fill in the information gaps. See the What You Can Do section for more information.



REBECCA SIOMALA



DONNA ELLIS



STEPHEN MIRICK

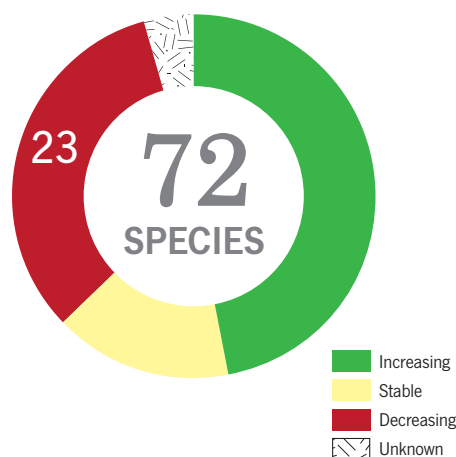
Boreal Chickadees (left), Canada Jays (above), and Spruce Grouse (top) are all northern species which barely enter New Hampshire in Coos County and the White Mountains. There are limited data on their population trends, but the chickadee appears to be declining in parts of the Northeast.

HARDWOOD-MIXED FORESTS



PAM HUNT

View of hardwood and mixed forest habitat from Pitcher Mountain in Stoddard, NH.



Species of Greatest Conservation Need

Ruffed Grouse	Veery
Chimney Swift	Wood Thrush
American Woodcock	Purple Finch
Northern Goshawk	Cerulean Warbler
Olive-sided Flycatcher	Canada Warbler
Eastern Whip-poor-will	Scarlet Tanager

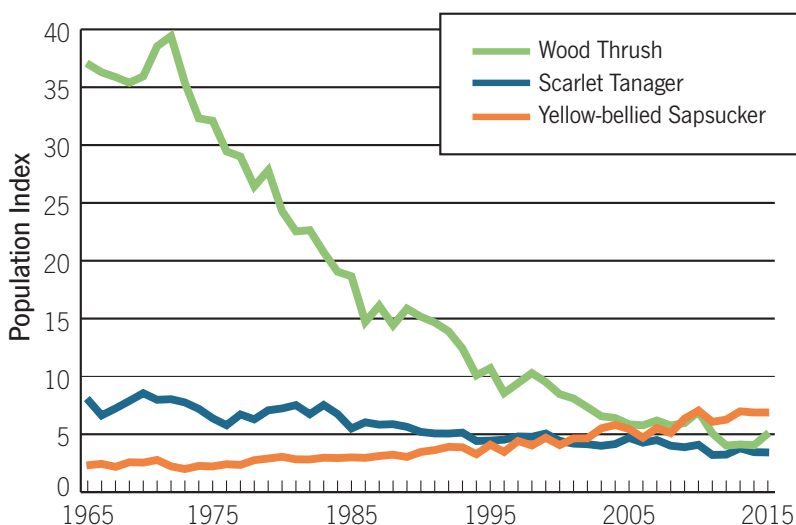
Other Representative Species

Broad-winged Hawk
Barred Owl
Pileated Woodpecker
Red-eyed Vireo
Baltimore Oriole
Ovenbird
Black-throated Blue Warbler
Black-throated Green Warbler
Rose-breasted Grosbeak

This habitat occurs throughout the state and includes a wide variety of forests and tree species, including oaks, pines, hemlock, beech, maple, and birch. It includes four forest types from the **WAP**: hemlock-hardwood-pine, Appalachian oak-pine, northern hardwoods-conifer, and floodplain forest. Embedded within these are small areas of swamp that also support forest birds. Many of the species that use hardwood-mixed forests are generalists that also occur in spruce-fir forests and developed areas.

Current Trends

Hardwood-mixed forests support the largest number of breeding species in New Hampshire. The good news is that two-thirds of the bird species in this habitat are either stable or increasing. Most of these are familiar year-round **residents** or short distance migrants, including species such as Wild Turkey, Downy Woodpecker, American Robin, and Chipping Sparrow. Declining species comprise a third of the total habitat group, and



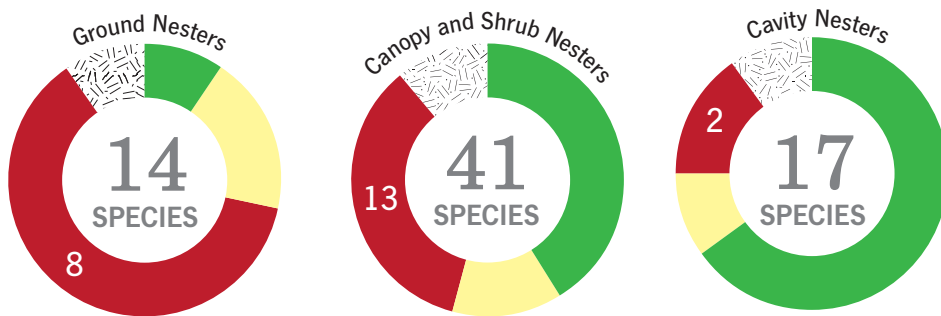


Figure 3. Species population trends in three forest bird nesting categories: those that nest on or near the ground, those that nest in shrubs and tree branches, and those that nest primarily in tree cavities.

include several **long-distance migrants** like Wood Thrush, American Redstart, Scarlet Tanager, and Baltimore Oriole. Many of these declining species require unfragmented interior forests, and have likely suffered from increasing development in formerly forested parts of the state. Many forest-interior species also nest on the ground and these are declining more than those species nesting above the ground in cavities or tree branches (Figure 3).

Primary Threats

Development

By far the most significant threat facing this habitat group is development, which causes both direct loss of habitat and habitat **fragmentation**. Fragmentation reduces uninterrupted forest tracts to small and/or isolated patches of forest. It also introduces new threats caused by proximity to people and developed areas. Among these risks are predation by cats, raccoons, skunks, and squirrels, reduced reproductive success due to **brood parasites** like the Brown-headed Cowbird, fatalities from encounters with windows, and exposure to herbicides and pesticides.

Invasive species

Invasive insects pose a significant threat to New Hampshire's forests, whether from host-specific insects like the hemlock woolly adelgid and the emerald ash borer or more generalist species like the Asian longhorn beetle and gypsy moth. These pests have the potential to alter the tree species composition of our forests, with as yet unknown effects on birds. In some settings, **invasive** plants

can displace native species, and many non-native plants support fewer insect species than native ones, thus providing less food for native birds.

Acid deposition

There is increasing evidence that calcium depletion from forest soils, a side effect of **acid deposition**, can result in less calcium available for birds to make eggshells. This has the potential to significantly affect avian reproductive success. This is new research, and more detailed results are not yet available.

Conservation Actions

Focus on preserving unfragmented blocks of forest land: the bigger the better. At the municipal level, this means pursuing regulatory tools for maintaining intact habitats and land conservation opportunities, both within the municipality and between or among municipalities. Efforts to prevent the spread of **invasive species** need to intensify.

Data Needs

The relatively few species in this habitat without good trend data are primarily birds of prey that are poorly sampled by most monitoring programs because they are dispersed and hard to detect. More data are needed on the magnitude of calcium depletion effects of acid rain and the impacts of **invasive species**.

Among our most common forest birds are (from top to bottom) Scarlet Tanager (canopy-nester, declining), Black-throated Blue Warbler (shrub-nester, stable), Canada Warbler (ground-nester, declining), and Pileated Woodpecker (cavity-nester, increasing).



SHANNON LEWIS



LEN MEDLOCK



REBECCA SUOMALA

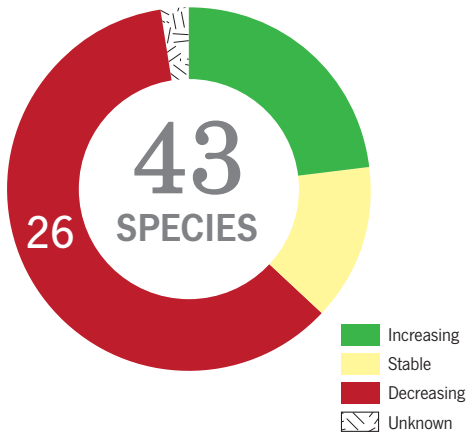


DIRK VAN DER MERWE

SHRUBLANDS

PAM HUNT

Power line rights-of-way are an important type of early successional habitat in New Hampshire.



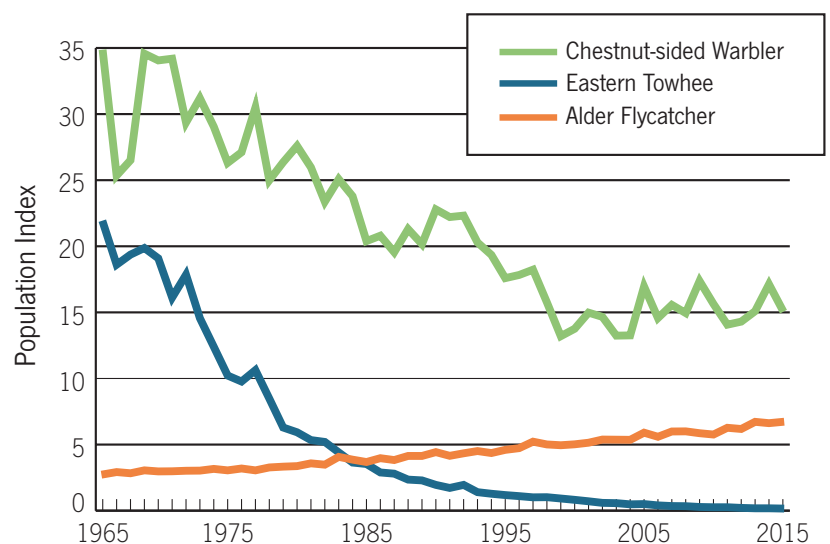
Species of Greatest Conservation Need

Ruffed Grouse
Common Nighthawk
Eastern Whip-poor-will
American Woodcock
Northern Harrier
Brown Thrasher
Eastern Towhee
Field Sparrow
Vesper Sparrow
Golden-winged Warbler
Blue-winged Warbler
Prairie Warbler

Other Representative Species

Willow Flycatcher
Gray Catbird
Chestnut-sided Warbler
Indigo Bunting

Shrublands are habitats dominated by woody shrubs with few or no trees. In New Hampshire, power line rights-of-way, shrubby old fields, **wildlife openings**, old gravel pits, and pine barrens provide shrubland habitat. Shrubland habitats require periodic disturbance (for example: fire, brush-clearing, timber harvest) to prevent them from reverting to forest. **WAP** habitats included here are **anthropogenic** shrublands, pine barrens, and some communities associated with rocky ridges and peatlands. Not included in this habitat category are birds found primarily in regenerating spruce-fir forests (see Spruce-Fir Forest), shrubby wetlands, or **edge** habitats associated with residential or commercial development (see Developed Areas).



Current Trends

Of the forty-three species that breed in New Hampshire shrublands, two thirds are declining. Some of the strongest declines are seen in birds like the Eastern Towhee and Brown Thrasher, which prefer very dense thickets such as in pine barrens. Increasing species are mostly those that often live in close proximity to people, including Ruby-throated Hummingbird, Carolina Wren, and Chipping Sparrow.

Primary Threats

Habitat loss

Most declines among these birds can be attributed to habitat loss. Prior to European settlement, shrublands were relatively rare (except along the coastal plain) and dispersed in New Hampshire, created by the occasional fire, ice or wind storms, beavers, or Native Americans. Widespread clearing for agriculture in the 19th and 20th centuries gave rise to extensive grasslands (see Grasslands) and shrublands, creating more habitat for these early successional birds, and their numbers increased. With the loss of farms, formerly open areas have either been developed or matured into forest, with a resulting decline in shrubland bird populations.



BOB BASILE

Indigo Bunting is one species that readily colonizes recent clear cuts or other areas with high densities of shrubs.

Conservation Actions

Given the extent of New Hampshire's forests and its importance to forest bird populations, it is neither feasible nor desirable to restore shrubland bird populations to their peak levels of the 19th century. Instead, conservation actions should focus on identifying areas where shrubland bird populations are still viable, or where active land management has the potential to maintain or restore such populations. When these sites are identified, they can be managed to limit forest growth.

Data Needs

Further research and monitoring are needed to evaluate different management regimes for maintaining shrubland habitat. Of particular interest is how birds may respond to management for the endangered New England cottontail.



PAW HUNT

Although still common south of the White Mountains, the Eastern Towhee has largely disappeared from northern New Hampshire.

What do we do about early successional species?

Wildlife that rely on shrublands and grasslands are often considered “conservation reliant” species, meaning that without active habitat management they are likely to decline or even disappear from much of their ranges. Historically, many of these species were rare or absent in New Hampshire before European settlement. Grasslands were quite rare, and even those that resulted from beaver or Native American activity were too small to support grassland specialists. Most of the latter colonized the state during the peak land-clearing era in the 1800s, when vast swaths of forest were converted to farmland.

Shrubland birds have always been here, albeit in lower numbers. Many are adapted to small forest disturbances caused by fire, wind, or ice storms, and colonize such openings readily. They probably reached peak abundance in the mid-1900s as abandoned agricultural lands began to revert to forest. Thus the declines we see in towhees, thrashers, and similar species may predate the start of the Breeding Bird Survey in the 1960s, and losses of shrubland habitats have continued unabated.

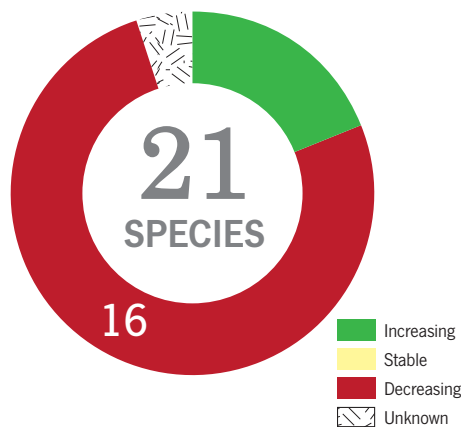
The question often facing conservation biologists is some variant of “how many early successional species are needed” in a particular landscape. To restore towhee or Bobolink populations to 1970 levels might require extensive clearing of now-forested land, which could be harmful to forest birds. Some shrubland and forest birds can coexist, but usually in more complex habitats like pine barrens. Although declining, most shrubland species remain common, and a more feasible strategy may be to stabilize populations rather than trying to restore them to a larger portion of the landscape. For grassland birds, where habitat creation is unlikely, the best we can do is work towards maintaining existing habitats where we can, and be prepared for further declines. From a species perspective, it is more cost effective to conserve these declining species in the Midwest and Great Plains where they remain relatively common.

GRASSLANDS



PAM HUNT

Grassland habitat maintained by mowing at the Concord Airport, NH.



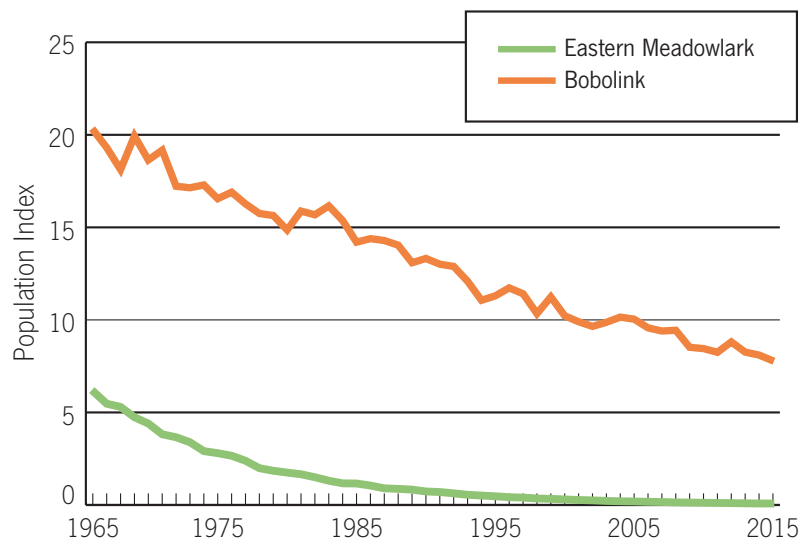
Species of Greatest Conservation Need

Upland Sandpiper
Northern Harrier
American Kestrel
Horned Lark
Cliff Swallow
Vesper Sparrow
Grasshopper Sparrow
Bobolink
Eastern Meadowlark

Other Representative Species

Tree Swallow
Savannah Sparrow
Red-winged Blackbird

Grasslands are typically large agricultural fields (pastures and hayfields), airfields, capped landfills, and reclaimed gravel pits. All grasslands in New Hampshire must be maintained by mowing, grazing, or burning to prevent their reverting to shrublands and, ultimately, to forests. The birds common to this habitat are more typical of extensive grasslands found in the Midwest and Great Plains. They may have colonized New England when forests were converted to farmland in the late 18th and 19th centuries, or – if already present in small numbers – become more abundant as grassland habitat expanded in New England. A few species are included in this category because open fields are their preferred foraging habitat, and as a result they nest in close proximity to grasslands but not actually among the grasses (e.g., American Kestrel, Cliff Swallow).



Current Trends

Populations of most grassland birds are in decline. Only four appear to be increasing, and none of these are specialists in this habitat (e.g., Wild Turkey, Red-tailed Hawk, Eastern Bluebird). Many once common species are now restricted to only a handful of nesting areas in the state (one site for Upland Sandpiper, two or three for Horned Lark).

Primary Threats

Habitat loss

Most declines among these birds can be attributed to habitat loss. Like shrublands, large grasslands were historically rare in northern New England prior to European settlement. As a result, most of the grassland birds that currently occur in New Hampshire are relatively recent colonists, and declines are clearly tied

to the continued loss of this habitat to development, succession, or conversion to less suitable agricultural crops (e.g., corn). Of the grasslands that remain, many are too small to support **area-sensitive** species like Grasshopper Sparrow and Upland Sandpiper, which only nest in large fields and rarely use fields smaller than 30 acres.

Grassland management practices

Nests may be destroyed or young birds killed by equipment when fields are mowed too early in the season, before chicks have fledged. Early mowing also removes the grassy cover around nests, dramatically increasing nestlings' exposure to predators.

Conservation Actions

Given the continued loss of New Hampshire's grasslands, a key conservation strategy is to identify those grasslands that have the greatest potential to support large

populations of multiple species. At such sites, typically large fields (greater than 30 acres), the focus should be a combination of land protection and appropriate management that benefits grassland birds. Even in smaller fields, delayed (after August 1) or partial mowing will benefit local populations of Bobolinks and Savannah Sparrows, and in the process may contribute to regional populations.

