



2021-2022

RESEARCH + MANAGEMENT REPORT

Non-Game Species Conservation and Management



Download additional sections at mefishwildlife.com/wildlifereport



2021-22 RESEARCH & MANAGEMENT REPORT

Maine Department of Inland Fisheries and Wildlife protects and manages Maine's fish and wildlife and their habitats, promotes Maine's outdoor heritage, and safely connects people with nature through responsible recreation, sport, and science.

Non-Game Species Conservation & Management

Meet The Non-Game Species Conservation & Management Group	2
Canada Lynx.....	3
Bats	9
Northern Bog Lemmings.....	13
New England Cottontail	14

Download additional sections at mefishwildlife.com/wildlifereport

- » Endangered & Threatened Species Conservation In Maine
- » Beginning with Habitat
- » Land Acquisition & Water Access Programs
- » Habitat Conservation & Management
- » Bird Conservation & Management
- » Game Species Conservation & Management
- » Reptile, Amphibian, and Invertebrate Conservation & Management
- » Regional Wildlife Management

Compiled and edited by
Lauren McPherson

Maine Department of Inland Fisheries & Wildlife

353 Water Street
41 State House Station
Augusta, ME 04333-0041
207-446-2964

Project Funding

These studies are financed in part through Federal Aid in Wildlife Restoration Funds under Projects 88D and 87R and through State Wildlife Grants.

The Department of Inland Fisheries and Wildlife receives Federal funds from the U.S. Department of the Interior.

Accordingly, all Department programs and activities must be operated free from discrimination in regard to race, color, national origin, age or handicap. Any person who believes that he or she has been discriminated against should write to The Office of Equal Opportunity, U.S.



Meet The Non-Game Mammals Conservation & Management Group



Jennifer Vashon
Wildlife Biologist
Black Bear and Canada Lynx

Jennifer oversees the management of black bears and Canada lynx – a federally-threatened species. Jen designs and implements surveys and monitoring plans for bears and lynx and analyzes biological data for these species. She is the departmental spokesperson for lynx and bear, makes annual recommendations for harvesting black bears, and provides technical support on bear and lynx issues to stakeholders in Maine and other states. Jen also ensures that the Department meets its obligations under the federal Incidental Take Permit for Canada lynx.



Cory Stearns
Wildlife Biologist
Small Mammals

Cory is the small mammal specialist for MDIFW, overseeing the research, monitoring, and restoration efforts for small mammals. Most of his work is focused on New England cottontails, bats, and northern bog lemmings.

MAMMAL GROUP CONTRACT WORKERS AND VOLUNTEERS

Lynx Project

- Adrianna Bessenaire
- Ben Holt

Bat Project

- Sara Beck
- Christopher Heilakka
- Erik Blomberg
- Connor White
- Adrianna Bessenaire
- Matt O’Neal
- Elaina Bradford
- Jesse De La Cruz
- Mark Ford

New England Cottontail Project

- Sarah Dudek
- Jeff Tash
- Helen Manning
- Joe Badger
- Kirk Michaud
- Abigail Burke
- Melissa Bauer
- Adrienne Kovach
- Madi Harvey
- Julia Mast

CANADA LYNX

Jennifer Vashon

A Northern Species

Canada lynx (*Lynx canadensis*) thrive in northern Canada, which offers an abundance of the three important factors for this species' survival: boreal spruce/fir forests, high snow depths, and snowshoe hare. The southern end of their range extends to several northern U.S. states (**Figure 1**), with persistent breeding populations found in Maine, Minnesota, Montana, Washington, and Colorado.

FIGURE 1. CANADA LYNX RANGE



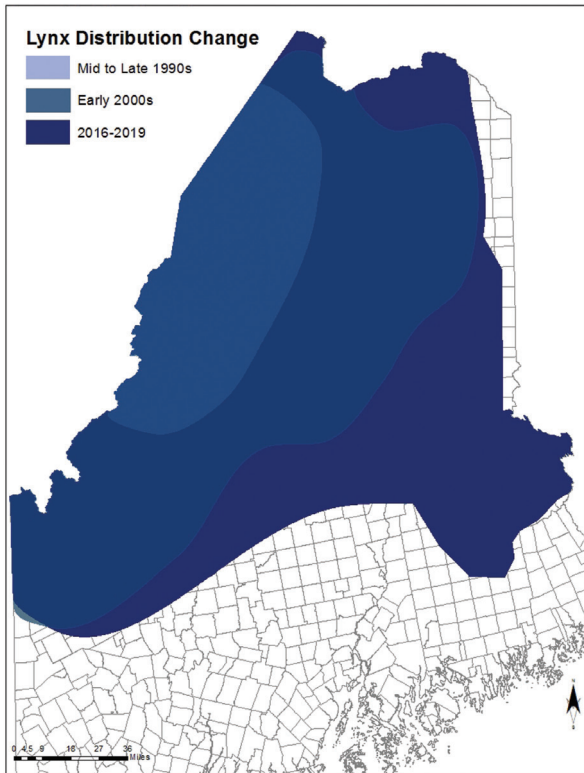
Range map by IUCN Red List



In Maine, lynx reside primarily in our northern spruce/fir forest, where snow depth often remains above a foot for at least three months of the year. Although eastern Maine is not considered part of lynx historic range, lynx have been expanding eastward in recent years (Figure 2) in response to optimal habitat, favorable winter conditions, and sufficient prey.

Their primary prey, snowshoe hare, seek cover and food in young, dense spruce/fir forests, including forests following natural or human disturbance (e.g., wind damage or forest cutting). They can also be found in older forests that have a dense understory of trees.

FIGURE 2. LYNX HAVE BEEN EXPANDING THEIR RANGE IN NORTHERN MAINE.



When Snowshoe Hare Thrive, Lynx Thrive, Too

Because lynx specialize on snowshoe hare, lynx abundance is tied to snowshoe hare abundance.

