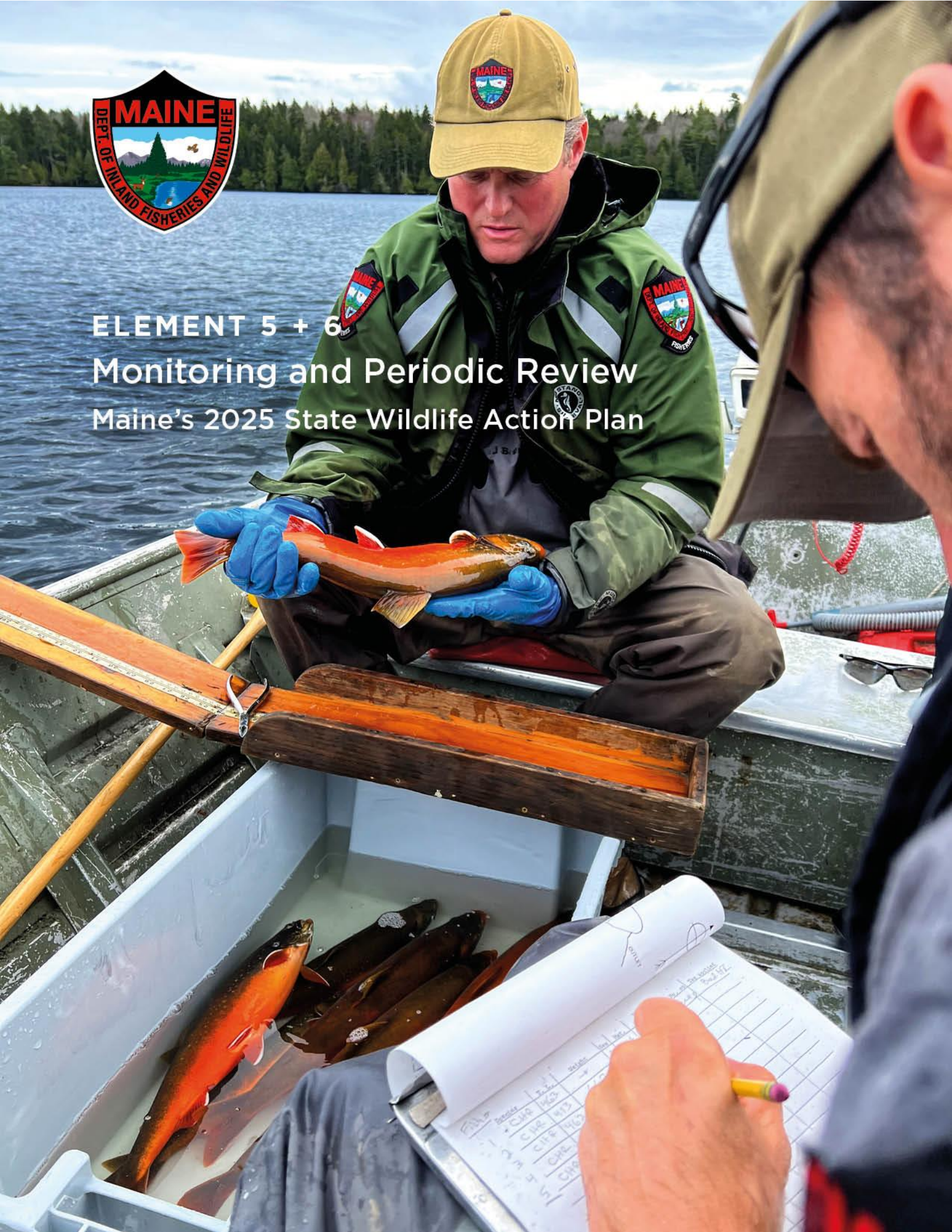


ELEMENT 5 + 6

Monitoring and Periodic Review

Maine's 2025 State Wildlife Action Plan

Table of Contents

List of Tables

Key to Acronyms

BwH	Beginning with Habitat
DNA	Deoxyribonucleic Acid
eDNA	Environmental Deoxyribonucleic Acid
GIS	Geographic Information System
GOMSWG	Gulf of Maine Seabird Working Group
GPAC	Global Programme of Action Coalition
HMG	Habitat Management Guidelines
MAMP	Maine Amphibian Monitoring Program
MARAP	Maine Amphibian and Reptile Atlasing Project
MBS	Maine Butterfly Survey
MBBA	Maine Bumble Bee Atlas
MCMI	Maine Coastal Mapping Initiative
MDDS	Maine Damselfly and Dragonfly Survey
MDIFW	Maine Dept. of Inland Fisheries and Wildlife
MDEP	Maine Dept. of Environmental Protection
MDMR	Maine Dept. of Marine Resources
MFFA	Maine Flower Fly Atlas
MFFS	Maine Flower Fly Survey
MNAP	Maine Natural Areas Program
MNHO	Maine Natural Heritage Observatory
NADP	National Atmospheric Deposition Program
NIACS	Northern Institute of Applied Climate Science
NMFS	National Marine Fisheries Service
NRCS	National Resource Conservation Service
NOAA-Fisheries	National Oceanic and Atmospheric Administration – Fisheries
PAM	Passive Acoustic Monitoring
SGCN	Species of Greatest Conservation Need
SHARP	Saltmarsh Habitat and Avian Research Program
SMART	Specific Measurable Achievable Relevant Time-based
SWAP CAT	State Wildlife Action Plan Conservation Action Tracker
SWG	State Wildlife Grants
SWH	Significant Wildlife Habitat
TNC	The Nature Conservancy
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey

Prepared by Maine Department of Inland Fisheries and Wildlife in Collaboration with Maine Departments of Agriculture, Conservation, and Forestry and Marine Resources, and Key Conservation Partners

Element 5 + 6: Monitoring and Periodic Review

5/6.0 Abstract

In this element, we outline the methods we will use to monitor Species of Greatest Conservation Need (SGCN) and their habitats and describe how we will track progress made in implementing the Plan over the next ten years. To accomplish this, we will continue to work closely with federal, state, and private conservation partners to develop and implement cooperative species monitoring programs. Where possible, monitoring programs target multiple species, usually within the same taxonomic group.

In the pages that follow, we describe the monitoring programs that are in place or proposed for SGCN in Maine and include a table for each of the taxonomic groups referenced throughout this plan. The Maine Department of Inland Fisheries and Wildlife (MDIFW) and partners also identified habitat-scale survey and monitoring needs during the development of conservation actions. We present these actions with examples of existing and general survey and monitoring techniques that could be used to achieve habitat monitoring objectives. Finally, MDIFW and partners developed 12 programmatic actions to help guide Plan implementation over the next ten years. Two of these actions address monitoring and are described in greater detail.

5/6.1 Introduction

In the previous chapter, we discussed Maine's strategies for conserving SGCN and their habitats across the state. Maine's approach is built on a foundation of habitat conservation, which is designed to ensure that adequate habitat remains available in perpetuity to support not only Maine's SGCN, but the full array of wildlife occurring in Maine. Those efforts are supplemented with species-specific conservation actions focused on priority threats for Priority 1 and Priority 2 SGCN.

In this chapter, we outline the methods we will use to monitor SGCN and their habitats. We also describe how we will monitor the progress made in implementing the Plan over the next 10 years. As with previous iterations of the Plan in Maine, MDIFW will continue to work closely with federal, state, and private conservation partners to develop and implement cooperative species monitoring programs

5/6.1.1 Significant Differences from Maine's 2015 Plan

The components of Elements 5 and 6 proposed here remain consistent with the 2015 Plan, with streamlined and updated presentations of SGCN as well as habitat survey and monitoring efforts. The 2025 Plan does, however, include the added description of monitoring for SGCN plants, which was not presented in the 2015 Plan. The results of these monitoring efforts will be utilized in our periodic review of the success of our Plan, and we will engage with outside partners on a regular basis to evaluate our efforts and redirect where necessary to achieve our conservation goals.

Maine's 2025 Plan will serve as an umbrella plan for all species, both listed and unlisted. For species at greatest risk of extirpation, MDIFW has a separate species recovery planning process in place.

5/6.2 Monitoring SGCN

SGCN run the gamut from species for which we have little information to those that are intensively monitored through formal, multi-state initiatives. We work closely with federal, state, and private conservation partners to develop and implement cooperative species monitoring programs. Where possible, monitoring programs target multiple species, usually within the same taxonomic group. In the pages that follow, we describe Maine's monitoring programs for SGCN and include a table for each of the following taxonomic groups (Tables 5/6 - 1 to 5/6 - 7):

"SGCN run the gamut from species for which we have little information to those that are intensively monitored through formal, multi-state initiatives. We work closely with federal, state, and private conservation partners to develop and implement cooperative species monitoring programs."

- Birds
- Amphibians and Reptiles
- Inland and Freshwater Invertebrates
- Inland Fish
- Mammals
- Marine species
- Plants

Within each table, we use an 'O' for 'ongoing' to indicate that the species is currently being monitored with the referenced approach, and an 'N' for 'new' to indicate that the species is not currently monitored with the referenced approach, but it could be monitored using this methodology if resources become available. An 'I' entry indicates that the technique provides interim, preliminary data but the existing methodology is not an optimal strategy to monitor populations.

5/6.2.1 Birds

Bird monitoring in Maine relies heavily on community (i.e., participatory or citizen) science in which volunteers follow specific protocols for conducting surveys and reporting observations. A prime example is the Second Bird Atlas that was conducted from 2018-2022, with wintering data collection extending through March of 2023. This massive effort involved 4,334 volunteers who submitted over 6.7 million records of breeding and wintering birds to update our understanding of the abundance and distribution of Maine's avifauna. By comparing results to those of the First Bird Atlas, conducted from 1978-1983, we can also detect changes in populations, which is essential for determining species status and conservation needs.

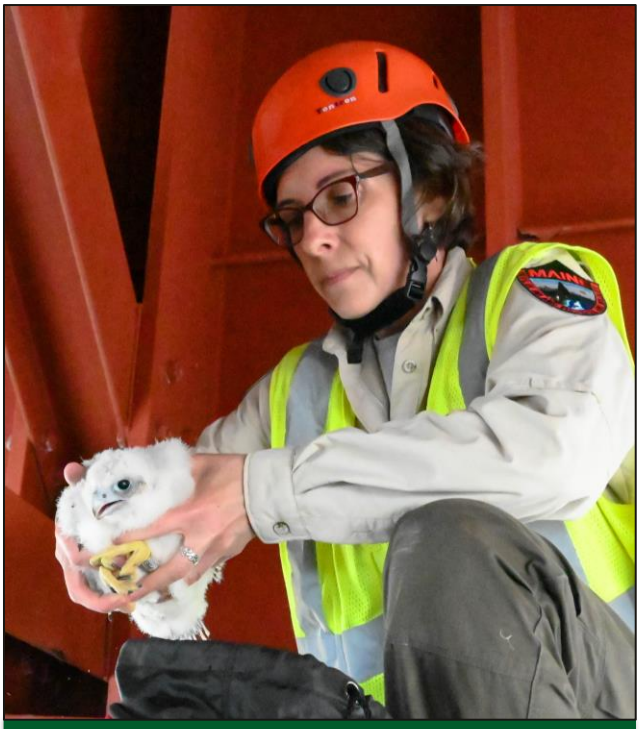
Currently, 16 distinct programs are used to monitor 123 of the 145 bird SGCN in Maine (Table 5/6 - 1). In addition, MDIFW monitors 19 SGCN birds using individual, species-specific protocols. Only 14 SGCN birds are not currently subject to some type of formal monitoring program. If additional resources become available, new species-specific monitoring protocols may be implemented for one of these species, the American Oystercatcher (*Haematopus palliatus*), and an additional 12 SGCN that already have some monitoring in place. In addition, the Second Bird Atlas produced a vast quantity of data that will be examined closely in the coming years. This information will be incorporated into MDIFW's database for Endangered, Threatened, and Special Concern species to help inform

land conservation and local, regional and statewide conservation planning efforts, as well as environmental review and will be an important resource for species assessments and status reviews conducted over the next ten years.

Many bird monitoring protocols are statewide in scope. Others have broad regional (e.g., Mountain Birdwatch) or national (e.g., Christmas Bird Count and Breeding Bird Survey) coverage. In addition to these structured programs, data from migration count sites provide another important source of information on bird populations in Maine. Together, these programs and data sources inform species status assessments and updates to Maine's Species of Greatest Conservation Need list. The Second Bird Atlas included several surveys that used specialized methods to target specific groups such as secretive marsh birds, nocturnal and crepuscular birds such as nightjars and owls, high elevation birds, and offshore wintering birds. These specialized surveys may be repeated annually or at regular intervals (e.g., every five years) to further assess these species.

The following describes some of the current monitoring programs that occur in Maine.

In 2019, MDIFW developed a statewide monitoring protocol for Peregrine Falcons (*Falco peregrinus*) to document their presence, productivity, and emerging threats. This protocol has been implemented annually in collaboration with a broad network of federal, state, and local agencies, as well as nonprofit organizations, private landowners, and other partners. The program aims to assess the status of nesting pairs across the state while supporting efforts to mitigate threats.



Peregrine Falcon (*Falco peregrinus*) nest check and chick banding. © MDIFW

In 2024, MDIFW initiated a new year-round monitoring and research effort for Golden Eagles (*Aquila chrysaetos*) in collaboration with the Eastern Golden Eagle Working Group. This work focuses on understanding the distribution, movements, survival, and habitat use of the species in Maine. Given the elusive nature of this genetically distinct eastern population, the program also seeks to identify key threats and inform regional conservation actions across the species' range.

Since 2013, MDIFW has collaborated with members of the Maine Falconry and Raptor Conservancy, who started an initiative to install and track American Kestrel (*Falco sparverius*) nest boxes. This effort involves annual banding, monitoring nesting success, re-sighting marked individuals, and recording mortality to help understand the causes of long-term population declines. MDIFW plans to build on this work by expanding nest box coverage and involving more partners to strengthen statewide monitoring and conservation efforts.

For over forty years, MDIFW has been a member of the Gulf of Maine Seabird Working Group (GOMSWG), a collaborative effort among state and federal agencies, universities, non-governmental organizations, and private citizens that have been working to monitor, manage, and restore populations of colonial nesting seabirds in the Gulf of Maine. This group conducts an annual tern census using standardized methods to estimate the total number of individual terns and species composition of terns using each island. In addition, this group also surveys and monitors other island-nesting seabirds such as Atlantic Puffins (*Fratercula arctica*), Razorbills (*Alca torda*), and Black Guillemots (*Cepphus grylle*).

