MAINE'S WILDLIFE ACTION PLAN

Prepared by

Maine Department of Inland Fisheries Wildlife

in collaboration with

Maine's Conservation Partners
September 2015

MAINE DEPARTMENT OF INLAND FISHERIES AND WILDLIFE

The Department of Inland Fisheries and Wildlife is established to preserve, protect and enhance the inland fisheries and wildife resources of the State; encourage the wise use of these resources; ensure coordinated planning for the future use and preservation of these resources, and provide for effective management of these resources.

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COVER PHOTO CREDITS

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Brook Trout (*Salvelinus fontinalis*, SGCN Priority 3 + Maine "heritage" species) - © Merry Gallagher, Maine Department of Inland Fisheries and Wildlife
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2015 Maine Wildlife Action Plan Steering Committee

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Members of the Coordination Team served as the principle authors of the Action Plan, taking on the daunting task of filling in the details and share ultimate responsibility for its content. We greatly appreciate their contributions.

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Elements 7/8	Amanda Shearin, Mark Stadler

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Foreword

It is difficult to believe that it has been 10 years since Maine's first Wildlife Action Plan was written. Initiated in 2001, the State Wildlife Grants Program allocated funds to states that have an approved Plan. These funds, matched by state dollars, provide ongoing support for monitoring, research, management, and habitat protection for Species of Greatest Conservation Need (SGCN), many of which are species of special concern or threatened and endangered. Most of these species lack financial support except through special programs, such as the Federal Endangered Species Act, or state programs such as the Chickadee Check-Off or the Loon Plate, both of which are unpredictable and declining sources of revenue.

Maine contains a wealth of ecosystems from the spruce forests of the north to vast coastal areas; from high mountains to thousands of lakes, ponds, and streams. This diversity of ecosystems supports thousands of associated species. It is the wealth of this diversity and its conservation that this plan addresses in detail.

The climate gradient in Maine, spanning four degrees of latitude, is equal to that extending from Poland to northern Finland, a distance covering 20 degrees of latitude; it is no wonder that we are blessed with such a diversity of species. Numerous species, such as the New England Cottontail, reach their northern range limit in central or southern Maine, while others, such as the Canada Lynx, are restricted to northern Maine.

The leadership of the Maine Department of Inland Fisheries and Wildlife (MDIFW) and its Steering Committee in developing this Plan has been superb. Their ability to bring together scores of participants ranging from state and federal agencies, Native Americans, and a wide diversity of NGOs, testifies to their leadership and the importance of this Plan. The Steering Committee, representing a wide spectrum of interests, contributed countless hours to the success of the Plan and their advisory role should be continued officially throughout the life of the Plan. Their help in guiding priorities, considering emerging issues, and developing partnerships will be essential over the next 10 years.

The 2005 Plan was a giant step in guiding actions to understand and conserve a plethora of species that were poorly understood or lacked funding for effective conservation. It chartered a greatly expanded area of responsibility and action for MDIFW. Citizen scientists participated in numerous statewide surveys covering everything from butterflies and herons to freshwater mussels. Many of these volunteers are state and national experts and the data are excellent. As a result of this information, specific conservation actions are in place for these species and their habitats. The 2005 Plan also highlighted the Beginning with Habitat (BwH) initiative, which is a voluntary, non-regulatory program. More than 100 towns and NGO's have used BwH data compiled by MDIFW and the Maine Natural Areas Program to prioritize and conserve important habitats containing rare ecosystems and associated SGCN. These efforts are concentrated in southern and central regions and have been highly successful.

The 2015 Plan builds on the achievements of the earlier Plan but is much more comprehensive; the number of SGCN species almost doubles in the current Plan. This is partly due to the excellent survey and monitoring that occurred over the past 10 years providing MDIFW with a greater understanding of the status of many poorly understood species. However, the greatest number of new species occurs in marine or estuarine habitats poorly documented in the 2005

Plan. The Maine Department of Marine Resources has statutory responsibility for all marine and estuarine species, including migratory fish. Their participation in the 2005 Plan was limited; however, they have been an integral part of the team developing the current Plan and have provided a wealth of information and conservation needs on numerous poorly known species.

Based on vulnerability, a total of 58 species are designated of highest priority. Timely conservation measures presented in the Plan can avoid further declines in these and other species. The Plan is easy to follow. To check on a species' status, simply click on it in Table 1-3 and all of the data are available, including qualification criteria, habitat associations, stressors, conservation actions, and range maps. The detail is amazing and represents a quantum leap in our understanding of many species. The Plan emphasizes habitat stressors as well as stressors to individual SGCN. In doing this, groups of species and guilds are incorporated into the conservation actions. Although plants are not dealt with individually, conservation actions dealing with habitats and ecosystems will include many of the state's rare plant species.

Finally, there is the issue of funding the key components of this Plan. Currently, there is no long term, predictable funding at the state or federal level that parallels the Federal Aid Programs for harvested species. The Association of Fish and Wildlife Agencies has formed a Blue Ribbon Committee on Sustaining America's Diverse Fish and Wildlife Resources under their Teaming With Wildlife theme to address this important issue. Their success in this effort will influence greatly the ability of Maine and other states to conserve the vast majority of species under their jurisdiction. All of us will need to support this in the future.

In summary, Maine's 2015 Wildlife Action Plan is a tribute to all of the conservation partners and their extraordinary efforts to gather the vast quantities of data on many rare or poorly known species, and chart a path for their conservation. The Plan is exhaustive, well presented, and easy to follow and will guide the state for years to come.

Congratulations are due to everyone who made this Plan a reality.

Ray "Bucky" Owen
Professor Emeritus, University of Maine, Orono
Commissioner, Maine Dept. of Inland Fisheries and Wildlife, 1993-1997

Introduction

WELCOME TO MAINE

Located at the northeast tip of the United States, Maine is a relatively large and very rural state by eastern standards. It spans 320 miles from north-to-south and 210 miles east-to-west at its full extent. Maine lies halfway between the equator and the North Pole. It is the only state in the continental U.S. more connected to Canada than its border with other states. The total area (33,315 square miles) nearly equals that of the other four New England states combined. The 2013 U.S. census reported a human population of only 1.33 million in Maine, or 43 people per square mile: the lowest population density in the East.

Tumbledown Mountain Maine.
© Phillip deMaynadier

Maine is a land rich in contrasts between the boreal and temperate, freshwater and saltwater, upland and wetland, and alpine and lowlands. The predominant feature across this diverse landscape is 17.5 million acres of forests that cover 89% of Maine's land area. Woodlands are interspersed with rugged mountains; more than 5,600 lakes and ponds; 5,000,000 acres of wetlands; 31,800 miles of rivers and streams; 4,100 miles of coastline; and 4,613 coastal islands and ledges (Brandes 2001, Gawler et al. 1996). Maine is the most heavily forested state in the nation, but also boasts some of the most significant grassland and agricultural lands in New England.

This mosaic of diverse physical settings supports a wide diversity of wildlife. Islands in the Gulf of Maine showcase one of the most unique blends of seabird nesting colonies along the East Coast, including rare species such as Roseate and Arctic Terns, Atlantic Puffin, and Razorbill. Maine's relatively clean, free-flowing rivers sustain some of the best remaining populations of rare freshwater mussels and dragonflies in the East; host globally rare endemics, such as the Tomah Mayfly and Roaring Brook Mayfly; and support a distinct population segment of the federally Endangered Atlantic Salmon. Maine's mountains and forested habitats host a significant portion of the global breeding habitat of neotropical migrant birds such as the Bicknell's Thrush and Black-throated Blue Warbler. The state has some of the best examples of Pitch Pine-Scrub Oak forest remaining in New England, which host a suite of globally rare plants and invertebrates.

Maine is in an ecological transition zone, and its wildlife resources are a convergence of species that are at or approaching the northern or southern limit of their ranges. The species most familiar to us – birds (423 species), non-marine mammals (61 species), reptiles (17 species), amphibians (18 species), inland fish (39 species), and marine species (>280 fishes, mammals, and other chordates) – actually comprise less than two percent of the known wildlife species in the state. Experts have documented over 15,000 species of invertebrates, 2,100 species of plants, 310 species of phytoplankton, 271 species of macrophytes, and 3,500 species of fungi,

but they believe many times these numbers actually exist (McCollough et al. 2003, D. Gilbert pers. comm.). This array of flora and fauna is particularly impressive when one considers that only a handful of species were present just 15,000 years ago when a mile-high sheet of ice covered the state.

Fish and wildlife play an important role in the lives of Maine people as they provide a source of enjoyment, recreation, and employment. Maine's quality of life, its traditional "outdoor" values, and its economy, particularly its rural economy, are strongly shaped by the diversity and abundance of its fish and wildlife. The Maine Department of Inland Fisheries and Wildlife (MDIFW) and the Maine Department of Marine Resources (MDMR) are the state agencies in which the public has entrusted its concern for Maine's fish and wildlife.

Birch Point State Park, Maine. © Mark Stadler

STATE AUTHORITY FOR WILDLIFE AND FISHERIES MANAGEMENT

The Maine Department of Inland Fisheries and Wildlife (MDIFW) is responsible for the stewardship of Maine's inland fisheries and wildlife resources. MDIFW conducts its management programs under the guidance of the legislature's Joint Standing Committee on Inland Fisheries and Wildlife and with the advice and consent of the Fish and Wildlife Advisory Council: a ten-member citizen's advisory group whose members are appointed by the governor and subject to legislative confirmation. MDIFW partners with the U.S. Fish and Wildlife Service (USFWS) for management of 'federal trust species:' notably migratory birds, federally-listed Endangered or Threatened (E/T) species, and species that are candidates for E/T listing.

Maine has had laws protecting its fish and wildlife since 1830. This early enforcement effort was the birth of the MDIFW (then Department of Inland Fisheries and Game). Although MDIFW's mission has always included protection of species not pursued for food or sport, there has been a continual shift in its focus from that of a state agency concerned mostly with the administration of laws dealing with hunting and fishing to one with considerable responsibility for the conservation and enhancement of all the inland fisheries and wildlife resources of the state.

During the 1970s, the Maine Legislature broadened the MDIFW mission. It enacted laws pertaining to E/T species and nongame wildlife, which clearly established that MDIFW had the authority to protect, maintain, and enhance all fish and wildlife species in the state, as well as their habitat. To reflect this, the legislature changed the name of the Department from 'Inland Fisheries and Game' to 'Inland Fisheries and Wildlife.' Beginning in the 1990s, MDIFW mainstreamed nongame responsibilities throughout its Bureau of Resource Management and these are now widely integrated throughout MDIFW's work program.

The Maine Department of Marine Resources (MDMR) functions to conserve and manage marine and estuarine resources; to conduct and sponsor scientific research; to promote and develop Maine's coastal fishing industries; to advise and cooperate with local, state, and federal officials concerning activities in coastal waters; and to implement, administer, and enforce the laws and regulations necessary for these purposes. It is responsible for the management of Maine's marine resources from the high-water mark out to three nautical miles from the outermost islands lying offshore in the Gulf of Maine.

Rockport Harbor, Maine. © Mark Stadler

Management responsibilities follow guidance from the state legislature and the MDMR Advisory Council: 15 representatives from coastal fishing industries who are appointed by the governor and subject to legislative confirmation. The legislature directs development of state policy, and through the Joint Standing Committee on Marine Resources, oversees legislation regarding the conservation and development of marine resources. MDMR partners with the National Marine Fisheries Service for management of 'federal trust' fauna: inter-jurisdictional fish, marine mammals, and other species of concern including federally listed E/T species.

THE STATE WILDLIFE GRANT PROGRAM

As the responsibilities of MDIFW have evolved over time so has the method of funding fish and wildlife conservation and management activities. Like other state fish and wildlife agencies, MDIFW programs rely heavily on federal aid distributed to states as established by the Wildlife Restoration (Pittman - Robertson) Act enacted in 1937 and the Sport Fish Restoration (Dingell - Johnson) Act passed in 1950. These funds are derived from federal excise taxes on firearms, ammunition, fishing equipment and tackle. The USFWS Wildlife and Sport Fisheries Restoration program is critical to state agency partners and the conservation of game fish and wildlife species. A traditional emphasis on habitat management has provided numerous secondary benefits to nongame species as well. Federal funding for E/T species are administered under Section 6 of the Endangered Species Act (ESA): often strategic, but funds are limited.

MDMR has fulfilled its charge to conserve and manage marine and estuarine resources and to conduct and sponsor scientific research with the support of funding sources that have also changed over the years. Since 1984, MDMR has complete projects supported by USFWS Wildlife and Sport Fish Restoration funds (Wallop - Breaux Amendment). With the Federal ESA listing of some marine species, MDMR has conducted work with the aid of National Oceanic and Atmospheric Administration Species Recovery Grants to States (ESA, Section 6). Past programs, like the Species of Concern Grant Program, enabled the MDMR to advance research of non-listed species such as Rainbow Smelt. These opportunities have provided the necessary funds for the agency to complete work on non-commercial species; however, work focusing on many species of conservation need have not been eligible for these programs as they are not federally listed or do not support recreational fisheries.

At the state level, it is clear that stable and secure financial support for nongame and E/T wildlife and fish has not developed for MDIFW or MDMR. The legislature established a voluntary income tax donation 'Chickadee Check-off' in 1984 followed by a conservation registration 'Loon Plate' (1995) and then a 'Sportsman's Plate' (2007) for vehicles as initial sources for program funding. These and other charitable contributions generate >90% of state funds for MDIFW nongame programs and are held in trust as the 'Endangered and Nongame Wildlife Fund'. Profits from a special lottery ticket 'Maine Outdoor Heritage Fund' help support new projects by state resource agencies via a competitive grants program. After 31 years, all state funds reliant on donations have declined, programs for nongame species operate via triage, and the number of E/T species continues to rise.

Recognizing this broad need, Congress created the State Wildlife Grant Program (SWG) in 2002 to help state and tribal resource agencies address conservation for fish and wildlife deemed to be 'Species of Greatest Conservation Need' (SGCN). SWG funds are appropriated annually by Congress and allocated to states by a formula that takes into account each state's size and population.

> *"Action Plans provide a foundation for the future of wildlife conservation and a stimulus to engage states and federal agencies and other conservation partners to think strategically about their individual and coordinated roles in prioritizing and accomplishing conservation actions."*

To be eligible to participate in the SWG program, Congress required all states and territories to develop a statewide Comprehensive Wildlife Conservation Strategy (CWCS), now formally known as a State Wildlife Action Plan (SWAP). Action Plans provide a foundation for the future of wildlife conservation and a stimulus to engage states and federal agencies and other conservation partners to think strategically about their individual and coordinated roles in prioritizing and accomplishing conservation actions. In 2005, states and territories submitted their first round of plans to the U.S. Fish and Wildlife Service (USFWS) for review. Maine's CWCS (http://www.maine.gov/ifw/wildlife/reports/wap.html) was approved as submitted and remains a valuable, comprehensive review.

SWG funds apportioned to Maine totaled $7.6 million during 2001-2014. Projects undertaken with SWG funds (MDIFW 2014) have addressed many SGCN, all geographic areas of the state, and have ranged in scale from ecosystems to subspecies. Projects have varied in length from one to five years. They include baseline surveys and inventories, research, management, and habitat conservation. SWG funds also help support 10 full-time biologist positions. The SWG program has significantly advanced the conservation of Maine's SGCN and continues to play a critical role in minimizing reliance on E/T listings.

THE VALUE OF MAINE'S WILDLIFE ACTION PLAN

Early successes from the first generation of state Action Plans are widely chronicled (Association of Fish and Wildlife Agencies 2011, Cook et al. 2008). A summary of accomplishments from Maine's 2005 plan (MDIFW 2014) reveals the wide array of conservation

benefits for SGCN: population management, habitat management, research, surveys/monitoring, and outreach. Many ongoing efforts and most new initiatives during the past ten years were enhanced or enabled by SWG funding administered by MDIFW as outlined in the 2005 Plan.

This 2015 Action Plan reflects greater expectations for prioritization, performance monitoring, efficiencies, and overall collaboration with conservation partners (Heinz Center 2008, Lauber et al. 2009, Wilkinson et al. 2009). The full document itself is reduced by 70% in length from our 2005 CWCS, but provides a pathway to detailed reports on 378 SGCN, 42 macrogroups, and 38 stressors evaluated in the 2015 Plan. These linked reports are generated by a database. Thus, their content is not static and can be updated periodically during the ten-year horizon of this Plan.

The value of Maine's 2015 Wildlife Action Plan extends far beyond the requirements of the State Wildlife Grant program and beyond the missions of both MDIFW and MDMR. It is an opportunity and challenge for both agencies and their conservation partners to provide effective and visionary leadership in the conservation of all the state's wildlife. Maine's Action Plan is intended to supplement, not duplicate, existing fish and wildlife programs and to target species in greatest need of conservation - species that are indicative of the diversity and health of wildlife in the state - while keeping "common species common."