Data Needs

As grassland birds become more and more restricted to a smaller number of sites, it is important to monitor these sites periodically to make sure populations are still present. At sites where conservation measures such as delayed mowing have been implemented, we need concrete data on whether these actions have benefited the birds.



ROSALIND RENFREW

Frequent mowing can destroy birds' nests outright or expose them to predators (above). The only nesting area for the state-endangered Upland Sandpiper (below) is the Pease airport. Setting areas aside from disturbance can be of great benefit to ground-nesting grassland birds (inset).



STEPHEN MIRICK,
PAUL HUNT (inset)



LEN MEDLOCK

Eastern Meadowlarks (above) and Bobolinks (below) require different-sized grasslands. The meadowlark's need for larger areas is partially behind its more significant decline.



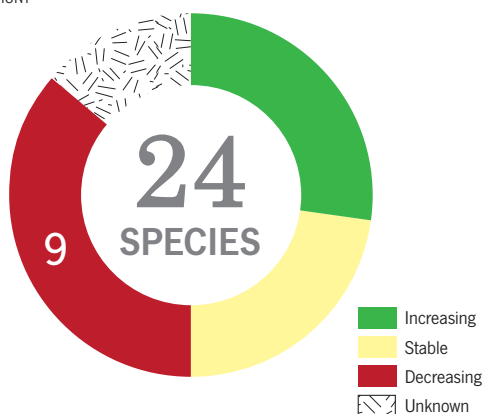
STEPHEN MIRICK

COASTAL HABITATS



PAM HUNT

Mudflats and salt marsh in the Hampton-Seabrook, NH estuary.



Species of Greatest Conservation Need

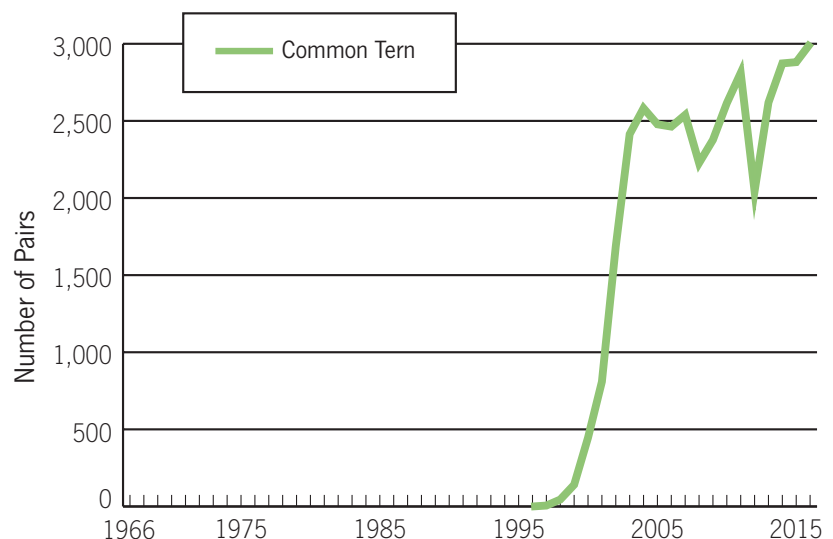
American Black Duck	Salt Marsh
Willet	
Common Tern	
Purple Martin	
Marsh Wren	
Nelson's Sparrow	
Saltmarsh Sparrow	
Piping Plover	Beach and Dune
Least Tern	
Roseate Tern	Coastal Islands
Common Tern	
Arctic Tern	

Coastal habitats are also important for several SGCNs that do not breed in New Hampshire. See *Birds in Migration and Winter* for more detail.

Other Representative Species

Common Eider
Herring Gull
Double-crested Cormorant
Osprey

New Hampshire's coastline may be small, but it contains three habitats found nowhere else in the state: salt marsh, dunes, and coastal islands. Each supports a relatively small number of breeding species. Salt marsh, the most extensive of the three, occurs on the coast and inland along Great Bay, its tributary rivers, and upstream along the Salmon Falls River. It is home to three species of sparrows restricted to salt marshes. The state's tiny remnant dune system is at the Hampton and Seabrook Dunes. This is the only place in New Hampshire where endangered Piping Plovers and Least Terns nest. Offshore islands, particularly the Isles of Shoals, are the primary nesting sites in the state for gulls, terns, and other marine birds.



After a decades-long absence, a concerted effort by NH Audubon and NH Fish and Game succeeded in returning nesting Common Terns to the Isles of Shoals in 1997.

Current Trends

Across these three habitats, roughly half of coastal nesting birds are increasing or stable. The majority of these are the recipients of targeted conservation efforts over the last few decades (e.g., Piping Plover, Common Tern). Declining populations include Tree Swallow and Purple Martin, both aerial insectivores (see p. 30), and the salt marsh specialists Nelson's and Saltmarsh Sparrows.

Primary Threats

Habitat loss and alteration

New Hampshire's dunes and salt marshes have suffered significant loss to buildings, parking lots, roads, and lawns over the years. One estimate is that 12% of the marsh in the Hampton-Seabrook Estuary has been lost since the 1930s, and dunes occupy only 16% of their former extent. Where habitat has not been destroyed, centuries of salt marsh alteration, through ditching, filling, and dam and road construction have degraded habitat quality. Studies in Hampton found that Saltmarsh Sparrows occupy only a tiny portion of available salt marsh, preferring the unaltered areas.

Disturbance

Beach goers and their dogs don't mix well with dune-nesting birds. Interference with incubating birds and the feeding of young causes fewer young birds to survive. Birds of less accessible salt marshes and islands are generally less susceptible to this kind of stress.

Predation

Increased predation by feral cats is a threat to dune-nesting birds, as are skunks, foxes, and other small animals. Predation, especially by gulls, is also an issue for island bird populations.

Changes in food supplies

This threat to coastal birds, especially fish-eating birds such as terns, relates to potential impacts from unsustainable fishing practices, climate change, pollution, or a combination of factors.

Rising sea level

Rising sea level from climate change threatens all the coastal habitats, and the potential for habitat to shift inland is limited by existing development. See the section on climate change for more information.

Pollution

An important threat to Great Bay is excessive nutrient run-off from municipal wastewater treatment facilities. Oil spills from shipping or pipelines also pose a risk to fragile coastal ecosystems, and plastic waste is present on both land and sea.

Conservation Actions

To ensure the continued presence of salt marsh birds in the state, efforts should focus on restoring degraded salt marshes and protecting those that are still intact. At the same time, we need to determine which areas of salt marsh are most likely to remain viable in the wake of projected rises in sea level induced by climate change

and also identify and protect adjacent uplands that may become salt marsh with sea level rise. For dune-nesting species, key conservation actions include public education and restricted use areas to minimize human-bird interactions. Without the restricted use areas in Hampton and Seabrook, the state's population of plovers would disappear within a couple of years. Continued human intervention to discourage predators and maintain nesting habitat also will be needed to maintain the tern colony at the Isles of Shoals.

Data Needs

Although more trend information on salt marsh birds is needed, actions should be taken now to protect what little remaining habitat exists. More information on threats to island nesting populations is needed to identify the best protective actions.



KYLE WILMARTH

The entire global population of Saltmarsh Sparrows occurs from southern Maine to Chesapeake Bay, and it is threatened by habitat loss and sea level rise everywhere it occurs.



SCOTT HERON



LEN MEDLOCK

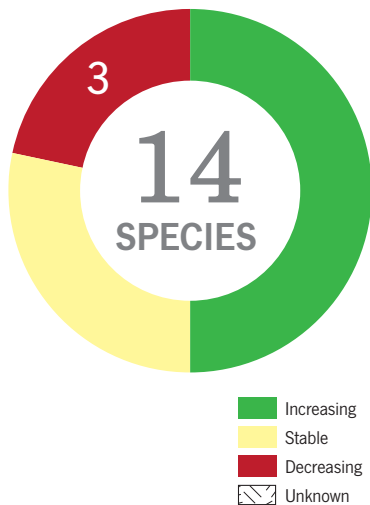
Willetts (left) nest in salt marsh and forage on coastal mudflats. Beach-nesting Least Terns (right) are vulnerable to predation and excessive human disturbance.

LAKES AND RIVERS



PAM HUNT

A look down the Merrimack River in Hooksett, NH.



Unlike other habitats discussed so far, this one is more about proximity to open water than vegetation. The birds included here, in contrast to those associated with the Marsh and Shrub Wetlands habitat, are generally not specific to certain plant communities. Most forage almost exclusively in or near lakes, ponds, rivers, and streams, and as a result usually nest nearby, whether in a bank, on a rocky shore, or in a shoreline tree. They are linked by their dependence on the aquatic habitat, and thus subject to factors that affect our surface waters.



DAVID FORSYTH

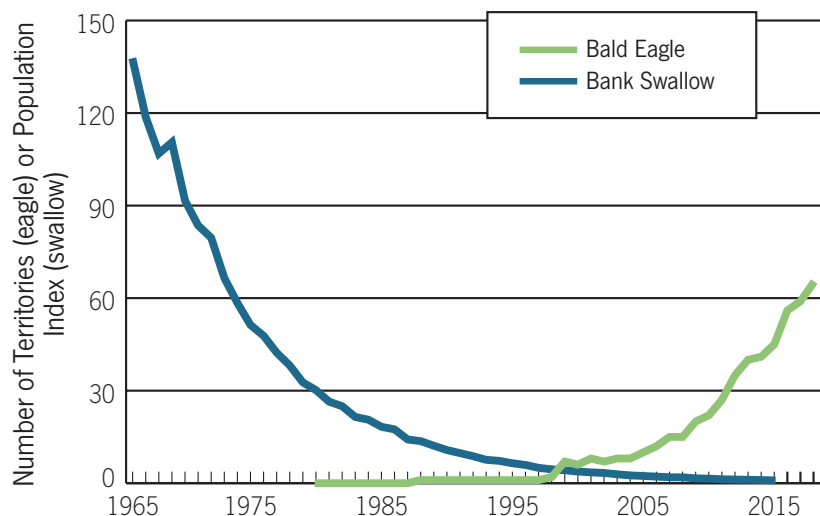
Belted Kingfisher pair fishing in freshwater.

Species of Greatest Conservation Need

Common Loon
Bald Eagle
Bank Swallow

Other Representative Species

Common Merganser
Spotted Sandpiper
Osprey
Belted Kingfisher



Current Trends

Most birds dependent on lakes and rivers are faring well. Proportionally more species in this group are increasing than in any other. In many cases, these increases have resulted directly from targeted conservation efforts. Osprey, Bald Eagle, Common Loon, and Canada Goose populations have all benefited from restoration work throughout their ranges. Only three species are declining, the most significant of which is the Bank Swallow (see Aerial Insectivores, p. 30). The other two species are Spotted Sandpiper and Belted Kingfisher.

Primary Threats

Disturbance at nests

People recreating on lakes and rivers can disturb nesting birds, causing them to abandon their nests: the more disturbance, the more abandoned nests. Predators, such as raccoons, increase in numbers near human development and present a significant threat to nesting birds unless measures are taken to protect nests. When development reaches a certain threshold, some species, including loons and eagles, may move out.

Chemical contaminants

As long-lived top predators in the food chain, birds such as loons and eagles can **bioaccumulate** environmental toxins that get into the water from the land or from the air. Even when they are not lethal to the birds, these toxins can significantly reduce reproductive success. Despite New Hampshire's first in the nation ban on lead sinkers and jigs, lead poisoning from ingestion of lost or discarded fishing tackle remains the primary cause of mortality among New Hampshire's adult loon population. In addition to lead and mercury, potential toxins include PCBs and flame retardants.

Changes in food supply

Some of the contaminants above, plus pesticide run-off from adjacent farms or lawns, have the potential to alter aquatic food webs. There is increasing concern over declines in insect populations,

including in aquatic systems, and species higher on the food chain, including fish, may also be affected.

Altered shorelines

Development along lake and river shorelines can result in increased erosion, or even the loss of nesting trees for species like Bald Eagles. Efforts to reduce flooding by "hardening" river shorelines significantly reduce habitat for bank-nesting species like Belted Kingfisher and Bank Swallow, both of which are declining.

Conservation Actions

Key conservation strategies come down to individual actions, such as protecting nest sites from disturbance and outright destruction. Improved awareness, advocacy, and regulatory changes can all help these species, since we collectively are responsible for the detrimental effects of lead poisoning from lead sinkers, jigs, and shot, for disturbing nesting areas, and for destroying sensitive shoreline habitats.

Leave sandy river banks unchanged for nesting Bank Swallows and kingfishers.

Data Needs

The data on the lethal effects of lead in loons are compelling. We need better data on the potential effects of other toxins on birds that use lakes and rivers.



JANE KOLIAS

This 2019 Bald Eagle pair (above) was the first to breed in Concord since 1880. Common Loons (below, with chicks) have benefitted from protective signage, artificial nesting rafts, and a lead sinker ban.



KEVIN TALBOT



PAW HUNT, STEPHEN MIRICK (inset)

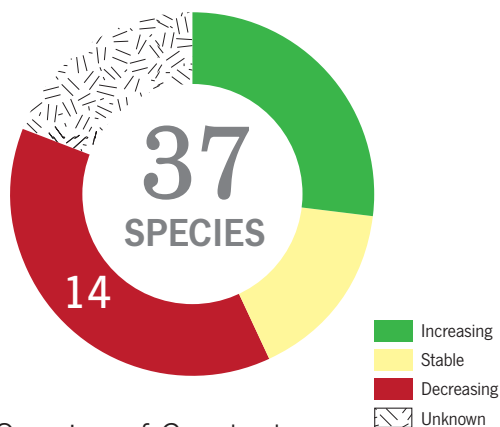
A Bank Swallow colony along the Saco River in Conway. These colonies may shift locations as banks continue to erode. Inset: Young Bank Swallows at the mouth of their burrow.

MARSH AND SHRUB WETLANDS



PAM HUNT

Marsh wetland in Canterbury, NH.



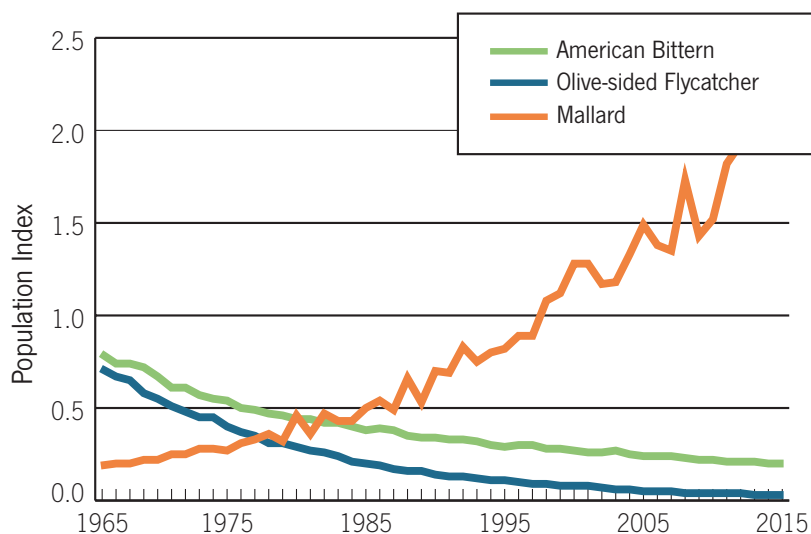
Species of Greatest Conservation Need

American Black Duck
Pied-billed Grebe
Sora
Common Gallinule
Least Bittern
Northern Harrier
Olive-sided Flycatcher
Marsh Wren
Rusty Blackbird

Other Representative Species

Canada Goose
Wood Duck
Virginia Rail
Great Blue Heron
Eastern Kingbird
Swamp Sparrow
Red-winged Blackbird
Yellow Warbler

*This habitat includes a wide range of plant communities with persistent standing water and wetland vegetation, whether herbaceous (e.g., cattails, sedges, and grasses), shrubby, or some combination of the two. It can also include elements of floodplain forests, swamps, and peatlands depending on local vegetation. Wetland birds can be placed in two categories, with typical “marshbirds” occupying primarily cattail and sedge wetlands and other species restricted to shrub wetlands or their **edges**. Some birds, like Canada Geese, use a wide variety of wetland habitats, while others, notably Wood Duck, Osprey, and Great Blue Heron, nest in trees and forage in the surrounding wetlands.*



Current Trends

Many wetland birds, particularly the marshland species, are very secretive and live in often inaccessible habitat. Population trend data are still unknown for a fifth of species. The remainder are evenly split between increasing (e.g., Osprey and several waterfowl) and decreasing (many birds typical of shrubby wetlands such as Common Grackle and Yellow Warbler) species.

Primary Threats

Altered wetland hydrology

Dredging, filling, damming, or otherwise changing a wetland affects what plants can grow there, the amount of water it holds during which seasons, and the insects, snails, and other fauna that are present. These changes in turn affect wildlife use of the wetland. The effects of wetland alteration are likely to be most profound among species which require larger wetlands, such as American Bittern and Pied-billed Grebe. Although these impacts are regulated, and the regulatory goal is to minimize impacts, direct habitat loss is still a key threat facing birds in this habitat.

Invasive species

While **invasive species** are often introduced to a wetland when it is being modified for human purposes, birds and other wildlife may be sources of seeds or live plant fragments as well. When **invasive species** such as purple loosestrife and *Phragmites* reeds replace native vegetation and dominate a wetland, the habitat no longer supports typical marsh birds. The effects of other **invasive species** are less well known and likely will increase in the future.

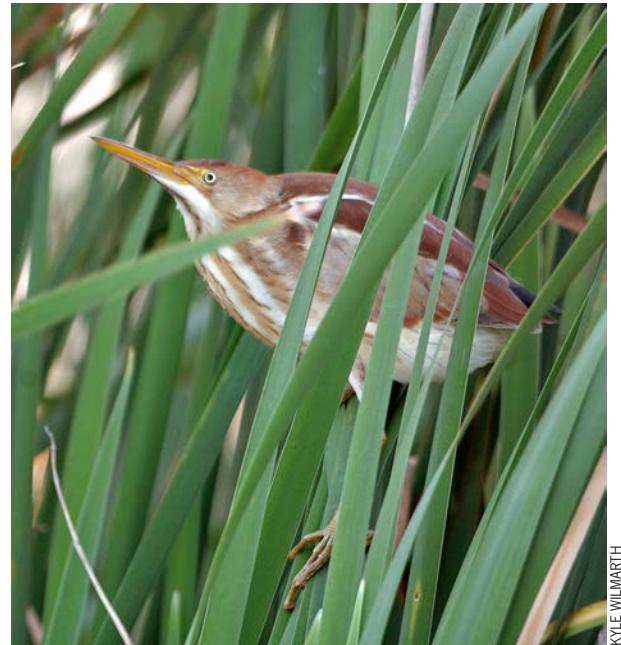
Conservation Actions

Direct protection of wetlands and the adjacent uplands is the most important conservation action that can benefit wetland birds. This includes both minimizing human impacts and protecting against **invasive species**. Where wetland water levels are subject to management (e.g., at impoundments), it is important to maintain appropriate

water levels that avoid both flooding and drawdowns during the nesting season (May through July) to protect nests and foraging habitat.