Approximately every five years, MDIFW, in partnership with the US Fish and Wildlife Service (USFWS) and Maine Natural History Observatory (MNHO), conducts a survey of all coastal islands for nesting Double-crested Cormorants (*Nannopterum auritum*), Great Black-backed Gulls (*Larus marinus*), and Herring Gulls (*Larus smithsonianus*). These surveys involve collection of aerial photographs for all the islands, followed by manual counting of gull and cormorant nests from the imagery. In 2024, the Double-crested Cormorant nesting numbers also contributed to the Atlantic Flyway Colonial Waterbird Survey, a coordinated survey effort among states and provinces within the Atlantic Flyway focused on five Tier 1 species: Double-crested Cormorant, Least Tern (*Sternula antillarum*), Common Tern (*Sterna hirundo*), Black Skimmer (*Rynchops niger*), and Laughing Gull (*Leucophaeus atricilla*). Common Tern and Laughing Gull numbers from GOMSWG, and Least Tern numbers from MDIFW's annual census also contribute to this flyway-scale survey.

Coastal mixed-species heronries are also inventoried approximately every five years. These island colonies are surveyed on the ground by MDIFW staff to catalogue nesting pairs of Black-crowned Night Heron (*Nycticorax nycticorax*), Snowy Egret (*Egretta thula*), Glossy Ibis (*Plegadis falcinellus*), Great Egret (*Ardea alba*), Little Blue Heron (*Egretta caerulea*), and Great Blue Heron (*Ardea herodias*). In addition, Great Blue Heron colonies are

Case Study: Coastal Island Heron Colony Monitoring

Maine's Great Blue Herons (*Ardea herodias*) are in decline, yet monitoring of colonies ensures MDIFW understands population dynamics. Canopy nests are monitored using extendable mirrors (right). © MDIFW

surveyed statewide periodically via aerial surveys, and annually by volunteers through the Heron Observation Network, a community science adopt-a-colony program in operation since 2009.

MDIFW participates in the annual Piping Plover Census (*Charadrius melodus*), counting all breeding pairs. © MDIFW

Annually, staff from Maine Audubon coordinate Piping Plover (*Charadrius melodus*) and Least Tern inventories and management under contract with MDIFW. The annual census is used to determine if and when Maine's Piping Plover population has achieved thresholds of contribution and recovery goals established by USFWS for the Atlantic coast, as well as Maine's own Piping Plover population and productivity targets.

MDIFW biologists conduct shorebird surveys in priority areas previously identified as being candidates for Significant Wildlife Habitat (SWH) designation under Maine's Natural Resources Protection Act. They also re-survey mapped Shorebird Feeding and Roosting areas statewide, an effort often stretching across multiple years. These surveys help inform the Environmental Review program, as well as others, amid continuing developmental pressures in coastal regions.

Periodically, since the early 2000s, MDIFW and the MNHO have collaborated to conduct surveys for the Purple Sandpiper (*Calidris maritima*), a shorebird that overwinters along Maine's rocky intertidal zones and islands. These surveys are conducted by boat in nearshore and offshore habitats using a double-observer approach. Results are essential for understanding their abundance and distribution in Maine.

Additionally, periodically since the early 2000s, MDIFW and the MNHO have collaborated to conduct surveys for Harlequin Ducks (*Histrionicus histrionicus*), a waterfowl species that overwinters along Maine's rocky intertidal zones and islands. These surveys are conducted by boat nearshore and offshore. Results are used for understanding their abundance and distribution in Maine over time.

MDIFW conducts annual Maine Waterfowl Brood Counts on 25-36 wetlands to generate indices of annual waterfowl production and inform trend analyses across years.

Along with the USFWS, MDIFW conducts singing male American Woodcock (*Scolopax minor*) surveys along established routes annually, in late April through mid-May

Waterfowl brood survey. © MDIFW

as well. Routes consist of 10 stops along the roadside. Observers record the number of singing (i.e., peenting) males. This serves as an index to the breeding population.

In 2018, Maine and several other Atlantic Flyway states and provinces initiated a photo survey to estimate annual recruitment in Common Eider (*Somateria mollissima*) and Scoter (e.g., Black Scoter [*Melanitta americana*], Surf Scoter [*Melanitta perspicillata]*, and White-winged Scoter [*Melanitta deglandi*]) populations. Each fall, between October 15 and December 15 participating agencies collect digital photos of eiders and scoters in flight. Photos are then classified to species, age and sex using plumage characteristics. This information is being used to inform population assessments of each species.

Periodically since the 1990s, winter surveys for Barrow's Goldeneye (*Bucephala islandica*) are conducted at established survey points along the Maine coast and at some river points. Observers record observations of Barrow's during a ten-minute survey window, repeated three times at each site. Data is used to help monitor the winter population trend.

Since 2014, the Department has conducted annual male Ruffed Grouse (*Bonasa umbellus*) drumming surveys to monitor the breeding population as indexed by the number of drumming males per route. Routes are repeated up to three times in the same year in a window between late April and late May. At each stop observers record the number of individual male Ruffed Grouse heard drumming and the total number of drumming events heard in a 5-minute period.

Mountain Birdwatch helps to track population changes to Blackpoll Warbler (*Setophaga striata*) breeding in Maine. © Kenzie Roeder

There are several examples of surveys led by other organizations or agencies that provide invaluable data for evaluating the status of Maine's bird SGCN. The Vermont Center for Ecostudies, formerly Vermont Institute of Natural Science, launched Mountain Birdwatch in the spring of 2000 to establish a monitoring program for Bicknell's Thrush (*Catharus bicknelli*) and other montane forest birds. The Vermont Center for Ecostudies uses these data to measure population trends, monitor changes in bird distribution, model potential breeding habitat, identify conservation opportunities, evaluate proposed development, and predict effects of climate change on mountain songbirds.

MNHO coordinates annual statewide owl monitoring and nightjar monitoring. The Maine Owl Survey is a multi-year effort to record owl observations during the courtship and breeding season through playback surveys and monitored nest boxes. The Maine Nightjar Monitoring Project was launched in 2017 to monitor Maine's two nightjar species: the Eastern Whip-poor-will (*Antrostomus vociferus*) and the Common Nighthawk (*Chordeiles minor*). Each year, volunteers conduct surveys along routes through nightjar habitat at dusk and again on moonlit nights.

Common Loon (*Gavia immer*) are surveyed annually by Maine Audubon's Maine Loon Project. The results of this effort ensures Maine has an annual population estimate.

For more than 40 years, Maine Audubon has conducted the Annual Common Loon (*Gavia immer*) Count, a community science program whereby volunteers count the number of adults and chicks on Maine's lakes and ponds on the third Saturday of July each year. These data help estimate the annual population and track population trends while also revealing areas to focus efforts that can reduce loon disturbance and mortality.

MDIFW often uses data collected from community science platforms, such as ebird, to document observations of Maine's avifauna and track species sightings. While MDIFW used this platform to store data for the Second Bird Atlas, it remains a useful tool to monitor birds in Maine. While eBird observations have their limitations (species may not be detected even when they are present, or species may be wrongly identified), biologists often examine eBird for observations of SGCN birds to identify newly documented populations or colonized sites. These observations may help direct future surveys or conservation actions.

Maine Second Breeding Bird Atlas relied on thousands of participants submitting breeding bird observations on eBird. This data provides a snapshot of how Maine's bird population is changing. © MDIFW

Table 5/6 - 1 Inventory of population monitoring projects focused on Maine's bird Species of Greatest Conservation Need, identified for the 2025 Wildlife Action Plan. Key: O = Ongoing; N = New; I = Interim

Scientific Name	Common Name	Priority	Species-Specific Monitoring	Breeding Bird Survey	Christmas Bird Count	Mountain Birdwatch	Secretive Marsh Bird Surveys	Island Nesting Tern Surveys	Maine Owl Survey	Wading Bird Colony Surveys & Monitoring	Migratory Shorebird Survey	Waterfowl Brood Counts	MDIFW regional shorebird surveys for SWH designation and mapping	Grassland Bird Surveys	Nightjar Surveys	Island Aerial Imagery for Gulls & Cormorants	Common Eider and Scoter Digital Photo Survey	Maine Open Habitat Raptor Project	Spruce Budworm Specialist Surveys
Accipiter atricapillus	American Goshawk	3	O																
Aquila chrysaetos	Golden Eagle	1	O																
Circus cyaneus	Northern Harrier	3					I							O				O	
Anas rubripes	American Black Duck	3										O							
Aythya marila	Greater Scaup	2																	
Bucephala islandica	Barrow's Goldeneye	1	O																
Histrionicus histrionicus	Harlequin Duck	1	O																
Melanitta americana	Black Scoter	3															O		
Melanitta deglandi	White-winged Scoter	3															O		
Melanitta perspicillata	Surf Scoter	3															O		
Somateria mollissima	Common Eider	1	O													I	O		

Scientific Name	Common Name	Priority	Species-Specific Monitoring	Breeding Bird Survey	Christmas Bird Count	Mountain Birdwatch	Secretive Marsh Bird Surveys	Island Nesting Tern Surveys	Maine Owl Survey	Wading Bird Colony Surveys & Monitoring	Migratory Shorebird Survey	Waterfowl Brood Counts	MDIFW regional shorebird surveys for SWH designation and mapping	Grassland Bird Surveys	Nightjar Surveys	Island Aerial Imagery for Gulls & Cormorants	Common Eider and Scoter Digital Photo Survey	Maine Open Habitat Raptor Project	Spruce Budworm Specialist Surveys
Chaetura pelagica	Chimney Swift	2		O															
Antrostomus vociferus	Eastern Whip-poor-will	2													O				
Chordeiles minor	Common Nighthawk	2													O				
Alca torda	Razorbill	2						O											
Arenaria interpres	Ruddy Turnstone	2									O		O						
Bartramia longicauda	Upland Sandpiper	1	I	O										O					
Calidris alba	Sanderling	2									O		O						
Calidris alpina	Dunlin	3									O		O						
Calidris canutus rufa	Red Knot	1									O		O						
Calidris maritima	Purple Sandpiper	1	O																
Calidris minutilla	Least Sandpiper	3									O		O						
Calidris pusilla	Semipalmated Sandpiper	2									O		O						
Cepphus grylle	Black Guillemot	3						O											
Charadrius melodus	Piping Plover	1	O																

Scientific Name	Common Name	Priority	Species-Specific Monitoring	Breeding Bird Survey	Christmas Bird Count	Mountain Birdwatch	Secretive Marsh Bird Surveys	Island Nesting Tern Surveys	Maine Owl Survey	Wading Bird Colony Surveys & Monitoring	Migratory Shorebird Survey	Waterfowl Brood Counts	MDIFW regional shorebird surveys for SWH designation and mapping	Grassland Bird Surveys	Nightjar Surveys	Island Aerial Imagery for Gulls & Cormorants	Common Eider and Scoter Digital Photo Survey	Maine Open Habitat Raptor Project	Spruce Budworm Specialist Surveys
Chlidonias niger	Black Tern	1	O				I												
Chroicocephalus philadelphia	Bonaparte's Gull	3																	
Fratercula arctica	Atlantic Puffin	2						O											
Gallinago delicata	Wilson's Snipe	3					O												
Haematopus palliatus	American Oystercatcher	3	N																
Larus marinus	Great Black-backed Gull	3						O								O			
Leucophaeus atricilla	Laughing Gull	3						O											
Limnodromus griseus	Short-billed Dowitcher	2									O		O						
Numenius phaeopus	Whimbrel	2	N								O		O						
Phalaropus fulicarius	Red Phalarope	3																	
Phalaropus lobatus	Red-necked Phalarope	2																	
Pluvialis squatarola	Black-bellied Plover	3									O		O						

Scientific Name	Common Name	Priority	Species-Specific Monitoring	Breeding Bird Survey	Christmas Bird Count	Mountain Birdwatch	Secretive Marsh Bird Surveys	Island Nesting Tern Surveys	Maine Owl Survey	Wading Bird Colony Surveys & Monitoring	Migratory Shorebird Survey	Waterfowl Brood Counts	MDIFW regional shorebird surveys for SWH designation and mapping	Grassland Bird Surveys	Nightjar Surveys	Island Aerial Imagery for Gulls & Cormorants	Common Eider and Scoter Digital Photo Survey	Maine Open Habitat Raptor Project	Spruce Budworm Specialist Surveys
Scolopax minor	American Woodcock	2	O																
Sterna dougallii	Roseate Tern	1						O											
Sterna hirundo	Common Tern	3						O											
Sterna paradisaea	Arctic Tern	1						O											
Sternula antillarum	Least Tern	1	O																
Tringa flavipes	Lesser Yellowlegs	1	N								O		O						
Tringa melanoleuca	Greater Yellowlegs	3	N								O		O						
Tringa semipalmata	Willet	2	N				O				O		O						
Tringa solitaria	Solitary Sandpiper	3																	
Uria aalge	Common Murre	3		O				O											
Megaceryle alcyon	Belted Kingfisher	3																	
Coccyzus americanus	Yellow-billed Cuckoo	3		O															
Coccyzus erythropthalmus	Black-billed Cuckoo	3		O															

Scientific Name	Common Name	Priority	Species-Specific Monitoring	Breeding Bird Survey	Christmas Bird Count	Mountain Birdwatch	Secretive Marsh Bird Surveys	Island Nesting Tern Surveys	Maine Owl Survey	Wading Bird Colony Surveys & Monitoring	Migratory Shorebird Survey	Waterfowl Brood Counts	MDIFW regional shorebird surveys for SWH designation and mapping	Grassland Bird Surveys	Nightjar Surveys	Island Aerial Imagery for Gulls & Cormorants	Common Eider and Scoter Digital Photo Survey	Maine Open Habitat Raptor Project	Spruce Budworm Specialist Surveys
Falco peregrinus	Peregrine Falcon	1	O																
Falco sparverius	American Kestrel	2												I				O	
Bonasa umbellus	Ruffed Grouse	3	O		I														
Canachites canadensis	Spruce Grouse	3			I														
Gavia immer	Common Loon	3	O																
Gavia stellata	Red-throated Loon	3			O														
Fulica americana	American Coot	3					O												
Gallinula galeata	Common Gallinule	2					O												
Porzana carolina	Sora	3					O												
Ammodramus savannarum	Grasshopper Sparrow	1												O					
Ammospiza caudacuta	Saltmarsh Sparrow	1	O				O												
Ammospiza nelsoni	Nelson's Sparrow	2	O				O												
Anthus rubescens	American Pipit	2	N			O													
Bombycilla cedrorum	Cedar Waxwing	3		O															