The Plan addresses the full array of vulnerable wildlife and their habitats in Maine: vertebrates and invertebrates in both terrestrial and aquatic habitats. Maine law defines 'wildlife' as any species of wild, free-ranging fauna including fish and invertebrates that are absent from the jurisdiction for some state agencies. The Plan builds on a long history of public involvement and collaboration among conservation partners. It is meant to be dynamic, responsive, and adaptive. Hence, Maine's Action Plan serves as a solid foundation for the future of wildlife conservation that will help guide the collaborative efforts of state and federal agencies, tribes, conservation partners, and individuals to ensure success.

Maine's conservation partners developed the Wildlife Action Plan through a lengthy participatory process that included the general public. The Plan is non-regulatory. The suite of voluntary species and habitat conservation actions in the Plan complement, but do not compete with, existing work programs and priorities of state agencies and their partners. Indeed, conservation actions will in most cases supplement existing efforts and inspire new initiatives on behalf of Maine' SGCN.

ROADMAP TO THE PLAN'S EIGHT ELEMENTS

Congress identified eight required elements to be addressed in each state's SWAP (Teaming with Wildlife Committee 2003). Congress also directed that strategies identify and focus on "species of greatest conservation need," yet address the "full array of wildlife" and wildlife-related issues, helping to keep common species common. Wildlife Action Plans must address these eight elements:

1. Information on the distribution and abundance of species of wildlife, including low and declining populations as the state fish and wildlife agency deems appropriate, that are indicative of the diversity and health of the state's wildlife;

2. Descriptions of locations and relative condition of key habitats and community types essential to conservation of species identified in (1);

3. Descriptions of problems that may adversely affect species identified in (1) or their habitats, and priority research and survey efforts needed to identify factors that may assist in restoration and improved conservation of these species and habitats;

4. Descriptions of conservation actions proposed to conserve the identified species and habitats and priorities for implementing such actions;

5. Proposed plans for monitoring species identified in (1) and their habitats, for monitoring the effectiveness of the conservation actions proposed in (4), and for adapting these conservation actions to respond appropriately to new information or changing conditions;

6. Descriptions of procedures to review the strategy at intervals not to exceed 10 years;

7. Plans for coordinating the development, implementation, review, and revision of the plan with federal, state, and local agencies and Indian tribes that manage significant land and water areas within the state or administer programs that significantly affect the conservation of identified species and habitats; and

8. Provide an opportunity for public participation in the development of the Wildlife Action Plan.

The founding legislation and subsequent guidance emphasize that broad public participation is an essential element of developing and implementing these plans.

MDIFW led the effort to develop Maine's 2015 Action Plan. The Plan creates a vision for conserving the state's wildlife, and it is much more than an agency plan because of broad participation by dozens of Maine's conservation partners. While each state's strategy will reflect a different set of issues, management needs, and priorities, states are working together to ensure nationwide consistency and a common focus (AFWA 2012, Crisfield et al. 2013).

To facilitate development of Maine's revised Action Plan, MDIFW and partners addressed Elements 1, 2, 3, and 4 in unique chapters. We combined Elements 5 and 6 into a single chapter because of the considerable overlap of monitoring and adaptive management inherent in each. Similarly, we have combined elements 7 and 8 as a single chapter reflecting their mutual emphasis on collaboration and public involvement.

KEY TO ACRONYMS

CWCS	Comprehensive Wildlife Conservation Strategy
ESA	Endangered Species Act
E/T	Endangered and/or Threatened Species
MDIFW	Maine Dept. of Inland Fisheries and Wildlife
MDMR	Maine Dept. of Marine Resources
SGCN	Species of Greatest Conservation Need
SWAP	State Wildlife Action Plan
SWG	State Wildlife Grants (Program)
USFWS	U.S Fish and Wildlife Service

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Executive Summary

INTRODUCTION

Located at the northeast tip of the United States, the State of Maine is approximately 320 miles long and 210 miles wide. It is almost as large (33,315 square miles) as all other New England states combined. Maine is a land rich in contrasts between the boreal and temperate, freshwater and saltwater, upland and wetland, and alpine and lowlands. Maine is a transition area, and its wildlife resources represent a blending of species that are at or approaching the northern or southern limit of their ranges. This mosaic of diverse physical settings supports a wide diversity of wildlife that few other states can equal.

Fish and wildlife play an important role in the lives of Maine people as they provide a source of enjoyment, recreation, and employment -- Maine's quality of life, its traditional "outdoor" values, and its economy, particularly its rural economy, are strongly shaped by the diversity and abundance of its fish and wildlife. The public has entrusted the conservation of Maine's fish and wildlife to the Maine Dept. of Inland Fisheries and Wildlife (MDIFW) and the Maine Dept. of Marine Resources (MDMR).

Road Map to the Eight Required Elements

To facilitate review of Maine's Action Plan, separate chapters address each of the eight required elements.

Elements 1, 2, 3, and 4 each have a unique chapter; we have combined elements 5 and 6 and also 7 and 8 into a single chapter because of their close relationships. Each chapter also addresses differences from Maine's 2005 Comprehensive Wildlife Conservation Strategy.

Maine's 2015 Wildlife Action Plan addresses the full array of wildlife and their habitats in Maine -- vertebrates and invertebrates in terrestrial and aquatic (freshwater, estuarine, and marine) habitats – and wildlife is defined as any species of wild, free-ranging fauna including fish. It builds on a long history of public involvement and collaboration among conservation partners. The Plan is dynamic, responsive, and adaptive. Hence, Maine's Action Plan serves as a solid foundation for the future of wildlife conservation that will help guide the collaborative efforts of state and federal agencies, tribes, conservation partners, and individuals to ensure success.

The Wildlife Action Plan was developed through a lengthy participatory process with state agencies, targeted conservation partners, and the general public. The Plan is non-regulatory. The suite of voluntary species and habitat scale conservation actions in the Plan complement, but do not compete with, existing work programs and priorities by state agencies and partners. Indeed, conservation actions will in most cases not replace current management strategies, but hopefully supplement existing efforts and inspire new initiatives on behalf of Maine' Species of Greatest Conservation Need.

ELEMENT 1: SPECIES OF GREATEST CONSERVATION NEED

A critical dilemma facing conservation biologists and managers worldwide is the need to allocate limited dollars, staff, and programmatic resources toward a growing list of conservation challenges. Foundational to this prioritization process in Maine's State Wildlife Action Plan is the development of a list of Species of Greatest Conservation Need (SGCN). Biologists from Maine Department of Inland Fisheries and Wildlife (MDIFW) and other state agencies, with cooperation from conservation partners and species experts, developed a suite of objective criteria for designating SGCN that is intended to be transparent and science-based, and recognizes that species conservation concerns can be identified at global, regional, and local scales. The primary themes for SGCN prioritization include risk of extirpation, population trend, endemicity, and regional conservation concerns. Secondary themes for SGCN prioritization include climate change vulnerability, survey knowledge, and indigenous cultural significance.

Maine's 2005 list of SGCN totaled 213 species grouped into two priority levels. To help further advance the challenge of species prioritization, Maine's 2015 list of 378 SGCN are assigned to three species priority levels: Priority 1 (Highest; 58 SGCN), Priority 2 (High; 131 SGCN), and Priority 3 (Moderate; 189 SGCN), all of which are eligible for State Wildlife Grant (SWG) assistance from the U.S. Fish and Wildlife Service. The 2015 process for reviewing and identifying Maine SGCN included both species deletions (33) and additions (198) to the 2005 list. The net increase in SGCN is driven primarily from a) additional conservation science designation criteria, b) scrutiny of more invertebrate taxa, c) significantly greater attention to marine fauna in the Gulf of Maine, and d) more explicit recognition of climate change vulnerability. It is our hope that identifying a relatively comprehensive, prioritized suite of SGCN will help MDIFW and conservation partners implement meaningful conservation actions for some of Maine's most vulnerable and valued wildlife resources over the coming decade.

ELEMENT 2: KEY HABITATS AND NATURAL COMMUNITIES

Maine's Wildlife Action Plan employs The Northeast Terrestrial Habitat Classification System (NETHCS), developed by NatureServe and The Nature Conservancy (TNC), to identify the extent of habitats and community types essential to the conservation of Species of Greatest Conservation Need (SGCN). Federal and state agencies in the Northeast have endorsed the NETHCS as a tool for assessing habitat distribution and composition. The specific version of the NETHCS used in Maine includes a number of modifications made by the Maine Dept. of Inland Fisheries and Wildlife (MDIFW) and the Maine Dept. of Marine Resources (MDMR) to reflect Maine's landscape and coastal features. The basic layer within NETHCS is the habitat 'system', which corresponds to the Ecological Systems classification. There are approximately 150 Ecological Systems in Maine. We used the more general 'Macrogroup' level for several of our analyses, and there are 42 habitat macrogroups in Maine.

Maine further consolidated the macrogroups into three broad habitat categories to facilitate development of conservation actions. The broad categories are Coastal and Marine, Terrestrial (including Freshwater Wetlands) and Freshwater Aquatic (Rivers, Lakes, and Ponds). The importance of various habitats to SGCN is not related to their statewide abundance; habitats such as pine barrens, open freshwater wetlands, and rivers and streams are dis-proportionately important compared to many other habitat types. We estimate that there are 3,824,842 acres of conservation land in Maine, accounting for nearly 20% of the State. Much of this conserved

land lies within Focus Areas of Statewide Significance; we identify these focus areas to help prioritize Maine's landscape for SGCN and other habitat values.

ELEMENT 3: PROBLEMS AFFECTING SGCN AND THEIR HABITATS

Maine's State Wildlife Action Plan (SWAP) focuses much attention on the habitats used by Species of Greatest Conservation Need (SGCN). The Plan uses a coarse filter – fine filter approach to conservation to ensure, where possible, that individual conservation initiatives benefit multiple species, while also acknowledging that some species require individualized attention. We assigned stressors to both habitats and to SGCN, in order to clearly identify the issues that should be addressed at each level in the conservation hierarchy. As with most other states in the Northeast, we identified stressors using the International Union for the Conservation of Nature (IUCN) Threat Classification Scheme. While the IUCN system is useful for categorizing stressors to SGCN and their habitats, we found that the system lacks the resolution to clearly identify the specific issues that should be considered for conservation attention. Therefore, when assigning stressors we chose to adopt the primary and secondary IUCN categories, but replaced the tertiary category with a detailed narrative that fully describes the issue and its impact on the species or habitat being considered. In addition, we adapted Table 7 (*Threat characteristics and categorical ratings)* from The Northeast Lexicon to identify characteristics for each stressor assignment.

We assigned stressors to Priority 1 and 2 SGCN, and assigned 'Severity' and 'Actionabilty' characteristics for each Stressor – SGCN interaction. The concepts of 'Likelihood', 'Certainty' and 'Spatial Extent' were considered implicitly, and only those Stressors that were determined to have a moderate or high Impact for each of these characteristics were assigned. In addition, only those stressors with moderate or high Severity were assigned to SGCN. We developed a simple matrix to prioritize SGCN stressors, using the combination of the Impact scores for 'Severity' and 'Actionability.' We identified stressors for terrestrial and freshwater aquatic habitats using Anderson at al. (2013) as our primary source of reference material. Because no single comprehensive source is available that describes that state of marine habitats along Maine's coast, we used a wide variety of scientific publications, as well as expert opinion of agency staff and partners, to compile information on stressors. We assumed that the habitat systems within each terrestrial and marine macrogroup all faced similar conservation problems; therefore we assigned stressors to each macrogroup, but did not identify stressors separately for each habitat system, with the exception of freshwater aquatic habitats (River and Streams, and Lakes and Ponds) were we identified stressors separately for each of systems Unlike our approach for SGCN, we assigned all 7 stressor characteristics for each habitat – stressor combination.

We assigned 38 unique stressors to 190 Priority 1 and 2 SGCN species, for a total of 1,099 SGCN – stressor combinations. We assigned 31 unique stressors to 34 habitats macrogroups, for a total of 326 habitat – stressor combinations. Development, including existing and new Roads and Railroads and Housing and Urban Areas, and Invasive Non-native/Alien Species/Diseases, were assigned to the largest number of habitats.

ELEMENT 4: CONSERVATION ACTIONS

The conservation actions contained in Maine's revised State Wildlife Action Plan (SWAP) consist of complementary coarse- and fine-filter approaches that maximize limited conservation dollars. The Maine Department of Inland Fisheries and Wildlife (MDIFW), the Maine Department of Marine Resources (MDMR), the Maine Coastal Program (MCP), the Maine Natural Areas Program (MNAP), and other conservation partners worked closely to develop a thorough catalog of coarse- and fine-filter conservation actions. We attempted to balance action specificity with flexibility so that actions can be adapted as needed to emerging issues and information. Conservation actions are non-regulatory approaches undertaken voluntarily by agencies and other conservation partners. Actions are not intended to replace current management strategies, but can be used to bolster existing efforts or inspire new ones.

The actions reflect several stages of prioritization. Conservation partners identified a total of 311 actions for Species of Greatest Conservation Need (SGCN). Of these, partners applied 197 actions to individual SGCN, 88 to guilds, and 26 to one or more taxonomic groups. We assigned nine of these actions to all SGCN species. Conservation partners also identified 322 habitat actions, including 165 marine and coastal habitat actions, 54 freshwater aquatic habitat actions, and 103 terrestrial and wetland habitat actions. Given the volume of habitat conservation actions identified, workgroups developed several themes to organize actions into discrete packages of related actions that address common stressors or use similar techniques. Actions within a theme are often complementary, and when undertaken together, may be the most effective and efficient use of conservation resources. Three 'super-themes' emerged across habitat groups: Connectivity, Invasive Species, and Mapping and Outreach. Actions included in these themes will be more effective with coordinated efforts across habitats. Each conservation action is linked to its target SGCN or habitat and the stressor(s) the action is addressing in a relational database, an idea proposed in the 2005 Comprehensive Wildlife Conservation Strategy (CWCS) and successfully developed as part of this Plan. We also identified 11 programmatic actions to help guide implementation and tracking of the 2015 Action Plan; we have broadly grouped these actions as Outreach and Engagement, Funding and Tracking, Action Development, and Regional Partnerships. In this chapter, we also propose criteria partners may wish to consider if evaluating how best to direct resources to conservation actions in the plan. We also discuss differences from Maine's 2005 CWCS.

ELEMENT 5: MONITORING

ELEMENT 6: PERIODIC REVIEW

In this chapter, we outline the methods we will use to monitor SGCN and their habitats, describe how we will monitor the progress made in implementing the Action Plan over the next ten years, and address the procedures we will use to review and update the Action Plan moving forward. We work closely with federal, state, and private conservation partners to develop and participate in cooperative species monitoring programs. Where possible, monitoring programs target multiple species, usually within the same taxonomic group. We also describe the monitoring programs that are in place for SGCN in Maine. We include a table for each of the five taxonomic groups this plan references.

MDIFW and partners identified habitat-scale survey and monitoring needs during development of conservation actions. We present these actions with examples of existing and general survey and monitoring techniques that partners can used to achieve these habitat-monitoring objectives.

MDIFW and partners developed 11 programmatic actions to help guide Action Plan implementation over the next ten years. Three of these actions address monitoring, which this chapter describes in detail.

MDIFW will use the programmatic actions to monitor conservation action progress at least annually. MDIFW will also establish an Implementation Committee in the Fall 2015 comprised of agency staff and conservation partners. This committee will review Action Plan accomplishments and address emerging issues or adaptive management needs. We will undertake a comprehensive plan review beginning in year eight of the 2015 Action Plan.

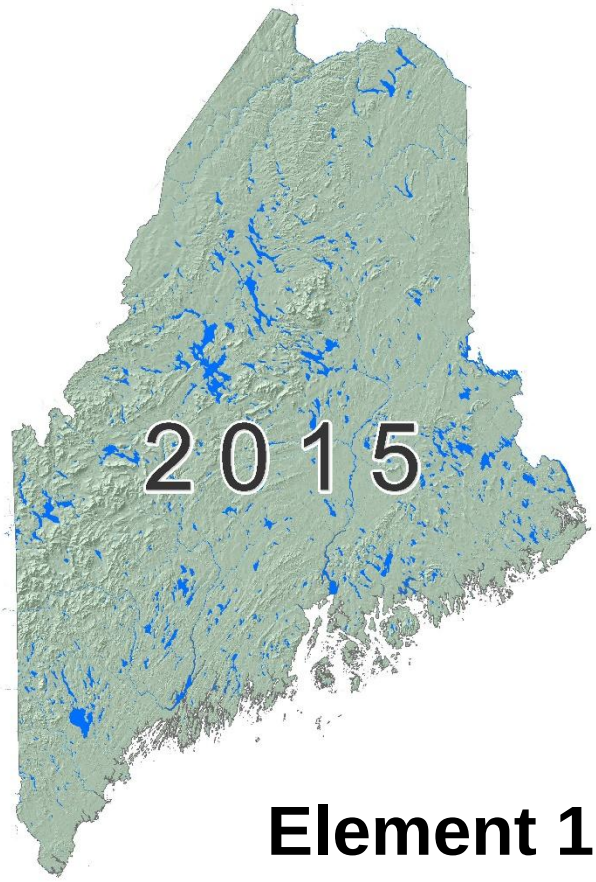
ELEMENT 7: COORDINATION WITH PARTNERS

ELEMENT 8: PUBLIC PARTICIPATION

Maine has a long history of successful collaboration among conservation partners -- conducting comprehensive wildlife planning and public involvement for nearly forty years. MDIFW began assembling a SWAP coordination team in January 2014. This planning team developed the strategies necessary to achieve the eight required elements of the 2015 SWAP. In September 2014, the Coordination Team established a SWAP Steering Committee to guide the overall development of the SWAP. The Steering Committee represented the broader partner group by providing regular and timely input into the activities and proposed strategies of the Coordination Team. The Coordination Team and the Steering Committee began preparing Maine's charter early in the update; the Steering Committee officially adopted the charter in November 2014. The Coordination Team invited 158 conservation partners to participate in the preparation of Maine's 2015 SWAP, representing 102 unique organizations and the public from July 2014 – June 2015. The partners attended five, seven-hour "conservation partner" meetings at which they collaborated in the development of Elements 1-5 of the 2015 SWAP.