Data Needs

Better data on many marshbirds, especially the more secretive ones such as rails and bitterns, are needed to identify trends and factors affecting their populations.



KYLE WILMARTH

Least Bitterns are only known to nest in two or three locations in New Hampshire.



SANDY AND ROGER AMES

Although still common in shrubby wetlands statewide, Yellow Warblers are only half as common as they were 50 years ago.



LORI CHARRON

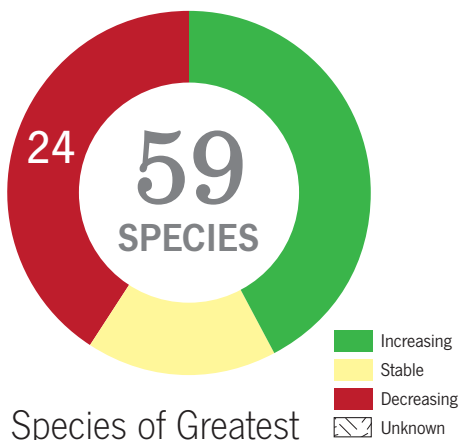
Young Pied-billed Grebes often ride on their parent's back.

DEVELOPED AREAS



PAM HUNT

Rooftop view of downtown Concord, NH near dusk.



Species of Greatest Conservation Need

Common Nighthawk
Chimney Swift
American Kestrel
Peregrine Falcon
Purple Martin
Bank Swallow
Cliff Swallow
Purple Finch

Other Representative Species

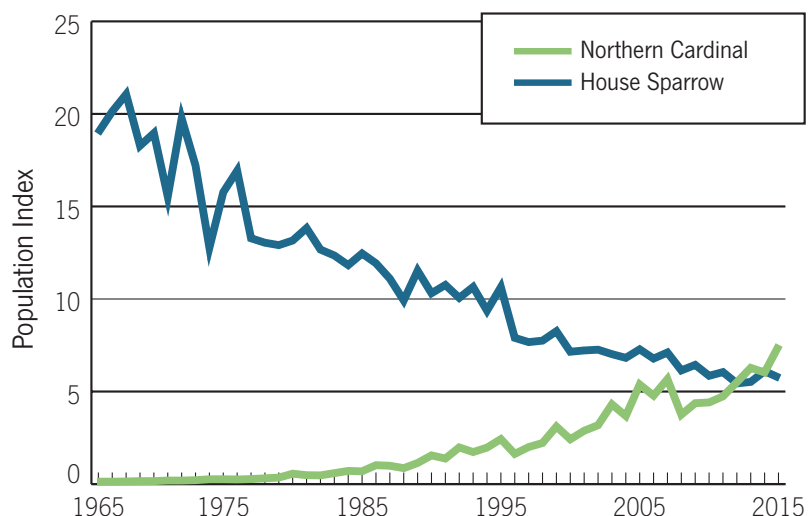
Mourning Dove
Cooper's Hawk
Red-bellied Woodpecker
Downy Woodpecker
Eastern Phoebe
Tufted Titmouse
House Wren
Northern Mockingbird
House Finch
Northern Cardinal

This category captures urban and residential areas, loosely defined as sites where natural vegetation occupies no more than half of the available land. Some 59 species have adapted well to human-dominated areas, and are found with regularity in developed areas, while others also use nearby forests or other unaltered habitats.



REBECCA SUOMALA

Uncapped chimneys are important roosting areas for Chimney Swifts in spring and fall, and for nesting during the summer.



Current Trends

Slightly more species in this group are increasing than decreasing. Increases are occurring largely among non-migratory birds, many of which are expanding their ranges north into the state. Once considered more southern birds, the Northern Cardinal and Tufted Titmouse are now common year-round **residents**, while more recently Red-bellied Woodpeckers and Carolina Wrens have colonized southern New Hampshire. Declining species tend to be longer distance migrants, forest **edge**, and shrubland species. In many cases their declines likely are tied to factors other than their use of developed landscapes. Two non-native species (European Starling, House Sparrow) are also in decline, although the reasons are not well understood.

Primary Threats

Direct mortality

After habitat loss, the greatest threats to birds involve mortality related to the human environment (see Threats to New Hampshire's Birds, p. 33). Cats and windows kill billions of birds a year in the United States, and most of this mortality is in developed areas.

Loss of specialized nesting sites

For a small number of species, direct changes to developed habitats may be contributing to declines. Caps on chimneys cut off access for Chimney Swifts, and conversion from peastone rooftops to other materials has reduced available nesting sites for Common Nighthawks.

Conservation Actions

More than anything else, the most important thing we can do in developed areas is to make them safe and welcoming for native birds. Specific actions include keeping cats indoors, reducing risks of collisions, planting native species, and providing appropriate food and shelter (see What You Can Do, p. 43). A specific action to help Chimney Swifts is to remove chimney caps, at least during breeding season from late April through early August.

Data Needs

We need to better understand the stresses on birds using developed habitats. How does predation affect productivity? What is the risk of mortality from windows in a standard two-story residential home and how can we minimize that risk? Knowing the answers to these and other basic questions we can prioritize conservation strategies for making developed neighborhoods bird friendly.



PAMI HUNT

Keeping cats indoors saves the lives of billions of birds each year.



LEN MEDLOCK

Both the Northern Cardinal (above) and Merlin (below) have adapted well to urban and suburban settings. Cardinals started moving into the state from the south in the 1960s and have only recently made it north of the White Mountains. Merlins, on the other hand, have expanded their breeding range into the state from the north beginning in the 1990s, and are now scattered across the state in low numbers.



PAMI HUNT



ANDRE MORAES

As a non-native species, the House Sparrow is not a conservation priority, and can even be detrimental to other species (here usurping a cavity in a Purple Martin house). However, their declining populations (here and in their native Europe) may indicate still-unknown environmental threats facing birds in developed landscapes.

ROCKY AND ALPINE



VANESSA JOHNSON

Exposed rock and alpine vegetation near the top of Mount Washington, NH.



This category encompasses habitats that are generally poorly vegetated and usually occur at higher elevations. Rocky habitats include cliffs, rocky ridgelines, and talus slopes (the latter rarely used by birds) in the northern and western parts of the state. Alpine habitats dominated by sedges and forbs occur above 4,900' in the White Mountains. Very few species of birds occur in the alpine zone, and only the American Pipit occurs here as a breeding species.

Current Trends

With only six species known to breed in this habitat, a broad summary of trends is not informative, especially since these six species use quite different sub-habitats.

Primary Threats

Climate change

It is often assumed that high-elevation alpine habitats will be among the first to feel the effects of a warming climate, and potentially get replaced by high-elevation spruce-fir. However, there is also evidence that the harsh climate in the Presidential Range will slow any such effects.

Recreation

These habitats are fragile, with limited soil to support the growth of plants. A well-known risk to the alpine zone is vegetation trampling by hikers who go off-trail. Cliff-nesting Peregrine Falcons are sensitive to disturbance from rock climbers, and for this reason cliffs with active nests are closed each year during the breeding season.

Conservation Actions

Ensuring that the impacts of hikers and climbers are minimized is the key conservation action in these habitats. Ensuring that alpine habitats persist in the long term requires rapid and effective efforts to slow or mitigate climate change.

Data Needs

Although ongoing monitoring of Peregrine Falcons and recent studies of American Pipits allow us to assess the status of those two species, we lack data on Common Nighthawks in these habitats.

Species of Greatest Conservation Need

Common Nighthawk
Peregrine Falcon
American Pipit

Other Representative Species

Turkey Vulture
Common Raven
Dark-eyed Junco



STEPHEN MIRICK

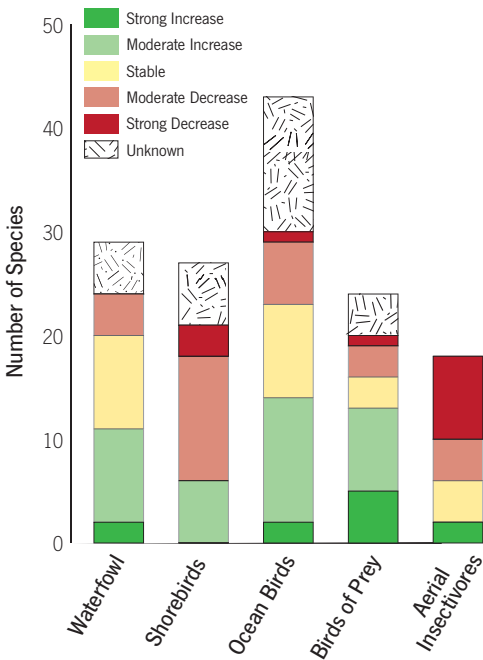
Mount Washington is one of only two places in the eastern United States where American Pipits nest.



Findings and Recommendations by Species Groups

While habitat associations are important when thinking about broad-scale bird conservation, it can also be useful to consider other ways of grouping similar birds together. This was perhaps most evident during the DDT era, when predatory birds high on the food chain, whether they ate fish or other birds, were all affected by accumulation of pesticides in their tissues. Here we present

summaries of the conservation status of five groups of birds (Figure 4), each defined by some combination of ecology and relatedness that transcends habitat (although many often share a habitat). For three of these groups: waterfowl, shorebirds, and seabirds, the majority of species don't actually breed in New Hampshire, and the grouping helps highlight the conservation challenges faced by highly migratory birds across their full annual cycle (see also *Birds in Migration and Winter*, p. 39). For birds of prey and aerial insectivores, the unifying feature is diet, and many of the threats and conservation actions related to these groups cross habitat lines. Increases in waterfowl and birds of prey are testament to how we can succeed at reversing declines as long as we know what the problems are. It's never too late to work on such emerging conservation issues.



	Waterfowl	Shorebirds	Ocean Birds	Birds of Prey	Aerial Insectivores
Strong Increase	2	0	2	5	2
Moderate Increase	9	7	12	8	0
Stable	9	0	9	3	4
Moderate Decrease	4	12	6	3	4
Strong Decrease	0	3	1	1	8
Unknown	5	6	13	4	0
Total	29	28	43	24	18

Figure 4. Comparison of bird population trends among five taxonomic or foraging groups (includes breeding and non-breeding species). Numbers in the table indicate the number of species in each trend category.

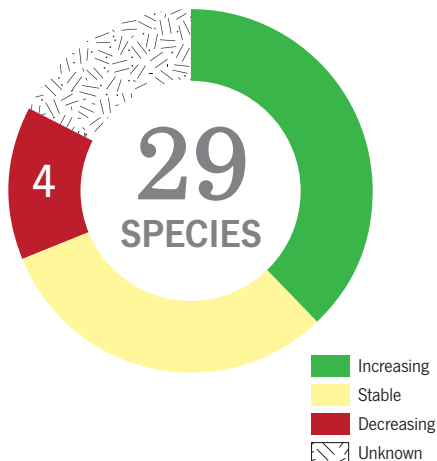
Although Barred Owls appear to be increasing in New Hampshire, we are in need of better trend data for nocturnal raptors like owls.

WATERFOWL



PAM HUNT

Several species of waterfowl resting and feeding in a flooded field during spring migration.



Species of Greatest Conservation Need

American Black Duck

Other Representative Species

Canada Goose
Wood Duck
Mallard
Ring-necked Duck
Common Goldeneye
scoters
mergansers

Waterfowl are represented by ducks, geese, and swans, with 29 species in New Hampshire at some time of year. Most of these are migrants, with the highest concentrations along our major river valleys and the coast, where several species also winter. Many of our breeding species are much more common in migration than summer, and seek out open water when inland lakes and rivers begin to freeze.

Current Trends

Most waterfowl, both in New Hampshire and across North America, are stable or increasing. This is in part testament to over a century of work, largely funded by hunters, to preserve nesting habitat and carefully manage populations. Species like the Canada Goose also benefited from efforts to introduce new populations and have increased to the point of being pests in some areas. Three species that migrate through New Hampshire are declining: Blue-winged Teal, Greater Scaup, and White-winged Scoter, while trends for a handful of others are poorly known.

Primary Threats

Loss of habitat

Loss of nesting habitat has long been the main threat to waterfowl. This was originally evident during the conversion of prairie wetlands to farmland, but is now more closely tied to the effects of climate change on these same wetlands, as well as on tundra wetlands far to the north. In New Hampshire,

breeding habitat is believed secure, and most concern relates to the largely undetermined effects of climate change on the coastal and marine ecosystems used during migration and winter.

Conservation Actions

Hunting is one of the primary tools used to regulate waterfowl populations, with shorter seasons and smaller bag limits implemented in cases where a species is in decline. Any actions that protect wetland and shoreline habitats will also benefit waterfowl. Water quality can also be important, particularly in places like Great Bay where excess nutrient inputs have altered aquatic communities, including dramatic declines in important waterfowl food species like eelgrass.

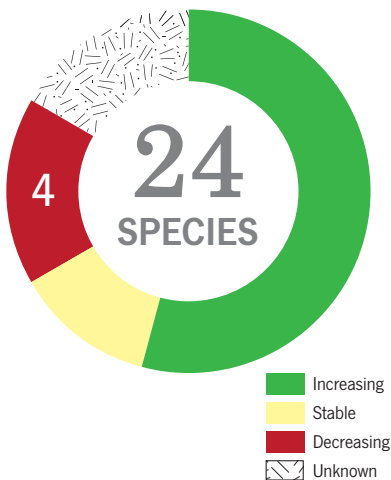
Data Needs

Population trends for most waterfowl are well known at a continental scale, but are poorly known at a regional scale (e.g., New England). More refined estimates of population size and distribution in New Hampshire may prove useful in assessing future threats.

BIRDS OF PREY

JOHN HESSION

The Peregrine Falcon is one of several raptors that benefited from dedicated conservation action in the 1970s and 1980s.



This group includes all the hawks, eagles, owls, and falcons. Most of them occupy top positions in their food chains, which historically has been associated with greater risk from chemical contamination, human activity or environmental change.

Current Trends

Some raptors have been the beneficiaries of focused conservation actions. The banning of DDT in the 1970s, combined with targeted efforts such as captive breeding, allowed for recovery of Osprey, Bald Eagle, and Peregrine Falcon across the eastern United States. Smaller raptors such as the Cooper's Hawk have likely increased at least in part thanks to efforts initiated for other species. As a result, most of the birds in this group are increasing or stable. Our only declining breeder is the American Kestrel, although note that the Golden Eagle was extirpated from the state back in the 1950s.

Primary Threats

Disturbance, Pollution

Although many species are doing well, disturbance and pollutants remain problems. Eagles and other birds of prey are still susceptible to lead poisoning, often from carcasses. New chemicals with unknown affects are continually released into the environment. American Kestrel declines could potentially be tied to pesticides or changes in habitat both on the breeding and wintering grounds.

Conservation Actions

Forest-dwelling raptors (e.g. Northern Goshawk) often require relatively large tracks of unbroken habitat, and benefit from land protection efforts. Although there is concern about various emerging environmental contaminants, more research is needed to understand the prevalence and effects of these chemicals on birds of prey. Efforts to help kestrels by erecting nesting boxes are expanding in New England.

Data Needs

Although most species in this group are well-monitored, the nocturnal owls are not usually detected by traditional survey methods, and we lack robust data on their population trends.

Species of Greatest Conservation Need

Northern Harrier
Northern Goshawk
Bald Eagle
Golden Eagle
American Kestrel
Peregrine Falcon

Other Representative Species

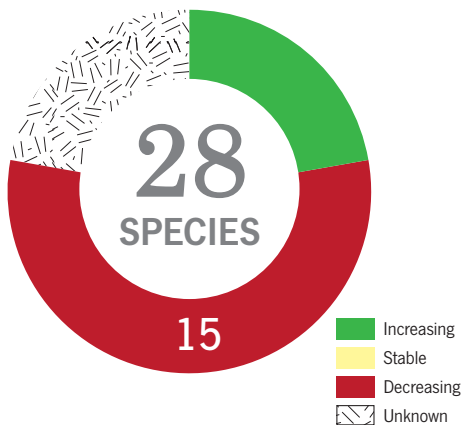
Osprey
Cooper's Hawk
Broad-winged Hawk
Red-tailed Hawk
owls
Merlin

SHOREBIRDS



PAM HUNT

Several species of shorebirds roosting together in Hampton, NH at high tide.



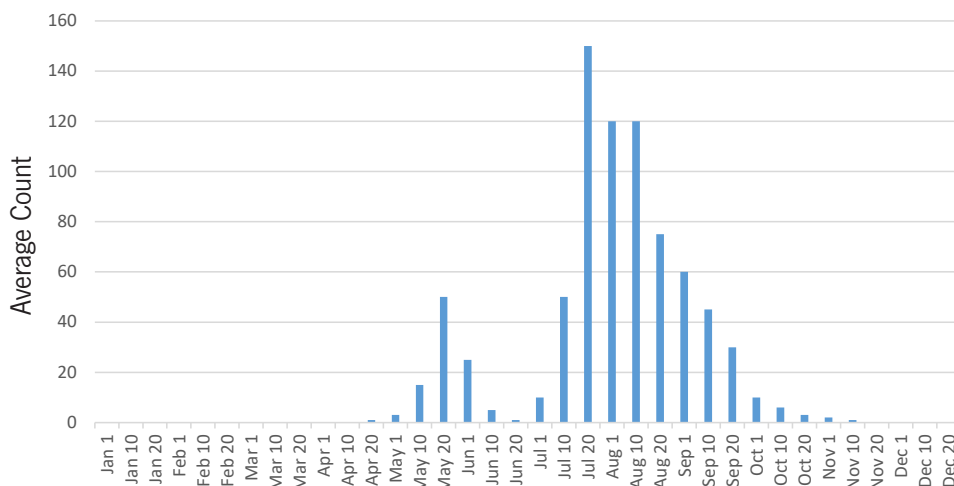
All New Hampshire shorebirds belong to one of two related families: plovers or sandpipers. While only eight species breed here, another 20 occur regularly as migrants. Some of the latter are among the most accomplished migratory birds in the world, flying from arctic nesting grounds to South America and back each year. Although a few species breed or migrate through grasslands and wetlands in interior parts of the state, the vast majority are restricted to the coast. In fall in particular, flocks of hundreds of plovers and sandpipers feed and rest in the Hampton-Seabrook Estuary on their way south to the Caribbean or South America.