In Canada, snowshoe hare populations follow predictable 10-year cycles, typically peaking in abundance at the beginning of the decade and dipping mid-way through before slowly increasing again. Lynx survival and productivity follows this same trend, lagging by two to three years. Once lynx become more common, snowshoe hare numbers begin to decrease, and a decrease in lynx numbers follows.

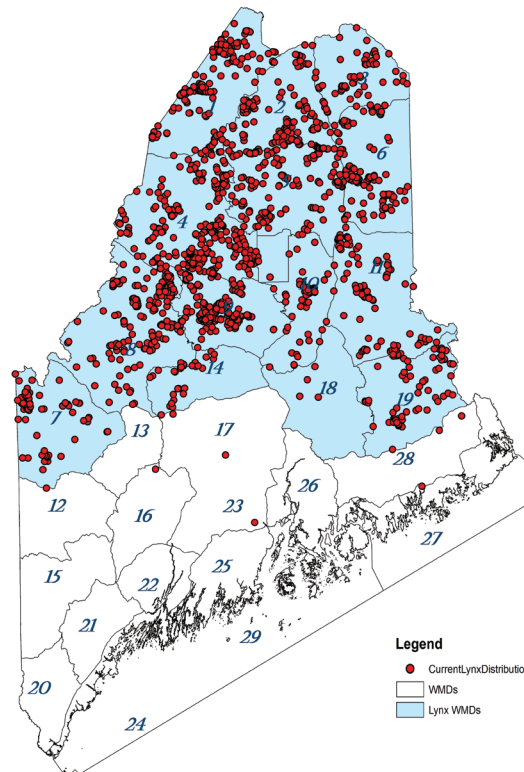
Snowshoe hare numbers also influence lynx reproductive rates, with female lynx producing more kittens when they have a lot to eat. In Canada, although litters as large as eight kittens have been observed, a normal litter is one to five. In Maine, when snowshoe hares are abundant, litters of four to five kittens are common. Age is also a factor — younger females typically give birth to smaller litters and although lynx can reach reproductive maturity as yearlings, very few do even in the core of the range when snowshoe hares are most abundant.

Maine is Home to the Largest Lynx Population in the Lower 48

Estimates suggest there are more than 1,000 adult lynx in northern Maine. Including offspring, the total may approach 2,000. The population has been growing since the 1990s, when habitat conditions following the spruce budworm outbreak began to support an abundance of prey.

Over the last 20 years, people in northern Maine have been seeing lynx more regularly (Figure 3). Since lynx are naturally calm and mostly ambivalent to the presence of people, they will often stay in the area long enough for a viewer to capture a photo or video. Such an opportunity to watch lynx in their natural environment is a truly unique and memorable experience.

FIGURE 3. CREDIBLE LYNX OBSERVATIONS IN MAINE SINCE 2000



Why are Lynx in Maine Thriving?

Nearly 90% of Maine’s land area is classified as forest — the highest percentage of any U.S. state. And within the expansive spruce and fir forests of northern Maine, conditions are ideal for lynx: human development is low, snow is deep, and a blend of natural and human disturbances have created record-high levels of lynx habitat.



Much of northern Maine’s acreage is actively managed for commercial forest products; and in the 1980s, a major insect outbreak impacted most of the spruce and fir, causing extensive areas to be cut to salvage dead or diseased trees. This event, combined with the ongoing

harvest schedule, has created many young, dense, regenerative softwood thickets perfect for snowshoe hare (and therefore lynx).

Is it a lynx or bobcat?

Two closely related wild felids are found in Maine, the bobcat and Canada lynx. Although bobcats and lynx are both small, bobtailed cats, bobcats are more habitat and prey generalists, and do not do well in areas with deep snow. As a result, bobcats are more common in southern portions of the state and are found in a variety of habitats. So, location is your first clue as to whether it is likely a bobcat or a lynx. Next, you can look at certain key features.

Lynx are similar in appearance to bobcats but have more pronounced features, with larger ruff around the face, long black tufts on the ears, noticeably large feet, and a completely black tipped tail.

LYNX	BOBCAT
	
EAR TUFTS Generally greater than 1"	Generally less than 1"
FACIAL RUFFS Larger facial ruffs with black banding at outer edges	Smaller facial ruffs with less distinct banding on outer edge
PELT COLOR More uniform coat color. Generally grey pelt including the back of the hind legs. Belly fur greyish white with some black spots.	Reddish brown pelt with distinctive dark brown fur along the back of the hind legs. Belly fur white with distinct black spots.
TAIL COLOR Generally matches body color except the entire tip (about the last 1") is black	Usually has dark bars and the tip of the tail is black on upper side but is white on underside
FEET Large and snowshoe-like feet and hind legs are longer than the front, giving a "stooped" appearance	Smaller feet (proportional to body) and hind legs are not as long as lynx
TRACK SIZE In dirt: up to 3 3/8" wide x 3 3/4" long	In dirt: up to 2 5/8" wide x 2 1/2" long
In snow: up to 5 1/2" wide x 5 1/2" long	In snow: up to 2 1/2" wide x 2 1/2" long
Stride: 11-18"	Stride: 6-14"



LYNX TRACKS

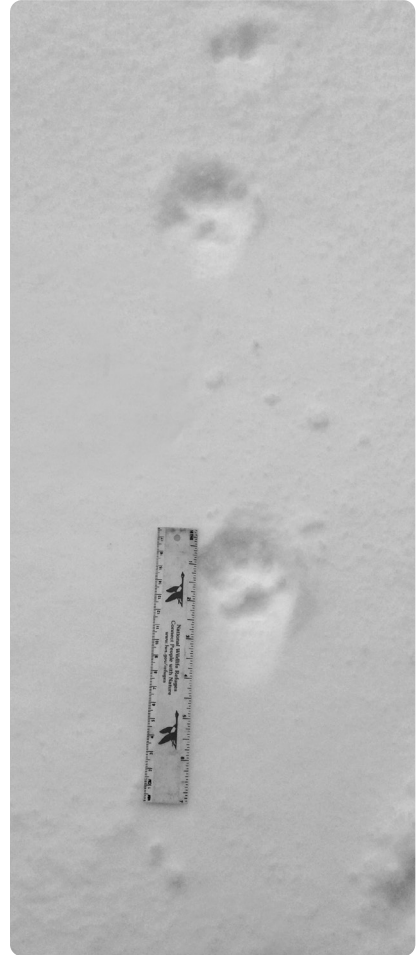


Set of lynx tracks in snow. Photo by MDIFW



Set of lynx tracks in crusty snow. Photo by Chuck Hulsey.