Scientific Name	Common Name	Priority	Species-Specific Monitoring	Breeding Bird Survey	Christmas Bird Count	Mountain Birdwatch	Secretive Marsh Bird Surveys	Island Nesting Tern Surveys	Maine Owl Survey	Wading Bird Colony Surveys & Monitoring	Migratory Shorebird Survey	Waterfowl Brood Counts	MDIFW regional shorebird surveys for SWH designation and mapping	Grassland Bird Surveys	Nightjar Surveys	Island Aerial Imagery for Gulls & Cormorants	Common Eider and Scoter Digital Photo Survey	Maine Open Habitat Raptor Project	Spruce Budworm Specialist Surveys
Cardellina canadensis	Canada Warbler	2		O															
Cardellina pusilla	Wilson's Warbler	2		O															
Catharus bicknelli	Bicknell's Thrush	1				O													
Catharus fuscescens	Veery	3		O															
Catharus ustulatus	Swainson's Thrush	3		O		O													
Cistothorus stellaris	Sedge Wren	1					O												
Coccothraustes vespertinus	Evening Grosbeak	1		O	O														O
Contopus cooperi	Olive-sided Flycatcher	2		O		O													
Contopus virens	Eastern Wood-Pewee	2		O															
Corthylio calendula	Ruby-crowned Kinglet	2		O		O													
Dolichonyx oryzivorus	Bobolink	2		O										O					

Scientific Name	Common Name	Priority	Species-Specific Monitoring	Breeding Bird Survey	Christmas Bird Count	Mountain Birdwatch	Secretive Marsh Bird Surveys	Island Nesting Tern Surveys	Maine Owl Survey	Wading Bird Colony Surveys & Monitoring	Migratory Shorebird Survey	Waterfowl Brood Counts	MDIFW regional shorebird surveys for SWH designation and mapping	Grassland Bird Surveys	Nightjar Surveys	Island Aerial Imagery for Gulls & Cormorants	Common Eider and Scoter Digital Photo Survey	Maine Open Habitat Raptor Project	Spruce Budworm Specialist Surveys
Empidonax flaviventris	Yellow-bellied Flycatcher	2		O		O													
Empidonax minimus	Least Flycatcher	3		O															
Eremophila alpestris	Horned Lark	2		O	O									O					
Euphagus carolinus	Rusty Blackbird	2	O																
Geothlypis philadelphia	Mourning Warbler	2		O															
Haemorhous purpureus	Purple Finch	3		O	O	O													
Hirundo rustica	Barn Swallow	2	N	O										I					
Hylocichla mustelina	Wood Thrush	1		O															
Icterus galbula	Baltimore Oriole	2		O															
Icterus spurius	Orchard Oriole	3		O															
Leiothlypis peregrina	Tennessee Warbler	1		O															O
Leiothlypis ruficapilla	Nashville Warbler	3		O															

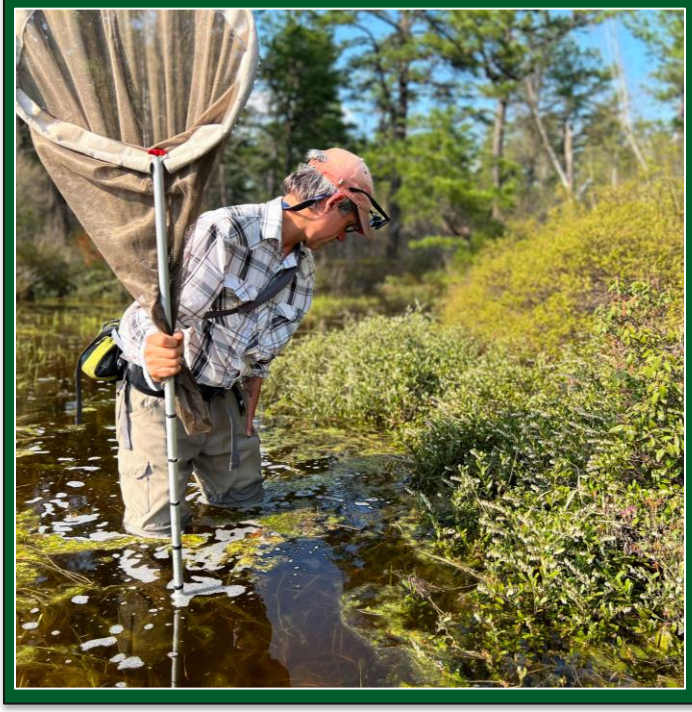
Scientific Name	Common Name	Priority	Species-Specific Monitoring	Breeding Bird Survey	Christmas Bird Count	Mountain Birdwatch	Secretive Marsh Bird Surveys	Island Nesting Tern Surveys	Maine Owl Survey	Wading Bird Colony Surveys & Monitoring	Migratory Shorebird Survey	Waterfowl Brood Counts	MDIFW regional shorebird surveys for SWH designation and mapping	Grassland Bird Surveys	Nightjar Surveys	Island Aerial Imagery for Gulls & Cormorants	Common Eider and Scoter Digital Photo Survey	Maine Open Habitat Raptor Project	Spruce Budworm Specialist Surveys
Loxia curvirostra	Red Crossbill	3		O	O	O													
Loxia leucoptera	White-winged Crossbill	3		O	O	O													
Melospiza lincolnii	Lincoln's Sparrow	2		O															
Mimus polyglottos	Northern Mockingbird	3		O															
Mniotilta varia	Black-and-white Warbler	3		O		O													
Molothrus ater	Brown-headed Cowbird	3		O															
Parkesia motacilla	Louisiana Waterthrush	3		O															
Passerella iliaca	Fox Sparrow	2		O															
Perisoreus canadensis	Canada Jay	3		O	O														
Petrochelidon pyrrhonota	Cliff Swallow	1	N	O															
Pheucticus ludovicianus	Rose-breasted Grosbeak	3		O															
Pinicola enucleator	Pine Grosbeak	2		O	O														

Scientific Name	Common Name	Priority	Species-Specific Monitoring	Breeding Bird Survey	Christmas Bird Count	Mountain Birdwatch	Secretive Marsh Bird Surveys	Island Nesting Tern Surveys	Maine Owl Survey	Wading Bird Colony Surveys & Monitoring	Migratory Shorebird Survey	Waterfowl Brood Counts	MDIFW regional shorebird surveys for SWH designation and mapping	Grassland Bird Surveys	Nightjar Surveys	Island Aerial Imagery for Gulls & Cormorants	Common Eider and Scoter Digital Photo Survey	Maine Open Habitat Raptor Project	Spruce Budworm Specialist Surveys
Pipilo erythrophthalmus	Eastern Towhee	3		O										I					
Piranga olivacea	Scarlet Tanager	3		O		O													
Poecile hudsonicus	Boreal Chickadee	2		O	O														
Pooecetes gramineus	Vesper Sparrow	2		O															
Progne subis	Purple Martin	1	N	O															
Riparia riparia	Bank Swallow	1	N	O										I					
Setophaga caerulescens	Black-throated Blue Warbler	3		O															
Setophaga castanea	Bay-breasted Warbler	2		O		O													O
Setophaga fusca	Blackburnian Warbler	3		O															
Setophaga pensylvanica	Chestnut-sided Warbler	3		O															
Setophaga ruticilla	American Redstart	3		O															
Setophaga striata	Blackpoll Warbler	1		O		O													

Scientific Name	Common Name	Priority	Species-Specific Monitoring	Breeding Bird Survey	Christmas Bird Count	Mountain Birdwatch	Secretive Marsh Bird Surveys	Island Nesting Tern Surveys	Maine Owl Survey	Wading Bird Colony Surveys & Monitoring	Migratory Shorebird Survey	Waterfowl Brood Counts	MDIFW regional shorebird surveys for SWH designation and mapping	Grassland Bird Surveys	Nightjar Surveys	Island Aerial Imagery for Gulls & Cormorants	Common Eider and Scoter Digital Photo Survey	Maine Open Habitat Raptor Project	Spruce Budworm Specialist Surveys
Setophaga tigrina	Cape May Warbler	2		O		O													O
Spinus pinus	Pine Siskin	3		O															
Spizella pallida	Clay-colored Sparrow	3		O															
Spizella pusilla	Field Sparrow	2		O										O					
Stelgidopteryx serripennis	Northern Rough-winged Swallow	3	N	O										I					
Sturnella magna	Eastern Meadowlark	1		O										O					
Tachycineta bicolor	Tree Swallow	2	N	O			I							I					
Toxostoma rufum	Brown Thrasher	2		O															
Tyrannus tyrannus	Eastern Kingbird	3		O			I							I					
Vermivora cyanoptera	Blue-winged Warbler	3	N	O															
Zonotrichia albicollis	White-throated sparrow	3		O		O													
Ardea herodias	Great Blue Heron	2								O									

Scientific Name	Common Name	Priority	Species-Specific Monitoring	Breeding Bird Survey	Christmas Bird Count	Mountain Birdwatch	Secretive Marsh Bird Surveys	Island Nesting Tern Surveys	Maine Owl Survey	Wading Bird Colony Surveys & Monitoring	Migratory Shorebird Survey	Waterfowl Brood Counts	MDIFW regional shorebird surveys for SWH designation and mapping	Grassland Bird Surveys	Nightjar Surveys	Island Aerial Imagery for Gulls & Cormorants	Common Eider and Scoter Digital Photo Survey	Maine Open Habitat Raptor Project	Spruce Budworm Specialist Surveys
Botaurus lentiginosus	American Bittern	3					O							I					
Butorides virescens	Green Heron	3					O												
Egretta caerulea	Little Blue Heron	3								O									
Egretta thula	Snowy Egret	3								O									
Ixobrychus exilis	Least Bittern	1					O												
Nycticorax nycticorax	Black-crowned Night-heron	2								O									
Picoides arcticus	Black-backed Woodpecker	2		O	O	O													
Picoides dorsalis	American Three-toed Woodpecker	1		O	O	O													
Podiceps auritus	Horned Grebe	3			I														
Podilymbus podiceps	Pied-billed Grebe	3					O												
Ardenna gravis	Great Shearwater	3																	
Ardenna grisea	Sooty Shearwater	3																	
Fulmarus glacialis	Northern Fulmar	3																	

Scientific Name	Common Name	Priority	Species-Specific Monitoring	Breeding Bird Survey	Christmas Bird Count	Mountain Birdwatch	Secretive Marsh Bird Surveys	Island Nesting Tern Surveys	Maine Owl Survey	Wading Bird Colony Surveys & Monitoring	Migratory Shorebird Survey	Waterfowl Brood Counts	MDIFW regional shorebird surveys for SWH designation and mapping	Grassland Bird Surveys	Nightjar Surveys	Island Aerial Imagery for Gulls & Cormorants	Common Eider and Scoter Digital Photo Survey	Maine Open Habitat Raptor Project	Spruce Budworm Specialist Surveys
Hydrobates leucorhoa	Leach's Storm-petrel	2																	
Puffinus puffinus	Manx Shearwater	3																	
Asio flammeus	Short-eared Owl	1							I					O				O	
Asio otus	Long-eared Owl	3							O									O	
Megascops asio	Eastern Screech-Owl	3							O									O	
Tyto furcata	American Barn Owl	3							O									O	
Morus bassanus	Northern Gannet	3																	
Nannopterum auritum	Double-crested Cormorant	3														O			
Phalacrocorax carbo	Great Cormorant	1	O					O											



Case Study: Participatory Science and Conservation Status Assessments

MDIFW and MNAP are increasingly using species distribution data collected by users of participatory (i.e., community or citizen) science platforms to inform conservation status assessments.

Agency staff download species observation data from platforms like eBird and iNaturalist, where users upload their observation, to better understand species diversity and distribution in Maine.

This information was incorporated into the Maine Breeding Bird Atlas, Maine Bumble Bee Atlas, Maine Reptile and Amphibian Atlas, and Maine Dragonfly and Damselfly Atlas, just to highlight a few.

5/6.2.2 Inland Reptiles, Amphibians, and Invertebrates

Currently, biologists use nine distinct programs to monitor 88 of the 164 (54%) reptile, amphibian, and invertebrate SGCN in Maine (Tables 5/6 - 2 and 5/6 - 3). In addition, biologists monitor approximately 60 SGCN in these taxonomic groups using individual, species-specific protocols. Many SGCN invertebrates are not currently subject to some type of formal monitoring program.

Inland Reptiles and Amphibians

The Maine Amphibian and Reptile Atlasing Project (MARAP) is one of the longest standing wildlife atlasing projects in Maine, with records collected by more than 3,000 observers. Initiated in 1984, MARAP is currently a cooperative venture between MDIFW and the University of Maine. The MARAP database contains over 20,000 records for 35 terrestrial and freshwater species (33 native, 2 exotic), as well as marine turtles and the extirpated Timber Rattlesnake. As with many wildlife atlas datasets that are primarily designed to document distribution, biologists can use the MARAP database to indirectly infer population trends and range shifts by revisiting previously documented sites over time.

Northern Black Racers (*Coluber constrictor constrictor*) require species specific monitoring to identify critical habitat. © MDIFW

Non-Marine Invertebrates

Monitoring of invertebrate SGCN lags behind reptiles, amphibians, and other vertebrate taxa. This is due to the high diversity of SGCN invertebrates, a lower level of knowledge about their distribution and habitat relationships, and limited MDIFW staff and resources to work with the group. Nevertheless, MDIFW and partners have increased their knowledge of SGCN invertebrates considerably since 2015, with special emphasis on Unionoida (freshwater mussels), Gastropoda (aquatic and terrestrial snails), Ephemeroptera (mayflies), Odonata (damselflies and dragonflies), Lepidoptera (butterflies and moths), Coleoptera (tiger beetles), Hymenoptera (bumble bees), and most recently Diptera (flower flies). A series of volunteer wildlife atlasing programs now provide distribution baselines for many of Maine's invertebrate SGCN. Biologists have designed the Maine Butterfly Survey (MBS), Maine Damselfly and Dragonfly Survey (MDDS), Maine Bumble Bee Atlas (MBBA), and Maine Flower Fly Survey (MFFS) to collect sighting information from trained volunteer community scientists, to help map the distribution and relative abundance of these species groups across the state. In some cases, these programs are among the first of their kind in the country and have helped to gather critical information on understudied and poorly understood taxa. In the future MDIFW hopes to collaborate with partners to develop additional atlasing projects to improve our knowledge of other invertebrate groups, such as tiger beetles, fireflies, other bees, and crayfish.