Species of Greatest Conservation Need

Piping Plover
Upland Sandpiper
Whimbrel
Ruddy Turnstone
Red Knot
Sanderling
Purple Sandpiper
Semipalmated Sandpiper
Willet

Other Representative Species

Black-bellied Plover
Semipalmated Plover
Killdeer
Dunlin
Least Sandpiper
Spotted Sandpiper
Greater Yellowlegs
Lesser Yellowlegs



Seasonal variation in average abundance of Semipalmated Sandpipers in coastal New Hampshire. The much larger peak in the fall is the result of shifts in migratory pathways between seasons (spring migration is farther west) and the addition of numerous young birds in the fall. The period of fall **stopover** in New Hampshire overlaps extensively with peak human beach use, putting these birds at frequent risk of disturbance. Note that high counts in late July have been as high as 2,000 birds. (This figure is based on eBird data for Rockingham County.)

Current Trends

Half the shorebird species that occur in New Hampshire are declining. This includes a mix of breeding species (e.g., Killdeer, Spotted Sandpiper), species that winter here (Purple Sandpiper), and species that migrate all the way to the tropics (Whimbrel, Lesser Yellowlegs). Many others, primarily species that breed in the arctic, have poorly understood trends.

Primary Threats

Climate change

Because most species are closely tied to low-lying habitats, they are at risk throughout their annual cycle. Tundra nesters may lose habitat to flooding or melting permafrost, and find key migratory **stopover** sites lost to rising sea levels.

Human disturbance

The same coastal habitats used by migrating shorebirds (and some nesting ones) are also popular with people, and sharing this limited habitat inevitably leads to conflict. Repeated flushing of roosting birds can cause them to waste valuable energy reserves and perhaps compromise survival during long migratory journeys. Disturbance of nesting Piping Plovers by people and their pets can result in direct mortality or reproductive failure. And while not a threat here in the north, many species are still hunted for sport in South America and the Caribbean, with unknown effects on overall populations.

Conservation Actions

A key need for both breeding and migrating shorebirds in coastal New Hampshire is a network of safe places to breed, feed, and rest. Enclosures and symbolic fencing help reduce the risk of human intrusion on nesting Piping Plovers, but birds stopping during their spring and fall migration have no such safeguards. Increased awareness of shorebirds' needs is a key goal of coastal outreach efforts. New Hampshire's only population of Upland Sandpipers faces threats common to other grassland species – see Grasslands (p. 14) for more information.

Data Needs

Our knowledge of shorebird populations is improving, but large gaps

remain, especially for arctic-nesting species. More data are also needed on the magnitude of the various threats that operate during migration.



The Whimbrel is one of the larger species of shorebird to migrate through New Hampshire each year. It spends the winter along the coasts of the Caribbean, Central and South America.



*Dunlin is the larger bird amongst the smaller Semipalmated Sandpipers (above); shorebirds roosting on the rocky shoreline during a migration **stopover** in Hampton, NH (below left); Killdeer with eggs (below right).*

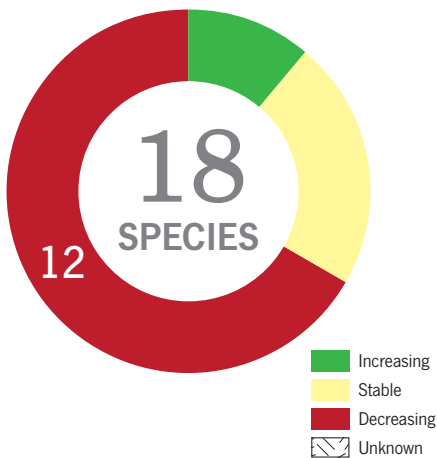


AERIAL INSECTIVORES



PAM HUNT

Tree Swallows gather during a spring migration stop in Exeter, NH.



The birds in this group share a food source: insects which they catch on the wing. They occupy a variety of habitats. The “salliers” (whip-poor-will and flycatchers) capture their prey by flying out from a perch, while others are “hawkers” or “aerialists” that are constantly in the air while foraging (nighthawks, swifts, and swallows).

Current Trends

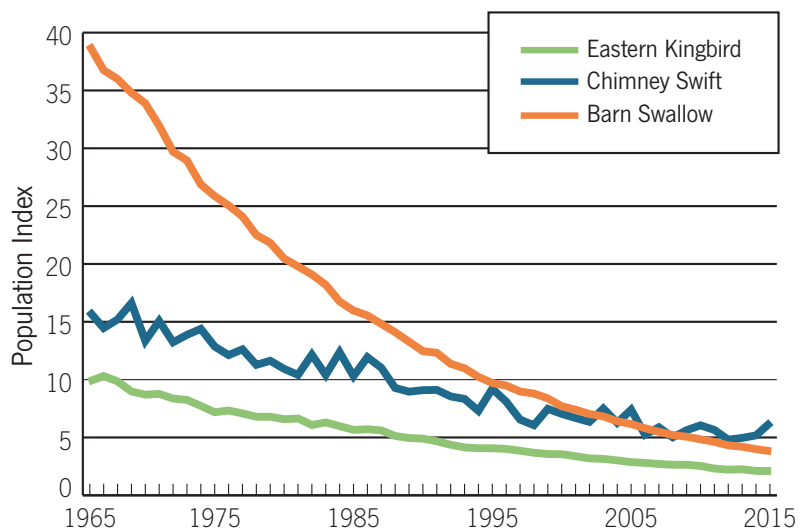
Two thirds of New Hampshire’s 18 aerial insectivores are experiencing long-term declines. Only two (Willow and Alder Flycatchers) are increasing, and four appear to be stable. Declines are most dramatic among the hawkers, with only one stable species (Northern Rough-winged Swallow) and seven declining.

Species of Greatest Conservation Need

Common Nighthawk
 Eastern Whip-poor-will
 Chimney Swift
 Olive-sided Flycatcher
 Purple Martin
 Bank Swallow
 Cliff Swallow

Other Representative Species

Eastern Wood-Pewee
 Eastern Phoebe
 Eastern Kingbird
 Tree Swallow
 Barn Swallow



Primary Threats

Threats to aerial insectivores are still poorly understood, but include the three items below. It is troubling to note that the species declining the most are the longest-distance migrants, suggesting that the most important factors might not be operating on the breeding grounds.

Declining Prey Populations

There is increasing evidence for declines in insect populations worldwide, which in turn could obviously affect a group of birds so dependent upon them. Reasons for insect declines include intensified agriculture, pesticides, and climate change – all of which could operate at any point in these birds' annual cycle.

Loss of Habitat

Some aerial insectivores (Common Nighthawk, Chimney Swift, Cliff and Barn Swallows) nest almost exclusively in **anthropogenic** habitats (e.g., gravel pits, chimneys, bridges and buildings, respectively). Birds nesting in such areas are more prone to disturbance, including intentional nest removal, or direct loss of nesting opportunities. For example, capping and lining of chimneys makes them unusable by swifts. Bank stabilization projects along rivers alters normal erosion

patterns and reduces the availability of sand banks used by Bank Swallows.

Climate Change

Unseasonable and highly variable weather in spring is predicted to increase due to climate change. This can result in cold snaps and extended rainy periods which often suppress flying insect activity. When this happens, many aerial insectivores may have trouble finding food. There are multiple cases of Purple Martins abandoning nesting attempts under prolonged unseasonable conditions, and in worst case scenarios there can be mortality of adults or young. There is also the possibility of **phenological mismatch**, wherein birds' spring arrivals are no longer in synch with insect emergence, and less food is available to feed hungry young later in the summer.

Conservation Actions

Although threats remain poorly understood, there are things we can do to help aerial insectivores. Since all these species are likely vulnerable to pesticides, whether from direct ingestion or reduction in food supply, reducing or eliminating our use of pesticides can only help them. If swifts or swallows are nesting on your property, try to give them space, and don't remove their nests. They are only here a

few months and successfully raising young is critical if populations are to grow.

Data Needs

Since the previous *Conservation Guide* was published, we have made good progress towards understanding these species' status and distribution in New Hampshire. Perhaps more than any other group, we need more data on the nature of the threats facing aerial insectivores, particularly as they relate to factors operating during migration and winter.



Aerial insectivores come in all shapes and sizes: Eastern Kingbird chicks in nest (above), Eastern Whip-poor-will chick (bottom right), Olive-sided Flycatcher (middle right), and a Common Nighthawk catching an insect in flight (top right).



DAVID LIPSY



CHARLIE NIMS



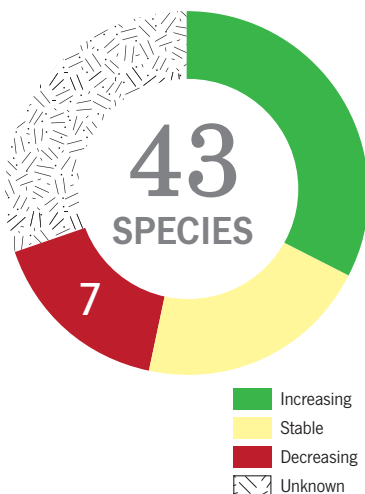
STEPHEN MIRICK

OCEAN BIRDS



PAM HUNT

Gulls and other seabirds following a fishing trawler.



Although New Hampshire has a short coastline, our nearshore and offshore waters provide critical habitat to over 40 species of birds. Most of them do not breed here, and these off-season visitors come from places as far flung as the Canadian tundra or remote islands in the southern Atlantic Ocean. Representative groups include sea ducks (eiders, scoters), auks (e.g., guillemots and puffins), gulls and terns, loons, shearwaters and petrels, and cormorants. Most eat marine invertebrates or fish.

Current Trends

Roughly half the seabirds occurring in New Hampshire are stable or increasing, although a significant portion of the remainder have unknown trends. On a global scale, however, this is one of the most imperiled groups of birds, often because they are extremely sensitive at their nesting areas.

Primary Threats

Predators, Rising sea level, Climate change, Pollution

Many species are island nesters, making them vulnerable to threats as diverse as introduced predators and rising sea levels. Climate change also has the potential to alter the marine food webs on which they depend, and pollution – both from oil and discarded plastics – is pervasive and hard to control. For the several species that are **long-distance migrants**, all these threats are compounded across their complex annual life cycles.

Conservation Actions

We have done a good job of protecting the seabirds that nest in New Hampshire, and oil spill response plans exist for the entire coast and Great Bay. Climate change and plastics pollution operate on a global scale and require broad-reaching actions, but simple things like changing buying habits to reduce waste can make a difference in local communities.

Data Needs

Ocean birds that don't nest in New Hampshire are poorly monitored in their non-breeding season, and as a result we don't know how populations are doing when they visit our waters. At the same time, we lack detailed data on how threats such as plastic affect most of these species.

Species of Greatest Conservation Need

- Least Tern
- Roseate Tern
- Common Tern
- Arctic Tern
- Common Loon (non-breeding)

Other Representative Species

- Common Eider
- Black Guillemot
- gulls
- shearwaters
- Northern Gannet
- Double-crested Cormorant

Threats to New Hampshire's Birds

Birds face a diverse and changing list of threats during the course of their lives, and while many have been presented in the previous sections, many more cut across the habitats or species groups already discussed. This section serves to provide more detail on these threats in particular.

HABITAT LOSS AND DEGRADATION



PAM HUNT

Continued loss of habitat to housing, commercial development, and agriculture is the greatest immediate threat to most birds worldwide.

Direct habitat loss usually involves conversion from one type of land cover to another, usually through development or agriculture. When habitat is lost in this way, it is obviously no longer suitable for

the birds that used to live there. Habitat degradation, here including **invasive species**, effects of climate change, and lack of or inappropriate management, can have similar effects. How this

threat operates in different habitats has already been discussed (see Findings and Recommendations by Breeding Habitat, p. 7).

THREATS DURING MIGRATION AND WINTER



STEPHEN MIRICK

Brant migrating along the New Hampshire coast.

Habitat loss and the following threats also operate outside of the breeding season, including when birds may be hundreds or thousands of miles away on their winter grounds. Because of the

importance of the non-breeding season to bird conservation, it is treated in more detail in the section, Birds in Migration and Winter (p. 39).

DISTURBANCES



PAM HUNT

Crowded beaches are not compatible with the needs of migrating and nesting shorebirds.

Sometimes the mere presence of human activity can be a threat to birds and other wildlife. For example, close approach by watercraft has long been known to disturb nesting birds such as loons, and wildlife managers have responded with remedies such as installing signage and roping off

areas around nests. The same strategies are used for cliff-nesting Peregrine Falcons and Piping Plovers on coastal beaches. Outside the breeding season, those same beaches are used by migrating shorebirds, which are also sensitive to disturbance but do not benefit from the same protections

(see *Birds in Migration and Winter*, p. 39). It is increasingly recognized that many other nesting birds will alter their behavior in response to passive recreation such as hiking and dog-walking, with implications for trail placement even on protected lands.

HUMAN-RELATED MORTALITY



TIM O'CONNELL

An estimated half a billion birds die each year in the United States by colliding with buildings and glass windows.

Beyond altering their habitats and introducing foreign substances into their environments, we also kill billions of birds each year because of our human footprint on the landscape. Many of these deaths are preventable with a little foresight and common sense, and reducing such mortality is one of the best ways individuals can make a difference.

Cats

Predation is a natural phenomenon in the wild, whether on nests, young, or adult birds. Decidedly not natural are the populations of native or exotic predators associated with human development, and foremost among these is the domestic cat. The combined numbers of feral and “outdoor” cats are responsible for billions of bird fatalities each year. The

situation is exacerbated when feral cats are intentionally fed, resulting in a concentration of potential predators. Even well-fed cats will kill birds and other small animals, and pet cats often find ways to circumvent belled collars and other ways to make them less efficient hunters. Keeping cats indoors is a very simple solution to this threat, and it's also better for the cats.

Collisions

Humans have erected many obstacles in the airspace that birds use, and all of these tend to be fatal when birds fly into them. The majority of collision mortality comes from birds hitting buildings, and not just the windows. Roughly half a billion birds die this way each year in the United States, and while we tend to hear of mass mortality events at glass-covered city

skyscrapers, individual homes are just as deadly. Our homes are more likely to have suitable habitat nearby, meaning that birds are present more consistently and the sheer number of houses leads to many dead birds. Tens of millions more birds are killed by collisions with power lines, communication towers, wind turbines, and motor vehicles. In all cases (except motor vehicles), mortality varies considerably depending on conditions, and tends to be higher when lighting is present (this can confuse birds migrating at night) and when visibility is poor, but there are several ways to make structures safer for birds (see *What You Can Do*, p. 43).

POLLUTION

PAM HUNT

*Pollutants from coal-fired power plants include carbon dioxide (a greenhouse gas), the chemicals responsible for **acid deposition**, and mercury, which enters water bodies downwind where it can pose a health risk to wildlife and people.*

Human activity is the source of significant unnatural inputs into natural environments: in air, in water, and on land. Although efforts to curb some types of pollution have been successful, new chemicals and activities constantly pose a risk to birds, often indirectly or unintentionally. Examples of pollutants known to affect birds include plastics, pesticides, **acid deposition**, lead, and mercury.

Plastics

Plastic pollution is everywhere, from litter along highways to nearly-microscopic particles in the water. Larger pieces pose a direct risk to birds through entanglement (e.g., monofilament fishing line), while small pieces are easily ingested. The latter can interfere with a bird's ability to digest food, and the very smallest fragments (microplastics) may even impair basic

biological functions such as reproduction or foraging success. There is still much to learn about the hidden costs of pervasive plastic pollution, but data on the negative effects are slowly accumulating.

Pesticides

Pesticides are an important component of commercial agriculture, and are also commonly used in smaller scale applications on yards and gardens. They can affect birds directly or by suppressing their food supplies. DDT is the classic example of a pesticide with detrimental effects on birds (through lowering reproductive success), and while it is now banned, other pesticides have been developed. There is increasing evidence that many of these, particularly the group known as neonicotinoids, can be toxic to birds, particularly when ingested directly via coated seeds. It can be hard to document declines in insect populations, but there is increasing evidence that such declines have already occurred over a large portion of the earth. It's even harder to relate insect declines directly to bird populations, but this linkage is often proposed as a factor behind the declines in species such as swifts and swallows (see Aerial Insectivores, p.30).

Acid deposition

Acid deposition can cause insidious changes to the environment, particularly in the Northeast, where airborne pollutants from the west are carried eastward. Here in New Hampshire, where our granitic soils are especially vulnerable to acidification, the effects are exacerbated. **Acid deposition** can leach calcium from forest soils, in turn reducing the availability of calcium to forest

invertebrates such as snails. Birds that rely on such invertebrates in their diet may encounter fewer prey or prey with lowered calcium levels. Birds require calcium for egg production but the implications of calcium deficiency are poorly understood at this time.

Heavy metals and other contaminants

Birds are sensitive to contaminants such as lead, mercury, and manufactured organic compounds, none of which occur naturally in the environment. The effects from exposure or ingestion range from lower reproductive success, neurological problems, and other biological dysfunctions, to death. The harmful effects of lead are well documented, and while the long-term impacts of mercury are largely unknown, birds in salt marshes and high elevation forests have been shown to have relatively high mercury levels, presumably because mercury is more easily absorbed in these habitats. Industrial chemicals such as flame retardants and PFOS/PFOA are increasingly of concern when they occur in our drinking water, and we have almost no data on how they might affect birds and other wildlife. Some contaminants **bioaccumulate**, meaning that their concentrations increase over time if they continue to be ingested. This is why DDT was so detrimental to birds of prey, but at present we don't know how other chemicals behave when concentrated in birds.



NANCY MURPHY

This Eastern Screech-Owl was found tangled in fishing line. It recovered with the assistance of a wildlife rehabilitator.

CLIMATE CHANGE

PAM HUNT

Habitat damage from storms, such as this from a Massachusetts tornado, may become more frequent as a result of climate change.

Climate change is a complex process, and while it's possible to predict large scale changes in climate and weather, the day-to-day weather we all experience cannot be easily attributed to longer term global patterns. The same is true for plant and animal responses to climate change. We can speak in generalities, and a few certainties, but the magnitude of changes will be subject to many interacting factors. This section is intended to lay out the generalities; to explain how we think climate change will affect the birds of New Hampshire. There will be some examples of species where specific effects are better understood, and examples of those where they are not. There will even be a few examples of species that appear likely to behave counter to more simplistic predictions of species-climate interactions. The best we can do is present what we currently understand and be prepared to adjust our thinking, as natural systems either succeed or fail to adapt to a changing climate.