MDIFW sought to both inform the public of its intent to revise the Action Plan and to encourage public participation. It established a Public Outreach Subcommittee to guide its public participation efforts. The subcommittee identified effective methods for engaging and soliciting input from the public, and the Coordination Team and Steering Committee scaled these methods to make effective use of agency resources and ensure an appropriate level of public participation.

The success of Maine's 2015 Wildlife Action Plan depends on continued partner and public engagement during plan implementation. To help guide implementation of these actions and to encourage continued public involvement, MDIFW and its partners developed six outreach Programmatic Theme that relate to 1. Outreach and Engagement and 2. Program Funding and Tracking.



MAINE'S WILDLIFE ACTION PLAN

Element 1: Species of Greatest Conservation Need

Prepared by

Maine Department of Inland Fisheries and Wildlife

In collaboration with

Maine's Conservation Partners

September 2015

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KEY TO ACRONYMS

ASMFC	Atlantic States Marine Fisheries Commission
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
EBTJV	Eastern Brook Trout Joint Venture
ECOS	Environmental Conservation Online System
ESA	U.S. Endangered Species Act
E/T	Endangered and/or Threatened
ETSC	Endangered, Threatened, and Special Concern
GIS	Geographic Information System
IUCN	International Union for the Conservation of Nature
MDACF	Maine Department of Agriculture, Conservation and Forestry
MDIFW	Maine Department of Inland Fisheries and Wildlife
MDMR	Maine Department of Marine Resources
MESA	Maine Endangered Species Act
MRSA	Maine Revised Statutes Annotated
NARSP	North Atlantic Regional Shorebird Plan
NAWCP	North American Waterbird Conservation Plan
NEFWDTC	Northeast Fish and Wildlife Diversity Technical Committee
NEPARC	Northeast Partners in Amphibian and Reptile Conservation
NMFS	National Marine Fisheries Service
RSGCN	Regional Species of Greatest Conservation Need
SC	Special Concern
SGCN	Species of Greatest Conservation Need
SoC	Species of Concern
SWAP	State Wildlife Action Plan
SWG	State Wildlife Grants
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
USSCP	U.S. Shorebird Conservation Plan
WNS	White-nose syndrome

The Legislature finds that various species of fish and wildlife have been and are in danger of being rendered extinct within the state of Maine, and that these species are of esthetic, ecological, educational, historical, recreational and scientific value to the people of the State. The Legislature, therefore, declares that it is the policy of the State to conserve, by according such protection as is necessary to maintain and enhance their numbers, all species of fish or wildlife found in the State, as well as the ecosystems upon which they depend.

107th Maine Legislature, 1975: preface to Maine's Endangered Species Act (MESA)

1.0 ABSTRACT

A critical dilemma facing conservation biologists and managers worldwide is the need to allocate limited dollars, staff, and programmatic resources toward a growing list of conservation challenges. Foundational to this prioritization process in Maine's State Wildlife Action Plan is the development of a list of Species of Greatest Conservation Need (SGCN). Biologists from Maine Department of Inland Fisheries and Wildlife (MDIFW) and other state agencies, with cooperation from conservation partners and species experts, developed a suite of objective criteria for designating SGCN that is intended to be transparent and science-based, and recognizes that species conservation concerns can be identified at global, regional, and local scales. The primary themes for SGCN prioritization include risk of extirpation, population trend, endemicity, and regional conservation concerns. Secondary themes for SGCN prioritization include climate change vulnerability, survey knowledge, and indigenous cultural significance.

Maine's 2005 list of SGCN totaled 213 species grouped into two priority levels. To help further advance the challenge of species prioritization, Maine's 2015 list of 378 SGCN are assigned to three species priority levels: Priority 1 (Highest; 58 SGCN), Priority 2 (High; 131 SGCN), and Priority 3 (Moderate; 189 SGCN), all of which are eligible for State Wildlife Grant (SWG) assistance from the U.S. Fish and Wildlife Service. The 2015 process for reviewing and identifying Maine SGCN included both species deletions (33) and additions (198) to the 2005 list. The net increase in SGCN is driven primarily from a) additional conservation science designation criteria, b) scrutiny of more invertebrate taxa, c) significantly greater attention to marine fauna in the Gulf of Maine, and d) more explicit recognition of climate change vulnerability. It is our hope that identifying a relatively comprehensive, prioritized suite of SGCN will help MDIFW and conservation partners implement meaningful conservation actions for some of Maine's most vulnerable and valued wildlife resources over the coming decade.

"A critical dilemma facing conservation biologists and managers worldwide is the need to allocate limited dollars, staff, and programmatic resources toward a growing list of conservation challenges. Foundational to this prioritization process in Maine's State Wildlife Action Plan is the development of a list of SGCN."

1.1 INTRODUCTION

Agencies and conservation partners have long faced the dilemma of allocating limited funds to address the critical needs of species designated as Endangered or Threatened (E/T). The much larger number of vulnerable species at risk of being listed as E/T is even more problematic. The Conservation and Reinvestment Act in the U.S. (2001) and a similar Species at Risk Act in Canada (2002) emphasize that need and established funding for states and provinces to address an array of biodiversity risks within their borders beyond a focus on E/T species. Conservation challenges solved at these local and regional scales are less likely to escalate into national or international crises. Additional benefits of working proactively with locally or regionally vulnerable species include a greater likelihood of success and minimal reliance on regulations.

An approved State Wildlife Action Plan is a requisite for receipt of federal SWG funding. The primary conservation targets of these plans are SGCN populations and habitats. Each state has considerable flexibility for SGCN designations and resulting SWG expenditures, though there is foundational guidance offered in the Wildlife Conservation and Restoration Act that SWG funds are intended "…for the benefit of a diverse array of wildlife and associated habitats, including species that are not hunted or fished, to fulfill unmet needs of wildlife within the States." Maine's 2015 Plan relies on objective criteria to identify and prioritize SGCN. Specifically, MDIFW and Plan partners emphasize the following five general concepts for SGCN eligibility:

1. **Acute Vulnerability**: State, federal or international agencies formally designate the risk of species extirpation. We also acknowledge those species experiencing recent, dramatic population declines and likely to be listed as E/T in the near future.
2. **Regional Conservation Priority**: One or more scientific partners have identified the species as a high regional concern in the Northeast. We include regional endemics and species with disproportionate range occurrences in the Northeast.
3. **Data Deficiency**: Some rare, understudied taxa require further survey and research to accurately determine conservation status.
4. **Climate Change Sensitivity**: Northeastern climate change projections indicate a suite of species will face significant risks in the near future.
5. **Cultural Significance**: Maine tribes identified some SGCN based on special values to tribal heritage in combination with emerging ecological vulnerabilities.

Some states develop Wildlife Action Plans that reflect the scope of the jurisdiction in the wildlife agency that legally administers SWG allocations to states. Maine's 2015 Plan includes other natural resource agencies. MDIFW is the lead agency for any terrestrial or freshwater wildlife species (including all birds). The Maine Department of Marine Resources (MDMR) has primary authority for all fauna (except birds) in coastal waters. The Maine Coastal Program in the state's Department of Agriculture, Conservation and Forestry (MDACF) also considers conservation issues in the Gulf of Maine. The Maine Natural Areas Program in MDACF has sole responsibility for rare plants. While flora are not directly eligible for SWG funds in Maine's 2015 Plan, Maine's Endangered and Threatened Plants (Appendix 1-1) are considered in the Plan's habitat-based conservation strategies. Finally, we acknowledge that participation by Maine's diverse alliance of conservation partners (private, public, and tribal) is essential to effective Plan implementation.

1.2 SIGNIFICANT CHANGES FROM MAINE'S 2005 PLAN

Maine and other states drafted their initial plans as a "Comprehensive Wildlife Conservation Strategy" (CWCS) for submission in 2005. The CWCS documents of that era were retitled (but not reformatted) as State Wildlife Action Plans (SWAP). Maine's 2005 CWCS still serves as a thorough, detailed account of the full scope of wildlife, habitats, threats, conservation actions, and monitoring programs in the State (http://www.maine.gov/ifw/wildlife/reports/wap.html). Key differences in Element 1 of the 2015 Action Plan are:

- Purpose: Maine's resource agencies and conservation partners strove to construct a document that better served as a statewide conservation plan rather than one focused on MDIFW perspectives.

- SGCN emphasis: A focus on SGCN rather than the full array of fish and wildlife resources significantly reduced the length of Element 1 and each subsequent chapter of the 2015 Action Plan.

- SWAP database: Similar to the review of habitats and stressors in subsequent parts of this Plan, Element 1 includes a tabulation of 378 SGCN (Table 1-3) that is hot-linked to database report summaries for each SGCN. This strategy streamlines the Plan itself and provides updateable information (in lieu of static tables) during its 10-year horizon.

- Expanded faunal reviews: Several taxa groups received much greater attention for SGCN eligibility in 2015: marine fauna in the Gulf of Maine and terrestrial/freshwater invertebrates. Plant conservation remains ineligible for SWG funding, but habitat-scale conservation actions from Maine's 2015 Plan will benefit vulnerable flora and important natural communities.

- Refinements to SGCN qualifying criteria: Whenever possible, we employ objective, published reviews of species vulnerability among faunal groups to identify SGCN.

- Coordinated conservation in the Northeast: The Northeastern states and partner collaborations in USFWS Region 5 have focused on the regional scale of vulnerability. The Northeast Regional Conservation Needs program (http://rcngrants.org/) and North Atlantic Landscape Conservation Cooperative (http://northatlanticlcc.org/) are premiere examples.

- Vulnerable species in Canada: This Plan now extends SGCN eligibility for Maine fauna that are listed E/T by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC; http://www.cosewic.gc.ca/eng/sct5/index_e.cfm) in the neighboring provinces of New Brunswick, Nova Scotia and Quebec.

- Global vulnerability: Maine's 2015 Plan newly recognizes fish and wildlife species occurring in Maine as SGCN if listed as "Critically Endangered" (CR), "Endangered" (EN), or "Vulnerable" (VU) on the IUCN Red List.

- Climate change vulnerability: Although many climate change projections escalate beyond the 10-year duration of the Plan, the revised SGCN list of 2015 now includes species with high vulnerability and high certainty for this stressor in Maine.

1.3 AN OVERVIEW OF MAINE'S FAUNA AND SGCN

The diversity and health of Maine's natural resources is a priority for both residents and visitors. Maine's varied landscape, rural character, and traditional resource-based economy heighten public familiarity and appreciation for fish and wildlife. Regular exposure to fauna in the every-day lives of many Maine citizens reinforces concern for the state's natural heritage generally, and species-at-risk in particular.

"Maine's varied landscape, rural character, and traditional resource-based economy heighten public familiarity and appreciation for fish and wildlife. Regular exposure to fauna in the every-day lives of many Maine citizens reinforces concern for the state's natural heritage generally, and species-at-risk in particular."

The variety of wildlife is also key to the allure. Maine is a mixing zone of northern species allied with boreal systems prevalent in neighboring Canada that yield to southern species typical of Appalachian habitats that predominate further south in New England and beyond. Examples of northern fauna include Canada Lynx (*Lynx canadensis)*, Arctic Charr (*Salvelinus alpinus*), Mink Frog (*Lithobates septentrionalis*), and Atlantic Puffin (*Fratercula arctica*); all approach southernmost range limits in the state. Southern fauna that are near the northern edge of their range in Maine include New England Cottontail (*Sylvilagus transitionalis*), Roseate Tern (*Sterna dougalli*), Black Racer (*Coluber constrictor*), Loggerhead Sea Turtle (*Caretta caretta*), and Monarch Butterfly (*Danaus plexippus*).

The composition of Maine's animal and plant communities shifts considerably from south-to-north, in both terrestrial and aquatic habitats. Woodlands encompass nearly 85% of Maine's land area, but forests vary from deciduous and mixed forests prevalent in southern, western and central Maine to boreal conifers in northern and eastern regions and at higher elevations. Faunal associations shift accordingly as well. Surface waters cover almost 13% of the State and also offer diverse environments. Predominantly cool / cold lakes, rivers and streams yield to warmer waters in southwestern Maine. Maine's intricate coastline totals almost 3,500 miles, and the Gulf of Maine itself transitions into cooler waters along a west-to-east gradient due to tidal mixing with the North Atlantic's Labrador Current.

Not surprisingly, our knowledge of Maine fauna has limitations. For example, many invertebrate taxa are not yet considered, let alone proportionately represented among Maine's SGCN. Nevertheless, Maine's 2015 Plan identifies 378 SGCN spanning 44 orders of vertebrates and 28 orders of invertebrates. A compilation by major taxa groups (Table 1-1) reveals both the sheer number and diversity of SGCN at present in Maine.

Sixty (16%) SGCN in Maine are state-listed E/T species (Appendices 1-2 and 1-3). Only 18 SGCN (<5%) are federally-listed as E/T (Appendix 1-4). Thus, the vast majority of Maine's SGCN, while

"…the vast majority of Maine's SGCN, while characterized by distinct biological sensitivities, are not on the brink of extirpation or ecological crisis. This provides a strategic opportunity for MDIFW and a coalition of conservation partners to implement meaningful conservation for some of Maine's most vulnerable and valued wildlife populations in advance of the necessity for ESA listings and regulatory implications."

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Table 1-1. Diversity of fauna, E/T listings, and SGCN in Maine by major taxa groups.

Taxa Groups lead state agency juridiction	# Species			
	Extant in Maine	Federal E/T (ESA)	State E/T (MESA)	SGCN in 2015 Plan
Invertebrates subtotal[1]	>33,000	0	20	168
freshwater / terrestrial (MDIFW)	>15,000	0	20	132
marine (MDMR)	>18,000	0	0	36
Vertebrates subtotal	840	18	40	210
Amphibians (MDIFW)	18	0	0	4
Birds (MDIFW)	423	3	20	130
Fish	291	3	3	43
freshwater (MDIFW)	39	0	2	15
marine / diadromous (MDMR)	252	3	1	28
Mammals	85	8	10	22
marine (MDMR)	24	6	5	7
terrestrial (MDIFW)	61	2	5	15
Reptiles	23	4	7	11
freshwater / terrestrial (MDIFW)	17	0	4	7
marine (MDMR)	6	4	3	4
MAINE FAUNA TOTALS	>33,840	18	60	378

[1]Total includes only described species; the actual number is much greater.

1.3.1 MAMMALS (NON-MARINE)

General Overview

Maine's 61 species of non-marine mammals may be best characterized as a diverse mixture of boreal and temperate species. Maine encompasses three ecoregional provinces (Warm Continental Mountains, Warm Continental Division, and the Hot Continental Division) and is near the Subarctic Division in Canada. Maine's proximity to the Subarctic Division enables species, such as the Canada Lynx, that are typically found in boreal forests of Canada, to thrive in the mixed coniferous forests of northern Maine. Similarly, the Hot Continental Division's climate helps make it possible for species such as the New England Cottontail to persist at the northern extent of their range in southern Maine. While Maine's proximity to boreal and temperate regions may contribute to the diversity of mammals found in the state, this same proximity also raises a number of challenges for species that live near the edge of their range. Species on the southern edge of their range, like American Marten (*Martes americana*) and Canada Lynx may compete for resources with species more common to the south, such as Fisher (*Martes pennanti*) and Bobcat (*Lynx rufus*). Although we cannot say for certain how

mammals in Maine will be affected by climate change, it will likely be the species at the edge of their range that will experience the greatest change.

Conservation Overview

The species comprising Maine's native mammals have remained fairly constant over the last 100 years, since extinction of the Sea Mink (*Mustela macrodon*) and Eastern Cougar (*Felis concolor*), and state extirpation of Caribou (*Rangifer tarandus*) and Gray Wolf (*Canis lupus*). Today, Maine's mammals receive greater protection through regulatory measures and the conservation efforts carried out by MDIFW and a host of dedicated conservation partners.

Notwithstanding these conservation efforts, Maine mammals face a variety of challenges and threats. A total of 15 species (25%) of Maine's nonmarine mammals are listed as SGCN in this Plan. Although Moose (*Alces alces*) and Muskrat (*Ondatra zibethicus*) are numerous in Maine, they were listed as SGCN because of their cultural significance to native tribes and recent changes in the populations of these species in the Northeast and elsewhere. The factors behind these changes are still under investigation.