"Monitoring of invertebrate SGCN lags behind reptiles, amphibians, and other vertebrate taxa. This is due to the high diversity of SGCN invertebrates, a lower level of knowledge about their distribution and habitat relationships, and limited MDIFW staff and resources to work with the group."

Clayton's Copper (*Tharsalea dorcas claytoni*) habitat is often only accessible by canoe and adults have a short flight period. © MDIFW

The Tomah Mayfly (*Siphlonisca aerodromia*), an endemic species in the northeast, is only known from a few sites. Its larva feed on other mayfly species. Dip net surveys captured this individual during a spring flooding event. © MDIFW

Table 5/6 - 2 Inventory of population monitoring projects focused on Maine's inland amphibian and reptile Species of Greatest Conservation Need, identified for the 2025 Maine Wildlife Action Plan. Key: O=Ongoing; N=New; I=Interim.

CLASS Order Scientific Name	Common Name	Priority	Species-specific Monitoring	Northeast Blanding's, Spotted, and Wood Turtle Monitoring Initiative	Maine Amphibian & Reptile Atlasing Project (MARAP)	Maine Road Herp Hotspot Monitoring Project
AMPHIBIA (amphibians)						
Anura (frogs and toads)						
Lithobates pipiens	Northern Leopard Frog	2			O	I
Lithobates septentrionalis	Mink Frog	3			O	I
Caudata (salamanders)						
Ambystoma laterale	Blue-spotted Salamander	3			O	I
Gyrinophilus porphyriticus porphyriticus	Northern Spring Salamander	2	O		O	I
REPTILIA (reptiles)						
Squamata (lizards and snakes)						
Coluber constrictor constrictor	Northern Black Racer	1	O		O	I
Thamnophis saurita	Eastern Ribbonsnake	2	O		O	I
Testudines (turtles and tortoises)						
Clemmys guttata	Spotted Turtle	1	O	O	O	I
Emydoidea blandingii	Blanding's Turtle	1	O	O	O	I
Glyptemys insculpta	Wood Turtle	1	O	O	O	I
Terrapene carolina	Eastern Box Turtle	3	O		O	I

Table 5/6 - 3 Inventory of population monitoring projects focused on Maine's non marine invertebrate Species of Greatest Conservation Need, identified for the 2025 Wildlife Action Plan. Key: O=Ongoing; N=New; I=Interim.

CLASS Order Scientific Name	Common Name	Priority	Species-specific Monitoring	Maine Butterfly Survey (MBS)	Maine Damselfly & Dragonfly Survey (MDDS)	Maine Mussel Atlas & Surveys	Maine Bumble Bee Atlas (MBBA)	Maine Flower Fly Survey (MFFS)
BIVALVIA (freshwater molluscs)								
Unionoida (freshwater mussels)								
Margaritifera margaritifera	Eastern Pearlshell	3	O			O		
Alasmidonta undulata	Triangle Floater	3	O			O		
Alasmidonta varicosa	Brook Floater	1	O			O		
Atlanticoncha ochracea	Tidewater Mucket	1	O			O		
Lampsilis cariosa	Yellow Lampmussel	1	O			O		
GASTROPODA (aquatic and terrestrial snails)								
Basommatophora (air-breathing freshwater snails)								
Ladislavella mighelsi	Bigmouth Pondsnail	1						
Ladislavella oronoensis	Obese Pondsnail	3						
Littorinimorpha (mud snails)								
Floridobia winkleyi	New England Siltsnail	3						
Stylommatophora (air-breathing snails land snails)								
Appalachina sayana	Spike-lip Crater	3						
Neohelix dentifera	Big-tooth Whitelip	3						
Vertigo malleata	Malleated Vertigo	3						
Vertigo morsei	Six-whorl Vertigo	1						
Vertigo perryi	Olive Vertigo	3						
INSECTA (insects)								
Coleoptera (beetles)								
Cicindela ancocisconensis	Appalachian Tiger Beetle	2	O					
Cicindela marginipennis	Cobblestone Tiger Beetle	1	O					
Ellipsoptera marginata	Margined Tiger Beetle	1	O					

CLASS Order Scientific Name	Common Name	Priority	Species-specific Monitoring	Maine Butterfly Survey (MBS)	Maine Damselfly & Dragonfly Survey (MDDS)	Maine Mussel Atlas & Surveys	Maine Bumble Bee Atlas (MBBA)	Maine Flower Fly Survey (MFFS)
Nebria nivalis gaspesiana	Gaspé Gazelle Beetle	3	N					
Diptera (flies)								
Chrysogaster inflatifrons	Long-haired Wrinklehead	2						O
Eristalis brousii	Hourglass Drone Fly	3						O
Leucozona xylotoides	Eastern Hoary	3						O
Parasyrphus tarsatus	Holarctic Bristleside	2						O
Platycheirus modestus	Yellow Sedgesitter	3						O
Sericomyia slossonae	Slosson's Pond Fly	2						O
Volucella evecta	Eastern Swiftwing	3						O
Volucella facialis	Yellow-faced Swiftwing	3						O
Ephemeroptera (mayflies)								
Ameletus browni	Brown's Comb Minnow Mayfly	2						
Baetisca berneri	A Small Minnow Mayfly	3						
Baetisca carolina	Carolina Armored Mayfly	3						
Baetisca lacustris	Great Lakes Armored Mayfly	3						
Baetisca rubescens	Provancher's Armored Mayfly	2						
Hexagenia rigida	Straight Hex Burrowing Mayfly	3						
Epeorus frisoni	Roaring Brook Mayfly	1	O					
Nixe horrida	Rough Flat-headed Mayfly	3						
Nixe rusticalis	Rusty Flat-headed Mayfly	3						

CLASS Order Scientific Name	Common Name	Priority	Species-specific Monitoring	Maine Butterfly Survey (MBS)	Maine Damselfly & Dragonfly Survey (MDDS)	Maine Mussel Atlas & Surveys	Maine Bumble Bee Atlas (MBBA)	Maine Flower Fly Survey (MFFS)
Rhithrogena brunneotincta	Brown Flat-headed Mayfly	3						
Rhithrogena jejuna Eaton (s.s.)	A Flat-headed Mayfly	3						
Metretopus borealis	Boreal Cleft-footed Minnow Mayfly	3						
Parameletus midas	Midas Primitive Minnow Mayfly	3						
Siphlonisca aerodromia	Tomah Mayfly	1	O					
Siphlonurus barbaroides	Wild Primitive Minnow Mayfly	3						
Siphlonurus barbarus	Barbarous Primitive Minnow Mayfly	3						
Siphlonurus demarayi	Demaray's Primitive Minnow Mayfly	2						
Siphlonurus securifer	Hatchet Primitive Minnow Mayfly	3						
Hymenoptera (ants, bees, wasps and sawflies)								
Bombus affinis	Rusty-patched Bumble Bee	1	O				O	
Bombus ashtoni	Ashton's Cuckoo Bumble Bee	1					O	
Bombus citrinus	Lemon Cuckoo Bumble Bee	2					O	
Bombus fervidus	Yellow Bumble Bee	2					O	
Bombus flavidus appalachiensis	Appalachian Cuckoo Bumble Bee	3					O	
Bombus insularis	Indiscriminate Cuckoo Bumble Bee	2					O	
Bombus pensylvanicus	American Bumble Bee	3					O	
Bombus rufocinctus	Red-belted Bumble Bee	3					O	

CLASS Order Scientific Name	Common Name	Priority	Species-specific Monitoring	Maine Butterfly Survey (MBS)	Maine Damselfly & Dragonfly Survey (MDDS)	Maine Mussel Atlas & Surveys	Maine Bumble Bee Atlas (MBBA)	Maine Flower Fly Survey (MFFS)
Bombus terricola	Yellowbanded Bumble Bee	3					O	
Lepidoptera (butterflies, skippers, and moths)								
Catocala similis	Similar Underwing	2						
Zale obliqua	Oblique Zale	2						
Lycia rachelae	Twilight Moth	2						
Macaria exonerata	Barrens Itame	2						
Metarranthis apiciaria	Barrens Metarranthis Moth	2						
Nepytia pellucidaria	A Geometrid Moth	3						
Atrytonopsis hianna hianna	Dusted Skipper	3	O	O				
Erynnis brizo	Sleepy Duskywing	2	O	O				
Euphyes conspicua orono	Black Dash	3	O	O				
Hesperia leonardus leonardus	Leonard's Skipper	3	O	O				
Hesperia metea metea	Cobweb Skipper	2	O	O				
Poanes massasoit massasoit	Mulberry Wing	3	O	O				
Callophrys eryphon eryphon	Western Pine Elfin	2	O	O				
Callophrys gryneus gryneus	Juniper Hairstreak	1	O	O				
Callophrys hesseli hesseli	Hessel's Hairstreak	1	O	O				
Callophrys lanoraieensis	Bog Elfin	3	O	O				
Callophrys polios polios	Hoary Elfin	2	O	O				
Erora laeta	Early Hairstreak	2	O	O				
Plebejus idas empetri	Crowberry Blue	2	O	O				
Plebejus idas scudderii	Northern Blue	2	O	O				
Satyrium acadica acadica	Acadian Hairstreak	3	O	O				

CLASS Order Scientific Name	Common Name	Priority	Species-specific Monitoring	Maine Butterfly Survey (MBS)	Maine Damselfly & Dragonfly Survey (MDDS)	Maine Mussel Atlas & Surveys	Maine Bumble Bee Atlas (MBBA)	Maine Flower Fly Survey (MFFS)
Satyrium edwardsii edwardsii	Edwards' Hairstreak	2	O	O				
Satyrium titus winteri	Coral Hairstreak	3	O	O				
Tharsalea dorcas claytoni	Clayton's Copper	2	O	O				
Chaetaglaea cerata	Waxed Sallow Moth	3						
Chaetaglaea rhonda	Barrens Chaetaglaea	3						
Cucullia speyeri	Speyer's Cucullia Moth	3						
Lithophane lepida lepida	Pine Pinion	2						
Photedes inops	Spartina Borer Moth	3						
Psectraglaea carnosa	Pink Sallow	3						
Pyrrhia aurantiago	Aureolaria Seed Borer	3						
Sympistis perscripta	Scribbled Sallow Moth	3						
Xylena thoracica	Acadian Swordgrass Moth	3						
Xylotype capax	Broad Sallow	2						
Xystopeplus rufago	Red-winged Sallow	2						
Zale lunifera	Bold-based Zale Moth	2						
Zanclognatha martha	Pine Barrens Zanclognatha	2						
Boloria bellona bellona	Meadow Fritillary	3	O	O				
Boloria chariclea grandis	Arctic Fritillary	1	O	O				
Boloria eunomia dawsoni	Bog Fritillary	3	O	O				
Boloria frigga saga	Frigga Fritillary	1	O	O				
Chlosyne nycteis nycteis	Silvery Checkerspot	3	O	O				
Danaus plexippus plexippus	Monarch	3	O	O				

CLASS Order Scientific Name	Common Name	Priority	Species-specific Monitoring	Maine Butterfly Survey (MBS)	Maine Damselfly & Dragonfly Survey (MDDS)	Maine Mussel Atlas & Surveys	Maine Bumble Bee Atlas (MBBA)	Maine Flower Fly Survey (MFFS)
Lethe appalachia appalachia	Appalachian Brown	3	O	O				
Oeneis polixenes katahdin	Katahdin Arctic	1	O	O				
Polygonia gracilis gracilis	Hoary Comma	2	O	O				
Polygonia satyrus neomarsyas	Satyr Comma	2	O	O				
Papilio brevicauda gaspeensis	Short-tailed Swallowtail	2	O	O				
Pterourus troilus troilus	Spicebush Swallowtail	2	O	O				
Citheronia sepulcralis	Pine Devil	3						
Hemileuca lucina	New England Buckmoth	3						
Hemileuca maia maia	Eastern Buckmoth	2						
Hemaris gracilis	Graceful Clearwing	3						
Lapara coniferarum	Southern Pine Sphinx	3						
Paonias astylus	Huckleberry Sphinx	3						
Odonata (dragonflies and damselflies)								
Aeshna juncea	Sedge Darner	1	O		O			
Anax longipes	Comet Darner	2	O		O			
Epiaeschna heros	Swamp Darner	3	O		O			
Rhionaeschna mutata	Spatterdock Darner	2	O		O			
Argia translata	Dusky Dancer	2	O		O			
Enallagma carunculatum	Tule Bluet	3	O		O			
Enallagma durum	Big Bluet	1	O		O			
Enallagma laterale	New England Bluet	3	O		O			
Enallagma pictum	Scarlet Bluet	3	O		O			
Ischnura hastata	Citrine Forktail	3	O		O			
Ischnura ramburii	Rambur's Forktail	2	O		O			
Zoraena obliqua	Arrowhead Spiketail	3	O		O			

CLASS Order Scientific Name	Common Name	Priority	Species-specific Monitoring	Maine Butterfly Survey (MBS)	Maine Damselfly & Dragonfly Survey (MDDS)	Maine Mussel Atlas & Surveys	Maine Bumble Bee Atlas (MBBA)	Maine Flower Fly Survey (MFFS)
Somatochlora albicincta	Ringed Emerald	2	O		O			
Somatochlora brevicincta	Quebec Emerald	3	O		O			
Somatochlora linearis	Mocha Emerald	1	O		O			
Williamsonia lintneri	Ringed Boghaunter	1	O		O			
Gomphurus vastus	Cobra Clubtail	2	O		O			
Lanthus vernalis	Southern Pygmy Clubtail	3	O		O			
Ophiogomphus colubrinus	Boreal Snaketail	1	O		O			
Ophiogomphus howei	Pygmy Snaketail	3	O		O			
Progomphus obscurus	Common Sanddragon	2	O		O			
Stylurus spiniceps	Arrow Clubtail	2	O		O			
Leucorrhinia patricia	Canada Whiteface	3	O		O			
Libellula needhami	Needhams Skimmer	2	O		O			
Plecoptera (stoneflies)								
Allocapnia illinoensis	Illinois Snowfly	3						
Alloperla idei	Vernal Sallfly	3						
Alloperla voinae	Lawrence Sallfly	3						
Alloperla vostoki	Scotia Sallfly	3						
Utaperla gaspesiana	Gaspé Sallfly	3						
Ostrocerca prolongata	Bent Forestfly	3						
Neoperla mainensis	Maine Stone	3						
Pteronarcys comstocki	Spiny Salmonfly	3						
Trichoptera (caddisflies)								
Hydroptila blicklei	A Caddisfly	3						
Hydroptila dentata	A Purse Casemaker Caddisfly	3						
Hydroptila parachelops	A Caddisfly	3						
Hydroptila tomah	A Caddisfly	3						

CLASS Order Scientific Name	Common Name	Priority	Species-specific Monitoring	Maine Butterfly Survey (MBS)	Maine Damselfly & Dragonfly Survey (MDDS)	Maine Mussel Atlas & Surveys	Maine Bumble Bee Atlas (MBBA)	Maine Flower Fly Survey (MFFS)
Hydroptila xoncla	Retracted Microcaddisfly	3						
Ochrotrichia denningi	A Caddisfly	3						
Oxyethira rossi	A Caddisfly	3						
MALACOSTRACA (crustaceans)								
Decapoda (decapods)								
Faxonius limosus	Spinycheek Crayfish	3						

5/6.2.3 Inland Fish

The MDIFW monitors 19 inland fish SGCN of the total 54 fish species SGCN (35%) through the application of 19 distinct methodologies (Table 5/6 - 4). In most cases, MDIFW monitors individual species using multiple methods. Many of the monitoring approaches that apply to inland fish SGCN are components of MDIFW's larger fisheries management program implemented by regional biologists and are not targeted towards specific species. However, species-specific monitoring protocols are in place for nine species in this group. As managed sportfish, Landlocked Atlantic Salmon (*Salmo salar sebago*), Arctic Char (*Salvelinus alpinus oquassa*), Brook Trout (*Salvelinus fontinalis*), Lake Trout (*Salvelinus namaycush*), Lake Whitefish (*Coregonus clupeaformis*), Round Whitefish (*Prosopium cylindraceum*) and White Perch (*Morone americana*) populations are routinely monitored to assess population health and condition. In addition, eDNA and trawling surveys have become more commonly used for monitoring species presence of many SGCN fishes, but especially Bridle Shiner (*Notropis bifrenatus*) where an eDNA monitoring protocol was recently developed (Katz et al. 2024) and Lake Whitefish (*Coregonus clupeaformis*) where springtime trawling is used to determine larval fish presence. The use of eDNA technology, which relies on the detection of DNA in water samples to determine the presence or absence of species within the water body, has proven to be an extremely powerful approach for monitoring rare aquatic taxa as well as the presence of invasive fish species.