Birds are unique among the wildlife of New Hampshire in their extreme mobility. Only a handful of our 275 regularly-occurring species do not migrate, and even those few are capable of flight. As a result, birds are exceptional dispersers, and are able to colonize new areas relatively easily in response to environmental change. Because they are able to regulate their body temperature, birds are also able to tolerate wide ranges of temperatures. They still require food and shelter however, and even if they can easily move from one place to another there is no guarantee that they'll find the resources they need to survive.

There are several general predictions about how New Hampshire's climate will

differ in 50-100 years, and these will likely occur to some degree even if emissions are somehow brought under control. These predictions and their possible effects on birds are discussed here. These examples were chosen to provide a sampling of the many ways climate change may affect some of New Hampshire's more representative species.

Rising Temperatures

New Hampshire's average temperature has already risen by three degrees over the last century (Figure 5), and may rise another 5-10 by the end of the century, with winter temperatures expected to rise slightly more than summer ones. This will occur on land and in the ocean. A longer growing season may favor southern or more adaptable species and cause subtle shifts in ecosystem composition. Warmer winters will see a greater proportion of precipitation falling as rain rather than snow, which will influence things like soil freezing and spring stream flows. And since organisms vary in their ability to respond to warmer temperatures and longer growing seasons, there is a strong likelihood of **phenological mismatch**, wherein events formerly linked in time now occur at different times,

often with negative results for species or ecosystems. Examples of the variety of bird responses to increased temperature are also presented.

Direct Temperature Affects

Southern species may actually benefit from climate change. Carolina Wrens, for example, aren't that cold tolerant, and suffer high mortality during particularly cold winters here at the northern edge of their range. Warmer winters mean more will survive to breed in the spring, allowing this species to continue its slow and steady expansion to the north.

While warming temperatures may not have direct effects on most birds, there is at least one example of a species that could be harmed as winters become warmer. Canada (formerly Gray) Jays cache food, including pieces of meat from dead animals, in trees during the



PAM HUNT

Carolina Wrens are a southern species that has likely benefited from climate change, although they are still vulnerable to prolonged cold spells during the winter.

winter so that the food is available for nestlings when they hatch in early spring (April or even March, often when there is still snow on the ground). If temperatures don't stay below freezing as long, these caches may rot, depriving newly-hatched chicks of food, and ultimately reducing reproductive success. Such losses of productivity have already been documented in parts of Ontario.

Other northern species, such as Merlin, Fox Sparrow, and Palm Warbler have expanded their ranges southward in recent decades, indicating that a propensity for the boreal forest does not necessarily mean you're vulnerable to a warming environment.

Habitat Shifts

Habitat models predict that plants and plant communities will gradually shift in response to climate change: generally moving north and/or to higher elevations. In such scenarios, New Hampshire is expected to see more oaks and fewer spruce and fir, although these changes may occur very slowly. Birds are generally more tied to their habitats than to temperature regimes, so habitat shifts are likely to be more important. The logical outcome is that birds will track the availability of their preferred habitats. If those habitats are common or even increasing, the birds

might benefit, but in the opposite case they may find themselves restricted to smaller and smaller areas – to the extent that their habitat disappears from the state entirely. The poster bird for this issue is Bicknell's Thrush, which is already restricted to spruce-fir forest at the highest elevations of the White Mountains. If spruce and fir move upslope, the thrush may have little choice but to follow, and it may end up restricted to a fraction of its current range.

In addition to our native habitats and species, **invasive** plants and insects may also respond to climate change, with many

poised to increase their ranges in the state. At present, some non-native insect pests such as Hemlock Woolly Adelgid are limited by cold winters, but will likely spread north as the state warms. Similarly, many plants grow more rapidly in warmer conditions and **invasive** ones could pose a greater risk of overwhelming our native species.

Warming Oceans

Warming oceans will have profound effects on marine life. We are already seeing southern species of fish and crustaceans moving into the Gulf of Maine, and declines in those more typical of colder waters. The loss of the cold water species may have negative consequences for seabirds such as terns, which require some cold water fish to feed their young.

Phenological Shifts

Food supply may also be compromised by **phenological mismatch**, such as when insect abundance shifts earlier in the season while birds' reproductive cycles do not. This can occur because insect life cycles are more closely tied to local conditions, while migratory birds wintering the tropics are not. If birds arrive "on time" but insect abundance is ahead of schedule, the latter may peak before birds need caterpillars and other insects to feed their rapidly growing young. Some birds are showing an ability to shift their arrival times and nest initiation, while others are not. As is the case for all these threats, we are likely to see a wide range of responses.



High-elevation spruce-fir forests are expected to move upslope in response to a warming climate, resulting in less and less habitat for the bird species that rely upon them.

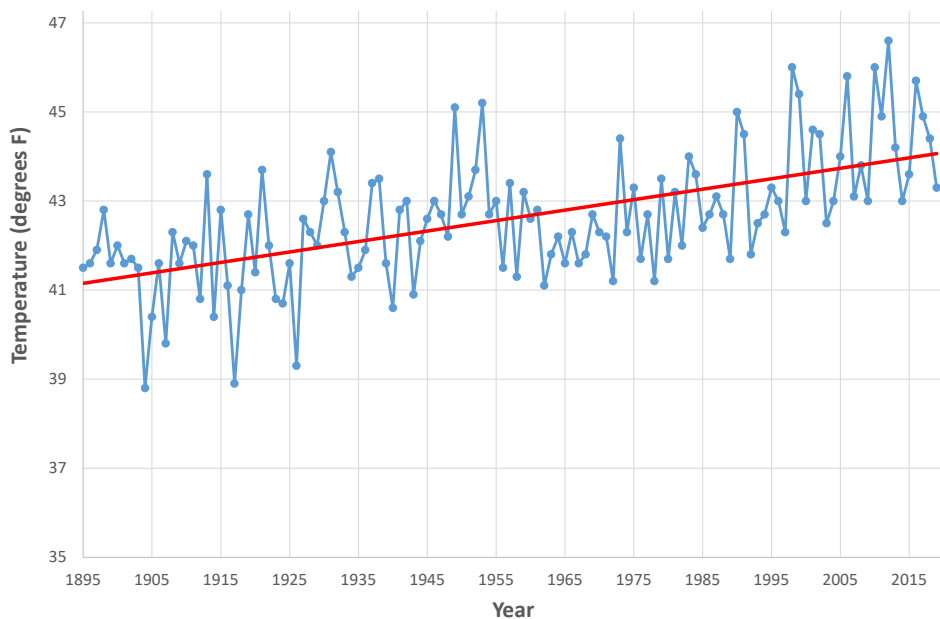


Figure 5. Average annual temperature in New Hampshire 1895-2019. Note that temperatures have increased by roughly 3 degrees in 120 years, and could increase by another 5-10 degrees in the next 75 years. Graph based on data from National Oceanic and Atmospheric Administration.

Sea Level Rise

The combination of melting ice and warming oceans may increase sea levels in New Hampshire by as much as two feet, and human activities intended to protect infrastructure and property are likely to exacerbate this effect by diverting water away from developed shorelines. The most obvious effect of sea level rise on birds will be the inundation of salt marshes and beaches along the coast. It is possible for new marsh to form further inland, but this depends on several factors, including existing development. Here in New Hampshire, there's little room for salt marshes to migrate in this way, and one species which risks losing a significant amount of existing habitat is the highly specialized Saltmarsh Sparrow. Beach-nesting species, already threatened by predation and disturbance, may also experience a loss of nesting habitat, while migrating shorebirds are likely to find feeding and roosting areas compromised or under water.

Changes to Storms

Storms may increase in frequency and intensity, including major storms such as hurricanes and more common events like ice

We're already seeing the effects of sea level rise during extreme high tides such as this one in Hampton, NH.



REBECCA SUOMALA

storms and strong winds. The effects of any single storm will be highly variable, ranging from localized flooding to damage across large areas of forest. Even if immediate impacts are minor, the cumulative effects of extreme weather on bird mortality and habitat composition could be measurable. Birds are especially vulnerable to storms during migration, and it is likely that we will see increased hurricane activity in the fall during the peak of southbound movement for most species. For returning birds in the spring, unexpected periods of cold and wet weather suppress flying insect activity, and are known to cause nesting failure in species like Purple Martins, or even direct mortality in migratory birds which rely on insects for food but are unable to find them.

Shifting Precipitation Patterns

As with storms, rising temperatures are likely to alter the timing and magnitude of precipitation. Less of New Hampshire's precipitation is likely to fall as snow, and we will potentially experience more frequent and longer periods of drought, both with cumulative effects on natural systems.

Climate models predict such drying – with likely effects on both habitat and food supply – in areas of the Caribbean and South America where many of our migrant songbirds spend over half the year. Those that survive may be in poorer condition to make the long journeys north to breed. See *Birds in Migration and Winter* (p. 39) for more information.

The effects of hurricanes on migrating birds are well-illustrated by the story of “Hope,” a tracked Whimbrel originally banded in Virginia in May 2009. Hope spent the summers in far northwestern Canada and her winters on St. Croix, in the US Virgin Islands, traveling roughly 6,000 miles each spring and fall. Whimbrels’ fall migration takes them over the western Atlantic in August, right in the middle of hurricane season, and researchers have documented at least nine instances of Whimbrels either avoiding or flying directly through the storms. This happened to Hope in 2011 when she was deflected from her route south by Tropical Storm Gert, flew non-stop for 27 hours against the wind to escape the storm, and eventually made her way back to St. Croix. Hope’s second encounter with a hurricane came in September 2017, when Hurricane Irma went over her wintering area after she had already arrived there. Although there was extensive damage to the island, Hope survived, only to have Hurricane Maria hit the same area less than two weeks later. This time Hope was not seen after the storm, although multiple other wintering Whimbrels were present in October. Although Whimbrels are clearly able to survive hurricanes, Hope’s luck had run out, and we are left wondering the fates of other migratory birds as tropical storms become more frequent and more intense as a result of climate change. (More info on Hope’s story can be found at: <https://ccbbirds.org/2019/04/03/farewell-to-hope/>)



LISA YNTEMA



NOAA



LISA YNTEMA



PAM HUNT

Unlike most warblers, Yellow-rumped Warblers consume significant numbers of berries in fall and winter, including bayberry as shown here.

Birds in Migration and Winter

Roughly 85% of New Hampshire’s breeding birds migrate to some degree. Some may only shift south within New England for a few months, while others make trans-hemispheric journeys to South America or the southern oceans and are gone for over half the year. At the same time, many other species that don’t breed in the state occur here in their non-breeding seasons. Some of the same threats already discussed continue to apply to “our” birds when they aren’t in New Hampshire, or to non-breeding birds that find themselves within our borders. This section will discuss the threats that affect bird populations during this critical time in their annual cycle: from when young leave the nest until birds return to nesting sites in the following breeding season.

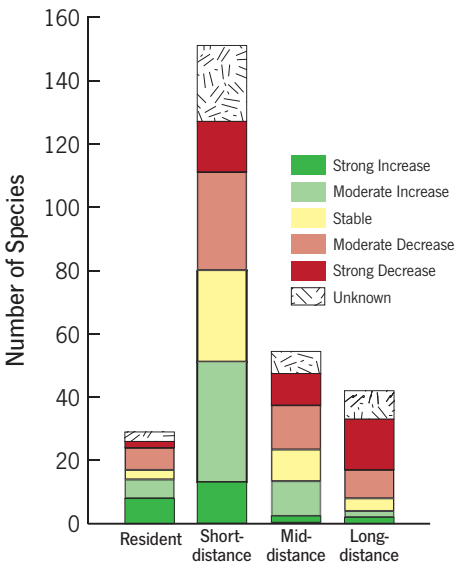
Birds are generally assigned to categories based on how far they migrate. Figure 6 shows the trends for four such groups in New Hampshire, as defined here:

Residents are species that don’t migrate at all, or at best make irregular local movements. This group includes most woodpeckers and owls, titmice, cardinals, grouse, and corvids (crows and jays).

Short-distance migrants spend the winter primarily in the southern United States, with some as far north as New England. This group includes most water birds, many raptors, and all finches and sparrows. Most such migrants, as well as our **residents**, are increasing or stable.

Mid-distance migrants for our purposes are those species that migrate to Central America or the Caribbean. There is some overlap between this group and the ones preceding and following it, and birds have been assigned based on where the majority of their winter range falls. Familiar species in this group include many warblers, flycatchers, and a few shorebirds.

Long-distance migrants winter in continental South America, often in the Andes, Amazon Basin, or southern



	Resident	Short-distance	Mid-distance	Long-distance
Strong Increase	8	13	2	2
Moderate Increase	6	39	11	2
Stable	3	29	10	4
Moderate Decrease	7	31	14	9
Strong Decrease	2	16	10	16
Unknown	3	25	7	9
Total	29	153	54	42

Figure 6. Comparison of bird population trends among four migration strategies (includes breeding and non-breeding species). Numbers in the table indicate the number of species in each trend category.

coastal areas (e.g., many shorebirds). This is the destination for many shorebirds, swallows, and seabirds, as well as individual species like the Bobolink and Scarlet Tanager.

The farther a species migrates, the greater the chance that its population is declining (Figure 6). More species are increasing or stable than declining among **residents** and **short-distance migrants**. Increasing and declining species are roughly equal among mid-distance migrants. The numbers flip for the longest migrants however, where only four species are increasing compared to 25 decreasing. No matter how far they travel, migratory birds face additional challenges.

Understanding the Annual Cycle is Important for Conservation

Imagine for a moment that you are a migratory bird. It doesn't matter if you breed in New Hampshire and fly south for the winter, breed in the arctic and pass through, or breed elsewhere and spend part of your non-breeding season here,



Arctic-nesting Snow Buntings only occur in New Hampshire from November through March, when they can be found in large flocks in open grassy fields.

ELAINE FALETRA

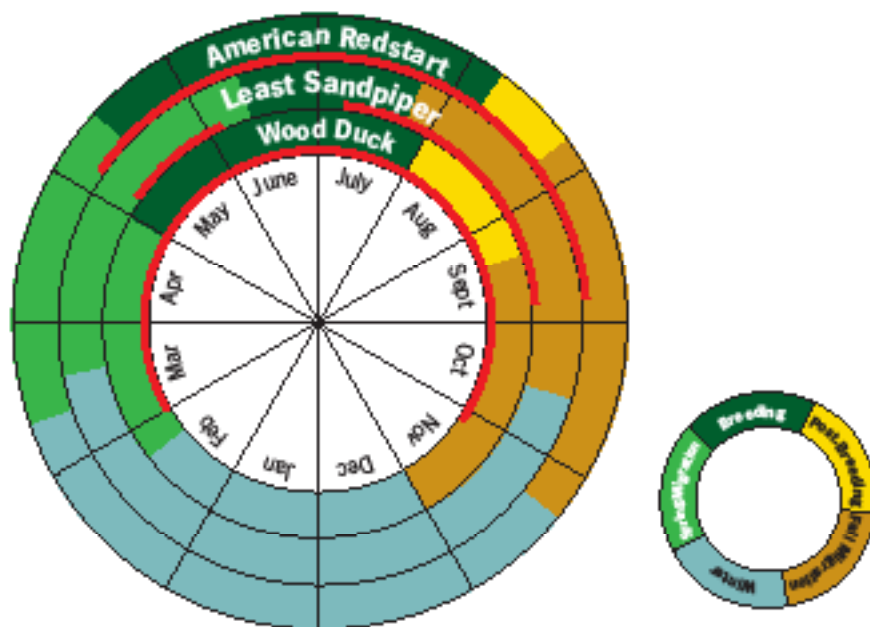


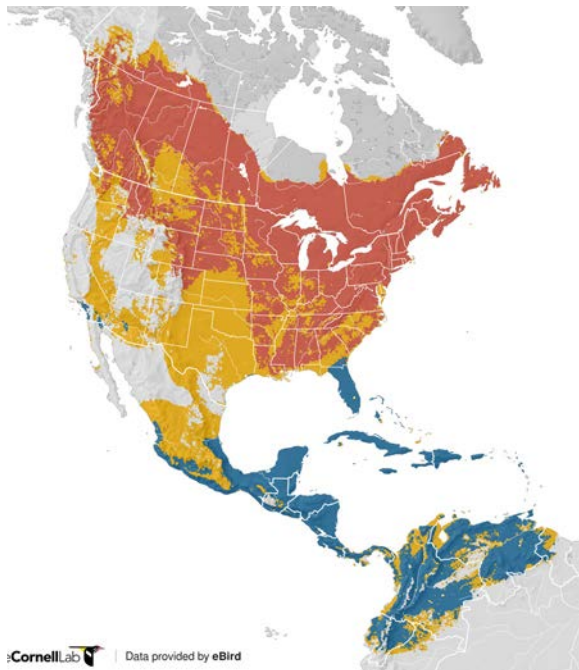
Diagram showing the annual cycles of three representative birds. The colored arcs represent generalized date ranges for each stage of the life cycle, with red lines indicating when that species predominately occurs in New Hampshire. The American Redstart is a **long-distance migrant** that winters in the Caribbean, and only occurs in New Hampshire from May through September. In contrast, Wood Ducks only migrate as far as the southern United States, and spend significantly longer here in the north: arriving in March and not leaving until November. The Least Sandpiper is an example of a species that doesn't breed in New Hampshire. It nests in the arctic and winters in the tropics and only occurs in the state during a short period in spring and slightly longer period in fall.

you will follow the same general annual cycle. Understanding this cycle and how the different components interact is critical to understanding the conservation of migratory birds.

The threats that operate during the breeding season have already been discussed, but much can still befall "our" breeding birds before they even leave New Hampshire. Between nesting and migration is a poorly understood time known as the post-breeding period, when adults and young alike wander away from nesting areas and prepare for their upcoming migratory journeys. They may not stray far, but they often use very different habitats. For instance, many of New Hampshire's forest birds move into shrublands in late summer, where they feed on abundant insects and newly-ripe fruit in preparation for migration. Active birders know to seek out habitat **edges** at this time of year to maximize the number of birds they encounter. Biologists are only just starting to study birds during the post-fledging period, but it is increasingly clear that any factors that reduce survival in late summer will be additive to the threats which

operated while birds were still nesting. Even if your local swallows successfully produced large numbers of young, there is no guarantee that these young will even survive until the start of southbound migration. They may be more vulnerable to predators (including cats), more likely to collide with structures, or more susceptible to changes in food supply.