BOBCAT TRACKS



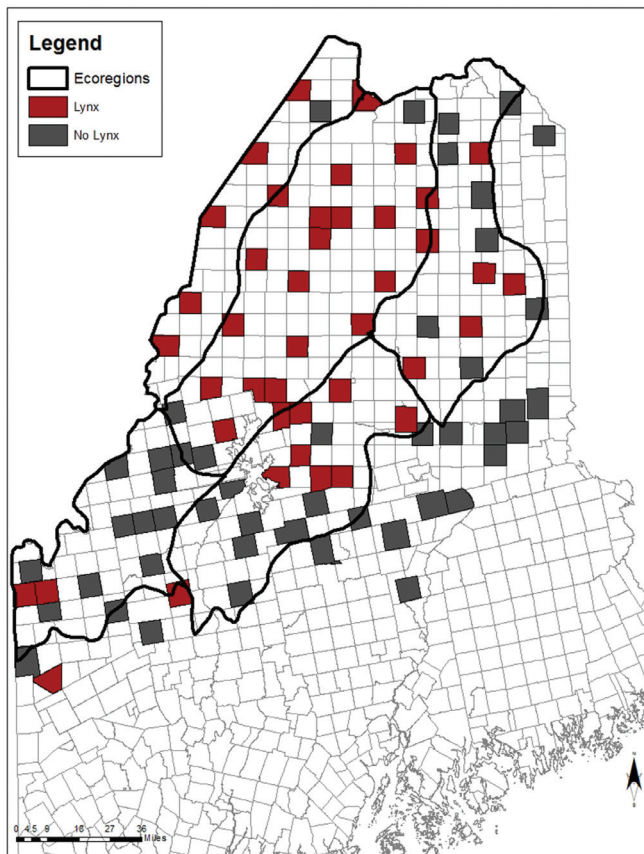
Set of bobcat tracks in crusty snow. Photo by MDIFW

Lynx Management in Maine

Despite their recent population growth, lynx remain a federally-threatened species and a state species of special concern. MDIFW's management efforts include:

- Monitoring lynx status, distribution, and habitat conditions
- Maintaining closed hunting and trapping seasons
- Enforcing laws to reduce illegal activities
- Implementing measures to minimize accidental take of lynx while trapping other species
- Sharing information with private land managers so they can continue to provide lynx habitat

FIGURE 4. LYNX SURVEYS COMPLETED DURING THE WINTERS OF 2003-2008 SHOW LYNX ARE FOUND PRIMARILY IN NORTHERN MAINE.



MAINE'S FIRST LYNX SNOW TRACKING STUDY

In the 1990s, MDIFW began collecting baseline lynx status information by conducting winter snow track surveys along the Maine/Quebec border. During the next decade, in an effort to document the distribution of lynx in the state, we expanded this effort to most of northern and western Maine. Between 2003 and 2008, MDIFW biologists surveyed 89 northern Maine towns and found lynx in 41 (46%) of them (**Figure 4**).

MAINE'S FIRST LYNX TELEMETRY STUDY

In 1999, we initiated a 12-year telemetry study in a four-township area near northern Maine's Allagash Wilderness Waterway. This study, which involved capturing 191 lynx and fitting 85 of them with either GPS or VHF collars for monitoring, was instrumental in documenting the status of Maine's growing lynx population and providing habitat recommendations to private forest landowners.

Through the study, biologists were able to identify lynx habitats and determine the size of the areas lynx were using. We found that lynx were spending most of their time in regenerating spruce/fir clearcuts with some of Maine's highest snowshoe hare densities, and that an adult male would typically share an area with two to three females. When snowshoe hare were abundant, most females would give birth to litters ranging from one to five kittens. And when snowshoe hare were the most abundant, most litters contained four to five kittens.

In 2012, the Department combined this data with the lynx densities and proportion of occupied areas (as determined by snow-track surveys) to develop a **species assessment and the first data-driven statewide lynx population estimate**.

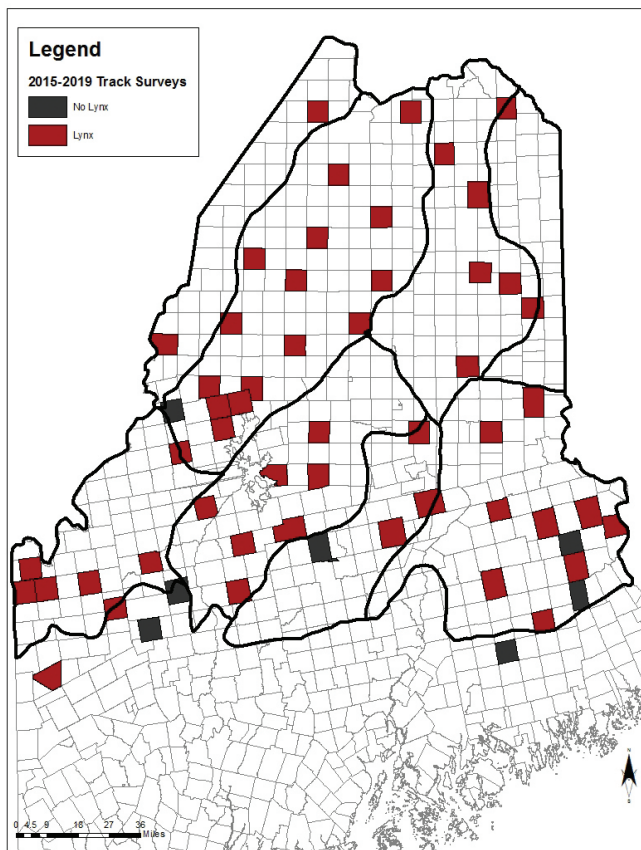
SNOW TRACKING 2.0

In the winter of 2015, with an increase in reliable lynx and kitten observations in eastern and western Maine, Department biologists began updating lynx population estimates. We started by systematically resurveying towns in northern, western, and eastern Maine, searching for lynx tracks in the snow. These surveys were concluded in 2019.