"…eDNA technology, which relies on the detection of DNA in water samples to determine the presence or absence of species within the water body, has proven to be an extremely powerful approach for monitoring rare aquatic taxa as well as the presence of invasive fish species."

Case Study: Monitoring Bridled Shiner using eDNA

Many SGCN species are challenging to monitor, as they are either very rare, or near impossible to detect. One such SGCN is the Bridled Shiner (*Notropis bifrenatus*).

MDIFW in collaboration with the University of Maine, sampled environmental DNA (eDNA) suspended in the water column to confirm presence of existing populations and to document previously unknown populations. Monitoring SGCN using eDNA can provide an efficient way to monitor secretive and rare SGCN in Maine.

eDNA has tremendous potential and we anticipate continued use, as additional reference libraries and assays are developed. © Merry Gallagher

Lowbush blueberry (*Vaccinium angustifolium*) ©MDIFW

Table 5/6 - 4 Inventory of population monitoring programs used for Maine's inland fish Species of Greatest Conservation Need, identified for the 2025 Wildlife Action Plan. Key: O=Ongoing; N=New; I=Interim.

Scientific Name	Common Name	Priority	Species-specific Monitoring	Clerk Creel Census	Voluntary Creel Census	Baitfish Dealer Inspections	Stream Electro Fishing	Lake Electro Fishing	Gill Netting	Trap Netting	Telemetry/Marking	eDNA	Beach Seines	Minnow Traps/Pots	Fishway Traps	Trawling	SCUBA / Snorkeling	Experimental Angling	Monitoring Salmon Traps & Lifts	Spawning Stock Surveys
Catostomus catostomus	Longnose Sucker	3	N			O	O	O	O	O					O					
Catostomus commersoni	White Sucker	3	N			O	O	O	O	O					O					
Coregonus clupeaformis	Lake Whitefish	1	O	O	O		N	N	O	O	N	N	N		N	O	N	O		O
Culaea inconstans	Brook Stickleback	3	N				O				N	N	N	O	N					
Erimyzon oblongus	Creek Chubsucker	2	N			O	O	N	N	O	N	N	O	O	N		N			
Esox americanus americanus	Redfin Pickerel	2	O	O			O	N		N			N							
Etheostoma fusiforme	Swamp Darter	1	N				O						O				N			
Hybognathus regius	Eastern Silvery Minnow	3	N			O	O	O					O	O	N					
Lethenteron appendix	American Brook Lamprey	3	N				O				N	N								
Margariscus margarita	Pearl Dace	3	N			O	O	O				N	O	O	N					

Scientific Name	Common Name	Priority	Species-specific Monitoring	Clerk Creel Census	Voluntary Creel Census	Baitfish Dealer Inspections	Stream Electro Fishing	Lake Electro Fishing	Gill Netting	Trap Netting	Telemetry/Marking	eDNA	Beach Seines	Minnow Traps/Pots	Fishway Traps	Trawling	SCUBA / Snorkeling	Experimental Angling	Monitoring Salmon Traps & Lifts	Spawning Stock Surveys
Morone americana	White Perch	3	O	O	O			O	O	O	N	N	O	O				O		
Notropis bifrenatus	Bridle Shiner	2	O			O	O	O			N	O	O	O	N					
Notropis heterolepis	Blacknose Shiner	3	N			O	O	O			N	N	O	O	N					
Prosopium cylindraceum	Round Whitefish	1	O	O	O		N	N	O	O		N			N	N	N	N		N
Rhinichthys cataractae	Longnose Dace	3	N			O	O	O					O	O	N		N			
Salmo salar sebago	Landlocked Atlantic Salmon	2	O	O	O		O	O	O	O	O				N		N	O	O	O
Salvelinus alpinus oquassa	Arctic Charr	1	O	O	O				O	O	O	N					O	O		O
Salvelinus fontinalis	Brook Trout	2	O	O	O		O	O	O	O	O	N			O		O	O	O	O
Salvelinus namaycush	Lake Trout	3	O	O	O			O	O	O		N				N	O	O		O

5/6.2.4 Mammals

Mammals often occur at relatively low densities and occupy large landscapes, making the application of comprehensive, multi-species monitoring protocols challenging. Of Maine's 19 mammal SGCN, six currently are subject to a species-specific monitoring protocol, and the seven bat species are monitored collectively using acoustic recorders (Table 5/6 - 5). A new methodology using DNA from collected fecal pellets has been successfully used to survey for Northern Bog Lemmings (*Synaptomys borealis sphagnicola*) and other small mammal species. MDIFW has recently initiated a new mammal monitoring program via game cameras that are used to monitor multiple species, including American Marten (*Martes americana*) and Snowshoe Hare (*Lepus americanus*). Additionally, MDIFW is in the process of developing a mammal atlas that will use a variety of techniques (e.g., fecal pellets, small mammal trapping, citizen science, etc.) to gather data on all of Maine's mammal species, including the SGCN.

Table 5/6 - 5 Inventory of population monitoring projects focused on Maine's mammal Species of Greatest Conservation Need, identified for the 2025 Wildlife Action Plan. Key: O=Ongoing; N=New; I=Interim.

Scientific Name	Common Name	Priority	Species-specific Monitoring	Acoustic Bat Monitoring	New England Cottontail Range-Wide Conservation Strategy Monitoring	Mammal Atlas	Camera Surveys
Alces alces americanus	Moose	2	O			N	
Canis lupus	Gray Wolf or Eastern Canadian Wolf	2				N	
Lasionycteris noctivagans	Silver-haired Bat	3		O		N	
Lasiurus borealis	Eastern Red Bat	3		O		N	
Lasiurus cinereus	Hoary Bat	3		O		N	
Lepus americanus	Snowshoe Hare	3	O		O	N	N
Lynx canadensis	Canada Lynx	2	O			N	
Martes americana	American Marten	3	O			N	N
Microtus chrotorrhinus	Rock (yellow-nosed) Vole	3				N	
Microtus pennsylvanicus shattucki	Penobscot Meadow Vole	2				N	
Microtus pinetorum	Woodland Vole	3				N	

Scientific Name	Common Name	Priority	Species-specific Monitoring	Acoustic Bat Monitoring	New England Cottontail Range-Wide Conservation Strategy Monitoring	Mammal Atlas	Camera Surveys
Myotis leibii	Eastern Small-footed Myotis	1		O		N	
Myotis lucifugus	Little Brown Bat	2		O		N	
Myotis septentrionalis	Northern Long-eared Myotis	1		O		N	
Ondatra zibethicus	Muskrat	3	O			N	
Perimyotis subflavus	Tri-colored Bat	1		O		N	
Sorex dispar	Long-tailed Shrew	3				N	
Sylvilagus transitionalis	New England Cottontail	1	O		O	N	
Synaptomys borealis sphagnicola	Northern Bog Lemming	2				N	

5/6.2.5 Marine Fauna

Monitoring of marine SGCN occurs through a wide variety of programs and includes the involvement of numerous conservation partners. We summarize these monitoring programs according to broad taxonomic groupings of species that are monitored using similar methods. In addition, Table 5/6 - 6 provides a detailed list of the monitoring approaches that are used for each species.

Marine Mammals and Sea Turtles

The Maine Department of Marine Resources (MDMR) has received funding since 2021 to mobilize efforts to better understand the density and distribution of North Atlantic Right Whales (*Eubalaena glacialis*) in the Gulf of Maine as well as targeted funding to test and improve alternative gear strategies. The newly formed Division of Marine Mammal Research within MDMR houses 25 full time staff within five research programs: Survey, Passive Acoustic Monitoring (PAM), Habitat, Alternative Gear, and Biological Modeling. Funding for this work has primarily come from the Consolidated Appropriations Act starting in 2023, though additional support has been made available through the American Rescue Plan Act and US Endangered Species Act Section 6 funding. The Survey Program was implemented in 2024 to conduct monthly standardized visual surveys for all marine mammal species using vessel and aerial platforms. The goal of this program is to collect data to understand the spatial and temporal distribution and habitat use of North Atlantic Right Whales in the Gulf of Maine, though data are collected on all marine mammal and sea turtle sightings, as well as incidental data recording of large fishes and fish schools. In

addition, the members of this program provide support for response surveys. The PAM program originated with an offshore monitoring project that consisted of 10 PAM sites for the detection of North Atlantic Right Whales from 2021-2023 in collaboration with the University of Maine. These data were analyzed for North Atlantic Right Whale detections. Funding from the Consolidated Appropriations Act of 2023 was used to deploy an additional 26 PAM buoys starting in 2023. Data analysis and supplementary field work is underway with multiple collaborations with research partners to better understand the acoustic presence of North Atlantic Right Whales, though data on other vocalizing marine mammal species have been recorded as well.

The three other programs housed within the Division of Marine Mammal Research are focused on habitat monitoring, data integration and modeling, and alternative gear. The Habitat Program is currently under development, and the goal of this program is to better understand the density and distribution of the primary prey of the North Atlantic Right Whale, the copepod *Calanus finmarchicus*. In addition, this program will collect data to understand zooplankton community composition, water mass characteristics, and nutritional properties of zooplankton to explore the relationship between prey characteristics and North Atlantic Right Whale habitat use. The Biological Modeling Program is comprised of analysts who integrate the data collection efforts of MDMR with external data to develop statistical models to inform the distribution of North Atlantic Right Whales and lobster fishing gear in the Gulf of Maine. Data analysis and modeling efforts are run by MDMR staff, as well as through contracts with Duke University, Bigelow Laboratory for Ocean Sciences, and Stony Brook University. Multiple data sharing collaborations are underway through this analysis, including with local whale watching companies, the North Atlantic Right Whale Consortium, and the Northeast Fisheries Science Center.

The Bureau of Marine Patrol and the Division of Marine Mammal Research are also involved in the marine mammal and sea turtle disentanglement training process, and multiple officers and staff have received advanced training by the Atlantic Large Whale Disentanglement Network. The trained responders participate in broader coastwide disentanglement efforts and contribute data to the Greater Atlantic Regional Fisheries Office, who monitor and assess individual entanglement cases.

Finfish: Diadromous, Groundfish, and Ocean Migratory Fish

MDMR regularly performs both species-specific monitoring programs, as well as surveys that target multiple species, in Maine waters. The Inshore Trawl Survey is a fisheries-independent assessment of living resources inside the coastal waters of Maine and New Hampshire. Until this survey began in 2000, Maine and New Hampshire were the only states on the east coast that did not conduct a near-shore assessment. This survey also assesses lobsters, recreational finfish, and non-commercial species of ecological interest and provides environmental habitat data through conductivity, temperature, and depth instrumentation casts conducted throughout the survey. This multispecies survey benefits decision makers confronted with a diverse array of fisheries management issues.

Monitoring programs also include port sampling and reporting from commercial and recreational fishers. During MDMR's commercial and recreational sampling efforts, it collects biological data including length, weight, and maturity from groundfish, river herring, scallops, urchins, shrimp, and other fished species. MDMR also collects scales and otoliths from fish for ageing.

Annually, from May through October, MDMR interviews anglers to estimate the total number of fish caught, released, and harvested; the weight of the harvest; total number of angler trips; and number of people participating in marine recreational fishing in Maine. This effort is part of a National Marine Fisheries Service (NMFS) - Marine Recreational Information Program to estimate the impact of recreational fishing on marine resources. MDMR staff also monitor the winter Rainbow Smelt recreational fishery throughout the state through creel surveys.

Trawl surveys are conducted by MDMR to assess marine finfish populations © MDMR

MDMR's recreational fishing staff conduct the NMFS Large Pelagic Survey from July through October, annually, to monitor the catch and the effort expended by fishers to take tunas and sharks. This survey consists of dockside vessel interviews and telephone calls to Atlantic BluefinTuna (*Thunnus thynnus*) permit holders. Additionally, Volunteer Logbook Programs for Striped Bass (*Morone saxatilis*) and Rainbow Smelt (*Osmerus mordax*) monitor avid recreational fishers to collect additional information. In this program, anglers record information about fish harvested or released during each trip, time spent fishing, area fished, number of anglers, and target species. In addition to the Large Pelagic Survey, MDMR began deploying acoustic receivers in 2020 from May to October each year to monitor habitat use of white sharks in southern Maine waters and began tagging other migratory sharks to monitor migration and habitat use of these highly migratory species in the Gulf of Maine

Annually, from mid-May through August, MDMR conducts bi-weekly beach seine surveys in the estuary formed by the Kennebec and Androscoggin Rivers. MDMR uses these surveys to monitor the abundance of juvenile American Shad (*Alosa sapidissima*), Alewives (*Alosa pseudoharengus*), and Blueback Herring (*Alosa aestivalis*), as well as Striped Bass (*Morone saxatilis*), Rainbow Smelt (*Osmerus mordax*), and several resident species. MDMR conducts the surveys at 14 permanent sampling sites in the tidal freshwater portion of the estuary and at six additional sites in the lower, salinity-stratified portion of the river. MDMR has conducted these surveys since 1979 and uses the data to monitor species assemblages, population trends, and habitat use.