And then there's fall migration itself, a time of shifting weather patterns, increased physiological costs, and for young birds the simple fact that they have never done this before. Long-term studies of migratory birds generally tell us that the vast majority of annual mortality occurs during migration (both fall and spring). If a bird was less successful at finding food during the post-fledging period, it might not be in prime condition to migrate, and might die early in the journey. Whether short or long, this annual journey is a gauntlet of new and familiar threats. There are predators (including people), obstacles (e.g., buildings, towers), unpredictable weather (including the fall hurricane season!), and ongoing habitat loss and degradation. A migrating bird can be killed outright, or



LEO MCKILLOP

The American Redstart is one of the best studied migratory songbirds across its annual cycle, with research carried out on both the breeding grounds (red on map) and wintering areas (blue). New technologies are increasingly providing information on what happens during migration (yellow), including timing, routes, and linkages between breeding and wintering areas. Citation for map on p. 56.

it can fly through the night only to find an important resting area converted to a subdivision, drained for agriculture, or otherwise rendered unsuitable. If the bird can't rest or find food, it's that much less likely to continue the next day. Over the course of weeks or months, these incremental stressors result in at least a third of annual mortality occurring during fall migration, and another third in spring.

Once a bird reaches its wintering area, many of the threats it faced during migration may remain. Habitat loss is still important, and for many **long-distance migrants** the loss of suitable habitat in the winter range has long been considered an important driver of declines. Depending on the habitat, more pervasive use of pesticides and other chemicals is an additional threat, although one still very poorly understood. Although mortality is relatively low during this stationary period, habitat quality can have important carry-over effects for the annual cycle. Poor quality winter habitat means birds are in poorer condition when the time comes to migrate north. Even if it doesn't die along the way, it may arrive too late to find a mate and breed.

Thus we see that conditions in late summer can impact fall migration, and conditions over the winter influence

spring migration and even breeding success. If we want to conserve migratory birds, we cannot ignore these connections, for the most important threats might not be the ones we're able to address here in New Hampshire.

With this in mind, what follows is a list of threats and how they operate outside of the breeding season.

Threats During Migration and Winter

Habitat degradation and loss

Birds still need food and shelter during migration and winter, and if the habitats

that provide these are degraded there is a higher risk of mortality from predation or starvation. Areas where birds rest en route are called **stopover** sites, and these vary greatly in the quality of resources they provide. Something as small as a clump of trees in an urban neighborhood might be attractive to a migrating warbler in desperate need of a place to land, but the best **stopover** sites tend to be in more intact native habitats. The same applies once a bird has arrived at its winter destination. If the habitat there is intact the bird stands a good chance of surviving until spring migration, but if not it may be forced into poorer habitat where survival is compromised. As more suitable wintering habitat disappears, fewer birds survive the winter to return to northern breeding grounds. Even if they survive, birds from low-quality winter habitats may be in poor condition and less likely to reproduce successfully.

Stopover habitat loss occurs all along a species' migration route and is especially detrimental along coastlines. Coastal plains are often the first or last landfall for migrants making long overwater crossings, and can be an important source of food. New Hampshire's coastal shrub habitat provides berries and insects in the fall, a combination that allows birds to build up fat quickly to fuel their migration. In the US, and increasingly in Central and South America, development in the coastal plain eliminates this vital **stopover** habitat, fragmenting forests and degrading or filling in wetlands. Extensive loss of wintering



PAM HUNT

This deforested hillside in the Caribbean once provided habitat for a wide variety of migratory and local birds.

habitat is most pervasive in Latin America and the Caribbean, where many people still rely on subsistence agriculture and continue to clear forests for this purpose. At the same time, even larger areas of habitat are being converted to commercial agriculture, including cattle farms, aquaculture, coffee plantations, soybean fields, avocado groves, and other uses. Agriculture doesn't have to be a total loss in terms of habitat, as evidenced by studies of birds in shade vs. sun coffee plantations, and there are increasing efforts to develop more sustainable practices for other commodities such as chocolate and rice. Note also that winter habitat loss is not just a tropical issue. Wetlands and bottomland forest in the southern United States have long been removed or altered for agriculture, effecting species like wintering Rusty Blackbirds. The urban/residential footprint required to support growing human populations is an ongoing issue everywhere.

Chemical use (see pg. 35)

In many cases, pesticides and other contaminants are less regulated outside the United States, where they have the potential to significantly impact non-breeding and **resident** birds alike. In 1996, for example, application of a pesticide to control grasshoppers resulted in the death of thousands of wintering Swainson's Hawks in Argentina. DDT, long banned in the US and Canada, is still used for mosquito control in parts of South America, and the effects of other pesticides remain largely unknown. There is increasing concern that intensifying agriculture in parts of South America may be contributing toward declines in aerial insectivores such as swallows and nighthawks.

Collisions (see pg. 34)

Most mortality from collisions with buildings (windows) and towers likely occurs during migration, when birds are in unfamiliar surroundings and often migrating at night, when they can easily become confused

by artificial light. Even if they are not killed outright, confused birds are easy prey for predators such as cats.

Human disturbance (see pg. 34)

During migration, it is critical that birds build up sufficient fat reserves to fuel the next leg of their journey. When not actively foraging, they need to rest and conserve energy, and anything that disturbs them may compromise their migratory preparation. Most research on this topic relates to migrating shorebirds, which often roost on beaches that are also used by people. When these resting birds are flushed by beach-goers or their dogs, they expend valuable energy, and may end up delaying their departure as a result. The later they leave, the less likely they are to survive the entire journey. An extreme version of this threat is thankfully rare, and involves unregulated hunting of migrating or wintering shorebirds and terns. This practice is limited to a handful of countries in the eastern Caribbean and South America, but is believed to have contributed to declines in some species.

Climate change (see pg. 36)

Climate change is likely to severely impact the availability and suitability of habitat. Sea level rise will inundate coastal areas used by water birds, and increased drought will likely reduce food supplies in wintering habitats. Increasingly volatile weather patterns may increase mortality

risk during migration as a result of increased storm frequency or unseasonal temperature swings. Finally there is the issue of **phenological mismatch**, wherein the timing of seasonal events becomes out of synch. For example, many studies have documented increasingly early dates for leaf-out or insect emergence as temperatures warm. Migrant birds, however, may not advance their arrival or nest-initiation dates, especially if they are migrating in from far away. If they fail to time their arrival appropriately, they risk missing the peak in insect abundance they require to successfully feed their young. Studies on this issue have shown variable results, but in extreme cases birds may be significantly compromised.



PAM HUNT

*Threats faced by migratory birds on their wintering grounds also affect **resident** species in tropical countries. Conservation actions implemented "south of the border" can thus benefit "our" birds as well as rare or declining species such as Cuban Parrots that use the same habitats. Everything is connected.*



PAM HUNT

Wetlands in the Caribbean provide habitat to large numbers of North American migrants in the winter. Of the eight species in this photo (can you find them all?), all but one have breeding populations in the United States. Answer on p. 54.



What You Can Do to Help Conserve New Hampshire's Birds

Whether you're a bird watcher, landowner, business owner, or community official, there are ways you can help New Hampshire's birds. This section highlights actions we can take as enlightened and concerned citizens to help ensure all of New Hampshire's birds are here for generations to come. A list of resources, including those mentioned in this section, are presented in Resources for More Information (p. 48).

Conservation Goals

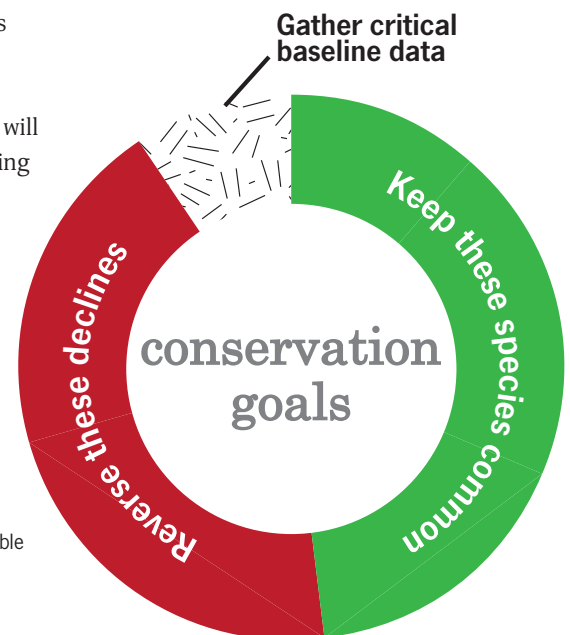
In the context of trends and threats to New Hampshire's birds, there are three overarching conservation goals:

1. **Reverse species declines.** These species need our help, and we need to implement a diverse array of actions to ensure they remain on the landscape. We also want their populations to recover to the point that they are no longer conservation priorities.
2. **Keep common species common.** Just because a species is currently increasing or stable doesn't mean it always will be. Declines in common species may be early indicators of unforeseen environmental problems. Maintaining healthy habitat for widespread species will also benefit the rarer or declining ones that co-occur.

3. Gather critical baseline data.

Many rare or secretive species have unknown trends, and as a result we don't always know their true conservation status. If they're declining we'll need to start thinking about possible conservation actions, but in the absence of more information it's impossible to set priorities.

Each goal applies to groups of species showing similar population trends. All actions listed on the following pages contribute to these goals.



Breeding areas are often closed for two to three months during the nesting season. Respecting closed signs is one action we can take to benefit sensitive species such as this Willet.

As an Individual

Help close the knowledge gaps here at home

You don't need to be an expert to contribute to research on New Hampshire birds. Helping gather data as a citizen scientist can be as simple as counting birds at your feeder or watching swallows nest on your barn.

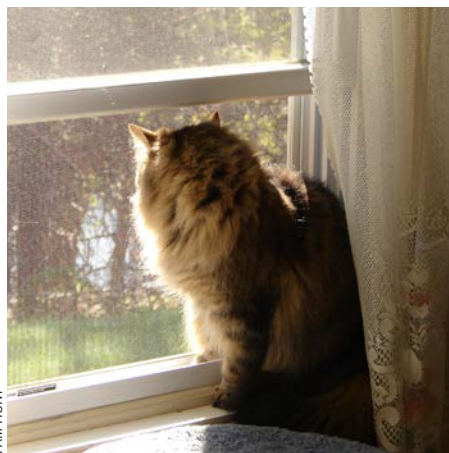
- » Sign up for NH Audubon's annual Backyard Winter Bird Survey.
- » Report your bird sightings to eBird.
- » Check the NH Audubon web site for volunteer opportunities.
- » Sign up for the Nature Groupie email list to learn about outdoor volunteer opportunities in New England.

Protect birds against predators and disturbances

- » Keep your cat indoors! Domestic cats are among the greatest threats to wild birds in the United States. Even well fed cats and cats with bells will kill birds. The American Bird Conservancy web site has details.
- » Obey signs posted to protect nesting birds, typically found on dunes, shorelines, and other sensitive nesting areas, and keep dogs leashed when near such areas. These precautions should continue into fall migration, when our coastal beaches in particular are critical resting areas for shorebirds on their journeys south.

Avoid Toxic Chemicals

- » Avoid using pesticides and insecticides; if you currently have pesticides, dispose of them at a household hazardous waste collection day.
- » Promote non-toxic control measures when necessary for mosquitoes in your home or community. Mosquitoes are an important food source for swallows, as well as bats and dragonflies, and these predators will help to keep them in check. To protect yourself from mosquitoes, use repellent, cover up, and reduce mosquito breeding opportunities around your house. Check state and federal web sites for prevention actions you can take in your yard.



After habitat loss, predation by domestic cats is the most significant threat to birds in North America. Keeping cats indoors can prevent unnecessary bird deaths, and also makes for safer and healthier pets.



Beach closures for nesting shorebirds are a common management tool, including in New Hampshire, where they serve to minimize disturbance to Piping Plovers.

- » Promote the use of lead-free fishing tackle. Lead poisons wildlife such as loons and eagles that inadvertently swallow tackle made from lead. According to the Loon Preservation Committee, lead poisoning from ingested lead fishing sinkers and lead-headed jigs is the largest cause of known adult loon mortality in New Hampshire.

Make your home, yard, and community bird friendly

- » Landscape and maintain a bird friendly yard. Plant native bird-friendly bushes and trees (they have more caterpillars for feeding young birds). Research indicates that a yard with 70% native species (by biomass) will provide enough food for sustainable chickadee reproduction (see video by Professor Doug Tallamy). Add plants to your yard with berries or mast (seeds and nuts); provide dense vegetation for shrub nesting birds; leave leaf litter and brushy areas where birds and their insect food can hide. Reduce lawn area and allow plants to grow under trees for caterpillars to complete their life cycle.
- » Keep your yard free of **invasive** plants. Educate yourself and others about the common **invasive** plants so you can act effectively to eliminate them.
- » Be on the lookout for **invasive** insect pests. Learn to identify insects like the Asian longhorn beetle and the hemlock woolly adelgid. Participate in organized surveys of vulnerable areas. Report any sightings to NHbugs. Use local firewood.
- » Windows are invisible killers because birds see only plants and sky reflected in them. Millions of birds are killed annually from flying into windows, more often during migration and most often from windows in homes. Not all windows are equally hazardous. Certain situations, such as highly reflective windows and those near bird activity areas like feeders deserve the most attention. There are a number of strategies for reducing reflections in glass.



UNITY DIENES

Placing something on the outside of windows, such as these “zen curtains,” can significantly reduce the number of bird strikes.

The simplest solution is to break up the reflection on the outside of the glass, and there is now special tape available for homeowners to modify their windows in this way. If you are replacing windows, ask for bird-friendly glass. There are products available and glass companies need to know there is a demand. Locate bird feeders and birdbaths less than two feet from any window so that birds cannot build up enough momentum to be injured if they do hit the window.

- » Birds can be disoriented by lighted windows at night. Many migrating birds move at night and are particularly susceptible. Some cities, including Boston, have initiated “lights out” programs during peak migration that need your support. Start a Fatal Lights Awareness Program (FLAP) in your city. Turn off unnecessary lights at night, even if you’re not in a big city.

- » Remove chimney guards from late April through early August. Participate in Chimney Swift conservation.
- » Leave dead trees standing and put up nest boxes with predator guards for cavity-nesting birds. Be sure to use proper dimensions and placement for the species in your habitat. Do not install boxes where House Sparrows are present unless you take action to prevent their nesting. This non-native species out-competes our native cavity nesters and is known to kill adults, youngsters, and eggs in the nest.

Protect birds on wintering grounds

- » Buy bird-friendly, shade grown coffee to help conserve wintering habitat and create a demand for this product. Shade grown coffee plantations maintain natural tree canopies similar to those of an undisturbed tropical forest and can support more than 150 species of birds – rivaling the numbers found in undisturbed tropical forests and including “our” orioles, tanagers, warblers, and thrushes. Sun coffee produces higher yields, but at tremendous ecological cost. Buy coffee that is certified “bird friendly” under the Smithsonian Institution’s program.
- » Avoid produce that is grown using toxic agrochemicals; buy local and organic whenever possible; advocate for accurate food labeling. Although the effects of pesticides in use are not fully known, experience with DDT offers a cautionary tale, from which we are still learning. As recently as 1996 the pesticide monocrotophos, applied to fields in Argentina, resulted in the deaths of thousands of Swainson’s Hawks, and we know that pesticides that kill insects eliminate a food source for insectivores. Neonicotinoids, a common pesticide, has been found to be toxic to birds, even in small quantities, and they persist in soils for months and even years. Many

Advocate for:

- » local regulations that protect wildlife (see “Community Official”)
- » reduced use of pesticides and other toxins
- » continued state and federal funding in support of bird conservation and habitat protection
- » organic farming-friendly laws and regulations
- » a national ban on lead sinkers and lead jigs and lead shot
- » a ban on the export of chemicals banned in the United States
- » climate change control legislation
- » acid rain control
- » other bird friendly legislation
- » strong federal environmental regulation



REBECCA SUOMALA

seeds come pre-coated with neonicotinoids, so pay careful attention to what you plant and plan accordingly.

- » Support reputable conservation organizations in the Caribbean, Central and South America. International field trip leaders can often provide information on local organizations.

Support bird research and monitoring

- » We lack a basic understanding of what environmental changes are affecting some of our birds here in New Hampshire. Support organizations like NH Audubon, whose staff are exploring possible causes of the population trends summarized here and identifying ways to reverse declines.
- » Support research into threats facing birds on the non-breeding grounds.

Support local and regional land conservation efforts and the organizations behind them

- » New Hampshire has a strong land trust community, and most cities and towns are served by a local or regional land trust. Become a land conservation advocate and a land trust member, or put your land into permanent conservation. For the land trust nearest you, see <https://nhlrc.org/find-land-trust>. Town and city conservation commissions are also often active in land protection efforts. Contact your town offices for more information, maybe the commission even needs a new member!
- » Support efforts to address threats and identify and protect critical **stopover** and wintering habitat in the US as well as the Caribbean, Central and South America.

Reduce Plastic Pollution

- » Minimize or eliminate use of single-use plastics such as drinking straws, shopping bags, and plastic utensils.
- » Use reusable canvas or durable plastic bags for shopping.
- » Retrieve lost monofilament line while fishing, and collect this dangerous litter when you encounter it.
- » Recycle plastic waste in your home and advocate for community recycling programs.
- » Participate in trash clean-ups.

As the Owner or Manager of Forest Land, Farmland, or a Wetland Habitat

- » If you own spruce-fir forest land, manage it for age class and structural diversity.
- » If you own a large tract of forest land, maintain it as such. Consider putting it into permanent conservation with a **conservation easement**, whereby you would continue to own and manage the land.
- » Create habitat for shrubland species without compromising

the habitat for interior forest species. This can be done with timber cuts planned to maximize early to mid-successional habitats that still maintain a large intact forest, or by allowing natural disturbances (fire, native insects, wind) to create openings within the forest. Always work with a licensed forester to ensure sound woodlot forestry practices on your land, and let your forester know that creating and preserving bird habitat is important to you!



Wildlife clearings or 'patch cuts' can be effective ways to benefit early successional (shrubland) bird species. Pictured is part of a 10-acre opening at NH Audubon's Popple Island Wildlife Sanctuary in Epsom, NH.

- » Time logging operations to avoid the nesting season.
- » If you already own shrubland habitat, consult a wildlife expert about the value of managing your habitat to prevent trees from growing in. Even in small patches, berry bearing shrub habitat is valuable for birds prior to and during migration. The UNH Cooperative Extension Habitat Stewardship Series on shrublands can provide guidance on shrubland maintenance.
- » If you have fields, time mowing to avoid disturbance to ground nesting species. Talk with a wildlife specialist from UNH Cooperative Extension about managing the land for grassland birds and consult Mass Audubon's Best Management Practices for Nesting Grassland Birds.
- » If you own marsh and scrub-shrub wetlands, floodplain forests, vernal pools, saltmarsh, or other special wetland habitats, learn what to do to encourage maximum wildlife use.

UNH Cooperative Extension provides numerous resources on managing land for wildlife including a very helpful series of brochures on habitat stewardship for the different types of habitats mentioned below. They also offer landowners free advice on forest management issues.