Results show that lynx now occupy a greater percentage of the available habitat in Maine. We surveyed 58 towns and found lynx in 51 (88%) of them (**Figure 5**). Of the 58 towns surveyed, 40 had been previously surveyed (see Figure 4), with a previous occupancy rate of 46%.

TELEMETRY 2.0

FIGURE 5. LYNX SURVEYS COMPLETED DURING THE WINTERS OF 2015-2019 SHOW LYNX EXPANDING THEIR DISTRIBUTION IN MAINE



In the fall of 2015, biologists launched a second telemetry study, through which we have captured 26 lynx (17 males, nine females) to date, primarily along the southern edge of Maine’s lynx range, and equipped them with GPS collars. These collars allow us to identify the habitats lynx are using across Maine and compare them both to each other

and to previous telemetry studies. They also allow biologists to locate lynx denning sites and estimate how many young are born each year.

Although three of the 26 GPS collars failed to send sufficient locational information, data from the other 23 indicated that these areas support resident lynx with established home ranges. They also allowed us to document some long-range movement by a subadult dispersing female lynx who traveled east, crossing I-95 and venturing as far as Fredericton, New Brunswick before returning to establish a home range in eastern Maine.

Thus far, we have monitored five of the nine female lynx during the denning period, and we know that two produced litters of two kittens each. However, since the start of the pandemic, we have not radiocollared lynx to minimize potential virus exposure. We will likely revisit this decision next year.

THE LAST YEAR

In 2022, we continued recording credible lynx sightings including observations of family groups throughout the state. We also continued to respond to road mortalities and accidental trapping of lynx. Although lynx are protected from harvest, they are sometimes caught in foothold traps set for other furbearers. When this occurs, most are released from traps unharmed. We document these captures to help address accidental take and further document lynx distribution in the state. We are also working with researchers at the University of Maine to further analyze existing track survey data. This work will help us to direct future efforts to spot changes in lynx occupancy and distribution. Future monitoring efforts will likely involve more winter snow track surveys throughout northern Maine.

THE FUTURE

In 2000, the USFWS listed lynx as a threatened species in 14 northern states including Maine due to inadequate protection of the species on federal lands. In 2018, the USFWS reviewed the status of lynx. Since the initial threat had been addressed with forest planning, and since lynx populations were more abundant in at least three of the six geographic units (including Maine), they recommended removing federal protection under the US Endangered Species Act. Before lynx can be delisted, the USFWS must finalize a recovery plan, which is expected by December 1, 2024.

This work is supported by the federal Pittman-Robertson program.

BATS

Cory Stearns

Bats are incredible creatures with super-hero qualities — they are the only mammals that can fly, and they hunt their prey using echolocation. They also serve the ecosystem by consuming a tremendous number of insects each night. Eight bat species live in Maine, falling into two categories: tree bats and cave bats.

All three of Maine's tree bat species (silver-haired, eastern red, and hoary bats) are considered species of special concern. They typically roost in tree foliage, are solitary, and migrate out of state for the winter.

Maine's cave bats include little brown (state endangered), eastern small-footed (state threatened), northern long-eared (state endangered, federally endangered), big brown (special concern), and tricolored bats (special concern, but proposed as state threatened and federally endangered). Bats in this group roost in tree cracks and cavities, tend to live in groups, and hibernate in caves during the long winter season (October-April). Little brown and big brown bats are also commonly called house bats, because of their affinity to roost in old barns and attics.

Cave bats are affected by white-nose syndrome (WNS), a deadly fungal disease first documented in the U.S. in 2006 and named after the distinct white noses of infected bats. The fungus grows in dark, moist, cool environments where bats hibernate, and bats or people can easily move the spores from one cave to another. Bats with the disease tend to wake more often from hibernation, which causes them to burn through precious energy reserves and eventually starve to death. Bats with WNS can do strange things, like flying around outside during the day in winter. Little brown bats used to fill our night skies; but since WNS spread to Maine in 2011, their population has declined by approximately 95%. Unfortunately, WNS has now been confirmed in at least 38 states and eight Canadian provinces. Researchers are studying the disease to determine effective treatment options and better understand why some individuals or species are more resistant than others, but there is a lot left to learn.



Monitoring

Bats are notoriously difficult to study — they are active at night, they are challenging to catch, and it now takes a lot of effort to locate some species. Luckily, we have specialized acoustic detectors that record high frequency bat calls and computer software that can identify various species' calls.

In 2015, MDIFW began conducting annual bat acoustic surveys using various methodologies. In the summers of 2015-2020, we collected data from stationary survey sites (i.e., where detectors are set in one location for the duration of the survey) and shared it with researchers Jesse de La Cruz and Dr. Mark Ford of Virginia Tech. Using presence/absence data for each species, as well as remotely sensed data, they were able to identify habitat features that influence the presence and detectability of each of our eight species and generate maps of where each species is likely to occur in the state. This work has greatly increased our knowledge of Maine's bat populations, and was used to establish our long-term monitoring program, which we initiated in 2022.

Previously, we surveyed new sites each year as means of establishing baseline information about our bat populations. Now that we have a solid understanding of our bats' relative abundance and distribution, we have transitioned to a long-term monitoring program. Although we will still survey some new sites each year, most will be repeated on a two-year rotation, with half the sites surveyed in even years and half in odd years. This will give us a more statistically robust methodology for tracking trends in our bat populations.



Prior to the 2022 survey season, we used the results of previous surveys to select many sites for inclusion in the long-term monitoring program, prioritizing those where our rarest species (i.e., northern long-eared, eastern small-footed, and tricolored bats) had been detected. To avoid issues with dependency between sites and to spread our effort across the state, we imposed a 1-km minimum distance between sites and a limit of two sites per property. Our conservation partners at Rachel Carson National Wildlife Refuge and Katahdin Woods and Waters National Monument also contributed their bat monitoring data.