Bats, as an order, perhaps face the most unified set of conservation threats. White-nose syndrome (WNS), a deadly fungal disease, has drastically reduced populations of *Myotis* spp. Because of this disease, Little Brown Bats (*Myotis lucifugus*) and Northern Long-eared Bats (*Myotis septentrionalis*) were state-listed as Endangered in 2015, and the Eastern Small-footed Bat (*Myotis leibii*) was newly state-listed as Threatened. These bat populations are not only threatened by WNS in Maine but throughout most of their U.S. range. Although WNS has primarily affected *Myotis* spp., Tri-colored Bats (*Perimyotis subflavus*) and Big Brown Bats (*Eptesicus fuscus*) are also affected. The impact of WNS on Maine's bat populations has heightened concerns over the effects of other mortality factors, such as wind turbines, and the vulnerability of maternity colonies to disturbance. Our lack of knowledge about the habits of bats in Maine also poses a significant threat to the species. It is difficult to undertake effective conservation actions if we do not understand many of the basic habits of bats. In addition to the three bat species that have recently been listed as E/T under MESA, Maine's five other species of bats are all considered species of Special Concern and/or SGCN.

Efforts underway in Maine and five other Northeast states were pivotal to a recent decision not to list the New England Cottontail (*Sylvilagus transitionalis*, SGCN Priority 1) as E/T under the federal ESA. © Tom Barnes

The availability and structure of forest seral stages in Maine is a major factor determining the abundance of Maine's mammals. In southern Maine, the loss of early successional habitat through forest maturation and development has resulted in a 75% to 80% decline of suitable habitat for New England Cottontail. In York County, only 3% of the landscape can be characterized as early successional forest habitat. The lack of shrublands and young forests in southern Maine threatnes not only the New England Cottontail, but also several SGCN birds associated with scrub-shrub habitat.

Conversely, in northern Maine, less than 3% of the landscape remains as ecologically mature forest that is suitable for deer wintering areas. This not only impacts Maine's White-tailed Deer (*Odocoileus virginianus*) but other mammals (e.g., American Marten, *Martes americana*) and birds that are dependent on mature interior forests. Unlike the interior boreal forests of Canada

and Alaska, where natural wildfires play a major role in determining the pace of forest succession, commercial logging operations and market forces are major factors influencing the composition and structure of Maine's northern forests.

1.3.2 BIRDS

General Overview

Birds enrich our lives and reflect the quality and health of our environment. North America provides habitat for over 900 species of birds. The Maine Bird Records Committee considers 423 bird species (nearly half of all North American birds) to be positively documented within the state of Maine. Maine's diverse mosaic of habitats supports 225 species of nesting birds. Nearly 200 others visit Maine as either fall / spring migrants or winter residents.

Maine's landscape is used by at least 29 inland species that reach the northern limits of their breeding distribution in Maine, and 28 species reside here at their southern limits. In addition, many of Maine's island-nesting seabirds reach their southern breeding terminus on Maine's coastal islands. Several other species have expanded their breeding ranges into Maine over the past century. New arrivals include the Sandhill Crane (*Grus canadensis*) and most recently, the Eastern Screech Owl (*Megascops asio*). Two species, the Peregrine Falcon (*Falco peregrinus*) and the Wild Turkey (*Meleagris gallopavo*) have been reintroduced into Maine following prolonged extirpation. Both are now carefully monitored and managed.

Maine is strategically located at a constriction point of the funnel in the Atlantic Flyway, a migratory path along eastern North America that tapers from a wide swath over the eastern Canadian arctic southward along the east coast. The Atlantic Ocean has a channeling effect on these migratory movements as birds fly south in late-summer and fall. In addition, Maine's vast coastline and more than 4,000 coastal islands provide important stopover areas for millions of migrating birds. This flyway includes some of the continent's most productive ecosystems and is home to about a third of the U.S. human population. Conserving birds and their habitats in Maine's portion of this important flyway is a monumental task.

Conservation Overview

All of Maine's bird guilds are represented on Maine's official E/T List or the List of Species of Special Concern (SC). The latter is an administrative list of species that could become E/T without attention. The challenges for future conservation and stewardship are many. At least five bird species are documented as extinct or extirpated from Maine, emphasizing the importance of preventing any more erosion of the state's avian biodiversity. Among 423 birds documented in Maine, 11 are listed as state Endangered, nine are listed as state Threatened, and 130 are listed SC and/or SGCN. Thus, conservation concerns exist for ~31% of the bird species known to inhabit Maine. Most attention is devoted to birds that breed, nest and raise their young in Maine. However two waterfowl, the Barrow's Goldeneye (*Bucephala islandica*) and Harlequin Duck (*Histrionicus histrionicus*), are state-listed as Threatened because they winter in significant numbers in coastal Maine. Since a large percentage of the North Atlantic populations of these waterfowl species winter here, Maine has a high regional management responsibility for them.

Threats to bird populations are many and conservation challenges are equally diverse. Managers are tasked with protecting small numbers of ground-nesting Least Terns (*Calidris minutilla*) and Piping Plovers (*Charadrius melodus*) that struggle to co-habit southern Maine's

sand beaches with tens of thousands of recreational users. Maine forest birds and many species of wetland birds may be faring well recently, but they too are threatened by cumulative impacts of development, habitat fragmentation, intensive forest practices, invasive species and various forest pests and diseases. While these species face numerous threats, vast areas of forest in Maine remain intact, presenting opportunities for large-scale conservation.

Songbirds are well represented in Maine given our diverse landscape. Because the state is so heavily forested, most forest-dwelling Passerines are doing well with only a few "vulnerable" exceptions for specialists such as Bicknell's Thrush (*Catharus bicknelli*). Abundance of some forest birds follows periodic boom and bust insect outbreaks. For example, Tennesee Warbler (*Oreothlypis peregrina*) and Evening Grosbeak (*Coccothraustes vespertinus*) peak during epidemics of Spruce Budworm (*Choristoneura fumiferana*). Overall, the health of Maine's forest songbirds is good, and their consideration as SGCN stems largely from disproportionate rangewide responsibility for them in Maine.

Grassland birds, in contrast, have struggled to maintain populations in Maine. Grasshopper Sparrows (*Ammodramus savannarum*) continue to occupy just a few sites in southern Maine, and Eastern Meadowlark (*Sturnella magna*) populations continue a long-term decline. Leading the declines however, are the aerial insectivores, mostly swallows, which by any measure are in rapid decline. Even populations of the widespread, locally abundant Tree Swallow (*Tachycineta bicolor*) have steadily declined over the last decade. Although causes remain speculative, most of these species are considered SGCN based on steep population declines.

In general, raptor populations have also fared well in Maine since the use of certain harmful pesticides was banned. Following years of intensive management to protect nests, Bald Eagles (*Haliaeetus leucocephalus*) were delisted in 2009, and populations continue to grow statewide. Changes in land use practices, population shifts, and some environmental toxins appear to be foremost influences at present. Habitat losses may result from natural (e.g., succession of grasslands to fwoodlands) or human impacts (including land development, fragmentation, etc.) that lead to both direct and indirect effects. Most raptor populations lack baseline indices or trend indicators. Limiting disturbance from recreation and development provides additional protection during critical nesting periods. Documenting continuing exposure of some persistent toxins such as lead, mercury, polychlorinated biphenyls, and polybrominated diphenyl ethers is a potential priority for some raptors.

Seabirds and salt marsh dependent birds face threats from pollution, over-fishing of important food items, and warming sea temperatures and rising sea levels caused by climate change. Rare seabirds and some colonial waterbird populations remain vulnerable as high percentages of their statewide nesting populations occur on a just a handful of managed sites. The maintenance and enhancement of populations of focal species will require careful monitoring of breeding populations and management that addresses threats that include: predations from gulls, habitat loss, changes in food availability in the Gulf of Maine, oil spills, incidental take during commercial fishing, and human disturbance near nests.

This regional endemic, the Saltmarsh Sparrow (*Ammodramus caudactus*, SGCN Priority 1) is a "vulnerable" species on the IUCN Red List. It lives in one of the most threatened habitats in the Northeast. © Patrick Leary

Maine's numerous wetlands and riparian areas are critical to a large percentage of Maine birds, including shorebirds, wading birds, and waterfowl. Poorly planned development that is too close to wetlands puts ecological functions at risk and leads to general habitat degradation, lower productivity, and eventual loss of birds. While the rate at which wetlands are lost has slowed since the 1980s, some of Maine's marsh birds (e.g., rails and bitterns) have become increasingly rare for unknown reasons. With rarity comes increased vulnerability to all stressors such as flooding associated with severe weather due to climate change; displacement of native vegetation by invasive species, human disturbance through recreation and development; and water regime changes at managed wetlands. Colonial wading birds such as Great Blue Herons (*Ardea herodias*) and Black-crowned Night Herons (*Nycticorax nycticorax*) have declined along the coast for unknown reasons; however disturbance, predators, and changes in food resources are all suspected. Continued surveys and monitoring are needed to shed light on the complex interspecific interactions as well as how species respond to changes in their local environment.

And finally, shorebirds that rely on coastal habitats for feeding and roosting during migration are negatively influenced by declining food resources and human disturbance. Recent data suggest that several Atlantic Flyway shorebird species have experienced declines of between 50% and 90% within the last three decades. Shorebird experts throughout the U.S. and Canada agree that the primary reason for shorebird declines is habitat loss from coastal development and human related disturbances. Thirty-eight shorebird species spend some portion of their annual life cycle in Maine including the federally listed Piping Plover and Red Knot (*Calidris canutus rufa*). Shorebirds are an important group for management consideration because large numbers of these birds concentrate in discrete areas of coastal habitat where they are highly susceptible to disturbance, habitat loss, and environmental contaminants. Conservation requires attention to these cumulative impacts.

Semipalmated Sandpipers (*Calidris pusilla*, SGCN Priority 2) & 13 other SGCN shorebirds stage along the Maine coast in annual, long-distance migrations from the Arctic to South America. © Lindsay Tudor

Maine's diverse and abundant bird resource face many natural challenges including starvation, predation, and severe weather. But the major threat for Maine birds remains habitat loss. Well-designed biological monitoring of Maine's bird resource is required to guide conservation strategies for priority birds. Conserving high value habitats and directing disturbance activities away from the most sensitive habitats will go a long way in ensuring a viable future for Maine birds and the people of Maine who enjoy watching them.

1.3.3 REPTILES AND AMPHIBIANS

General Overview

By eastern U.S. standards, Maine is a large and climatically diverse state. Thus, while North American reptiles and amphibians (herpetofauna) are richest at southern latitudes, Maine's relatively moderate southern and coastal climate permits a large number of species, especially snakes and turtles, to reach their northeastern range limit in the state. Only one species, the Mink Frog (*Rana septentrionalis*), reaches the southern edge of its range in Maine (and northern New Hampshire and Vermont). There are 36 species of herpetofauna known from Maine, including 18 amphibians and 18 reptiles, one of which is considered extirpated (Timber Rattlesnake, *Crotalus horridus*). Two others are introduced: a salamander (Mudpuppy, *Necturus maculosus*) and a turtle (Red-eared Slider, *Trachemys scripta elegans*). While Maine has a lower diversity of reptiles and amphibians than most eastern states, it provides some of the most extensive and intact remaining habitat for the species it hosts. Several are of regional and national conservation concern.

Conservation Overview

Reptiles and amphibians are two of the most imperiled vertebrate taxa worldwide, and this pattern of endangerment is also reflected in the status of Maine's fauna where a relatively large proportion of native reptile and amphibian species (33%) are listed as state Endangered or Threatened (four species), Special Concern (six species), Extirpated (one species), and/or SGCN (one additional species). This is in part due to the biogeography described above, whereby the area of greatest diversity, southern and coastal Maine, is also the most densely human populated with associated high rates of development, habitat loss and fragmentation, road mortality, predation, pollution, and illegal collection. The effect of climate change on the status of Maine's herpetofauna is uncertain, but given the group's limited dispersal capability and sensitivity to temperature and humidity gradients it is safe to expect significant changes in local distribution and abundance.

Reptiles (Snakes and Turtles)

Among Maine's vertebrates, reptiles are arguably the most imperiled, with eight of the state's native 17 species (47%) listed as Endangered, Threatened, Special Concern, Extirpated, and/or SGCN. The rarity of many of the state's snakes and turtles is partially attributed to the fact that nearly all reach or approach the northern edge of their range in Maine, but population viability for several species is further stressed by anthropogenic factors including most notably habitat loss, road kill, nest and hatchling loss to human-subsidized predators, and illegal collection. The globally rare and declining Wood Turtle (*Glyptemys insculpta*) is patchily distributed throughout the state, but the fate of Maine's other imperiled reptiles will likely be determined in just a few southern counties where the challenge is to conserve remaining high quality occurrences in a relatively densely human populated landscape.

Northern Black Racers (*Coluber constrictor*, SGCN Priority 1), Maine's rarest snake, persist only in barren and dry woodland habitats of York County, at their northernmost range limit. © Jonathan Mays

Spring Salamanders (*Gyrinophilus porphyriticus*, SGCN Priority 2), one of Maine's rarest amphibians, are a specialist of headwater streams in central and western regions of the state. © Jonathan Mays

Amphibians (Frogs, Toads and Salamanders)
Four of Maine's 18 amphibian species are listed as Special Concern and/or SGCN. As a group, Maine's amphibians are relatively secure compared to its reptiles, likely because of their greater fecundity, higher densities, lower sensitivity to adult mortality factors, and generally wider range distribution across the state. Two of Maine's salamanders are listed as SGCN largely because of their close breeding association with a specialized aquatic habitat that is vulnerable to loss and degradation – headwater streams (Spring Salamander; *Gyrinophilus porphyriticus*) and vernal pools (Blue-spotted Salamander; *Ambystoma laterale*).

1.3.4 FRESHWATER (NON-DIADROMOUS) FISH

General Overview
Maine's freshwaters host a variety of fishes including 39 native freshwater obligate species (live their entire lives in freshwater habitats) and 12 diadromous species that live part of their lives in freshwaters. A significant proportion of the fish fauna (diadromous or obligate freshwater) that occur in Maine's inland waters is non-native: 19 species (27%). We include two whose exact status needs to be confirmed: Banded Sunfish (*Enneacanthus obesus*) and Emerald Shiner (*Notropis atherinoides*). As with other fauna, Maine sits at a biogeographic transition zone with some native fishes occurring at the northernmost extent of their natural distribution such as Redfin Pickerel (*Esox americanus americanus*), Swamp Darter (*Etheostoma fusiforme*) and American Brook Lamprey (*Lethenteron appendix*). Others are at the southern end of their range, like Brook Stickleback (*Culaea inconstans*), Lake Whitefish (*Coregonus clupeaformis*) and Lake Trout (*Salvelinus namaycush*). In addition, Maine maintains the only remaining U.S. populations of a regional endemic freshwater fish, a landlocked subspecies of Arctic Charr (*Salvelinus alpinus oquassa*).

Conservation Overview
Freshwater and diadromous fishes of North America are among the most threatened taxonomic groups. The American Fisheries Society reports that approximately 39% of all described species are considered imperiled (Jelks et al. 2008). Five Maine species are E/T listed under either state (MESA) or federal law (ESA). Moreover, 51% (26/51) of Maine's native freshwater and diadromous fishes are listed as SGCN. Most fish require clean, clear waters and all are naturally restricted to movements within aquatic habitats. Hence their survival, reproduction, movement and dispersal capabilities are compromised by natural landscape features (ex. waterfalls, watershed divides) as well as anthropogenic infrastructure (e.g., dams, road/stream crossings, developed shorelines). In addition, Maine's native freshwater fishes are adapted to relative depauperate fish community conditions. Hence, many of Maine's native fishes compete poorly with the on-going invasions of non-native species whose presence can have potentially strong effects on local distribution and abundance.

Inland Coldwater Fishes (Salmon, Trout, Charr, Smelt and Whitefishes)
By physiological limitations, Maine's native salmonid fishes are at or near their southerly range extent and all seven native species have some level of conservation concern. Atlantic Salmon (*Salmo salar*) are federally listed as Endangered in Maine. Arctic Charr, Lake Whitefish, and anadromous populations of Brook Trout (*Salvelinus fontinalis*) are designated as Special Concern and all, including Lake Trout, Round Whitefish (*Prosopium cylindraceum*) and anadromous Rainbow Smelt (*Osmerus mordax*) are SGCN. In addition to threats associated with water quality and impediments to dispersal and migration, coldwater fishes are likely to be significantly affected by climate change in Maine.

Brook Trout (*Salvelinus fontinalis*, SGCN Priority 3), are a "Maine Heritage Fish." Although occurring statewide and in a diversity of habitats, their range is retracting due to multiple stressors including interactions with non-native species, land use conversion, fish passage constraints and climate change. © Merry Gallagher

Rare Native Fishes (Minnows and others)
Redfin Pickerel and Swamp Darter are state-listed as Endangered and Threatened respectively. Both species occur at the northern extent of their natural range in Maine where they have highly restricted distributions and are subject to water quality degradation and habitat loss. Most other rare native fishes in Maine are listed as SGCN (10 species) because of a general lack of knowledge regarding their current abundance, population trend and distribution. Their habitat and ecological requirements are diverse. However identifying true threats is difficult at this time without a better understanding of their current status.