As a Community Official

- » Ensure that your local ordinances and regulations protect wetlands and buffers along the wetlands, ponds, lakes, streams, and rivers in your community.



Buildings with extensive glass facades pose the greatest risk to birds, especially when near important habitats or migration routes. If the glass cannot be altered, turn off unnecessary lights, especially at night, and apply materials to exterior glass surfaces to break up the reflection (described in Bird Friendly Building Design).

PAM HUNT

use the publication *Innovative Land Use Planning Techniques*.

- » As regional planners, help communities identify intermunicipal conservation opportunities for protecting and connecting natural habitats. Keep abreast of efforts to identify significant habitats within your region. Consult the **WAP** or NH Fish and Game Department for assistance.

As a Business Owner/Leader

- » Keep abreast of emerging technologies to control aquatic weeds without herbicides. Native aquatics are not usually a problem. In New Hampshire, the most serious weeds are non-native species, especially milfoil (*Myriophyllum heterophyllum*). The most effective strategy is to keep non-native species out of lakes and ponds to begin with. Educating boaters about this threat and carefully inspecting boats for plant fragments before launching are important preventive steps.
- » Check your regulations to make sure they discourage road construction in undeveloped areas, and they do encourage connections between and among conservation properties. Every new road and cul-de-sac not only fragments the landscape but also heightens the risks to birds.
- » Do an audit of your municipal regulations with respect to wildlife and natural resources protection. See Resources for More Information.
- » Advocate for proper siting and design of towers to decrease risk of bird kills.
- » Identify the large, unfragmented blocks of forest and grassland in your community, including lands that abut undeveloped land in adjacent towns. In looking at your community, remember: town borders are even more meaningless to birds than international ones!
- » As conservation commission members, work with landowners, adjacent municipalities, and your local/regional land trust to help maintain these unfragmented lands.
- » As planning board members, engage developers in discussions about habitat protection. Minimize **fragmentation** by clustering houses and minimizing road construction in undeveloped land. In your planning work,

soils rather than planting lawns and hardwood trees that need watering and change pine barrens habitat. Seek advice from a landscaper who specializes in native plants. See the Landscaping chapter (Section 3) in *Innovative Land Use Planning Techniques* and *Integrated Landscaping: Following Nature's Lead*.

- » Pay attention to windows and night lighting. Turn off unnecessary lights when a building or office is unoccupied. This both saves energy and reduces the risk of disorienting migrating birds at night. Install outdoor lighting that is directed downward for the same reason.
- » Help create demand for bird friendly windows by asking for them in new construction or renovations. The glass industry needs to know there is a market.
- » If nighthawks, Cliff Swallows, or other native urban nesting birds choose your business for raising young, it is often easy to co-exist with them. They usually finish raising their young in a couple of months, they very rarely approach people, and a bird such as a nighthawk creates no mess to clean up. NH Audubon can help you identify the bird (not all urban nesting birds are native or welcome) and provide information about their habits and length of stay.
- » If you own a gravel pit and Bank Swallows move into an exposed bank, wait for the young to fledge before removing the gravel. They typically fledge in two months, although late nesters may linger until the end of July. These birds actually appreciate newly exposed sand and gravel banks for nesting, and may return the following year to occupy other parts of an active excavation.
- » Take steps that reduce your contribution to climate change.

Resources for More Information

SPECIFIC TOPICS

Bird Friendly Coffee

Bird Friendly Coffee certification, Smithsonian Institution:
<https://nationalzoo.si.edu/migratory-birds/bird-friendly-coffee>

Birds & Beans Coffee: <https://birdsandbeanscoffee.com/>

Bird Habitat

Certified Wildlife Habitat program, National Wildlife Federation: www.nwf.org/Garden-for-Wildlife/Certify

UNH Cooperative Extension: <https://extension.unh.edu/>

Contact UNH Cooperative Extension staff: <https://extension.unh.edu/programs/forests-trees>

New Hampshire's Native Trees, Shrubs, and Vines with Wildlife Value, UNH Cooperative Extension
https://extension.unh.edu/resources/files/Resource000427_Rep449.pdf

Your Woodlot, Your Legacy: Managing for Songbird Habitat, UNH Cooperative Extension
<https://extension.unh.edu/resource/your-woodlot-your-legacy-managing-songbird-habitat>

Focus on Wildlife brochures, UNH Cooperative Extension
<https://extension.unh.edu/tags/focus-wildlife-brochures>

Habitat Stewardship brochures, UNH Cooperative Extension
<https://extension.unh.edu/tags/habitat-stewardship-brochures>

Landscaping at the Water's Edge: An Ecological Approach, UNH Cooperative Extension
<https://extension.unh.edu/resource/landscaping-waters-edge-book>

The Backyard Naturalist by Susan Story Galt: NH Audubon

Native Plant Gardening books by professor Doug Tallamy
<http://www.bringingnaturehome.net/>; video: <https://grownativemass.org/Great-Resources/experts-videos/Natures-Best-Hope>

Best Management Practices for Nesting Grassland Birds, Mass Audubon
<https://www.massaudubon.org/our-conservation-work/wildlife-research-conservation/grassland-birds>

Integrated Landscaping: Following Nature's Lead, UNH Cooperative Extension
<https://extension.unh.edu/resource/integrated-landscaping-following-natures-lead-book>

Bird Houses

Wood Working for Wildlife: Homes for Birds and Animals by Carrol L. Henderson

All About Bird Houses, Cornell Lab of Ornithology: <https://nestwatch.org/learn/all-about-birdhouses/>

Cat predation – American Bird Conservancy

Information: <https://abcbirds.org/program/cats-indoors/>

Cat Friendly Solutions: <https://abcbirds.org/catio-solutions-cats/>

Chimney Swifts

Chimney Watch: <http://swift.sepif.org/>

Chimney Swift Conservation Assoc.: www.chimneyswifts.org/

Invasive Species

Invasive Species Frequently Asked Questions, NH Dept. of Agriculture
www.agriculture.nh.gov/divisions/plant-industry/faq-invasive-species.htm#invasivespecies

Prohibited Invasive Plant Species, NH Dept. of Agriculture
www.agriculture.nh.gov/publications-forms/documents/prohibited-invasive-species.pdf

USDA National Invasive Species Information Center, NH
www.invasivespeciesinfo.gov/us/new-hampshire

Damaging Insects and Diseases Information and Reporting, NH Bugs
<https://nhbugs.org/>

Firewood transportation ban: www.nh.gov/nhdf/community/forest-health/firewood.htm

Land Protection

New Hampshire Land Trust Coalition: <https://nhltc.org>



Eastern Bluebird on a nest box at the Massabesic Audubon Center, NH.

NH AUDUBON ARCHIVE

Loons and Lead

Protecting Loons from Lead

Loon Preservation Committee: <https://loon.org/loons-and-lead/>

Effect of lead on Common Loons

<https://wildlife.onlinelibrary.wiley.com/doi/full/10.1002/jwmg.21348>

Pesticides and Birds

Pesticides of home and garden, American Bird Conservancy

<https://abcbirds.org/program/pesticides/home-and-garden/>

Pesticides on food crops, American Bird Conservancy

<https://abcbirds.org/program/pesticides/food-crops/>

Mosquito Prevention at Home

New Hampshire: www.dhhs.nh.gov/dphs/cdcs/arboviral/documents/prevention.pdf

Center for Disease Control: www.cdc.gov/mosquitoes/pdfs/MosquitoBitePreventionUS_508.pdf

Swallow Conservation – NH Audubon (<https://nhbirdrecords.org/swallow-conservation/>)

Swallow Fact Sheets (PDF format)

New Hampshire Swallow Fact Sheet, Conservation of Bank Swallows at Active Gravel Pits,

Conservation of Barn Swallows, NH Cliff Swallow Information Brochure, Cliff Swallow

Nest Poster

Town Planning

Wildlife Habitat and Natural Resource Protection Audit of Town Documents

<https://wildlife.state.nh.us/wildlife/wap-audit.html>

Innovative Land Use Planning Techniques (Oct. 2008), NH Dept. of Environmental Services

New Hampshire Association of Conservation Commissions: www.nhacc.org

Window Collision Prevention

Birds Flying into Windows FAQs

American Bird Conservancy: <https://abcbirds.org/blog/truth-about-birds-and-glass-collisions>

Save Birds from Flying Into Windows

American Bird Conservancy: <https://abcbirds.org/get-involved/bird-smart-glass/#2>

Bird Smart Glass products

American Bird Conservancy: <https://abcbirds.org/get-involved/bird-smart-glass/>

Bird-Friendly Building Design

American Bird Conservancy: https://abcbirds.org/wp-content/uploads/2019/04/Bird-Friendly-Building-Design_Updated-April-2019.pdf

Fatal Light Awareness Program: <https://flap.org/>

Is Your Home/Workplace Safe (self-assessment), BirdSafe: <https://birdsafeca/>

Wind Siting Guidelines

Common Nighthawk Monitoring and Management at Wind Turbine Sites

NH Audubon: <https://nhbirdrecords.org/wind-turbines-and-nighthawks/>

NH RSA, Title XII, Public Safety and Welfare, Chapter 162-H, Energy Facility Evaluation, Siting, Construction and Operation, Section 162-H:10-a: www.gencourt.state.nh.us/rsa/html/XII/162-H/162-H-10-a.htm

NH RSA, Title LXIV, Planning and Zoning, Chapter 674, Local Land Use Planning and Regulatory Powers, Section 674:62-66 www.gencourt.state.nh.us/rsa/html/LXIV/674/674-mrg.htm

NH Rules, Chapter Site 100, Organizational Rules: www.gencourt.state.nh.us/rules/state_agencies/site100-300.html

Volunteer

Backyard Winter Bird Survey by NH Audubon: <https://nhbirdrecords.org/backyard-winter-bird-survey/>

Nature Groupie: <https://naturegroupie.org/>

NH Audubon: www.nhaidubon.org

eBird - NH: www.ebird.org/nh



PAM HUNT

While Oriental Bittersweet can provide food and shelter for birds, the plant can quickly overwhelm native plants and is now banned from sale in New Hampshire.



PAM HUNT

Most Cliff Swallows nest on buildings in New Hampshire. Because they are a threatened species, it is important not to disturb them during the breeding season.

WILDLIFE CONSERVATION ORGANIZATIONS

American Bird Conservancy (www.abcbirds.org)

This non-profit organization is among the leading advocates for bird conservation in the United States and elsewhere in the Western Hemisphere. It is active in many of the issues identified in this publication.

New Hampshire Audubon (www.nhaudubon.org)

A nonprofit statewide membership organization, independent of National Audubon, dedicated to the conservation of wildlife and habitat throughout the state. Bird information is provided through the quarterly publication *New Hampshire Bird Records*: www.nhbirdrecords.org

New Hampshire Fish and Game Department (www.wildlife.state.nh.us/)

The Department is charged with conserving all the wildlife in the state, both game and nongame species. At the Department's web site you can find wildlife information and links to the New Hampshire Wildlife Action Plan.

UNH Cooperative Extension (<https://extension.unh.edu/>)

Extension serves a valuable role in providing outreach and technical assistance to landowners across the state. At their web site you can find links to habitat management recommendations and information on programs offered by Extension.

NATIONAL BIRD CONSERVATION INITIATIVES

The following entities are collaboratives among agencies, non-profits, and other groups. Some are focused on a particular subgroup of birds.

Bringing Birds Back (www.3billionbirds.org)

Includes links to the 2019 *Science* paper mentioned in the introduction.

Partners in Flight (www.partnersinflight.org)

Assumes responsibility for conservation planning for landbirds, a broadly defined group that includes all species other than shorebirds, waterfowl, waterbirds, and resident game birds.

The North American Waterfowl Management Plan

www.fws.gov/birds/management/bird-management-plans/north-american-waterfowl-management-plan.php

The oldest of the bird initiatives, formed in 1986, primarily concerned with the conservation of ducks, geese, and swans.

The Shorebird Group

www.fws.gov/birds/management/bird-management-plans/the-us-shorebird-conservation-plan.php

Works to conserve North American shorebird populations through a combination of research, monitoring, and conservation planning.

US State of the Birds (www.stateofthebirds.org)

Here you can find copies of the national State of the Birds documents.

Waterbird Conservation

www.fws.gov/birds/management/bird-conservation-partnership-and-initiatives/waterbird-conservation.php

Focused on a broad selection of wetland and marine birds that includes colonial waterbirds (e.g., herons and terns), marshbirds (e.g., rails and bitterns), and other solitary species such as loons.

BIRD POPULATION DATA SOURCES

The resources listed below (among others) are vital tools to assess the health of bird populations both in New Hampshire and across North America.

Breeding Bird Survey (BBS) (www.pwrc.usgs.gov/bbs/index.cfm)

The BBS is a nationwide bird monitoring system established in 1966. It includes thousands of 25-mile roadside routes that are surveyed annually during the breeding season. The BBS website allows users to look up trends for any species or region, as well as providing a wealth of other information relevant to bird conservation.

Christmas Bird Count (www.audubon.org/conservation/science/christmas-bird-count)

This annual winter bird count began in 1900 and is the oldest survey of its kind. It is conducted by volunteers and coordinated by the National Audubon Society.

eBird - NH (www.ebird.org/nh)

This worldwide database of bird sightings includes the New Hampshire data that was formerly collected by NH Audubon.



LEN MEDLOCK

Orchard Oriole is a southern species that has been slowly increasing in New Hampshire. In the early 1980s it was found only in the extreme southeastern part of the state, but now can occasionally be found as far north as Concord, NH.

Appendix: Species and Habitat Data Reference Tables

The Breeding Species table includes all species that have bred in New Hampshire over approximately the last two decades.

- Italics** = Rare or irregular breeders
- B = Habitats in which a species breeds
- N = Additional habitat where the species occurs during migration or winter

The Non-breeding Species table includes species that are roughly annual in occurrence during migration or winter.

- x = Habitats used during migration or winter

If a species in either table is considered a Species of Greatest Conservation Need (SGCN), it is assigned one of the following categories:

- X = species listed as an SGCN in the 2015 *New Hampshire Wildlife Action Plan*
- SC = Special Concern in NH
- T = Threatened in NH
- E = Endangered in NH
- R = Considered a Regional SGCN in the northeastern United States (only shown if a species is not in any of the previous categories)

General Trend (see p. 5):

- II = strong increase
- I = moderate increase
- S = stable
- D = moderate decrease
- DD = strong decrease
- U = unknown

Breeding Species

In this table, habitats in which a species breeds are indicated with a “B.” If the species occurs in a different habitat consistently during the non-breeding season it is indicated with an “N.” See key on page 51.

Species	SGCN	Spruce-Fir	Hardwood-Mxd	Shrublands	Grasslands	Rocky and Alpine	Wetlands	Lakes and Rivers	Coastal	Developed	General Trend
Canada Goose					N		B	B	N	B	II
Mute Swan							B				D
Wood Duck							B				I
American Wigeon							B	N			I
Mallard					N		B	B	B	B	I
American Black Duck	X				N		B	N	B		S
Green-winged Teal					N		B	N	N		S
Ring-necked Duck							B	N			S
Common Eider									B		S
Common Goldeneye								B	N		S
Hooded Merganser							B	N			I
Common Merganser								B			II
Ruffed Grouse	X		B	B							D
Spruce Grouse	X	B									U
Wild Turkey			B	B	B						II
Pied-billed Grebe	E						B	N			U
Rock Pigeon										B	S
Mourning Dove				B						B	I
Yellow-billed Cuckoo				B							D
Black-billed Cuckoo	X			B							D
Common Nighthawk	E			B		B				B	DD
Eastern Whip-poor-will	X		B	B							D
Chimney Swift	X		B							B	DD
Ruby-throated Hummingbird			B	B						B	I
Virginia Rail							B		B		U
Sora	X						B				U
Common Gallinule	X						B				D
Sandhill Crane					B		B				I
American Oystercatcher	R								B		I
Piping Plover	E								B		I
Killdeer					B				N	B	DD
Upland Sandpiper	E				B						D
Wilson's Snipe					N		B				D
American Woodcock	X		B	B							D
Spotted Sandpiper							B	B	B		D
Willet	X								B		I
Black Guillemot									B		I
Herring Gull								N	B	B	DD
Great Black-backed Gull									B	N	D
Least Tern	E								B		U
Roseate Tern	E								B		S
Common Tern	T								B		S
Arctic Tern	X								B		D
Common Loon	T							B	N		II
Double-crested Cormorant								N	B		I
American Bittern							B				U

Species	SGCN	Spruce-Fir	Hardwood-Mxd	Shrublands	Grasslands	Rocky and Alpine	Wetlands	Lakes and Rivers	Coastal	Developed	General Trend
Least Bittern	SC						B				U
Great Blue Heron							B	B	N		I
Green Heron							B				DD
Turkey Vulture			B			B				B	II
Osprey							B	B	B		I
Northern Harrier	E			B	B		B		N		U
Sharp-shinned Hawk		B	B							B	I
Cooper's Hawk			B							B	II
Northern Goshawk	X	B	B								U
Bald Eagle	X							B			II
Mississippi Kite										B	I
Red-shouldered Hawk			B								I
Broad-winged Hawk		B	B								I
Red-tailed Hawk			B		B						I
Eastern Screech-Owl			B							B	S
Great Horned Owl			B		B						D
Barred Owl		B	B								I
Boreal Owl		B									U
Northern Saw-whet Owl		B	B								U
Belted Kingfisher								B		B	D
Red-headed Woodpecker			B								U
Red-bellied Woodpecker			B							B	II
Yellow-bellied Sapsucker		B	B								I
Downy Woodpecker		B	B							B	II
Hairy Woodpecker		B	B							B	I
Am. Three-toed Woodpecker	SC	B									D
Black-backed Woodpecker		B									U
Northern Flicker			B		N					B	D
Pileated Woodpecker		B	B								II
American Kestrel	SC				B					B	DD
Merlin		B	B							B	II
Peregrine Falcon	T					B				B	I
Great Crested Flycatcher			B							B	S
Eastern Kingbird				B			B			B	DD
Olive-sided Flycatcher	SC	B	B				B				DD
Eastern Wood-Pewee			B								D
Yellow-bellied Flycatcher		B									S
Alder Flycatcher				B			B				II
Willow Flycatcher				B			B				II
Least Flycatcher			B								DD
Eastern Phoebe								B		B	S
Yellow-throated Vireo			B								S
Blue-headed Vireo		B	B								I
Warbling Vireo			B	B						B	S
Philadelphia Vireo		B	B								I
Red-eyed Vireo			B	N							I