STATIONARY SURVEYS

In 2022, MDIFW and our conservation partners surveyed 225 stationary acoustic sites for a total of about 2,700 detector nights, with >248,000 recordings that were identifiable to species. The results of the 2022 surveys were similar to the Virginia Tech’s previous analysis, with big brown, hoary, and silver-haired bats collectively composing about 85% of all recordings. On the other end of the spectrum, our three rarest species (eastern small-footed, northern long-eared, and tricolored) each accounted for ≤1% of recordings. Hoary bats were detected at the most sites (82.7%), followed by little brown and eastern red bats (67.6%), big brown (61.8%), silver-haired (44.0%), eastern small-footed (12.0%), northern long-eared (8.4%), and tricolored bats (7.1%).

Through our summer monitoring efforts to date, interesting trends have emerged regarding Maine’s bat species distribution. Generally, species richness (the number of species present) and the number of bat recordings are both higher in the southern parts of the state, indicating that bats are more abundant there than they are in northern Maine.

As far as specific species go, big brown bats often roost in barns and attics, so it’s not surprising that their summer distribution is similar to Maine’s human distribution. Eastern red bats are present statewide, but uncommon in Aroostook County. Hoary bats are abundant throughout the state, but in 2022 were found more often in northern regions. Silver-haired bats occur most often in coniferous forests, so they are generally more abundant in northern areas. Little brown bats are well-distributed, but in 2022 were found at a higher portion of sites in northern Maine. Northern-long eared bats are rarely documented, but in 2022 were more commonly documented in coastal areas. Eastern small-footed bats are typically found in taluses, cliffs, or other rocky areas, and in the last two years have been found most often in southern and downeast Maine. And finally, tricolored bats have a patchy distribution and occur most often around major waterbodies.

FIGURE 1. THE NUMBER OF RECORDINGS IDENTIFIED TO SPECIES AT 225 STATIONARY ACOUSTIC SITES IN MAINE DURING SUMMER 2022.

EPFU= big brown bat, LABO = eastern red bat, LACI = hoary bat; LANO = silver-haired bat; MYLE = eastern small-footed bat; MYLU = little brown bat; MYSE= northern long-eared bat; PESU = tricolored bat

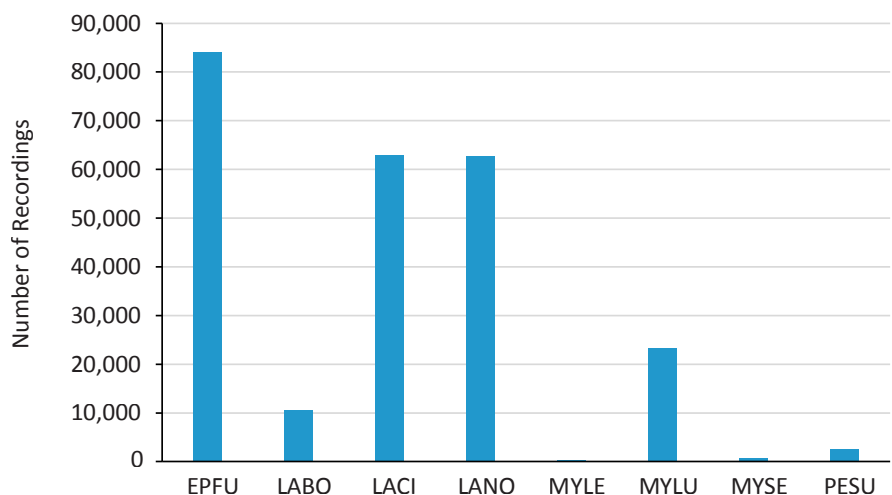




FIGURE 2. STATIONARY ACOUSTIC SURVEY SET-UP AT MAJOR GREGORY SANBORN (BROWNFIELD BOG) WILDLIFE MANAGEMENT AREA, THE ONLY SURVEY SITE WHERE ALL EIGHT SPECIES WERE CONFIRMED IN 2022.

MOBILE SURVEYS

While stationary acoustic surveys are great at detecting whether or not an area is occupied by a species, the current technology does not tell us how many individuals are present. A better methodology for monitoring bat abundance is the mobile survey. Mobile acoustic surveys involve attaching a microphone to a vehicle, which is driven at a constant 20-mph speed for the length of the survey. Since the detector moves at a rate faster than bats typically fly, each recording is likely from a different bat. This allows us to compare the actual numbers of bats detected during surveys. To supplement our stationary survey effort in 2022, we revisited nine mobile routes (ranging from 27 to 33 miles long) that we had previously surveyed in 2017 and 2018. In 2022, we detected more big brown, eastern red, hoary, and little brown bats per survey route than we did in the previous years. However, silver-haired bat numbers were lower in 2022.

FIGURE 3. AVERAGE NUMBER OF BAT RECORDINGS PER MOBILE SURVEY ROUTE, OF NINE ROUTES SURVEYED IN BOTH 2017 AND 2022.

LANO=silver-haired bat; MYLE=eastern small-footed bat; MYLU=little brown bat; MYSE=northern long-eared bat; PESU=tricolored bat

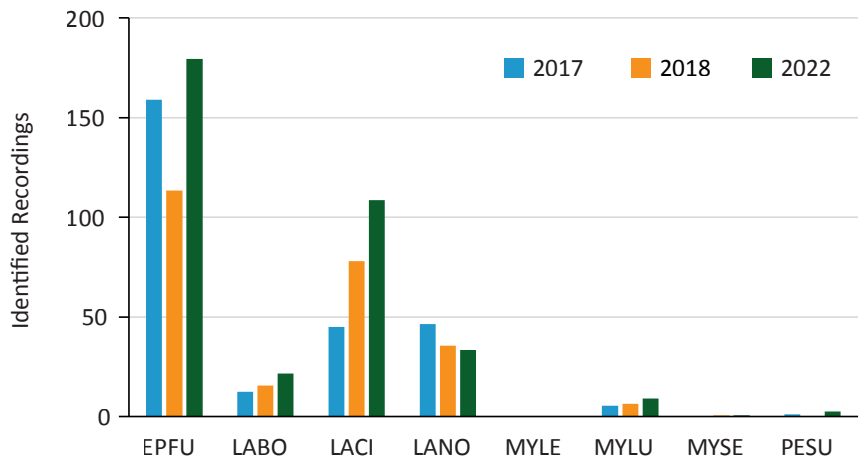




Photo by Ann Froschauer, USFWS.