MDMR collaborates with agencies, universities, and Tribal Nations to assess the effectiveness of diadromous fish passage at dams on many rivers in Maine. In addition, MDMR collaborates with agencies, Tribal Nations, municipalities, and non-governmental organizations to advocate for passage studies to assess impacts to diadromous species and inform measures to minimize or eliminate those impacts during the relicensing of dams under the regulatory authority of the Federal Energy Regulatory Commission, and MDMR works directly with dam owners and operators outside of relicensing. For example, the US Geological Survey Maine Cooperative Fish and Wildlife Research Unit at the University of Maine completed field work in 2018 and 2019 on a collaborative project with MDMR and National Oceanic and Atmospheric Administration – Fisheries (NOAA-Fisheries) documenting the energetic impacts of upstream passage delays on migration of adult Atlantic Salmon in the Penobscot and Kennebec Rivers. Fishery managers use this information to evaluate upstream movements of salmon within the drainages and the probability that fish are able to access spawning habitat with the energy needed to successfully spawn. In a separate study, UMaine collaborated with MDMR to track Sea Lamprey passage effectiveness on the Penobscot and Kennebec Rivers and found that operation of passage structures at night is critical to effective passage of this species. More recently, using environmental DNA (eDNA) and radio-telemetry, UMaine assessed current habitat use and changes in Sea Lamprey distribution tied to restoring access to habitat, highlighting how passage improvements are reshaping lamprey accessibility in the Penobscot River. In addition, since 2016, studies and monitoring on the St. Croix River have evaluated fish ladder performance at Milltown, Woodland, and Grand Falls dams, revealing moderate passage success but delays and site-specific inefficiencies, and later expanded into binational planning to identify feasible upstream and downstream passage improvements. More recently, the Milltown Dam removal launched a five-year monitoring program (2024-2029), while telemetry, hydraulic modeling, and engineering studies are guiding the design of new fish passage facilities at Woodland and Grand Falls dams.

MDMR conducts routine monitoring, or collects information from dam operators, of the abundance and status of juvenile and adult diadromous fishes in most of Maine's large watersheds. Traps to monitor adult returns are operated on the Androscoggin, Kennebec, Penobscot, Narraguagus, Union, Sebasticook, and Saco rivers. These fish counting facilities are typically operated from May through early November each year by agencies, dam owners or operators, or harvesters and provide counts of adult fish, and to a lesser extent, information on juveniles. Additional facilities are operated specifically to provide upstream passage for juvenile American Eel at many dams across Maine and a few of these also provide estimates of the number and size classes of eels that pass each year.

MDMR directs its Atlantic Salmon (*Salmo salar*) monitoring at determining the causes and ameliorating the precipitous decline in Atlantic Salmon returning to Maine waters. The focus of ongoing projects is to determine survival among freshwater life stages and understand the biological and environmental factors affecting survival. These include parr relative abundance and density and estimates of smolt emigration. In addition, redd counts are completed each fall to track spawning escapement in the Gulf of Maine Distinct Population Segment rivers without adult traps. MDMR staff are responsible for collecting, analyzing and reporting data to national and international organizations for the improvement of the Atlantic Salmon across their range, along with oversight of connectivity projects, habitat restoration and stocking to prevent extinction. The staff of MDMR also provide technical assistance to consultations for road and bridge construction and other compliance work to inform

impact assessments of the species. In addition, MDMR reviews and issues all stocking permits for searun Atlantic Salmon in Maine.

MDMR's current efforts to monitor and assess the populations of Shortnose Sturgeon (*Acipenser brevirostrum*) and Atlantic Sturgeon (*Acipenser oxyrinchus*) include population abundance assessment for Shortnose Sturgeon and assessing nearshore coastal movements of both sturgeon species. In addition, MDMR is partnering with federal agencies and University of Maine to consolidate datasets for the sturgeon populations in Maine's largest rivers. MDMR also maintains a Maine Sturgeon Sighting Reporter available to the public to help track when and where sturgeon are spending time in our waters. Reports of dead sturgeon help MDMR effectively respond to and recover carcasses which aides in documentation of age, size, sex, and cause of mortality. More consistent funding for sturgeon assessment would be required to continue and expand current efforts to include determining age structure and recruitment, sampling areas of historic sturgeon occurrence, documentation of seasonal distribution and essential habitat, development of criteria to identify critical habitat, designating identifiable habitat for sturgeon populations, ensuring fish passage. Recently, most monitoring of sturgeon has been supported by federal funding, including the Species Recovery Grants to States program administered by the National Oceanographic and Atmospheric Administration, and executed in collaboration with federal and academic research partners.

Since 2020, MDMR has coordinated a spring Rainbow Smelt (*Osmerus mordax*) spawning survey in collaboration with Gulf of Maine Research Institute, Downeast Salmon Federation, and The Nature Conservancy. This spring survey has engaged volunteers to monitor Rainbow Smelt spawning runs across Maine. These volunteers are trained to survey selected streams weekly during smelt spawning season, recording observations of fish or eggs along with habitat data such as depth, substrate, canopy cover, and potential passage barriers. This community science initiative helps fill critical data gaps across nearly 300 historic spawning streams, aiding resource managers in identifying active spawning sites, understanding habitat conditions, and prioritizing restoration actions to support declining smelt populations.

MDMR monitors American Eel (*Anguilla rostrata*) populations using fishery-independent surveys; a young-of-year survey, a yellow eel (i.e. subadult) mark and recapture survey, and a silver eel (i.e. mature adult) count. Each spring MDMR scientists enumerate all young-of-year (i.e., glass) eels that migrate upstream into West Harbor Pond and collect biological information (i.e., length, weight, pigmentation) on subsamples. From June to September each year, MDMR conducts the yellow eel survey in West Harbor Pond. This survey provides an annual index of growth and survival of yellow eels as a measure of productivity of the species. Finally, MDMR scientists trap, measure, and release silver eels as they migrate out of West Harbor Pond each fall on their way to spawn in the Sargasso Sea.

Marine Invertebrates

State, federal, university, and non-governmental organizations collaboratively monitor marine invertebrates. In addition to the Nearshore Trawl Survey and Port Sampling programs described above, MDMR collects information about commercial and non-commercial species through fishery-independent surveys.

MDMR uses dive surveys to monitor Green Sea Urchins (*Strongylocentrotus droebachiensis*). MDMR and industry divers count and measure urchins at fixed and random sites each spring from Kittery to Eastport. This survey provides fishery-independent data that MDMR uses in stock assessments to describe the status of the resource

and provide a scientific basis for the development of management measures. This survey was expanded in 2024 to include more oceanographic and multispecies measurements to better characterize the benthic ecology and habitat on the Maine coast.

MDMR and industry partners survey the Maine scallop resource annually, rotating among coastal sites from southern Maine to Quoddy Head. Sampling occurs in October and November prior to the start of the scallop season in December. The surveys provide fishery-independent data that fishery managers use for stock assessments to describe the status of the resource and provide a scientific basis for the development of management measures. The surveys also provide information on the effectiveness of the areas closed to fishing in growing scallop populations and to guide re-opening strategies.

Starting in 2012 MDMR began to monitor benthic epifauna and infauna through grab sampling and video surveys conducted by the Maine Coastal Mapping Initiative (MCMI). The grab sampling quantifies benthic infauna in the variety of subtidal habitats throughout Maine while the video survey provides information on the epifauna in those habitats. This program provides important data on non-commercial species in Maine's waters. The grab sampling and video surveys are conducted after MCMI conduct bathymetric surveys to identify and quantify benthic habitats. MCMI's survey provides critical updates to navigational charts as well as provide data on subtidal habitats that can be used for ecosystem-based management.

MDMR measures the abundance of commercially viable populations of Softshell Clams (*Mya arenaria*), hard clams, Eastern Oysters (*Crassostrea virginica*), and Blue Mussels (*Mytilus edulis*) on an ad hoc basis, often in partnership with staff from the town where the survey takes place. These surveys are usually site-specific to a single tidal flat and do not represent a statewide or regional stock assessment. Some towns, such as Brunswick and Harpswell, monitor soft shell clam abundance annually within their town boundaries and use these data to set limits on commercial shellfish licenses for the following year.

In 2024 MDMR established a series of fixed monitoring stations between Kittery and Eastport to characterize long-term changes in intertidal ecosystems. Multi-species transect surveys are conducted quarterly in the intertidal flat and rocky shore at each site. The abundance and size-distribution of several target species is measured, including four SGCN, and all species present are recorded. Up to twenty-two SGCN that inhabit the intertidal zone may be documented through this monitoring program, although it is worth noting that most of these have only been previously documented in Cobscook Bay.

The National Park Service monitors rocky shores in Maine as part of their Northeast Intertidal Monitoring Network that extends to the Boston Harbor Islands in Massachusetts. In Maine, field work is centered on Acadia National Park, specifically Ship Harbor, Bass Harbor, Otter Point, Schoodic Point, and Little Moose Island. Samplings also occurs at Metinic and Petit Manan islands. This is a long-term, annual program focuses on detecting changes in rocky-shore fauna and flora, monitoring tide pools, barnacle recruitment, vertical distributions of macroalgae and macroinverterates, and counting target species. It monitors alterations in oceanographic patterns and climate change on decadal time scales.

The New England Aquatic Nuisance Species Panel was established in 2001 to monitor nuisance species, create public outreach programs, suggest policy, and facilitate coordination of these activities among the New England states. While most efforts have targeted freshwater invasive species, scientists also monitor marine non-native

macroalgae and macroinvertebrates as part of the Rapid Assessment Survey, conducted from New York City to Eastport, Maine (Pederson et al. 2005, Wells et al. 2014). Data from these surveys are available from the Massachusetts Invader Tracking and Information System (MITIS). Citizen monitoring programs supply the scientific survey efforts that increase the spatial and temporal coverage of the Rapid Assessment Survey from Rhode Island to Wells, Maine for an abridged list of invasive species. The data collected from 2008 to present are available at the Massachusetts Ocean Resource Information System http://maps.massgis.state.ma.us/map_ol/moris.php.

The incipient network of field station sites called the Field Station and Marine Lab network in the Northeast includes many nonprofit and university affiliated coastal stations that monitor rocky and unconsolidated shores in Maine. Some of these projects involve citizen-science programs with significant outreach and education. Current stations include the R.S. Friedman Field Station in Cobscook Bay, Hurricane Island in Penobscot Bay, Coastal Studies Center in Casco Bay, and several others.

Cobscook Bay is an important area for Marine SGCN and is identified as a BwH Focus Area of Statewide Ecological Significance.

Table 5/6 - 6 Inventory of population monitoring programs focused on Maine's marine fauna Species of Greatest Conservation Need, identified for the 2025 Wildlife Action Plan. Key: O=Ongoing; N=New; I=Interim.

Scientific Name	Common Name	Priority	Species-specific Monitoring	Clerk Creel Census	Voluntary Creel Census	Mandatory Reporting	Stream Electro Fishing	Lake Electro Fishing	Gill Netting	Trap Netting	Beach Seines	Fishway Traps	DMR trawl survey	SCUBA / Snorkeling	Experimental Angling	Voluntary Sightings network	Spawning Stock Surveys	Habitat Mapping	Species Interaction Studies	Environmental/Habitat Change Effect Studies
Acipenser brevirostrum	Shortnose sturgeon	1	O						O		O					N	O	O		
Acipenser oxyrinchus	Atlantic Sturgeon	1	O						O		O		I			N	O	O		
Anguilla rostrata	American Eel	2	O			O	O			O	O	O	O				O	O		N
Alosa aestivalis	Blueback Herring	1	O			O	O			O	O	O	O				O	O	N	
Alosa pseudoharengus	Alewife	1	O			O	O			O	O	O	O				O	O	N	N
Alosa sapidissima	American Shad	1	O	O	O		O		O	O	O	O	O				O	O		
Gadus morhua	Atlantic Cod	2				O							O				O			
Microgadus tomcod	Atlantic Tomcod	3	N													N				
Melanogrammus aeglefinus	Haddock	3				O							O				O	N		

Scientific Name	Common Name	Priority	Species-specific Monitoring	Clerk Creel Census	Voluntary Creel Census	Mandatory Reporting	Stream Electro Fishing	Lake Electro Fishing	Gill Netting	Trap Netting	Beach Seines	Fishway Traps	DMR trawl survey	SCUBA / Snorkeling	Experimental Angling	Voluntary Sightings network	Spawning Stock Surveys	Habitat Mapping	Species Interaction Studies	Environmental/Habitat Change Effect Studies
Urophycis tenuis	White Hake	3											O					N		
Scomber scombrus	Atlantic Mackerel	3																		
Pomatomus saltatrix	Bluefish	3																		
Tautoga onitis	Tautog	3																		
Brosme brosme	Cusk	2											I					N		
Osmerus mordax	Rainbow Smelt	1	O	O	O	O				O	O		O			N	O	O	N	N
Ammodytes americanus	American Sand Lance	3											O							
Anarhichas lupus	Atlantic Wolffish	2	N										I				O	N		
Anarhichas minor	Spotted Wolffish	2	N																	
Morone saxatilis	Striped Bass	2	O	O	O						O		O				O	O		
Petromyzon marinus	Sea Lamprey	3	N				O					O								

Scientific Name	Common Name	Priority	Species-specific Monitoring	Clerk Creel Census	Voluntary Creel Census	Mandatory Reporting	Stream Electro Fishing	Lake Electro Fishing	Gill Netting	Trap Netting	Beach Seines	Fishway Traps	DMR trawl survey	SCUBA / Snorkeling	Experimental Angling	Voluntary Sightings network	Spawning Stock Surveys	Habitat Mapping	Species Interaction Studies	Environmental/Habitat Change Effect Studies
Thunnus thynnus	Atlantic Bluefin Tuna	3				O													O	
Pseudopleuronectes americanus	Winter Flounder	2				O							O				O	N		O
Salmo salar	Atlantic Salmon	1	O			O	O					O		O			O	O	N	O
Brevoortia tyrannus	Atlantic Menhaden	3																		
Clupea harengus	Atlantic Herring	3																		
Asterias forbesi	Forbes's Starfish	2	O										I	O				N		N
Asterias rubens	Common Sea Star	2	O										I	O				N		N
Stephanasterias albula	White Sea Star	2	O										I	O				N		N
Crossaster papposus	Common Sun Star	2											I	O				N		N
Solaster endeca	Purple Sunstar	2											I	O				N		N