1.3.5 INLAND AND FRESHWATER INVERTEBRATES

As is true globally, invertebrates dominate Maine's biota, both in terms of richness and biomass. Based on available data, Gawler et al. (1996) conservatively estimated that Maine hosts a total of 15,000 non-marine invertebrate species, representing nearly 98% of the state's animal species diversity. Like most other states, Maine's legal definition of "wildlife" (any species of the animal kingdom) includes invertebrates, thus challenging MDIFW and cooperators with a tremendous breadth and volume of species to protect and manage (McCollough 1997). One of the ways MDIFW triages its limited staff and program resources toward the conservation and management of invertebrates is to focus on those species and groups that are better-studied and which have well documented declines or imperilment.

The best-studied phyla in Maine, as in most states, are the Mollusca (e.g., snails and mussels: ~200 species) and Arthropoda (e.g., insects, crustaceans, spiders: ~7,950 species). These two groups include all of the non-marine invertebrate species considered in this Plan. Within these phyla, the state of knowledge on distribution, status, and life history is strongest for just three orders: the Unionoida (freshwater mussels), Odonata (damselflies and dragonflies), and Lepidoptera (butterflies and moths), or what some have referred to as the "charismatic microfauna." Accordingly, a large proportion (66%) of the priority invertebrate species determined to be SGCN are represented by members of these same groups (Unionoida – 6 species; Odonata – 36 species; and Lepidoptera – 47 species). Other invertebrate taxa also

considered in the SWAP because of partial, but growing, knowledge include Gastropoda (snails; 8 species), Plecoptera (stoneflies; 3 species), Trichoptera (caddisflies; 4 species), Ephemeroptera (mayflies; 15 species), Hymenoptera (bumble bees; 10 species), Coleoptera (beetles; 4 species), and Decapoda (crayfish; 1 species).

Conservation Overview

Maine was one of the last states in New England to officially include invertebrates among its state-listed E/T species in 1997, but there have since been considerable efforts to improve our knowledge of the targeted groups highlighted above. As such, Maine has now assigned official conservation status to a total of 134 invertebrate species, including 20 species as E/T, 78 species as SC, and 36 additional fauna as SGCN. Still, the list of Maine invertebrates of conservation concern remains very low as a proportion of the state's estimated non-marine species richness (<0.01%). It should be noted this is primarily because of a lack of knowledge, and not because invertebrates as a group are inherently more abundant or secure in Maine, as illustrated by the fact that over half (8 of 15 species) of all documented state wildlife extinctions and extirpations are comprised of invertebrates (Coleoptera and Lepidoptera). Undoubtedly, many more invertebrate losses remain undocumented. The conservation knowledge gap for Maine's invertebrates is significant compared to plants and vertebrates, and thus their representation on Maine's SGCN and other conservation status lists will inevitably grow as further knowledge is obtained on the population status, distribution, and trends of various at-risk taxa.

The following is a brief review of the conservation status and imperilment patterns for select groups of Maine invertebrate taxa that host most of the state's SGCN.

Snails (subclass: Pulmonata and Prosobranchia, class: Gastropoda, phylum: Mollusca)

According to Martin (1999, 2000), there are 76 species of terrestrial snails, and 45 species of freshwater snails, reported from Maine. At least five species are introduced, and the taxonomic status of several others is questionable. While a number of individual investigations of Maine's snails exist (Gleich and Gilbert 1976, Hotopp and Smith 1994, Martin 1999, Martin 2000, systematic surveys targeting terrestrial (Nekola 2008) and aquatic (Hotopp 2012) species of potential conservation concern have only recently been initiated. Most Maine SGCN snails fall in the Stagnicola (aquatic) and Vertigo (terrestrial) genera and are thought to be limited by requirements for high water quality and/or extreme habitat specialization.

Freshwater Mussels (order: Unionoida, class: Bivalvia, phylum: Bivalvia)

Freshwater mussels are one of the few invertebrate taxa that have been a focus of intensive statewide survey efforts in Maine. From 1992 to present, MDIFW biologists systematically surveyed over 1,700 sites on the state's rivers, streams, lakes and ponds to document the distribution and status of mussels in Maine. Ten species are documented in Maine, all native, with the greatest diversity in the Kennebec and Penobscot River drainages, where all 10 species are often present in the same stretch of river (Nedeau et al. 2000). To date, the invasive zebra mussel (*Dreissena polymorpha*) has not been reported in Maine, but it occurs in Vermont and Massachusetts. If introduced, this species could have substantial impacts on native mussels and other aquatic biota. While freshwater mussel diversity is relatively low in Maine, their levels of imperilment are high with 6 of 10 species assigned Threatened and/or SGCN status, a trend mirrored nationally where over 3/4 of U.S. species are considered imperiled by various states in their range. The group shares several life history characteristics (long-lived, benthic, sedentary, filter feeding) that increase their exposure to a suite of anthropogenic stressors including water pollution, eutrophication, sedimentation, dams, and the degradation of riparian integrity along forested rivers and streams.

Mayflies (order: Ephemeroptera), Stoneflies (order: Plecoptera), and Caddisflies (order: Trichoptera) = all class: Insecta, phylum: Arthropoda

At least 162 species of mayflies are reported from Maine (Burian and Gibbs 1991, S. Burian, pers. communication). While this group is relatively well studied compared to many other insects, comprehensive surveys have never been conducted in Maine, and information on mayfly diversity and status is incomplete. Maine has two species of regionally endemic mayflies listed as state Threatened and 13 additional species listed as Special Concern and/or SGCN. Most of Maine's mayflies of conservation concern have narrow geographic distributions and occupy riverine habitats, with many of these specialized to small, cold, headwater settings.

At least 94 species of stoneflies, representing all nine North American families, are reported from Maine (Mingo 1983; S. Burian, pers. Communication). Typically inhabiting cold, fast-flowing streams and rivers, stoneflies are likely more diverse than what is currently documented for Maine. Two of Maine's three SGCN stoneflies are globally rare species with only historic occurrence data, emphasizing the need for further survey effort.

The species richness of caddisflies is higher in Maine than in most regions of North America (Huryn and Harris 2000) with recent collections suggesting a total that exceeds 300 species (Huryn and Harris 2000). At least an additional 50 species of the lesser-known "micro caddisflies" in the family Hydroptilidae are also reported from the state (Blickle and Morse 1966, Huryn and Harris 2000). All of Maine's four SGCN species are considered globally rare, with two species having only been described and documented (to date) in Maine.

Bees, Wasps, and Ants (order: Hymenoptera, class: Insecta, phylum: Arthropoda)

At least 52 families and 855 species of bees, wasps, and ants have been reported from Maine (Dearborn et al. 1983; Stubbs et al. 1995). These numbers are most certainly conservative estimates, as surveys specifically designed to assess species diversity for the Hymenoptera have never been conducted (Stubbs et al. 1995). With the help of NatureServe, MDIFW recently acquired sufficient information to begin assessing the conservation status of Maine's bumble bees (*Bombus spp*), one of the state's most valuable pollinators of wild plants and cultivated crops. Of the 17 species of bumble bees documented from Maine, 10 are considered SGCN due to the lack of modern records or range-wide declines. Habitat loss, introduced diseases and parasites, pesticides, and intensive agricultural practices are all believed to have played a role in bumble bee declines in Maine and across North America. A recently launched citizen-science atlasing effort (http://mainebumblebeeatlas.umf.maine.edu/) is designed to increase our knowledge of bumble bee distribution and status in Maine.

Significant declines of the globally rare Rusty-patched Bumble Bee (*Bombus affinis,* SGCN Priority 1) are increasingly evident in many different pollinators. Monitoring programs are critical to better understand distribution, status and conservation strategies. © Rich Hatfield

Beetles (order: Coleoptera, class: Insecta, phylum: Arthropoda)

There are at least 96 families and 2,871 species of beetles reported from Maine (Majka et al. 2011). Generally recognized as the largest order of insects, the Coleoptera have not been

systematically surveyed in Maine and there are likely hundreds of state species records yet to be discovered (D. Dearborn, pers. communication). The best studied group of beetles in Maine, and probably North America, is the tiger beetles (family Carabidae, subfamily Cicindelinae). Three of Maine's four SGCN beetles are Cicindelids, including a newly discovered state species record, the Cobblestone Tiger Beetle (*Cicindela marginipennis*) known from only one riverine population in the western foothills. The federally-endangered American Burying Beetle (*Nicrophorus americanus*) is known historically from southwestern and central Maine, but is now believed to be state extirpated.

Butterflies and Moths (order: Lepidoptera, class: Insecta, phylum: Arthropoda)
Colorful, conspicuous, and ecologically important, butterflies are among the few insect groups that have benefited from considerable attention by early Maine naturalists (collections exist from as far back as 1870) and recent citizen scientist efforts through the Maine Butterfly Survey (http://mbs.umf.maine.edu/). There are 123 documented species of butterflies and skippers representing five families in Maine (Webster and deMaynadier 2005). Of special note is the relatively high proportion (20%) of Maine butterflies that are listed as Extirpated (five species), Endangered or Threatened (eight species), or Special Concern and/or SGCN (12 species): a result consistent with global trends elsewhere for the group (Stein et al. 2000, Thomas et al. 2004). Primary threats to Maine's butterflies include habitat loss and degradation to development, succession, and aerial pesticides. Most of Maine's rarest butterflies are associated with three habitat types: swamps, peatlands, and dry barrens, with the latter especially vulnerable to multiple threats in southern Maine.

Crowberry Blue (*Plebejus idas empetri,* SGCN Priority 2) is one of Maine's few regional endemics. The global range of this butterfly is restricted to a narrow band of coastal crowberry bogs in Maine and Canada's Maritime Provinces. © Bryan Pfeiffer

There are at least 17 families and 1,152 species of moths (macro) reported from Maine (Brower 1974). An additional 41 families and 1,720 species of "micro-moths" are also documented to occur in the state (Brower 1983, 1984, D. Dearborn, pers. communication). Much of this information is based on historic collections and the focused efforts of a few individual researchers. Comprehensive statewide surveys and species assessments have never been done for this taxon with especially pronounced knowledge gaps for the micro Lepidoptera. Much of what we know about the conservation status of moths in Maine comes from NatureServe, which tracks 108 species from the state, of which 18 are ranked as globally rare. Currently Maine lists two species of moth as Threatened and 24 species as SC and/or SGCN, with several more likely to be extirpated (D. Schweitzer, pers. communication). Like the butterflies, several of Maine's rarest moths are associated with pitch pine-scrub oak barrens and peatlands and are especially sensitive to any threats to these habitats.

Dragonflies and Damselflies (order: Odonata, class: Insecta, phylum: Arthropoda)
Like butterflies, dragonflies and damselflies are a popular and conspicuous insect group that have attracted significant attention from both scientists and the general public. Much of what is currently known about Maine's Odonates is the result of an assessment of historic records, MDIFW targeted surveys, and the recently completed Maine Dragonfly and Damselfly Survey (MDDS) (http://mdds.umf.maine.edu/). These efforts have led to a list of 158 species of dragonflies and damselflies known from Maine and considerable knowledge on distribution, habitat relationships, and conservation status of most species (Brunelle and deMaynadier 2005). Three of Maine's Odonata are listed as E/T and 25 species as Special Concern and/or SGCN. A recent assessment of high priority Odonata for conservation action in the Northeast identified 21 species in Maine because of high regional responsibility (narrow geographic ranges centered in the Northeast) and/or moderate to high imperilment due to habitat vulnerabilities and potential population declines (White et al. 2014). Most of Maine's most vulnerable Odonata are associated with northern peatlands, lakes, and moderate to large forested rivers.

1.3.6 MARINE FAUNA (EXCEPT BIRDS)

General Overview
There are approximately 1,800 known marine animal species in the Gulf of Maine, but it is estimated that far more are still undiscovered, especially in the invertebrate and chordate groups (Census of Marine Life 2015). Maine state waters (<3 nautical miles offshore) host a wide array of species including invertebrates, diadromous fishes, groundfish, marine mammals, sea birds, pelagic finfishes, and more. The diversity of habitat within coastal and marine waters, the geographic location between the Artic and Temperate zones, as well as complex coastal circulation patterns all provide Maine with unique and delicately balanced species assemblages.

Maine is the southern extent for some marine fauna. Polar Lebbeid Shrimp (*Lebbeus polaris*), Sea Strawberry (*Gersemia rubiformis*), and Atlantic Great Piddock (*Zirfaea crispata*) are SGCN from 3 different invertebrate classes that are restricted to waters from Maine northward. Conversely, others are at the northernmost range limits in Maine. The Horseshoe Crab (*Limulus polyphemus*) and Leatherback Sea Turtle (*Dermochelys coriacea*) are SGCN with distributions that range southward from the Gulf of Maine.

Some marine fauna have undergone severe population reductions in recent years. Maine waters host some of the last remaining, sizeable populations in the U.S. Notable SGCN examples include Atlantic Salmon and Rainbow Smelt. Several marine SGCN have large oceanic ranges or are highly migratory as adults: Atlantic Bluefin Tuna (*Thunnus thynnus*), Atlantic Salmon, all whales, and all sea turtles. The majority of marine species have highly dispersive juvenile stages. Taken together, these attributes contribute to a unique balance of species assemblages, with each species relying on the suite of others for prey, prey buffering, habitat (e.g., mollusk reefs), and nutrients transfer.

Conservation Overview
Aside from the Sea Mink (Section 1.2.1), only one marine species is known to be extinct in the Gulf of Maine: the Eelgrass Limpet (*Lottia alveus*). The Eelgrass Limpet, a marine gastropod, was estimated to have become extinct in the 1930s due to massive die-offs of eelgrass, which served as its primary habitat (Carlton et al. 1991).

A small number of marine species are protected via federal listing as E/T: three diadromous fish, six whales and four sea turtles. Eleven of these are also state-listed under MESA. The National Marine Fisheries Service (NMFS) designates some fauna as Species of Concern (SoC): three diadromous fishes, three groundfish and two elasmobranchs. However, numerous other species warrant conservation attention. State-listing of marine fauna under MESA is limited by statute to those federally listed as E/T.

While many marine species are subject to commercial and recreational fisheries, or being caught indirectly as bycatch, some of these species warrant conservation measures beyond fisheries management plans. The 2015 Maine Wildlife Action Plan lists 71 SGCN: nine diadromous fish, six groundfish, a pelagic fish (Bluefin Tuna,*Thunnus thynnus*), one ammodyte (American Sand Lance, *Ammodytes americanus*), five sharks, four skates, four sea turtles, six whales, one porpoise, and 34 invertebrates (= eight bivalves, one brachipod, two Cnidaria, 11 echinoderms, seven gastropods, and five arthropods).

The following is a brief review of the conservation status and imperilment patterns for select groups of marine taxa that host significant numbers of the state's SGCN.

Marine Invertebrates

Although a large proportion of the known marine animal species in the Gulf of Maine are invertebrates (~80%), less than half of the marine SGCN are invertebrates (34 species, 48% of SGCN). This is primarily due to a lack of knowledge about the status, distribution, or abundance of these species. Marine invertebrates face many of the same research challenges as terrestrial and freshwater invertebrates, including their small size, and small niches/habitats. Additionally, financial and logistical challenges specific to working in the marine environment compound these issues. Since 24% of the marine SGCN are commercially or recreationally harvested, some may have existing monitoring programs in place. However, there is a need for increased knowledge about population trends and reasons for decline for many of the invertebrate SGCN.

Sea Cucumbers (*Thyonidium drummondii*, SGCN Priority 2) and several other invertebrates are an important foundation of the marine ecosystem that may face additional risks from warming waters and acidification in the Gulf of Maine. © Maggie Hunter

Marine invertebrates vary in life history and are thus subject to a variety of stresses. Most juvenile invertebrates are found in the water column as zooplankton, and some species are sessile during at least part of their life cycle. Sessile organisms can be slow to recolonize an area after an event that reduces their abundance. Many invertebrates can be sensitive to changes in water quality including non-point source pollution and thermal changes. Calcareous invertebrates may be susceptible to changes in water pH resulting from increased dissolved carbon dioxide in the water. SGCN vulnerable to ocean acidification include Softshell Clam (*Mya arenaria*) and Gaper Clam (*Mya truncata*). With recent and sometimes rapid changes in coastal development, increases in sea surface temperature, and decreases in ocean pH, understanding if and

how these species are adapting and how their ranges and habitats are affected is imperative for developing successful conservation strategies.

Finfish: Diadromous, Groundfish, and Ocean Migratory Fish

There are over 50 commonly found finfish species in Maine waters, most of which have experienced population declines in the past 10-50 years. A total of 16 finfish species have been identified as SGCN for Maine, and 11 of those species have experienced recent, significant declines in abundance. Overfishing has been attributed to the decline of many of these species, including Atlantic Cod (*Gadus morhua*) and Haddock (*Melanogrammus aeglefinus*).