NON-TRADITIONAL HIBERNACULA STUDY

It's well known that some bats use caves and abandoned mines for hibernation. However, these are not the only places bats hibernate. Research in other states suggests the *Myotis* bats (i.e., little brown, northern long-eared, and eastern small-footed) also hibernate throughout the winter in between the rocks in talus slopes and cliff faces. Since Maine has few caves, gaining a better understanding of our non-traditional alternatives will help our bat conservation efforts. To that end, researchers at MDIFW, Acadia National Park, and the University of Maine partnered on a research project to document whether bats are over-wintering on talus slopes in Maine.

During the winters of 2017/18, 2018/19, and 2019/20, we used acoustic detectors to record bat activity during the core winter period (Dec.-Feb.) on talus slopes in western, central, and coastal Maine. We confirmed bat presence at 25 of 43 survey locations, including detections of big brown (25 sites), eastern small-footed (7 sites), little brown (10 sites), and northern long-eared bats (4 sites). The results suggest that the *Myotis* species are more likely to use larger and more open (i.e., fewer trees) talus slopes for over-wintering. The findings of this study will help us conserve areas with documented winter use and inform future research.

HOW TO HELP BATS

Sometimes bats accidentally get into people's houses, but most of the time they'd rather be in their own! Here are some ways you can help promote natural homes for bats, and keep them safely out of yours.

Give them a habitat. If you have a dead tree on your property, consider leaving it there. Dead trees/snags make wonderful homes for many species (including bats) that roost in the cavities and narrow spaces in between the bark and wood.

Build them a house. No dead tree? No problem. You can build a bat house by following the guidelines from Bat Conservation International www.batcon.org/resources/getting-involved/bat-houses.

Keep them outdoors. Learn more about how to bat-proof your home here: www.maine.gov/ifw/fish-wildlife/wildlife/living-with-wildlife.

Remove with care. If you already have a colony of bats living in your attic and want to remove them, we recommend you avoid doing so during the maternity season (summer) when young are unable to fly, or in winter when they need to be hibernating.

Keep your distance. Never pick up and handle bats. Some bats carry rabies, which is fatal to people and pets if left untreated.

Remove with care. If you find a bat in your home, close the interior doors and open the exterior doors and windows to let it fly out on its own. If that doesn't work, simply put a box over it after it lands. Then slowly slide a piece of cardboard or large envelope between the box and the surface so the bat goes into the box. Some bats may have a hard time flying from the ground, so place the box outside off the ground if you can (such as on a deck).

Call in help. If the bat appears sick and isn't able to fly, contact a bat rehabilitator: www.maine.gov/ifw/fish-wildlife/wildlife/living-with-wildlife/orphaned-injured-wildlife.

Get a test. If a bat is found in a room with an intoxicated, handicapped, sleeping person, child, or if you've had contact with a bat, the bat will need to be captured and tested for rabies. For rabies consultation, contact Maine CDC (1-800-821-5821).

Do some citizen science. If you have a colony of bats in your old barn, attic, or bat house, you can report your observations here: www.maine.gov/ifw/fish-wildlife/wildlife/species-information/mammals/report-bat-colony.html.

NORTHERN BOG LEMMINGS

Cory Stearns

The northern bog lemming (NBL), a state-threatened species, is Maine's most elusive mammal. It is more abundant in the core of its range in the tundra and alpine habitats in Canada and Alaska. The NBL reaches the southern edge of its range in Maine, where it has typically been found in forests at higher elevations (2,000 ft or higher) and in association with thick mats of sphagnum moss. NBL have only been found at five locations in the state, with Baxter State Park being a stronghold for the species.

Studying this species presents some unique challenges, starting with identification. To differentiate it from the much more numerous southern bog lemming, biologists have traditionally needed to capture and euthanize the animal and examine its teeth. But because the NBL is so rare, and because conventional methods used to capture small rodents (e.g., box traps, pitfalls, and snap traps) do not work well for it, we have had to think outside the box to better understand this species' range and habitat preferences.

The Department has partnered with Dr. Zach Olson at the University of New England to develop a northern bog lemming survey technique that uses DNA samples collected from the environment. One readily available source for such DNA samples is feces.

When feces pass through an animal's digestive tract, its intestinal wall sheds small amounts of cellular material. By picking up the feces and isolating the cellular material, scientists can identify what species of animal the sample came from.

In 2015, Dr. Olson successfully developed a technique to differentiate NBL from other rodents based on their genetic code. In 2016, fecal pellets were collected from three known NBL locations to test how well the technique performed in the field. Initial results were promising; NBL positive samples were identified at two of the three locations. But while this technique worked, it was time consuming to search and collect enough samples.

The U.S. Fish and Wildlife Service is currently reviewing the northern bog lemming for potential listing under the federal endangered species act. As part of the review process, in 2021 they conducted a survey effort in Maine (and other states) to collect additional information on the current distribution of the species. MDIFW coordinated with USFWS on survey methodology (which was based on Dr. Olson's methodology developed in Maine) and site selection. The survey effort did document a few new northern bog lemming locations. Due to having few known locations in Maine, further research on their distribution and population status remains a high priority.



Northern Bog Lemmings are found at a handful of locations in Maine in forests associated with thick mats of sphagnum moss like this site in Baxter State Park. Photo by A. Bessenaire.