Species	SGCN	Spruce-Fir	Hardwood-Mxd	Shrublands	Grasslands	Rocky and Alpine	Wetlands	Lakes and Rivers	Coastal	Developed	General Trend
Canada Jay		B									U
Blue Jay		B	B						B		D
American Crow			B						B		I
Fish Crow			B						B		II
Common Raven		B	B			B					I
Horned Lark	SC			B	N			?			D
Purple Martin	T								B	B	D
Tree Swallow				B		B		B	B		D
N. Rough-winged Swallow							B				S
Bank Swallow	SC						B		B		DD
Cliff Swallow	T			B					B		DD
Barn Swallow				B					B		DD
Black-capped Chickadee		B	B						B		I
Boreal Chickadee		B									D
Tufted Titmouse			B						B		II
Red-breasted Nuthatch		B	B						B		I
White-breasted Nuthatch			B						B		II
Brown Creeper		B	B								I
Carolina Wren			B	B					B		II
House Wren				B					B		D
Winter Wren		B	B								U
Marsh Wren	X						B		B		U
Blue-gray Gnatcatcher			B								I
Golden-crowned Kinglet		B									I
Ruby-crowned Kinglet		B		N							D
Eastern Bluebird				B					B		II
Veery	X		B								D
Bicknell's Thrush	SC	B									D
Swainson's Thrush		B									S
Hermit Thrush		B	B								S
Wood Thrush	X		B								DD
American Robin			B	N	N				B		S
Gray Catbird				B					B		S
Northern Mockingbird				B					B		D
Brown Thrasher	X			B							DD
European Starling									B		DD
Cedar Waxwing		B	B	B		B			B		S
House Sparrow									B		DD
American Pipit	SC			N	B			N			S
Evening Grosbeak		B	B						N		D
House Finch									B		S
Purple Finch	X	B	B						B		DD
Red Crossbill		B									U
White-winged Crossbill		B									U
Pine Siskin		B							N		U
American Goldfinch				B					B		S
Eastern Towhee	X			B							DD
Chipping Sparrow			B	B					B		I
Field Sparrow	X			B							DD
Vesper Sparrow	SC			B	B						DD
Savannah Sparrow					B						D

Species	SGCN	Spruce-Fir	Hardwood-Mxd	Shrublands	Grasslands	Rocky and Alpine	Wetlands	Lakes and Rivers	Coastal	Developed	General Trend
Grasshopper Sparrow	T				B						D
Nelson's Sparrow	SC							B			D
Saltmarsh Sparrow	SC							B			DD
Seaside Sparrow								B			S
Fox Sparrow		B		N						N	I
Song Sparrow				B	B					B	D
Lincoln's Sparrow		B		N			B				D
Swamp Sparrow				N			B				S
White-throated Sparrow		B	B	B						N	DD
Dark-eyed Junco		B				B				N	DD
Bobolink	X				B						DD
Eastern Meadowlark	T				B						DD
Orchard Oriole			B	B						B	I
Baltimore Oriole			B	B						B	DD
Red-winged Blackbird					B		B			B	D
Brown-headed Cowbird					B					B	D
Rusty Blackbird	SC	B					B				DD
Common Grackle				B			B			B	DD
Ovenbird			B								S
Louisiana Waterthrush			B					B			S
Northern Waterthrush			B				B				DD
Golden-winged Warbler	X			B							DD
Blue-winged Warbler	X			B							D
Black-and-white Warbler			B	B							DD
Tennessee Warbler		B		N							D
Nashville Warbler				B							DD
Mourning Warbler				B							DD
Common Yellowthroat				B			B				S
American Redstart			B	N							D
Cape May Warbler	X	B		N							D
Cerulean Warbler	T		B								D
Northern Parula		B	B	N							II
Magnolia Warbler		B		N							S
Bay-breasted Warbler	X	B									D
Blackburnian Warbler		B	B								S
Yellow Warbler				B			B				DD
Chestnut-sided Warbler				B							DD
Blackpoll Warbler		B		N							D
Black-throated Blue Warbler			B								I
Palm Warbler		B		N	N						II
Pine Warbler			B	N						B	II
Yellow-rumped Warbler		B	B	N							S
Prairie Warbler	X			B							I
Black-throated Green Warbler			B	N							I
Canada Warbler	X	B	B								DD
Wilson's Warbler		B		B							D
Scarlet Tanager	X		B	N							DD
Northern Cardinal				B						B	II
Rose-breasted Grosbeak			B	B							DD
Indigo Bunting				B							S

Non-breeding Species

In this table, an “x” indicates a habitat used by each species during migration or winter. See key on page 51.

Species	SGCN	Spruce-Fir	Hardwoods-Mxd	Shrublands	Grasslands	Rocky and Alpine	Wetlands	Lakes and Rivers	Coastal	Developed	General Trend
Snow Goose					x			x			I
Brant									x		S
Blue-winged Teal							x				D
Northern Shoveler							x				I
Gadwall							x		x		I
Northern Pintail					x		x	x	x		S
Greater Scaup								x	x		D
Lesser Scaup								x	x		S
Harlequin Duck	R								x		I
Surf Scoter									x		S
White-winged Scoter									x		D
Black Scoter									x		U
Long-tailed Duck									x		U
Bufflehead								x	x		I
Barrow's Goldeneye								x	x		U
Red-breasted Merganser									x		U
Ruddy Duck							x	x			U
Horned Grebe								x	x		D
Red-necked Grebe									x		I
American Coot							x	x			U
Black-bellied Plover									x		U
American Golden-Plover					x				x		U
Semipalmated Plover									x		D
Whimbrel	R								x		D
Hudsonian Godwit									x		D
Ruddy Turnstone	X								x		D
Red Knot	T								x		DD
Stilt Sandpiper									x		U
Sanderling	X								x		D
Dunlin									x		I
Purple Sandpiper	R								x		D
Least Sandpiper							x		x		I
White-rumped Sandpiper									x		U
Pectoral Sandpiper					x		x		x		U
Semipalmated Sandpiper	X								x		D
Short-billed Dowitcher									x		I
Solitary Sandpiper							x		x		U
Lesser Yellowlegs							x		x		DD
Greater Yellowlegs							x		x		I
Red-necked Phalarope									x		D
Dovekie									x		U
Common Murre									x		I
Thick-billed Murre									x		S
Razorbill									x		I
Atlantic Puffin									x		I
Black-legged Kittiwake									x		S

Species	SGCN	Spruce-Fir	Hardwoods-Mxd	Shrublands	Grasslands	Rocky and Alpine	Wetlands	Lakes and Rivers	Coastal	Developed	General Trend
Bonaparte's Gull									x		D
Laughing Gull									x		II
Ring-billed Gull					x			x	x	x	I
Iceland Gull									x	x	U
Lesser Black-backed Gull									x		I
Glaucous Gull									x		U
Black Tern							x	x	x		DD
Red-throated Loon									x		I
Northern Fulmar									x		U
Cory's Shearwater									x		U
Sooty Shearwater									x		U
Great Shearwater									x		U
Manx Shearwater									x		U
Wilson's Storm-Petrel									x		U
Leach's Storm-Petrel									x		I
Northern Gannet									x		I
Great Cormorant									x		S
Great Egret							x	x	x		II
Snowy Egret									x		S
Black-crowned Night-Heron							x		x		S
Glossy Ibis									x		S
Black Vulture						x				x	II
Golden Eagle	X	x	x			x					S
Rough-legged Hawk					x				x		S
Snowy Owl									x		D
Short-eared Owl					x				x		D
Northern Shrike				x	x					x	D
Sedge Wren	X			x			x				U
Gray-cheeked Thrush		x	x							x	DD
Bohemian Waxwing										x	D
Pine Grosbeak		x								x	DD
Common Redpoll		x	x	x						x	D
Lapland Longspur					x	x			x		S
Snow Bunting					x	x			x		D
American Tree Sparrow				x	x					x	D
Clay-colored Sparrow				x	x						I
White-crowned Sparrow				x	x					x	D
Orange-crowned Warbler				x							U
Connecticut Warbler				x							DD

Answer to bird quiz on p. 42:

From left to right as they appear, the eight species in this photo are as follows: White-cheeked Pintail, Great Egret, Blue-winged Teal, Greater Yellowlegs, Northern Shoveler, Common Gallinule, Tricolored Heron, and Black-necked Stilt. Only the pintail does not breed in the United States.

Glossary

Acid deposition – Also known as acid rain, this phenomenon is the result of the burning of certain fossil fuels. Nitrates and sulfates in coal combine with moisture in the atmosphere to create acidic particles. These particles can come to earth in rain, snow, fog, and dry particles and lower the pH (increase the acidity) of water bodies and the soil.

Anthropogenic – Anthropogenic habitats are those that are created or maintained by human activity. The term is most often used for shrublands and grasslands.

Area sensitive – Refers to species that require a certain minimum amount of habitat before they will settle and attempt to breed. Most commonly observed in forest and grassland birds.

Avifauna – Refers to the overall diversity and abundance of birds in a particular region.

Bioaccumulate – The process by which environmental toxins increase in concentration as they are passed up the food chain. This is the result of predators needing to consume multiple prey items, each of which has a dose of the toxin.

Brood parasite – Brood parasites are birds that lay their eggs in other species' nests, thus leaving their young to be raised by these "hosts." Parasitism often results in reduced reproductive output for the host birds. The primary brood parasite in New Hampshire is the Brown-headed Cowbird, which is known to lay eggs in the nests of over 100 species.

Conservation easement – A deed that runs with the land to permanently protect the land in an undeveloped condition for forestry, farming, habitat

conservation, low-impact outdoor recreation, and similar open space uses.

Edge – The area where two different habitats meet. Edges are zones of often rapid environmental change, such as when the cooler and moister conditions of a forest interior give way to a warm and dry grassland.

Fragmentation – The process by which a previously intact and expansive area of uniform habitat (usually forest or grassland) is broken into smaller and non-adjacent parcels, usually by roads, buildings, and or non-natural habitat (e.g., cornfields). See also "area sensitive."

Invasive species – These are plants or animals that are generally not native to an area and which have been accidentally or intentionally introduced. Lacking their natural enemies, they often reproduce at high rates, outcompete native species, and result in significant changes to the habitats in which they occur.

Long-distance migrants – Long-distance migrants are species which breed in the US and Canada but whose winter ranges are largely south of the United States, including the Caribbean, Mexico, and Central and South America.

Phenological mismatch – Phenology refers to the timing of events during a plant or animal's annual cycle. Many of these events (e.g., blooming, egg-laying) are partially controlled by climate, especially temperature and rainfall. Phenological mismatch occurs when plants and animals respond to climate change at different rates, resulting in events that formerly occurred at the same time of year no longer being synchronous. Examples include flowers

blooming a month earlier than their pollinators emerging from hibernation or birds arriving from migration too late to capitalize on spring insect emergences.

Residents – Resident species are non-migratory and spend their entire lives in New Hampshire. Some, such as chickadees and Blue Jays, may undertake short distance movements, but the species can still be found in the state year round.

Short-distance migrants – Short-distance migrants are species which breed in the US and Canada but whose winter ranges are primarily within the United States, although usually south of New Hampshire.

Species of Greatest Conservation Need (SGCN) – A species identified as rare or declining in a state or region and that is likely to benefit from directed conservation action. Species in state Wildlife Action Plans are all assumed to be SGCN.

Stopover – Stopover refers to periods during migration when migrants stop to rest and feed before continuing their journeys. Sometimes this occurs in specific locations (stopover sites), whereas any habitat so used is considered "stopover habitat." Both sites and habitats can vary in terms of the shelter and food they provide.

WAP – *New Hampshire Wildlife Action Plan*

Wildlife openings – Small openings in forest habitats created for the purpose of providing habitat diversity for wildlife. They are usually the result of complete or partial timber harvests and are dominated by a mix of grasses and shrubs.

A Note on Data Sources

Despite all the gaps in our knowledge, birds arguably are the best-monitored group of organisms in North America. Extensive data sets from continent-wide sources and more targeted surveys for state and federally endangered species and species of concern inform our understanding. By far the most important source is the Breeding Bird Survey (BBS, <https://www.pwrc.usgs.gov/bbs/>), a continent-wide program coordinated by the US Geological Survey since 1966. We used BBS data for New Hampshire wherever possible, but also looked at regional BBS trends when state sample sizes were too small to produce an accurate or reliable trend. Christmas Bird Count data, monitoring programs for rare species, Breeding Bird Atlases, NH Audubon's Backyard Winter Bird Survey, and raptor migration counts also factored into trend analyses when appropriate. They were especially useful for setting New Hampshire trends in a regional context.

Data from eBird were also used to inform this publication:

eBird: An online database of bird distribution and abundance [web application]. eBird, Cornell Lab of Ornithology, Ithaca, New York. Available: <http://www.ebird.org>.

Citation for map on page 40:

Fink, D., T. Auer, A. Johnston, M. Strimas-Mackey, O. Robinson, S. Ligocki, B. Petersen, C. Wood, I. Davies, B. Sullivan, M. Iliff, S. Kelling. 2020. eBird Status and Trends, Data Versino: 2018; Released: 2020. Cornell Lab of Ornithology, Ithaca, New York. <https://doi.org/10.2173/ebirdst.2018>



Data collected by birders form an increasingly important source of information on the status and distribution of birds worldwide.

NH Audubon Areas of Focus

NH Audubon's staff expertise runs deep—representing more than 350 combined years of conservation and education experience in New Hampshire. We are recognized for our accomplishments, but also for our leadership in addressing emerging environmental challenges. Our naturalists, biologists, and volunteers are some of the best in the region, and they willingly share their knowledge through our programs.



JACK DORSEY

Conservation Science

Through research, management, monitoring, expert consultation, and citizen science, we are dedicated to providing sound science that informs decision making. Our highly educated staff scientists share more than 150 years of combined experience in wildlife ecology and conservation. A strong corps of volunteers add crucial project support.



SEAN GILLERY

Environmental Policy

In close collaboration with our conservation partners, we advocate for effective environmental policies that are informed by science. We regularly testify in front of state and federal legislative committees, communicate with Congress and the NH legislature, and develop strategies for how to approach current environmental issues and proposed legislation.



HILARY CHAPMAN

Environmental Education

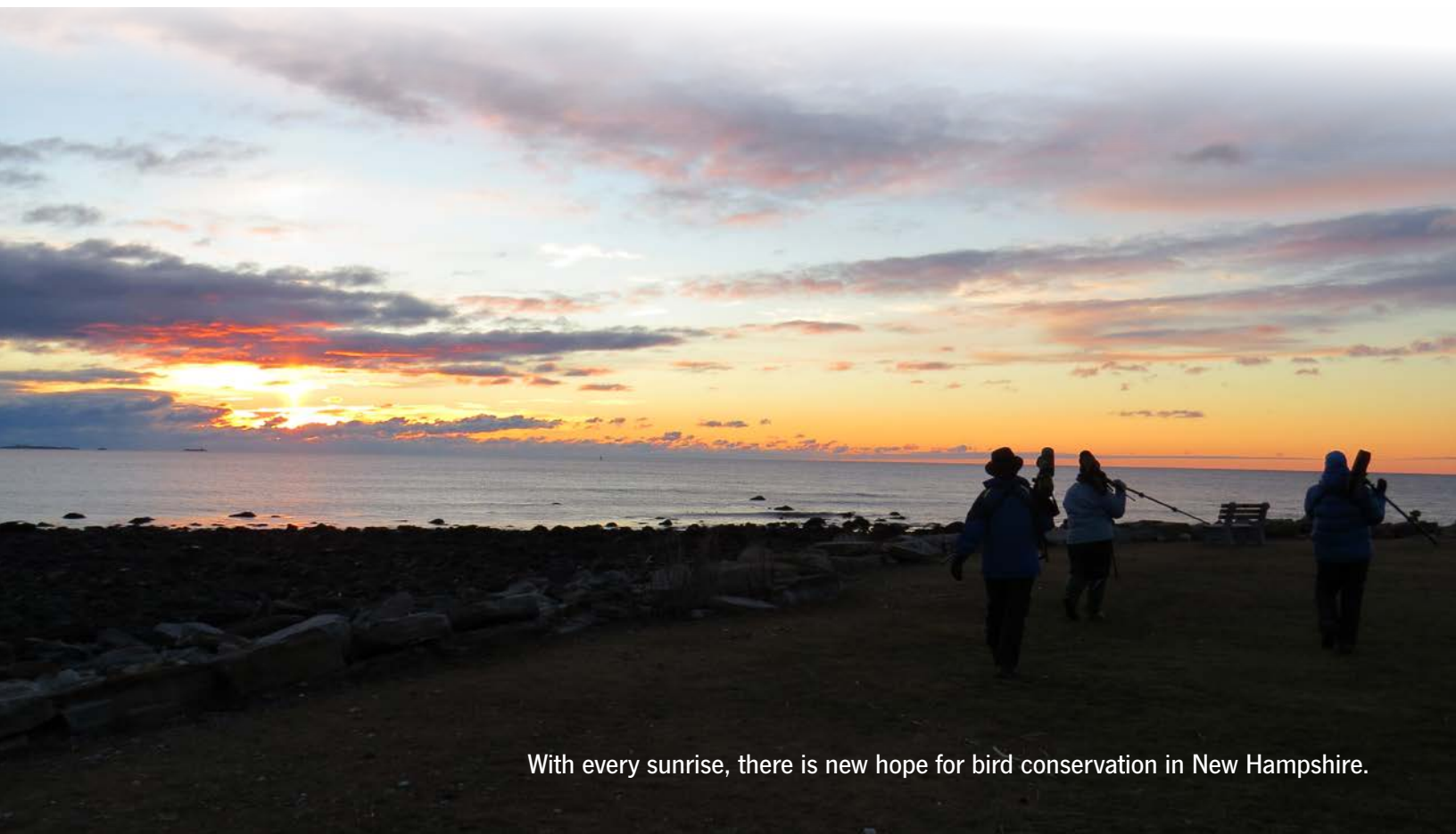
We reach over 40,000 youth and adults annually through environmental education programs delivered by highly qualified education staff. Programming takes place at our nature centers and off-site locations, including schools, across the state. In addition, summer and vacation camps provide the opportunity for children to get outside and experience the natural world.



CHERYLL WILLIAMS

Land Stewardship

NH Audubon actively stewards over 7,500 acres on 39 wildlife sanctuaries, spanning every New Hampshire county. Our lands provide recreational opportunities along 75 miles of trails. We actively enhance wildlife habitat by maintaining open fields, creating wildlife openings, and removing invasive species. Our sanctuaries protect several species of rare plants and animals, as well as unique natural communities.



With every sunrise, there is new hope for bird conservation in New Hampshire.

PAM HUNT

Each individual action you take to help
conserve birds can make a difference.

All of us working together, for a world we
share with the birds, is vitally important,
for our birds and for us.

The choice is ours.