Scientific Name	Common Name	Priority	Species-specific Monitoring	Clerk Creel Census	Voluntary Creel Census	Mandatory Reporting	Stream Electro Fishing	Lake Electro Fishing	Gill Netting	Trap Netting	Beach Seines	Fishway Traps	DMR trawl survey	SCUBA / Snorkeling	Experimental Angling	Voluntary Sightings network	Spawning Stock Surveys	Habitat Mapping	Species Interaction Studies	Environmental/Habitat Change Effect Studies
Mya arenaria	Softshell Clam	3	O			O												O	N	N
Mya truncata	Gaper Clam	2	O											O				N	N	N
Crassostrea virginica	Eastern oyster	2	O			O												O	N	N
Zirfaea crispata	Atlantic Great Piddock	2	O											O				N		N
Mytilus edulis	Blue Mussel	3	O			O												O	N	N
Margaritifera margaritifera	Eastern Pearlshell	3	O											O				N		N
Chlamys islandica	Icelandic Scallop	3	O										O	O				N	N	N
Placopecten magellanicus	Atlantic Sea Scallop	2	O			O							O	O				O	N	N
Mercenaria mercenaria	Hard-shelled Clam	3	O			O												O	N	N

Scientific Name	Common Name	Priority	Species-specific Monitoring	Clerk Creel Census	Voluntary Creel Census	Mandatory Reporting	Stream Electro Fishing	Lake Electro Fishing	Gill Netting	Trap Netting	Beach Seines	Fishway Traps	DMR trawl survey	SCUBA / Snorkeling	Experimental Angling	Voluntary Sightings network	Spawning Stock Surveys	Habitat Mapping	Species Interaction Studies	Environmental/Habitat Change Effect Studies
Sphyrna zygaena	Smooth Hammerhead	3	N																	
Alopias vulpinus	Common Thresher Shark	3	N																	
Isurus oxyrinchus	Shortfin Mako	2	N																	
Lamna nasus	Porbeagle	2	N																	
Carcharodon carcharias	Whike shark	2	O																	
Cetorhinus maximus	Basking shark	2	N																	
Carcharias taurus	Sand Tiger Shark	3																		
Amblyraja radiata	Thorny Skate	2											O							
Dipturus laevis	Barndoor Skate	3											O							
Leucoraja ocellata	Winter Skate	1											O							
Malacoraja senta	Smooth Skate	2											O							

Scientific Name	Common Name	Priority	Species-specific Monitoring	Clerk Creel Census	Voluntary Creel Census	Mandatory Reporting	Stream Electro Fishing	Lake Electro Fishing	Gill Netting	Trap Netting	Beach Seines	Fishway Traps	DMR trawl survey	SCUBA / Snorkeling	Experimental Angling	Voluntary Sightings network	Spawning Stock Surveys	Habitat Mapping	Species Interaction Studies	Environmental/Habitat Change Effect Studies
Strongylocentrotus droebachiensis	Green Sea Urchin	2	O			O							I	O				O	N	N
Arrhoges occidentalis	American Pelican Foot	2	O											O				N		N
Limneria undata	Wavy Lamellaria	3	O											O				N		N
Boreotrophon clathratus	Clathrate Trophon	2	O											O				N		N
Boreotrophon truncatus	Murex	2	O											O				N		N
Colus pygmaeus	Colus Snail	2	O											O				N		N
Ptychatractus ligatus	Spindle Shell	2	O											O				N		N
Limacina helicina	Limancina Snail	3	O											O				N		N
Cucumaria frondosa	Orange-footed Sea Cucumber	2	O			O							O							
Psolus fabricii	Psolus	2	O											O				N		N

Scientific Name	Common Name	Priority	Species-specific Monitoring	Clerk Creel Census	Voluntary Creel Census	Mandatory Reporting	Stream Electro Fishing	Lake Electro Fishing	Gill Netting	Trap Netting	Beach Seines	Fishway Traps	DMR trawl survey	SCUBA / Snorkeling	Experimental Angling	Voluntary Sightings network	Spawning Stock Surveys	Habitat Mapping	Species Interaction Studies	Environmental/Habitat Change Effect Studies
Psolus phantapus	Psolus	2	O											O				N		N
Thyonidium drummondii	Sea Cucumber	2	O										O							
Lebbeus groenlandicus	Spiny Lebbeid Shrimp	2	O										O	O				N		N
Lebbeus polaris	Polar Lebbeid Shrimp	2	O										O	O				N		N
Pandalus borealis	Northern Shrimp	1	O			O							O					O		O
Cancer irroratus	Atlantic Rock Crab	3																		
Balaenoptera borealis	Sei Whale	1	O													O		O		
Balaenoptera musculus	Blue Whale	1														O				
Balaenoptera physalus	Finback Whale	1	O													O				

Scientific Name	Common Name	Priority	Species-specific Monitoring	Clerk Creel Census	Voluntary Creel Census	Mandatory Reporting	Stream Electro Fishing	Lake Electro Fishing	Gill Netting	Trap Netting	Beach Seines	Fishway Traps	DMR trawl survey	SCUBA / Snorkeling	Experimental Angling	Voluntary Sightings network	Spawning Stock Surveys	Habitat Mapping	Species Interaction Studies	Environmental/Habitat Change Effect Studies
Eubalaena glacialis	North Atlantic Right Whale	1	O													O		O		
Megaptera novaeangliae	Humpback Whale	1	O													O		O		
Phocoena phocoena	Harbor Porpoise	3	O													O		O		
Physeter macrocephalus	Sperm Whale	1	O													O				
Calanus finmarchicus	A Copepod	3	N																N	N
Limulus polyphemus	Horseshoe Crab	1	N																	
Gorgonocephalus arcticus	Northern Basket Starfish	2	N										I	O				N		N
Alcyonium siderium	Dead Man's Fingers	3	N															N	N	N
Gersemia rubiformis	Sea Strawberry	2	N															N		

Scientific Name	Common Name	Priority	Species-specific Monitoring	Clerk Creel Census	Voluntary Creel Census	Mandatory Reporting	Stream Electro Fishing	Lake Electro Fishing	Gill Netting	Trap Netting	Beach Seines	Fishway Traps	DMR trawl survey	SCUBA / Snorkeling	Experimental Angling	Voluntary Sightings network	Spawning Stock Surveys	Habitat Mapping	Species Interaction Studies	Environmental/Habitat Change Effect Studies
Caretta caretta	Loggerhead Seaturtle	1														O				
Chelonia mydas	Green Seaturtle	1														O				
Dermochelys coriacea	Leatherback Seaturtle	1														O				
Lepidochelys kempii	Kemp's Ridley Seaturtle	1														O				
Terebratulina septentrionalis	Lamp Shell	2	O											O				N		N

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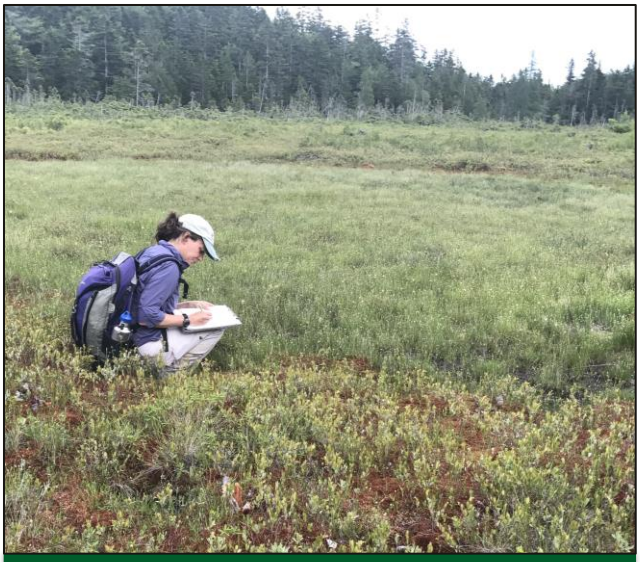
5/6.2.6 Plants



MNAP ecologists monitor rare plants communities and provide critical distribution information to public and private landowners. © MNAP

Maine Natural Areas Program (MNAP) maintains and updates monitoring data on rare plants in Maine, based on decades of MNAP staff surveys and plant population observations provided by botanists and ecologists, which are individually verified by MNAP. MNAP follows and shares plant survey protocols and field forms, and coordinates with other regional Natural Heritage programs and botanical experts to maintain current nomenclature, survey methods, and status information. Historically MNAP has also worked with partners such as Native Plant Trust for rare plant surveys of specific populations and habitats. Monitoring by MNAP ecologists occurs on a subset of taxa yearly, often in conjunction with natural community surveys, Ecological Reserve surveys, saltmarsh surveys, or in response to proposed projects with potential impacts to rare plant populations. Data are collected on population size, extent, reproductive status, and observed threats to viability. All field and geospatial data for rare plant surveys is processed by MNAP and is stored in the MNAP database.

Three plant species in Maine are listed as Threatened under US Endangered Species Act: Prairie White-Fringed Orchid (*Platanthera leucophaea*), Furbish's Lousewort (*Pedicularis furbishiae*), and Small Whorled Pogonia (*Isotria medeloides*). These species receive ongoing monitoring of all known populations in the state.

Prairie White-Fringed Orchid occurs in a single location in Maine, on property owned by The Nature Conservancy (TNC) and monitoring is typically performed by TNC staff, sometimes accompanied by MNAP ecologists.

Furbish's Lousewort is a global endemic that occurs on the St. John River in Maine, with smaller subpopulations in New Brunswick. MNAP ecologists survey the species yearly, with a two-year cycle required to complete surveys of all flowering stems on all known subpopulations.

Small Whorled Pogonia occurs in the southern third of the state, typically in younger to middle-aged mixed hardwood/softwood stands, often on land abandoned from historic agricultural use. Yearly surveys, including long-term demographic monitoring, occur on a subset of known populations, on private property, land owned by TNC, and the White Mountains National Forest. Every third year, a statewide population assessment of all known Small Whorled Pogonia sites is performed.

Table 5/6 - 7 Inventory of population monitoring programs focused on Maine's plant Species of Greatest Conservation Need, identified for the 2025 Wildlife Action Plan. Key: O=Ongoing; N=New; I=Interim.

Scientific Name	Common Name	Priority	Species-specific Monitoring	MNAP Survey & Monitoring	The Nature Conservancy Survey & Monitoring	Native Plant Trust Survey & Monitoring
Monocots (Monocots)						
Asparagales (Asparagus)						
Isotria medeloides	Small Whorled Pogonia	1	O	O	O	
Platanthera leucophaea	Prairie White-Fringed Orchid	1	O	O	O	
All other Monocots	Various (many species)	1-3	O	O	O	O
Eudicots (Eudicots)						
Pedicularis furbishiae	Furbish's Lousewort	1	O	O	O	
All other Eudicots	Various (many species)	1-3	O	O	O	O

5/6.3 Monitoring SGCN Habitats

Many of the SGCN monitoring efforts above involve some component of habitat monitoring. For SGCN habitats, factors affecting habitat distribution and integrity often occur at regional or state-wide scales. For example, the health of a headwater stream and its resident SGCN are influenced, in part, by barriers downstream and the integrity of the watershed as a whole. Likewise, the future distribution of tidal marshes in response to sea level rise and marsh migration is driven by factors at multiple scales, from individual culverts restricting tidal flow in streams to dynamics of large-scale sediment accretion. For other types of habitats, especially marine systems, we simply do not have a clear understanding of current or historic distributions and therefore have limited baseline information to assess changes over time. To address these knowledge gaps, MDIFW and partners identified habitat-scale survey and monitoring needs during development of conservation actions. We present these actions in Table 5/6 - 8 with examples of existing programs now being implemented (e.g., Stream Smart) as well as general survey and monitoring techniques (e.g., remote sensing) that could be used to achieve habitat monitoring objectives. This is not an exhaustive list of approaches, but rather a starting place to identify next steps and potential partnerships.

Table 5/6 - 8 Habitat Survey and Monitoring Approaches.