NEW ENGLAND COTTONTAIL

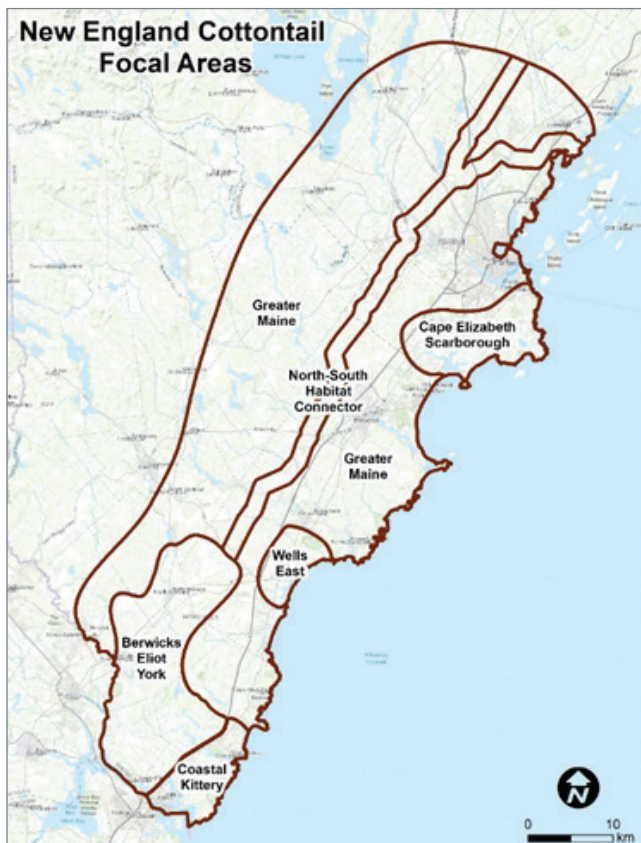
Cory Stearns

About the Rabbit

The New England cottontail (NEC; *Sylvilagus transitionalis*), or cooney, was once a common rabbit in southern and coastal Maine, ranging from Kittery to Belfast. However, NEC populations declined dramatically as old fields reverted into mature forests and shrubland was developed into residential areas.

In 2004, MDIFW closed the hunting season on NEC; and in 2007, we listed the species as endangered. By 2008, there were no known populations of NEC north of Portland. Today, there are only about 300 individuals in the state, which are only known to occur in 6 towns: Cape Elizabeth, Scarborough, Wells, York, Kittery, and Eliot.

FIGURE 9. MAINE'S FIVE FOCUS AREAS FOR NEW ENGLAND COTTONTAIL (NEC) RESTORATION.



The decline of NEC in Maine and in other northeastern states raises concern over the status of other wildlife species that use shrubland and young forest habitats. There are at least 42 Species of Greatest Conservation Need (SGCN) that use similar thicket habitats, including the eastern towhee, American woodcock, and black racer. Dense, shrubby habitat is rare in southern Maine, making up less than three percent of the land base; so most NEC restoration efforts are targeted at creating or maintaining such areas for the benefit of NEC and other wildlife

HABITAT RESTORATION EFFORTS

MDIFW receives tremendous help conducting habitat restoration and NEC recovery projects from our partners in the U.S. Fish and Wildlife Service, Natural Resources Conservation Service, Wildlife Management Institute, the National Fish and Wildlife Foundation, and Wells National Estuarine Research Reserve. Much of the NEC habitat restoration work in Maine occurs on private lands, so a special thanks also goes out to the many landowners who have participated in NEC conservation efforts.

Approximately 600 acres on over 55 public and privately owned sites are being (or have been) actively managed for NEC. These acres include existing habitat that is being actively maintained or enhanced and newly created habitat. Our habitat restoration efforts are led by Maine's NEC Restoration Coordinator Sarah Dudek, who is based at Rachel Carson National Wildlife Refuge. Among other duties, Sarah actively recruits and works with private landowners to manage their lands for cottontails and other wildlife species dependent on shrubland and young forest habitats. If you're a landowner within the NEC focal areas, and you are interested in conducting habitat management for New England cottontails, please contact Sarah at sarah_dudek@fws.gov or (207) 646-9226.

Monitoring Efforts

MDIFW participates in a regional program to monitor the trend in the number of habitat patches occupied by NEC throughout their range (including parts of ME, NH, MA, CT, RI, and NY). This helps guide management efforts by telling wildlife managers whether current NEC populations are expanding into new areas or being lost from formerly occupied areas.

To conduct this survey, biologists search patches for fecal pellets, which we then send to laboratories at the University of New Hampshire and University of Rhode Island for

DNA analysis to confirm the species (i.e., New England cottontail, eastern cottontail, or snowshoe hare). Each site in the program is surveyed on a 2-year rotation, with half the sites surveyed in even years and the other half in odd years. Because we always survey the same sites, any change in the number of occupied sites indicates a change in the NEC population.

The program has now been operating for five years; and during that time, we've observed a steady increase in the number of Maine sites occupied by NEC, from 21 sites in 2018 to 30 in 2022 (Table 1). However, the species still appears to be declining at the range-wide level.





TABLE 1. THE NUMBER OF PATCHES CONSIDERED OCCUPIED BY NEW ENGLAND COTTONTAILS AMONG THE 51 MAINE SITES SURVEYED REGULARLY (JAN.-MARCH EACH YEAR) SINCE THE FIRST YEAR OF THE REGIONAL MONITORING PROGRAM (2018), BY FOCAL AREA. The 2017 column represents the number occupied sites as of 2017 or the most recent survey (up to 5 years prior). N denotes the number of sites surveyed in the five years before the monitoring program. N denotes the number of sites surveyed as part of the regional monitoring program.