Some SGCN declines may be due to environmental changes and habitat alterations: e.g., Atlantic Wolfish (*Anarhichas lupus*) and Spotted Wolffish (*Anarhichas minor*). Fish populations can be slow to rebound after marked declines, even after fishing pressure has been reduced. This may be due to populations having been reduced below a critical threshold, combined with changes in habitat including increasing water temperature, reduction of bottom structure following trawling, and changes in predator-prey abundances. Key to the conservation of these species are efforts to identify spawning locations, migration patterns, habitat use, impacts of changing water chemistry and temperature, as well as how changing species assemblages will affect predator-prey relationships.

Diadromous fishes face a unique set of threats as they migrate between marine and freshwater. Obstructions in rivers and streams, alterations in water flow, and water runoff contamination and high nutrient inputs have all led to the reduction of species' populations. While some of these species respond well to existing management strategies, like improving fish passage and seed-stocking (e.g., Alewives, *Alosa pseudoharengus*), others continue to maintain only small populations despite conservation efforts (e.g., Atlantic Salmon). Continuing to improve fish passage and water quality is necessary to recover these species. Additionally, recent research has shown the importance of interspecific relationships. For example, the timing of spawning and migration patterns may provide prey-buffering for species of reduced numbers – e.g., schools of river herring may reduce predation of Atlantic Salmon smolts.

Alewives (SGCN Priority 2) are among the eight diadromous fish recognized as SGCN in this Plan. Most Maine rivers once supported major spawning runs, but many runs are currently less than half of their estimated potential. © Sharon Fiedler

Whales and Sea Turtles

There are at least 22 species of marine mammals and turtles that are known to frequent the waters of the northern Gulf of Maine. Many are SGCN, including six species of large whales federally-listed as Endangered since 1970: North Atlantic Right (*Eubalaena glacialis*), Humpback (*Megaptera novaeangliae*), Finback (*Balaenoptera physalus*), Sei (*Balaenoptera borealis*), Sperm (*Physeter macrocephalus*), and Blue (*Balaenaoptera musculus*). There are four species of federally-listed sea turtles: Kemp's Ridley (*Lepidochelys kempii*), Leatherback (*Dermochelys coriacea*), Green (*Chelonia mydas*), and the Northwest Atlantic Ocean distinct population segment of Loggerhead Turtles. All range widely in international waters with some presence in state jurisdiction in the Gulf of Maine.

The North Atlantic Right Whale, with a population now estimated over 400 is considered one of the most endangered of the large whales. For decades, since the end of commercial whaling, the Right Whale has shown slow recovery. The lack of Right Whale recovery has been linked to collisions with ships, entanglement in specific fishing gear, habitat degradation, and disturbance from vessels. Additionally, the Maine gillnet and lobster fisheries are documented as causing serious injury and mortality to this SGCN, as well as to other bycatch. Consequently MDMR, in collaboration with Maine's commercial fishing industries, developed a Comprehensive Marine "Wildlife Conservation Strategy for Large Whales and Sea Turtles" to reduce the risk posed by these fisheries to North Atlantic Right Whales and other protected resources. MDMR has a strategic role to balance commercial lobster and gillnet fisheries within State waters and impacts to large whales and sea turtles. The State of Maine is fully committed to the protection of Atlantic large whales and sea turtles, while at the same time protecting the economic and operational realities of the State's fisheries.

1.4 DISTRIBUTION OF MAINE'S SGCN AND ASSOCIATED HABITATS

Best management practices for State Wildlife Action Plan updates (AFWA 2012) recommend compiling information on the distribution of each SGCN and its associated habitats to help prioritize areas within the state for conservation actions. Range, distribution, and observations all describe geographic arrangements of elements (species and habitats) across a landscape. However, these terms have different meanings. Range is the broadest geographic extent across which an element could be found. The distribution of an element is the spatial pattern of its occurrence within its range and may be scattered, random, clustered, or regular depending on the population/community dynamics of the element and the heterogeneity of the landscape. Further, individual observations of an element may or may not be evidence of a viable or persistent population.

The sampling unit used for a spatial analysis should be appropriate to the scale and resolution of the input data and the needs it is intended to meet. We chose Maine's municipal township boundaries (for non-aquatic SGCN) and United States Geological Survey (USGS) HUC12 sub-watersheds (for aquatic SGCN) as the sampling units for this analysis. Both are familiar to the Maine conservation community and the general public and can easily be generalized to broader scales (e.g., counties, watersheds, or ecoregions).

We used our best available information to develop "species conservation range maps" for SGCNs in Maine. These maps are intended to identify within Maine the broadest geographic extent across which conservation actions might benefit each SGCN. These maps are not meant to convey the ecological ranges or distributions of these species. Because we used habitat to qualify these maps, however, for some species the maps may approximate their ecological distribution subject to 1) accuracy and resolution of the habitat mapping, 2) generalization of observation data to the sub-watershed/township scale, and 3) the existence of undocumented areas occupied by the species.

1.4.1 METHODOLOGY FOR MAPPING ELEMENT 1 – SGCN DISTRIBUTIONS

Our primary source of observation data was MDIFW's "Endangered, Threatened, and Special Concern" (ETSC) database, which includes observations on some, but not all of Maine's SGCNs. We supplemented MDIFW's ETSC data with SGCN observations from the following:

- Maine Damselfly and Dragonfly Atlas; (http://www.maine.gov/ifw/wildlife/species/invertebrates/damselfly_dragonfly.html)
- Maine Butterfly Survey; (http://www.maine.gov/ifw/wildlife/species/invertebrates/butterfly_survey.html)
- Maine Mussel Survey; (http://www.maine.gov/ifw/wildlife/species/invertebrates/freshwater_mussels.html)
- Maine Amphibian and Reptile Atlas Project; (http://www.maine.gov/ifw/wildlife/species/reptiles/atlasing_project.html)
- North American Breeding Bird Survey; (https://www.pwrc.usgs.gov/bbs/)
- Essential Wildlife Habitats mapped under Maine's Endangered Species Act
- MDIFW radio-telemetry locations and track surveys for Canada Lynx
- Shorebird Areas mapped under Maine's Natural Resources Protection Act
- MDIFW vernal pool locations with Blue-spotted Salamander observations
- MDIFW fish data sets
- eBird
- Maine Bumble Bee Atlas; (http://mainebumblebeeatlas.umf.maine.edu/)
- Maine Mayfly Database (http://www.maine.gov/ifw/wildlife/species/invertebrates/rare_mayflies.html)

These data sets varied greatly in data format. Some data sets were geospatial (i.e., GIS files), whereas others stored only attributes but included geographic coordinates that we used to generate geospatial representations. Most were point data, but some linked observations to unmapped sites along survey transects and others mapped observations as polygons. Thus, our first step in generating SGCN distributions was to standardize and assimilate these data sets. We then used all of these observations to determine in which Maine townships and sub-watersheds each SGCN occurred. We did not attempt to count observations of an SGCN within a township or sub-watershed or to estimate densities because sampling effort varied geographically and among data sets. Some observations also may have been duplicated across data sets. Although an observation from any of the data sets could indicate presence of the SGCN in a particular township or sub-watershed, we presented the data sets as separate GIS layers so users could compare the data sources or view them collectively for an SGCN.

1.4.2 METHODOLOGY FOR MAPPING ELEMENT 2 – HABITATS

We used a modified version of the Northeast Ecological Systems, 2014 Update (Ferree and Anderson 2013, http://northatlanticlcc.org/data/regional-spatial-data/terrestrial/tnc-terrestrial-habitat/ne-terrestrial-habitat-map) mapped by the North Atlantic Landscape Conservation Cooperative (NALCC), the Northeast Association of Fish and Wildlife Agencies, and The Nature Conservancy to map habitats for each SGCN. We updated their map for habitat classes for which we had and/or required more accurate/higher resolution spatial data including:

- Rivers and streams classified by MDIFW to small, medium, or large river or headwater/creek
- Lakes and ponds classified by MDIFW to oligotrophic, eutrophic, mesotrophic/intermediate, or dystrophic
- Tidal flats classified by substrate type by the National Wetlands Inventory
- Tidal marshes as mapped/classified by the Maine Natural Areas Program
- Lake and river shores classified by the National Wetlands Inventory
- Intertidal and subtidal habitats as mapped/classified by the Maine Department of Marine Resources

Using the resulting habitats, species specialists from MDIFW, with input from conservation partners, associated each SGCN with each ecological system and habitat macrogroup it was believed to use. We then identified the townships and sub-watersheds where these associated habitats occurred for each SGCN. Part of our goal was to identify unoccupied habitats or areas of undocumented SGCN presence. Some habitats, however, extended beyond the range of an SGCN and therefore presented an unrealistic estimate of its potential distribution. As part of our 2005 SWAP conservation actions, Maine divided the state into ecoregions and surveyed them for a variety of species including many SGCN. This work was the source for many of the SGCN observations in MDIFW's ETSC database. The species specialists associated each SGCN with each ecoregion where it was believed to occur and we then used those ecoregional associations to constrain the habitat mapping to more realistic extents.

The Maine GAP Analysis project (Krohn et al. 1998) used a similar process (i.e., combining observation data with habitat maps) to estimate distributions for vertebrate species in Maine. We included the GAP data in our species conservation range maps, calling it "potential habitat." Despite having fewer observations to work with and a much simpler habitat data set, the GAP distributions are quite similar to our updated distributions for many SGCNs.

1.4.3 SPECIES CONSERVATION RANGE MAPS

Our large number of SGCN, observation data sets, and habitat associations precluded mapping by hand. Instead, we used our SWAP database and a series of custom Python programs to automate map production. This approach will allow maps to be updated with relative ease for additional SGCNs as new observation data becomes available, our understanding of habitat relationships improve, or if the habitat map changes. The process generates a series of data tables linking SGCNs to townships and sub-watersheds based on observations of the SGCN and mapping of its associated habitats. Data for each SGCN then is used to update a map template that produces a PDF document in which the various input data sets can be toggled on or off according to user preference.

All of the SGCN species conservation range maps will be served to conservation partners and the public as digital files and/or via a web mapping service. Figure 1-1 illustrates some static images of a few SGCN example maps illustrating some of the variation in distribution patterns such as edge-of-range, rare but scattered, concentrated (e.g., coastal, mountainous), and ubiquitous.

1.4.4 SGCN DISTRIBUTION SYNTHESIS

Summarizing SGCN patterns statewide was a primary goal of mapping species conservation ranges to determine where conservation actions might be best applied to benefit the most species. One summary method is by taxonomic class—for example, all birds. This approach benefits conservation partners interested in working with certain groups of SGCN. Other groups might be interested in SGCN associated with particular habitats (e.g., emergent marshes), especially when a specific conservation action is tied to a habitat type (e.g., improved riparian buffer conservation). As with the species conservation ranges, we based our SGCN summaries on USGS subwatersheds for aquatic SGCN classes and habitats and on Maine townships for non-aquatic SGCN classes and habitats. Our goal is to present these summaries in an interactive map format where users can select which SGCN classes, habitats, and landscape units to use. For purposes of this static document, we have included a few possible examples (Figure 1-2).

Figure 1-1. Examples of conservation range maps by USGS sub-watersheds for aquatic SGCNs and by Maine townships for terrestrial SGCNs. Red/yellow shaded areas indicate an SGCN's presence based on observation data; green/blue indicates presence of potential habitats associated with the SGCN.

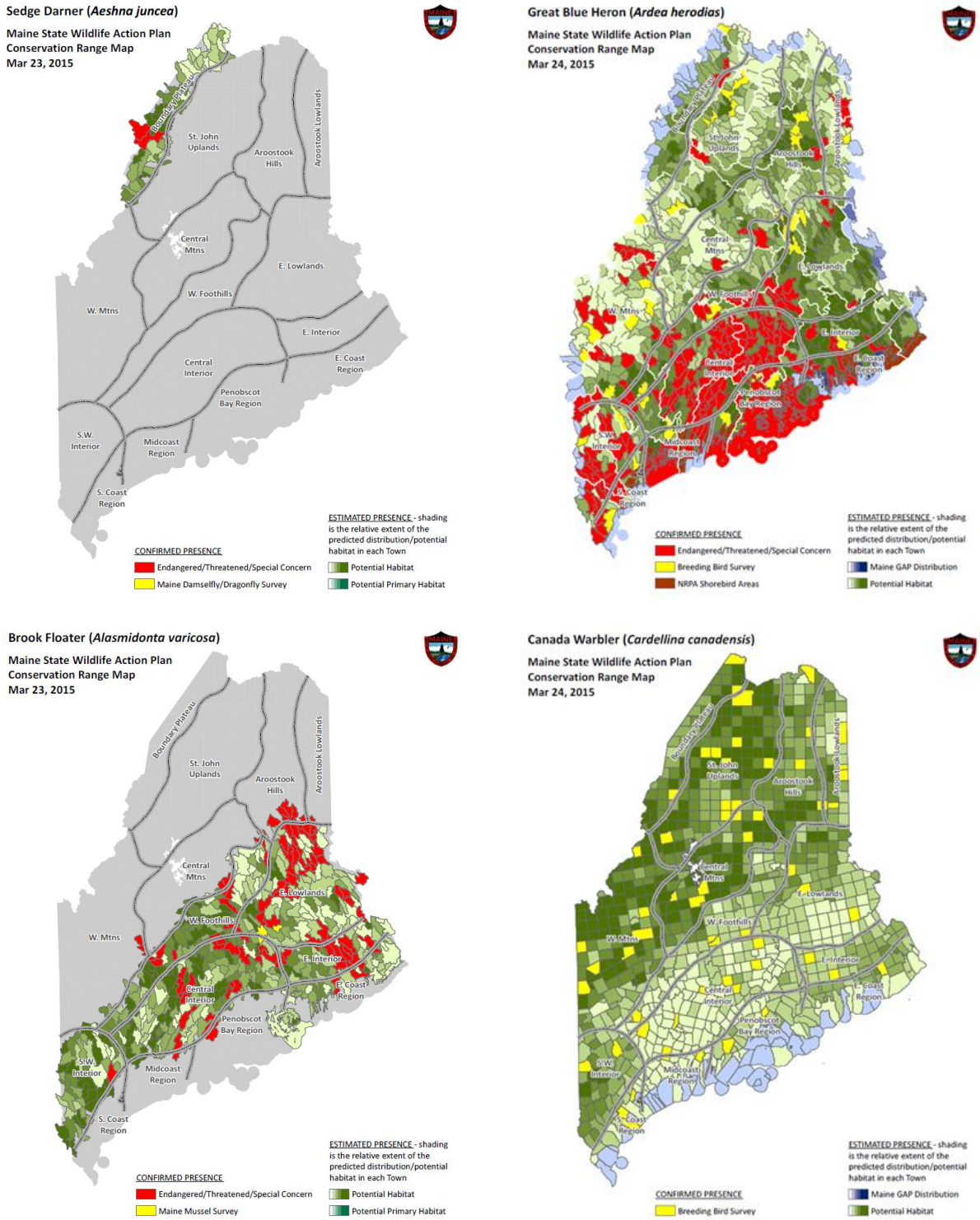
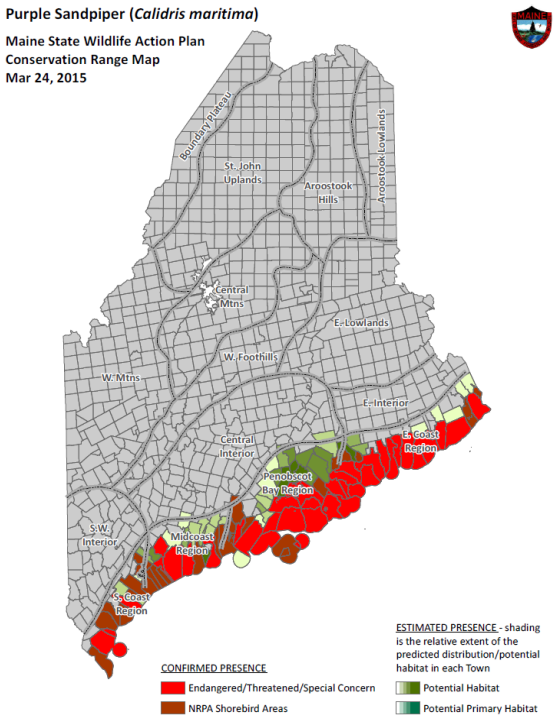
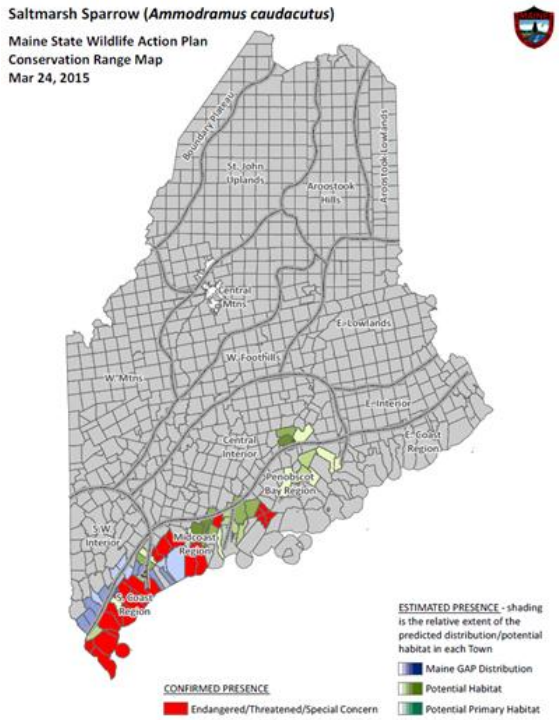
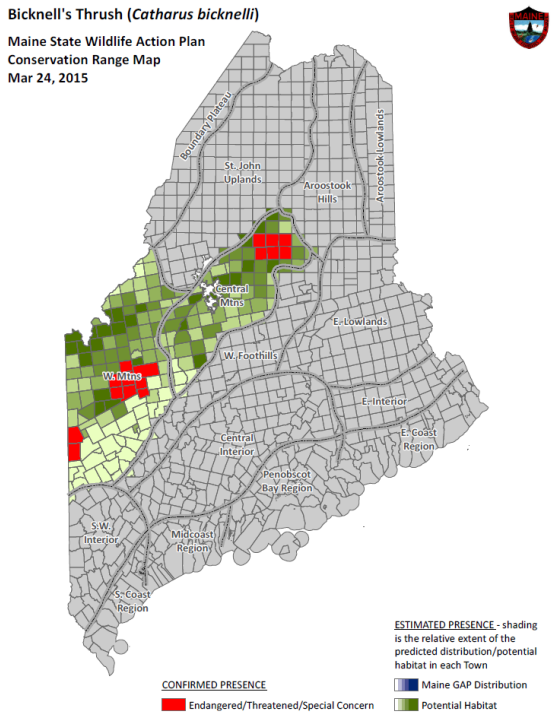