Habitat Group	Survey and Monitoring Focused Conservation Actions	Existing and Potential Survey and Monitoring Programs and Collaborations[1]
Freshwater Aquatic Habitats		
Headwaters and Creeks	• Identify high value native coldwater SGCN fish and other SGCN species habitats that may be vulnerable to watershed scale hydrology effects due to tree loss	• SGCN and habitat surveys • GIS models • Remote sensing • Maine Department of Environmental Protection (MDEP) water quality and bioindicator monitoring
Streams, Rivers, Lakes, and Ponds	• Complete a statewide inventory of the status and condition of road and railroad crossings, including on headwater streams • Conduct a statewide inventory of dams, including on headwater streams • Identify priority locations for ecological flow management in aquatic habitats • Increase habitat surveys & models for road stream crossings • Develop better methods to map potential barriers in priority watersheds • Track completed road stream crossing projects	• Stream Smart • National Lakes Condition Assessment • Stream barrier assessments and the Maine Stream Habitat Viewer • GIS models • Remote sensing • MDEP water quality • Bioindicator monitoring
Marine Habitats		
Coastal	• Work with municipalities to identify important SGCN nesting and migratory areas in rocky coast and coastal habitats during comprehensive planning	• SGCN and habitat surveys • Beginning with Habitat (BwH)
Intertidal	• Develop monitoring systems and rapid response plans to prevent the colonization of invasive/problematic species and diseases in intertidal, subtidal, and tidal marsh habitats • More frequently update intertidal and subtidal SGCN habitat maps and compare to historical maps to monitor changes in distribution over time • Continued underwater surveillance of potential and active aquaculture lease sites with a focus on SGCN and important habitats • Determine accuracy of commercial harvester- and dealer-reported landings and recreational	• Maine Invasive Species Network • iMapinvasives • BwH • Eelgrass surveys • Remote sensing • SGCN and habitat surveys

Habitat Group	Survey and Monitoring Focused Conservation Actions	Existing and Potential Survey and Monitoring Programs and Collaborations[1]
	fishing reports and surveys for target intertidal and subtidal SGCN and bycatch • Improve understanding of intertidal SGCN distributions especially in regards to ecosystem interactions and predator-prey relationships • Identify local intertidal ocean acidification and sea surface temperature refuges and resilient species	
Rocky Coast	• Identify and prioritize significant nesting, migratory, and wintering areas in rocky coast habitats for contingency planning • Work with municipalities to identify important SGCN nesting and migratory areas in rocky coast and coastal habitats during comprehensive planning • Identify invasive plant hot spots in rocky coast habitats	• SGCN and habitat surveys • BwH • Maine Invasive Species Network • iMapinvasives
Subtidal	• Develop monitoring systems and rapid response plans to prevent the colonization of invasive/problematic species and diseases in intertidal, subtidal, and tidal marsh habitats • Develop coastal Focus Areas of Statewide Ecological Significance (Focus Areas) encompassing marine habitats with high concentrations of SGCN using improved species occurrence maps • Continue to improve rapid response for oil and gas spills in intertidal and subtidal habitats, including state agencies efforts to have most up-to-date species maps, rapid response protocols in place, and regular scenario training • Expand surveys of recreational fishing efforts to include SGCN that are not targeted in current survey efforts • More frequently update intertidal and subtidal SGCN habitat maps and compare to historical maps to monitor changes in distribution over time	• Maine Invasive Species Network • iMapinvasives • Citizen scientist or volunteer monitoring programs • Remote sensing, • Eelgrass monitoring

Habitat Group	Survey and Monitoring Focused Conservation Actions	Existing and Potential Survey and Monitoring Programs and Collaborations[1]
	• Continued monitoring of potential and active aquaculture lease sites with a focus on SGCN and important habitats • Improve understanding of subtidal SGCN distributions especially in regards to ecosystem interactions and predator-prey relationships • Identify local subtidal ocean acidification and sea surface temperature refuges and resilient species	
Tidal Marsh	• Build upon and coordinate with existing monitoring efforts to establish a long-term tidal marsh monitoring program, with emphasis on assessing sediment dynamics in the context of sea level rise • Develop monitoring systems and rapid response plans to minimize the colonization of invasive/problematic species and diseases in intertidal, subtidal, and tidal marsh habitats • Continue and expand monitoring programs that track tidal marsh changes over time	• GIS models • Remote sensing • Sediment accretion monitoring (Rod Surface Elevation Tables) • Saltmarsh Habitat and Avian Research Program (SHARP) • Maine Invasive Species Network • iMapinvasives • Global Programme of Action Coalition (GPAC) • National Wetland Condition Assessment • Baseline and long-term ecological marsh monitoring • LiDAR models
Terrestrial and Freshwater Wetland Habitats		
Northern Floodplain and Swamp Forests	• Do early detection and control of invasive plants in floodplain forests to prevent spread, including on public lands and with voluntary agreements from private landowners	• Maine Invasive Species Network • iMapinvasives • Citizen scientist or volunteer monitoring programs • National Wetland Condition Assessment • Ecological Reserve Monitoring

Habitat Group	Survey and Monitoring Focused Conservation Actions	Existing and Potential Survey and Monitoring Programs and Collaborations[1]
		• Development of reference wetland dataset
Freshwater Marshes	• Identify high priority road segments/culverts for organism passage among freshwater wetlands	• Road Watch • BwH • SGCN and habitat surveys • GIS models • Remote sensing • National Wetland Condition Assessment • Ecological Reserve Monitoring • Development of reference wetland dataset
Grasslands- Shrublands- Right of Way vegetation	• Research and identify how much grassland, shrub, and early successional habitat for targeted SGCN species is needed and conduct an assessment of habitat availability on an ecoregional basis • Map potential grassland, shrublands, and early successional high value SGCN habitats of highest conservation priority	• GIS models • Remote sensing • SGCN and habitat surveys • BwH
Northern Upland Forests	• Continue research to better understand predicted impacts of climate change on northern forest and swamp SGCN habitats • Assess conserved lands, especially northern forests and swamps and rocky summits/ outcrops/ mountaintops, for climate change resiliency and habitat connectivity and use this information to guide future conservation efforts • Identify and conserve boreal forest refugia associated with SGCN • Continue long-term monitoring of SGCN and SGCN habitats associated with northern forests and swamps	• GIS models • Remote sensing • SGCN and habitat surveys • Maine Invasive Species Network • iMapinvasives • Forest Inventory and Assessment • Ecological Reserve monitoring • National Wetland Condition Assessment

Habitat Group	Survey and Monitoring Focused Conservation Actions	Existing and Potential Survey and Monitoring Programs and Collaborations[1]
	• Continue monitoring for invasive and problematic species and diseases, especially forest insect pests, in northern forest and swamps and south-central forests and swamps • Support the continuation of long-term monitoring of SGCN habitat condition and forest structure in northern forests and swamps • Assess impacts of browse pressure from moose and deer on SGCN species	
Rocky Summits-Outcrops-Mountaintops	• Assess conserved lands, especially northern forests and swamps and rocky summits/outcrops/mountaintops, for climate change resiliency and use this information to guide future conservation efforts • Continue research to better understand predicted impacts of climate change on rocky summits, outcrops, and mountaintop SGCN habitats, and identify possible mitigation strategies • Continue habitat/recreational monitoring stewardship on conserved rocky summit, outcrop, and mountaintop SGCN habitats	• GIS models • remote sensing • SGCN and habitat surveys • citizen science or volunteer monitoring programs
South-Central Floodplains and Swamps	• Continue monitoring for invasive and problematic species and diseases, especially forest insect pests, in northern forests and swamps and south-central floodplains and swamps • Undertake long-term monitoring of SGCN and their habitats in south-central floodplains and swamps • Partner with Maine Department of Transportation to identify invasive plant "hotspots" along roads and bridges, especially in south-central floodplains and swamps • Conduct earthworm sampling to identify the distribution of different earthworm species and their impacts	• Maine Invasive Species Network • iMapinvasives • Citizen science or volunteer monitoring programs • Forest Inventory and Assessment • Ecological Reserve monitoring • National Wetland Condition Assessment
Landscape	• Conduct an updated climate change vulnerability assessment of habitat groups in Maine	• Maine Won't Wait-Biodiversity Technical Assessment

Habitat Group	Survey and Monitoring Focused Conservation Actions	Existing and Potential Survey and Monitoring Programs and Collaborations[1]
	• Conduct an updated assessment of the effects of climate change on biodiversity across Maine • Assess currently conserved lands for climate change resiliency and use this information to help inform future conservation projects to protect under-represented, resilient habitats • Continued and expanded long-term monitoring stations for air and water quality, snowpack, and weather data, to better assess climate change impacts at statewide and regional scales	• NIACS climate monitoring work • Stream Temperature monitoring of Allagash Waterway Foundation • Maine Cooperative Snow Survey • Lake Stewards of Maine Editorial • NADP

[1]This column contains examples of existing programs (e.g., Stream Smart) and general survey and monitoring techniques (e.g., remote sensing) that could be used to achieve habitat monitoring objectives. This is not an exhaustive list of approaches, but rather a starting place to identify next steps and potential partnerships.

5/6.3.1 Tracking Statewide Habitat Trends and Conservation Programs

In addition to SGCN and habitat monitoring, we will track habitat trends and the effectiveness of broad conservation programs at the statewide scale. Several of these approaches are described below. We expect to add approaches as new assessment, mapping, landscape modeling, and remote sensing techniques emerge over the next decade.

Monitoring tidal saltmarsh health informs conservation actions as sea level rise degrades these important habitats. © MNAP

State, Regional and Local Conservation Planning

Conservation actions can be implemented at a wide range of scales from local to statewide and by a variety of partners from private landowners to state agencies. MDIFW and partners, through BwH, provide wildlife and habitat information and technical assistance with strategic conservation planning, restoration planning, and implementation efforts to external partners including municipalities, conservation organizations, and other state agencies. BwH also works with private landowners to help them achieve their wildlife management goals and to improve habitat for SGCN. The BwH program will track the below metrics to assess the effectiveness of the program itself, but also related statewide habitat trends.

Periodically Assessed Metrics

- Number of towns assisted with comprehensive plans, open space plans, ordinance revision, and other practices.
- Number, quality, and geographic distribution of presentations on conservation and restoration of climate-resilient habitats.
- Percentage of Focus Areas included in strategic conservation plans implemented by external partners.
- Collaborative identification of additional conservation priorities including wildlife travel corridors between Focus Areas, aquatic habitats, grasslands, terrestrial wildlife/roadway intersections, and others.
- Number of landowners and area of private land assisted with SGCN wildlife or habitat management planning, including Natural Resource Conservation Service (NRCS) wildlife-incentives delivered for SGCN.
- Number of forest management plan reviews processed.

Geospatial Resources

Since Maine's 2015 Plan, multiple partners have updated or created numerous habitat-related spatial datasets. The Maine Office of Geographic Information System data catalog provides many of these datasets to the public, and others are available directly from partners. MDIFW and BwH host and maintain several datasets, which are listed here. These datasets are updated regularly and can be queried to monitor statewide SGCN, land use, and habitat patterns over time.

Periodically Assessed Metrics

- Impervious/Developed Areas: Areas of impervious surfaces including buildings and roads.
- Rare, Threatened, and Endangered Wildlife Data (includes some SGCN): Includes known rare, Endangered, and Threatened species occurrences and associated habitats based on species observations.
- Undeveloped Habitat Blocks: Blocks of undeveloped land, including those greater than 100 acres.
- Habitat Connections: Modeled habitat areas needed to maintain or restore functional wildlife travel corridors between undeveloped habitat blocks greater than 100-acres and between higher value wetlands.
- Riparian Connectors: Modeled crossing locations for wetland dependent species moving between waterways and wetlands divided by roads.
- Conserved Lands: The State of Maine's conserved lands database includes lands in federal, state, and non-profit ownership.

Habitat Management Guidelines

"MDIFW and partners will continue to develop new and update existing voluntary, non-regulatory habitat management guidelines for priority habitats and species and will continue to make these available to landowners, land managers, towns, land trusts, and others ."

MDIFW and partners will continue to develop new and update existing voluntary, non-regulatory habitat management guidelines for priority habitats and species and will continue to make these available to landowners, land managers, towns, land trusts, and others. Several habitat conservation actions (see Element 4) address the need for Habitat Management Guidelines (HMG). We include this topic here in order to monitor development of HMGs statewide.

Periodically Assessed Metrics

- The number of SGCN for which HMGs are developed and published.
- The number of landowners, land managers, towns, land trusts, and others that receive HMGs.
- The number of landowners, etc., that implement habitat management according to the guidelines.

Land Conservation, Stewardship, and Management

Cooperation with state and federal agencies, non-profit organizations, landowners, land trusts, municipalities, and other partners to conserve habitat for priority species using fee acquisition, conservation easements, purchase of development rights, cooperative management agreements, management plans, improved comprehensive planning, habitat restoration and enhancements, and other conservation tools. Several habitat conservation actions and themes (see Element 4) address habitat conservation and supporting or expanding landowner incentives. This is an extremely important aspect of Maine's efforts to conserve habitats for SGCN, and conserving 30% of Maine is listed as a key goal in Maine Won't Wait, the State's Climate Action Plan. MDIFW, along with several conservation partners, has been involved in the planning, implementation and progress tracking and related actions of Maine's Plan will be integrated in this parallel initiative.

Periodically Assessed Metrics:

- Number of acres conserved via fee acquisition
- Number of acres conserved via conservation easement
- Number of acres conserved in Focus Areas
- Number of acres incorporated in cooperative management agreements and management plans

5/6.4 Programmatic Monitoring

MDIFW and conservation partners developed 12 programmatic actions to help guide Plan implementation over the next ten years (see Element 4, Table 4 - 14). Two of these -- Programmatic Actions 8 and 9 -- address monitoring and are referenced below and described in detail in Chapter 4. The full suite of Programmatic Actions is presented in Element 4: Conservation Actions.

Programmatic Action 8: Track Plan conservation action implementation accomplishments by agencies and partners.

With over 1,300 SGCN and habitat related conservation actions and with limited conservation funds, successful implementation of Maine's 2025 Plan will require collaborative efforts between MDIFW and its many conservation partners. MDIFW will work closely with partners to develop tracking systems for conservation expenditures and expenses and will develop feedback mechanisms to track partner efforts and accomplishments and use this information to periodically assess the effectiveness of the 2025 Plan. Methodologies for tracking actions will be discussed by the Plan Implementation Committee. MDIFW will highlight Plan progress and successes at periodic meetings with partners and through media as part of Programmatic Theme 2 (see Chapter 4). To further leverage limited funds, MDIFW will work with partners to maximize existing match opportunities and identify new ones, especially for volunteer time that MDIFW has not previously tracked.

Programmatic Action 9: This action relates to creating SMART (Specific, Measurable, Achievable, Results-oriented, and Time-bound) objectives for high priority SGCN and habitat conservation actions.

MDIFW and partners developed a comprehensive menu of conservation actions to address Maine's most pressing SGCN and habitat needs. The list is long, despite taking several measures to include only the most important actions (e.g., only developing actions for medium or high-level threats) and it includes a full suite of actions so that partners across the state can find a nexus to some aspect of the plan.

For the 2025 Plan we propose to prioritize conservation actions across State natural resource agencies (i.e., MDIFW, MDMR, and MNAP) and work with partners to address the highest priorities. For actions determined to have sufficient biological impact and feasibility, we will establish SMART objectives to monitor action accomplishments over the next ten years and include this information in tracking programs developed under Programs 7 and 8.

5/6.5 Plans for Revision

States are required to review and revise, as appropriate, their Wildlife Action Plans at least every ten years. In addition to a major plan revision every 10 years, MDIFW is committed to assessing regularly the progress made in implementing the Plan. MDIFW will use the programmatic actions referenced above, and described in more detail in Element 4, to monitor conservation action progress at least annually. As described in Programmatic Action 6 (see Table 4-13, Element 4), MDIFW will establish a full-time Plan Coordinator position to track conservation action progress across agencies and partner organizations to understand challenges and successes across Maine. As described in Programmatic Action 1 (see Table 4-13, Element 4), MDIFW will also establish an Implementation Committee in the Fall of 2025 comprised of agency staff and conservation partners. This committee will meet at least annually to review Plan accomplishments and to address any emerging issues or adaptive management needs that may be identified through monitoring activities. We will undertake a comprehensive plan review beginning in year eight of the 2025 Plan that will include reviewing the criteria and literature used for designating SGCN. We will revisit the threat levels assigned to SGCN and habitats and determine if our actions sufficiently prevented additional declines or improved threat rankings. MDIFW and its conservation partners will develop a revised Plan by October 1, 2035 for submission to USFWS.

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