FOCAL AREA	2017	2018	2019	2020	2021	2022
Cape Elizabeth/ Scarborough (N= 27)	10 (n=18)	14	17	18	19	20
Eliot/York/Berwicks (N=9)	3 (n=5)	2	2	1	2	2
Coastal Kittery (N=9)	4 (n=5)	4	4	4	4	3
Wells East (N = 6)	0 (n = 5)	1	1	1	2	5
Total (N=51)	17 (n=33)	21	24	24	27	30

In addition to the regional occupancy surveys, MDIFW also surveys other areas each year in hopes of uncovering new NEC locations. Over the last five years, we have documented a few previously unknown locations each year, increasing our total number of known occupied patches to 41. Most new detections are within 1 km of other known sites, but in 2021 we detected a NEC in western Wells within the North-South corridor focal area — the first detection in that focal area since 2001!

Once NEC are documented at a new site, that site is added to the regional monitoring program. Vacant sites are also added to the program to keep occupancy rates (% of sites that are occupied) at about 50%. This gives us an equal chance of documenting an increase or decrease in the population. There are currently 72 sites within the regional monitoring program.

Captive Breeding and Translocation

In 2011, the New England cottontail captive breeding program was started when Roger Williams Park Zoo (Providence, RI) began breeding NEC. The program has since grown to include Queens Zoo (Queens, NY) and a captive breeding pen at Great Bay National Wildlife Refuge (Newington, NH). The first rabbits produced in captivity were released on Patience Island, Rhode Island. The NEC population established on the island has grown to the point that the island itself is now used as part of the breeding program, with rabbits trapped annually for release.

The first captive-bred rabbits released in Maine were released at the Wells National Estuarine Research Reserve in fall 2017. A total of 60 rabbits were released at the Reserve in the falls of 2017-2019, with another four in fall 2021. We monitored success of the releases by conducting fecal pellet collection surveys each February. Melissa Bauer (PhD student at the University of New Hampshire) then conducted a detailed genetic analysis to determine the number of individuals present. The Wells Reserve population has risen from five individuals in 2019 to 17 in 2020, 25 in 2021, and 30 in 2022. Further, NEC dispersing from the Reserve have colonized seven other nearby patches of suitable habitat that were previously vacant.

In March 2022, the Rhode Island Division of Wildlife provided three NEC from the Patience Island colony, and MDIFW live-trapped five individuals from an existing population in Cape Elizabeth. We temporarily held these eight NEC at the Maine Wildlife Park before equipping them with radio collars and releasing them at Scarborough Marsh Wildlife Management Area. As of this writing (12/16/2022), seven of the eight were still alive. In summer 2022, game camera images documented uncollared rabbits, suggesting successful reproduction. In fall 2022, we released an additional seven NEC, including one from the Great Bay NWR pen, four from Roger Williams Zoo, and two from Queens Zoo.

The New Challenge

Formerly, the four biggest challenges to NEC recovery in Maine were:

- 1) Little remaining shrubland habitat
- 2) Small population sizes
- 3) Low genetic diversity resulting from isolated NEC populations and low rabbit numbers
- 4) Social and biological limitations associated with restoring shrubby habitat

Unfortunately, a new threat has emerged to the restoration of NEC populations in Maine: the eastern cottontail rabbit (*Sylvilagus floridanus*). Until recently, Maine was the only state in the northeast that did not have eastern cottontails, which are nearly indistinguishable to NECs, but are not native to New England.

Around 1900, state wildlife agencies and hunting clubs started introducing tens of thousands of eastern cottontails into the southern New England states. The introduction of non-native animals or plants often threatens native wildlife populations. In this case, the introduced eastern cottontail can use a wider variety of habitats and tends to have higher survival and reproductive rates than our native NEC. Eventually, when the two species occur together, eastern cottontails can displace NEC. For example, Rhode Island has lost almost all of its NEC population and now has primarily eastern cottontails.

In 2017, wildlife biologists verified an eastern cottontail population in Maine for the first time. They were documented on Badgers Island (Kittery) and in one mainland Kittery location, and likely dispersed across the river from Portsmouth, New Hampshire, which has a large eastern cottontail population. Until 2020, EC populations were only known to occur on Badger's Island; but a few other individuals were confirmed after being transported into the state accidentally in potted plants and other landscaping materials and intentionally by well-meaning people that rescued orphaned young in other states. We have also documented a couple road kills of unknown origin. In 2021, eastern cottontail populations were detected in Kittery, South Berwick, and Portland, and one individual was found in Wells. In 2022, we detected more ECs in each of those towns, plus in York. Unfortunately,

the two cottontail species can hybridize, and in 2019 two New England cottontail x eastern cottontail hybrids were detected in Cape Elizabeth. Hybridization appears to be rare, but does pose another threat to the persistence of New England cottontails.

What you can do to help:

If you're interested in aiding MDIFW's NEC restoration efforts, there are several ways to do so. First, if you're a landowner in one of the towns that currently has NEC, we'd love to talk to you about habitat management options on your property. Please contact Sarah Dudek (contact information is above) for more information. If you're not a landowner, you can support your local towns and land trusts as they conduct management activities. Finally, you can report any cottontail sightings to MDIFW's cottontail reporting webpage: mefishwildlife.com/rabbits. This page was launched in November 2021, but already has received >330 reported sightings. Most sightings are actually from snowshoe hares, but some have certainly been New England cottontails. Reported sightings will be used to direct winter surveys, and as a way to track population expansion of both cottontail species.

MDIFW would like to thank the following volunteers and contractors for participating in the New England cottontail project: Melissa Bauer, Abigail Burke, Sarah Dudek, Madi Harvey, Adrienne Kovach, Helen Manning, Julia Mast, and Jeff Tash.

This work is supported by the federal Pittman-Robertson and State Wildlife Grants programs, Natural Resources Conservation Service, USFWS' Partners' Program, Rachel Carson National Wildlife Refuge, Wells National Estuarine Research Reserve, the National Fish and Wildlife Foundation, Wildlife Management Institute, state revenues from sales of hunting and trapping licenses, and many private landowners.

This work is supported by the federal Pittman-Robertson and State Wildlife Grants programs, Natural Resources Conservation Service, USFWS Partners' Program, Rachel Carson National Wildlife Refuge, Wells National Estuarine Research Reserve, the National Fish and Wildlife Foundation, Wildlife Management Institute, state revenues from sales of hunting and trapping licenses, and many private landowners.