Figure 1-1. *continued: page 2 of 2.*







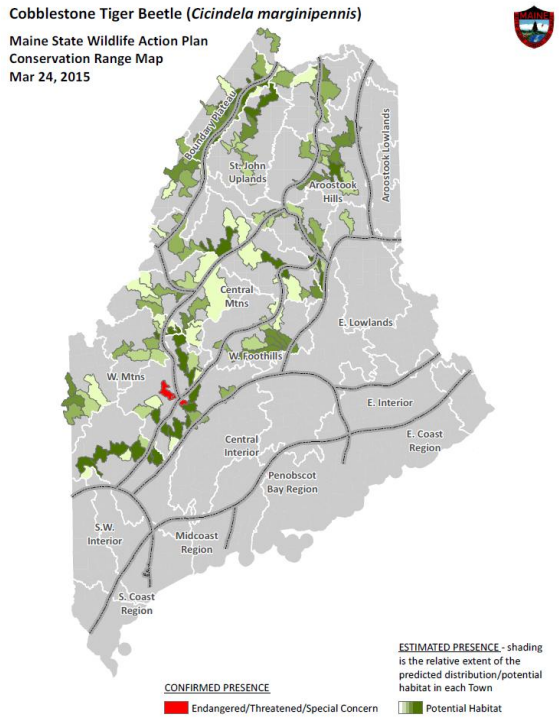
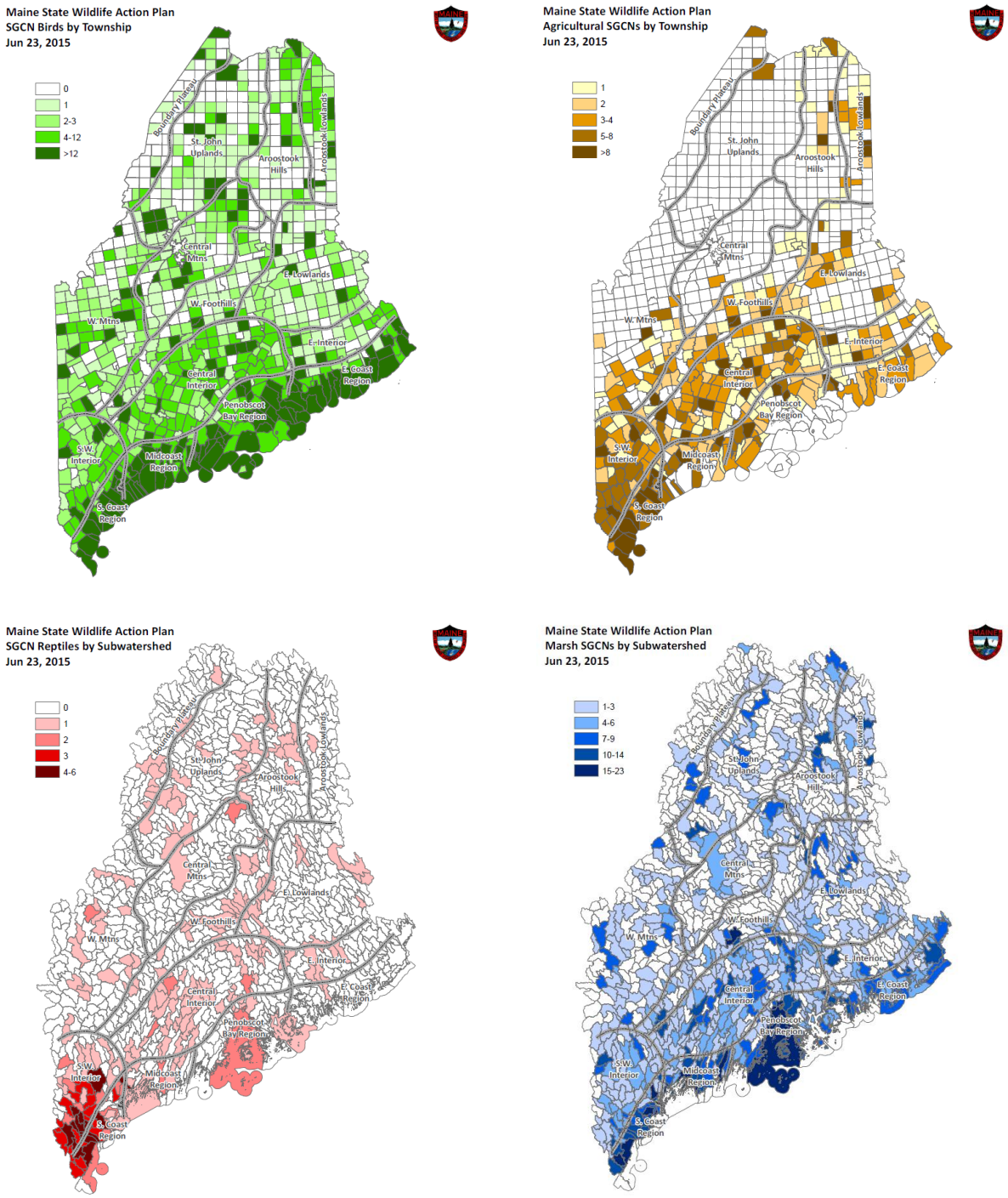


Figure 1-2. Examples of SGCN summaries by taxa class and habitat associations for USGS sub-watersheds and Maine townships.



1.5 DESIGNATION CRITERIA FOR MAINE'S SGCN - 2015

MDIFW biologists, with review and cooperation from conservation partners and species experts, offer the following criteria (and subcriteria) for designating Maine's eligible Species of Greatest Conservation Need (SGCN). The criteria and process for selecting SGCN are intended to be comprehensive, transparent, and based on best available science for prioritizing species of conservation concern at local, regional, and global scales. As proposed, fish and wildlife species (and subspecies) designated as priority 1 or 2 or 3 qualify as SGCN, and are thus eligible for State Wildlife Grant funding. The primary themes for SGCN prioritization include risk of extirpation, population trend, endemicity, and regional conservation responsibility. Secondary themes for SGCN prioritization include climate change vulnerability, survey knowledge, and cultural significance to Maine tribes (Table 1-2). Finally, only Maine extant species were considered for designation as SGCN in 2015.

"The criteria and process for selecting SGCN are intended to be comprehensive, transparent, and based on best available science for prioritizing species of conservation concern at local, regional, and global scales."

1.5.1 PRIORITY 1 (HIGHEST PRIORITY) SGCN

Generally, Priority 1 species include those that meet <u>two or more</u> of the following criteria:

1. **Risk of Extirpation** – Have current (or proposed) state or federal E/T status, or global endangerment status (International Union for the Conservation of Nature [IUCN])

2. **Recent Significant Declines** – A species currently (within 15 years) undergoing steep population decline statewide or regionally, which has already led to, or if unchecked is likely to lead to, local extinction and/or significant range contraction.

3. **Regional Endemic** – A species whose global geographic range is at least 90% contained within the area defined by USFWS Region 5, the Canadian Maritime Provinces, and southeastern Quebec (south of the St. Lawrence River).

4. **High Regional Conservation Priority** -- Identified as a high regional or global species of conservation concern by <u>one</u> of the following species assessment authorities (see Table 1-2 for Priority 1 subcriteria):

    a. Northeast Endangered Species and Wildlife Diversity Technical Committee [NESWDTC] (all vertebrates and freshwater mussels) – Therres 1999
    b. Northeast Regional Synthesis [RSGCN] (all vertebrates, freshwater mussels, and tiger beetles) – Terwilliger 2013
    c. NatureServe (all taxa) – NatureServe 2014
    d. Partners in Flight (land birds). Partners In Flight Science Committee 2012 Species Assessment Database, version 2012.
    e. North American Waterbird Conservation Plan [NAWCP] (all waterbirds) – Kushlan et al. 2002 and 2006 (marsh birds)
    f. North Atlantic Regional Shorebird Plan [NARSP] (shorebirds) – Clark and Niles 2000

g. U.S. Shorebird Conservation Plan [USSCP] (shorebirds) – U.S. Shorebird Conservation Plan 2004
h. Birds of Conservation Concern (all birds) – USFWS 2008
i. Northeast Partners In Amphibian and Reptile Conservation [NEPARC] (herpetofauna) – NEPARC 2010
j. American Fisheries Society (freshwater & diadromous fish) – Jelks et al. 2008
k. Atlantic States Marine Fisheries Commission Stock Assessments [ASMFC] - ASMFSC 2012
l. Eastern Brook Trout Joint Venture [EBTJV] - EBTJV 2011
m. Northeast Odonate Assessment (damselflies & dragonflies) – White et al. 2014

Note: Priority 1 designation is not intended for:

- species that have expanded their range into Maine within the past 50 years, OR
- species with only historic documentation (generally prior to mid-1970s)

1.5.2 PRIORITY 2 (HIGH PRIORITY) SGCN

Generally, Priority 2 species include:

- all other current State (Endangered, Threatened, or Proposed), Federal (Endangered, Threatened, Candidate, or Proposed) or Global (IUCN Critically Endangered or Threatened) risk of extirpation species, OR
- those that meet at least two of the following criteria:

1. **Global Vulnerability** – A species designated as Vulnerable by the International Union for the Conservation of Nature (IUCN).

2. **State Special Concern** – Listed as a current or proposed species of Special Concern in Maine.

3. **Recent Significant Declines** – A species currently (within 30 years) undergoing steep population decline statewide or regionally, which has already led to, or if unchecked is likely to lead to, local extinction and/or significant range contraction.

4. **Regional Endemic** – A species whose global geographic range is at least 90% contained within the area defined by USFWS Region 5, the Canadian Maritime Provinces, and southeastern Quebec (south of the St. Lawrence River).

5. **High Climate Change Vulnerability** – A species identified as highly vulnerable by Whitman et al. 2013 or Galbraith et al. 2014 (or other published source).

6. **Historical** -- Species currently listed as state (SH) or global (GH) Historical (by MDIFW or NatureServe) that have a reasonable probability of population rediscovery with further survey.

7. **High Regional Conservation Priority** -- Identified as a high regional or global species of conservation concern by one of the following authorities (see Table 1-2 for Priority 2 subcriteria):

a. Northeast Endangered Species and Wildlife Diversity Technical Committee [NESWDTC] (all vertebrates and freshwater mussels) – Therres 1999
b. Northeast Regional Synthesis [RSGCN] (all vertebrates, freshwater mussels, and tiger beetles) – Terwilliger 2013
c. NatureServe (all taxa) – NatureServe 2014
d. Partners in Flight (land birds). Partners In Flight Science Committee 2012 Species Assessment Database, version 2012.
e. North American Waterbird Conservation Plan [NAWCP] (all waterbirds) – Kushlan et al. 2002 and 2006 (marsh birds)
f. North Atlantic Regional Shorebird Plan [NARSP] (shorebirds) – Clark and Niles 2000
g. U.S. Shorebird Conservation Plan [USSCP] (shorebirds) – U.S. Shorebird Conservation Plan 2004
h. Birds of Conservation Concern (all birds) – USFWS 2008
i. Northeast Partners In Amphibian and Reptile Conservation [NEPARC] (herpetofauna) – NEPARC 2010
j. American Fisheries Society (freshwater & diadromous fish) – Jelks et al. 2008
k. Atlantic States Marine Fisheries Commission Stock Assessments [ASMFC] - ASMFSC 2012
l. Eastern Brook Trout Joint Venture [EBTJV] - EBTJV 2011
m. Northeast Odonate Assessment (damselflies & dragonflies) – White et al. 2014
n. Committee on the Status of Endangered Wildlife in Canada [COSEWIC] (all taxa) – COSEWIC 2015

Note: Priority 2 designation is <u>not</u> intended for species that have expanded their range into Maine within the past 25 years.

1.5.3 PRIORITY 3 (MODERATE PRIORITY) SGCN

Generally, Priority 3 species include those that meet <u>at least one</u> of the following criteria:

1. **Global Vulnerability** – A species designated as Vulnerable by the International Union for the Conservation of Nature (IUCN).

2. **State Special Concern** – Listed as a current or proposed species of Special Concern in Maine.

3. **Recent Significant Declines** – A species currently (within 30 years) undergoing steep population decline statewide or regionally, which has already led to, or if unchecked is likely to lead to, local extinction and/or significant range contraction.

4. **Regional Endemic** – A species whose global geographic range is at least 90% contained within the area defined by USFWS Region 5, the Canadian Maritime Provinces, and southeastern Quebec (south of the St. Lawrence River).

5. **High Climate Change Vulnerability** – A species identified as highly vulnerable by Whitman et al. 2013 or Galbraith et al. 2014 (or other published source).

6. **Understudied Rare Taxa** -- Recently documented or poorly surveyed rare species for which risk of extirpation is potentially high (e.g. few known occurrences), but insufficient data exist to conclusively assess distribution and status.

7. **Historical** -- Species currently listed as state (SH) or global (GH) Historical (by MDIFW or NatureServe) that have a reasonable probability of population rediscovery with further survey.

8. **Culturally Significant** -- Species identified as both biologically vulnerable and culturally significant by Maine's tribes.

9. **High Regional Conservation Priority** -- Identified as a high regional or global species of conservation concern by <u>one</u> of the following authorities (see Table 1-2 for Priority 2 subcriteria):

    a. Northeast Endangered Species and Wildlife Diversity Technical Committee [NESWDTC] (all vertebrates and freshwater mussels) – Therres 1999
    b. Northeast Regional Synthesis [RSGCN] (all vertebrates, freshwater mussels, and tiger beetles) – Terwilliger 2013
    c. NatureServe (all taxa) – NatureServe 2014
    d. Partners in Flight (land birds). Partners In Flight Science Committee 2012 Species Assessment Database, version 2012.
    e. North American Waterbird Conservation Plan [NAWCP] (all waterbirds) – Kushlan et al. 2002 and 2006 (marsh birds)
    f. North Atlantic Regional Shorebird Plan [NARSP] (shorebirds) – Clark and Niles 2000
    g. U.S. Shorebird Conservation Plan [USSCP] (shorebirds) – U.S. Shorebird Conservation Plan 2004
    h. Birds of Conservation Concern (all birds) – USFWS 2008
    i. Northeast Partners In Amphibian and Reptile Conservation [NEPARC] (herpetofauna) – NEPARC 2010
    j. American Fisheries Society (freshwater & diadromous fish) – Jelks et al. 2008
    k. Atlantic States Marine Fisheries Commission Stock Assessments [ASMFC] - ASMFSC 2012
    l. Eastern Brook Trout Joint Venture [EBTJV] - EBTJV 2011
    m. Northeast Odonate Assessment (damselflies & dragonflies) – White et al. 2014
    n. Committee on the Status of Endangered Wildlife in Canada [COSEWIC] (all taxa) – COSEWIC 2015

Note: Priority 3 designation is <u>not</u> intended for species that have expanded their range into Maine within the past 10 years.

Table 1-2. Vulnerability concepts and criteria for designating Maine's SGCN.

Vulnerability Factor	Authority (Source)	Metric[1]	Potential Priority	Primary Taxa
Extirpation	IUCN	"CR" or "EN"	1-2	all
Extirpation	IUCN	"VU"	1-3	all
Extirpation	ESA (USFWS)	"E" or "T" or "C" or "P"	1-2	all
Extirpation	MESA (MDIFW)	"E" or "T" or "P"	1-2	all
Potential Extirpation	MDIFW	"Special Concern"	2-3	all
Potential Extirpation	NMFS	"Species of Concern"	2-3	marine
Recent Decline	MDIFW (multiple)	Steep declines < 15 yrs.	1	all
Recent Decline	MDIFW (multiple)	Steep declines < 30 yrs.	2-3	all
Regional Endemics	MDIFW (multiple)	>90% of geographic range in the Northeast	1-3	all
Specialist Group Assessment	NEFWDTC (Therres 1999)	> 1: risk, data, area, spec, federal concerns	1-3	vertebrates & mussels
Specialist Group Assessment	RSGCN (Terwilliger & NEFWDTC 2013)	"high responsibility" AND "very high concern"	1	vertebrates
Specialist Group Assessment	RSGCN (Terwilliger & NEFWDTC 2013)	"high responsibility" AND "high concern"	2-3	vertebrates
Specialist Group Assessment	NatureServe (2014)	"G1-G2" (vertebrates) "G1" (invertebrates)	1	all
Specialist Group Assessment	NatureServe (2014)	"G3" (vertebrates) "G2" (invertebrates)	2-3	all
Specialist Group Assessment	COSEWIC (2015)	"E" or "T" in Atlantic Canada	2-3	all
Specialist Group Assessment	Partners in Flight (2012)	"concern, regional concern, or stewardship species" in US & CA	1-3	landbirds
Specialist Group Assessment	NAWCP (Kushlan et al. 2002, 2006)	"high concern"	1-3	waterbirds
Specialist Group Assessment	USSCP & NARSP (USSCP 2004; Clark & Niles 2000)	"highly imperiled" OR species of "high concern"	1-3	shorebirds
Specialist Group Assessment	Birds of Conservation Concern (USFWS 2008)	Listed in BCR 14 or 30	1-3	all birds
Specialist Group Assessment	NEPARC (2010)	"high responsibility" + "high concern" (red list)	1-3	reptiles & amphibians
Specialist Group Assessment	American Fisheries Society (Jelks et al. 2008)	Imperiled	1-3	fish

Table 1-2. *continued: page 2 of 2.*

Vulnerability Factor	Authority (Source)	Metric[1]	Potential Priority	Primary Taxa
Specialist Group Assessment	ASMFC (2012)	"decreasing, unstable/decreasing, or local subpopulation"	1-3	marine fish
Specialist Group Assessment	EBTJV (2011)	"imperiled"	1-3	brook trout
Specialist Group Assessment	Northeast RCN Odonate Assessment (White et al. 2014)	"high vul" OR ["mod vul" + "primary-significant" responsibility]	1-3	damselflies & dragonflies
Climate Change	Manomet (Whitman et al. 2013)	"high vulnerability" + > "low confidence"	2-3	all
Climate Change	(Galbraith et al. 2014)	"high concern, highly imperiled, or critical"	2-3	shorebirds
Climate Change	Multiple	miscellaneous	2-3	marine
Rare & Poorly Surveyed	MDIFW	specialized habitat + <5 EOs and "G4-G5" OR < 10 EOs and "G3"	3	all
Historical	MDIFW & NatureServe (2014)	SH/GH and high rediscovery potential	2-3	all
Culturally Significant	Maine Tribes	culturally significant + biologically vulnerable	3	all

[1]**Metric Notes:** CR = Critically Endangered, EN = Endangered, VU = Vulnerable, E = Endangered, T = Threatened, C = Candidate, P = Proposed, G1-G5 & GH = NatureServe Global rarity ranks (range ranks rounded as follows: G1G2=G1, G1G3=G2), SH = State Historic, BCR = Bird Conservation Region, EO = Element Occurrences

1.6 MAINE'S 2015 SGCN

Vulnerability concepts and criteria (Table 1-2) adopted in this Plan identified 378 SGCN in Maine. This number is significantly greater than the 213 SGCN recognized in the 2005 Plan, however of the 2005 total, 33 species have lost SGCN eligibility in 2015 (Appendix 1-5). The net expansion of the SGCN list between 2005 and 2015 mostly reflects updates and additions in SGCN designation criteria, recent significant declines for some species, more scrutiny of invertebrate taxa not assessed in 2005, and much greater attention to marine fauna now at risk in the Gulf of Maine.

For example, Maine's 2005 CWCS identified only 13 marine SGCN (five finfish, five whales, and three sea turtles), of which 11 were federally-listed as E/T. All 13 retain their SGCN status, but the 2015 Plan identifies 62 additional fauna in the Gulf of Maine as SGCN, a tally that does not consider species (especially marine invertebrates) for which there are no data to evaluate vulnerability. MDMR, the lead state agency for marine fauna (except birds), focused SGCN designations on species with reliable abundance indices and/or significant stressors.

The 2015 compilation of Maine's SGCN (Table 1-3) includes 378 fauna. Each cell for a species is linked to an SGCN Report that summarizes qualification criteria, habitat associations (Element 2), significant stressors to the species or its habitats (Element 3), potential conservation actions (Element 4), and conservation range maps. Click on the cell with the scientific name / common name to view reports of these details for each Maine SGCN, including data (e.g., range) that can be updated during the life of the Plan.

"The net expansion of the SGCN list between 2005 and 2015 mostly reflects changes in SGCN designation criteria, recent significant declines for some species, more scrutiny of invertebrate taxa not assessed in 2005, and much greater attention to marine fauna now at risk in the Gulf of Maine."

Priority tiers of SGCN in this Plan ultimately are based on the degree of vulnerability for each species. Tier 1 SGCN receive utmost concern throughout the various Plan elements. However, higher SGCN priority levels do not necessarily infer they are absolute priority conservation targets. Instead, habitat-based conservation actions, or those that address a guild of several SGCN, may be more significant than a strategy that benefits a single Tier 1 SGCN. Feasibility, outcomes, and cost of conservation actions also influence Plan priorities. Among the 378 SGCN recognized in this Plan, the total number of SGCN by priority level separate as follows:

- Tier 1 (Highest Priority) – 58 SGCN
- Tier 2 (High Priority) – 131 SGCN
- Tier 3 (Moderate Priority) – 189 SGCN

Table 1-3. Maine's SGCN (by taxa class) and qualifying factors, 2015.

CLASS Order *Scientific name*[1] Common name[1]	Maine SGCN Tier		Scale of Conservation Concern[2]				Number of Other Factors[3]
	2005	2015	State	Regional	National	Global	
ACTINOPTERYGII (ray-finned fishes; N = 33)							
Acipenseriformes (sturgeons and paddlefishes; N = 2)							
Acipenser brevirostrum Shortnose sturgeon	1	1	E	yes	E	VU	
Acipenser oxyrinchus Atlantic sturgeon	1	1		yes	T		1
Anguilliformes (true eels; N = 1)							
Anguilla rostrata American Eel	1	2	SC	yes			2
Clupeiformes (herrings; N = 3)							
Alosa aestivalis Blueback Herring	no	1		yes	SoC	VU	2
Alosa pseudoharengus Alewife	no	2		yes	SoC		2
Alosa sapidissima American Shad	2	1		yes			3
Cypriniformes (carps, minnows, loaches and allies; N = 7)							
Catostomus catostomus Longnose Sucker	2	3					1
Erimyzon oblongus Creek Chubsucker	no	3	SC				1
Hybognathus regius Eastern Silvery Minnow	no	3					1
Margariscus margarita Pearl Dace	no	3					1
Notropis bifrenatus Bridle Shiner	no	2	SC	yes			
Notropis heterolepis Blacknose Shiner	no	3					1
Rhinichthys cataractae Longnose Dace	no	3	SC				1
Esociformes (pikes and mudminnows; N = 1)							
Esox americanus americanus Redfin Pickerel	1	2	E				

[1] Click on a species name to launch a full SGCN report summarizing associated habitats, stressors, and conservation strategies for that species.
[2] State & Federal ESA Codes: Endangered Species [E]; Threatened Species [T]; Candidate Species [C]; Special Concern Species [SC]; Species of Concern [SoC]. IUCN Codes: Critically Endangered [CR]; Endangered [EN]; Vulnerable [VU].
[3] Other potential qualifying factors for 2015 SGCN designation include: climate change, recent significant decline, understudied species, regional endemism, historic taxon with rediscovery potential, and tribal cultural significance.

Table 1-3. *continued: page 2 of 27*

CLASS Order *Scientific name*[1] Common name[1]	Maine SGCN Tier		Scale of Conservation Concern[2]				Number of Other Factors[3]
	2005	2015	State	Regional	National	Global	
ACTINOPTERYGII (ray-finned fishes; continued)							
Gadiformes (cods, haddocks, grenadiers; N = 4)							
Brosme brosme Cusk	no	2		yes	SoC		1
Gadus morhua Atlantic Cod	no	1		yes		VU	
Lota lota Burbot	2	3					1
Melanogrammus aeglefinus Haddock	no	1		yes		VU	
Gasterosteiformes (sticklebacks; N = 1)							
Culaea inconstans Brook Stickleback	no	3	SC				1
Osmeriformes (smelts and allies; N = 1)							
Osmerus mordax Rainbow Smelt	2	1		yes	SoC		3
Perciformes (perch-like fishes; N = 6)							
Ammodytes americanus American Sand Lance	no	3		yes			
Anarhichas lupus Atlantic Wolffish	no	2			SoC		2
Anarhichas minor Spotted Wolffish	no	3		yes			1
Etheostoma fusiforme Swamp Darter	1	2	T				
Morone saxatilis Striped Bass	no	2		yes			2
Thunnus thynnus Atlantic Bluefin Tuna	no	2		yes	SoC	EN	
Pleuronectiformes (flatfish; N = 1)							
Pseudopleuronectes americanus Winter Flounder	no	2		yes			1

[1] Click on a species name to launch a full SGCN report summarizing associated habitats, stressors, and conservation strategies for that species.
[2] State & Federal ESA Codes: Endangered Species [E]; Threatened Species [T]; Candidate Species [C]; Special Concern Species [SC]; Species of Concern [SoC]. IUCN Codes: Critically Endangered [CR]; Endangered [EN]; Vulnerable [VU].
[3] Other potential qualifying factors for 2015 SGCN designation include: climate change, recent significant decline, understudied species, regional endemism, historic taxon with rediscovery potential, and tribal cultural significance.

Table 1-3. *continued: page 3 of 27*

CLASS Order *Scientific name*[1] Common name[1]	Maine SGCN Tier		Scale of Conservation Concern[2]				Number of Other Factors[3]
	2005	2015	State	Regional	National	Global	
ACTINOPTERYGII (ray-finned fishes; continued)							
Salmoniformes (salmon, trout, and whitefish; N = 6)							
Coregonus clupeaformis Lake Whitefish	1	2	SC				2
Prosopium cylindraceum Round Whitefish	2	2		yes			1
Salmo salar Atlantic Salmon	1	1		yes	E		1
Salvelinus alpinus oquassa Arctic Charr	1	1	SC	yes			1
Salvelinus fontinalis Brook Trout	2	3		yes			1
Salvelinus namaycush Lake Trout	1	3					1
AMPHIBIA (amphibians; N = 4)							
Anura (frogs and toads; N = 2)							
Lithobates pipiens Northern Leopard Frog	no	2	SC	yes			
Lithobates septentrionalis Mink Frog	no	3					1
Caudata (salamanders; N = 2)							
Ambystoma laterale Blue-spotted Salamander	2	2	SC	yes			
Gyrinophilus porphyriticus porphyriticus Northern Spring Salamander	no	2	SC	yes			
ANTHOZOA (corals, sea pens, sea fans, sea anemones; N = 2)							
Alcyonacea (soft corals; N = 2)							
Alcyonium digitatum Dead Man's Fingers	no	3					2
Gersemia rubiformis Sea Strawberry	no	2					3

[1] Click on a species name to launch a full SGCN report summarizing associated habitats, stressors, and conservation strategies for that species.
[2] State & Federal ESA Codes: Endangered Species [E]; Threatened Species [T]; Candidate Species [C]; Special Concern Species [SC]; Species of Concern [SoC]. IUCN Codes: Critically Endangered [CR]; Endangered [EN]; Vulnerable [VU].
[3] Other potential qualifying factors for 2015 SGCN designation include: climate change, recent significant decline, understudied species, regional endemism, historic taxon with rediscovery potential, and tribal cultural significance.

Table 1-3. *continued: page 4 of 27*

CLASS Order *Scientific name*[1] Common name[1]	Maine SGCN Tier		Scale of Conservation Concern[2]				Number of Other Factors[3]
	2005	2015	State	Regional	National	Global	
ASTEROIDEA (sea stars; N = 5)							
Forcipulatida (sea stars; N = 3)							
Asterias forbesi Forbes's Starfish	no	2					3
Asterias rubens Common Sea Star	no	2					3
Stephanasterias albula White Sea Star	no	2					3
Valvatida (N = 2)							
Crossaster papposus Common Sun Star	no	2					3
Solaster endeca Purple Sunstar	no	2					3
AVES (birds; N = 130)							
Accipitriformes (hawks, kites, eagles, and allies; N = 3)							
Aquila chrysaetos Golden Eagle	2	2	E	yes			
Buteo platypterus Broad-winged Hawk	no	3		yes			
Circus cyaneus Northern Harrier	no	3	SC				
Anseriformes (waterfowl; N = 5)							
Aythya marila Greater Scaup	2	2	SC				1
Bucephala islandica Barrow's Goldeneye	2	1	T				1
Clangula hyemalis Long-tailed Duck	no	3				VU	
Histrionicus histrionicus Harlequin Duck	2	1	T	yes			1
Somateria mollissima Common Eider	2	3					1

[1] Click on a species name to launch a full SGCN report summarizing associated habitats, stressors, and conservation strategies for that species.
[2] State & Federal ESA Codes: Endangered Species [E]; Threatened Species [T]; Candidate Species [C]; Special Concern Species [SC]; Species of Concern [SoC]. IUCN Codes: Critically Endangered [CR]; Endangered [EN]; Vulnerable [VU].
[3] Other potential qualifying factors for 2015 SGCN designation include: climate change, recent significant decline, understudied species, regional endemism, historic taxon with rediscovery potential, and tribal cultural significance.

Table 1-3. *continued: page 5 of 27*

CLASS Order *Scientific name*[1] Common name[1]	Maine SGCN Tier		Scale of Conservation Concern[2]				Number of Other Factors[3]
	2005	2015	State	Regional	National	Global	
AVES (birds; continued)							
Apodiformes (swifts and hummingbirds; N = 1)							
Chaetura pelagica Chimney Swift	2	2	SC	yes			1
Caprimulgiformes (nightjars; N = 2)							
Antrostomus vociferus Eastern Whip-poor-will	2	2	SC	yes			
Chordeiles minor Common Nighthawk	2	3		yes			
Charadriiformes (plovers, sandpipers, and allies; N = 30)							
Alca torda Razorbill	2	2	T				1
Arenaria interpres Ruddy Turnstone	2	2		yes			2
Bartramia longicauda Upland Sandpiper	1	1	T	yes			
Calidris alba Sanderling	2	2		yes			1
Calidris alpina Dunlin	no	3					1
Calidris canutus rufa Red Knot	2	1	SC	yes	T		1
Calidris maritima Purple Sandpiper	2	1		yes			2
Calidris minutilla Least Sandpiper	no	3					1
Calidris pusilla Semipalmated Sandpiper	2	2	SC	yes			2
Charadrius melodus Piping Plover	1	1	E	yes	T		
Chlidonias niger Black Tern	1	2	E				1
Chroicocephalus philadelphia Bonaparte's Gull	2	3	SC				

[1] Click on a species name to launch a full SGCN report summarizing associated habitats, stressors, and conservation strategies for that species.
[2] State & Federal ESA Codes: Endangered Species [E]; Threatened Species [T]; Candidate Species [C]; Special Concern Species [SC]; Species of Concern [SoC]. IUCN Codes: Critically Endangered [CR]; Endangered [EN]; Vulnerable [VU].
[3] Other potential qualifying factors for 2015 SGCN designation include: climate change, recent significant decline, understudied species, regional endemism, historic taxon with rediscovery potential, and tribal cultural significance.

Table 1-3. *continued: page 6 of 27*

CLASS Order *Scientific name*[1] Common name[1]	Maine SGCN Tier		Scale of Conservation Concern[2]				Number of Other Factors[3]
	2005	2015	State	Regional	National	Global	
AVES (birds; continued)							
Charadriiformes (plovers, sandpipers, and allies; continued)							
Fratercula arctica Atlantic Puffin	2	2	T				1
Haematopus palliatus American Oystercatcher	1	3	SC	yes			1
Leucophaeus atricilla Laughing Gull	no	3	SC				
Limnodromus griseus Short-billed Dowitcher	no	3		yes			1
Numenius phaeopus Whimbrel	2	2	SC	yes			1
Phalaropus fulicarius Red Phalarope	no	3					1
Phalaropus lobatus Red-necked Phalarope	2	2	SC				2
Pluvialis squatarola Black-bellied Plover	no	3					1
Scolopax minor American Woodcock	2	3					1
Sterna dougallii Roseate Tern	1	1	E	yes	E		
Sterna hirundo Common Tern	2	2	SC	yes			
Sterna paradisaea Arctic Tern	2	1	T	yes			
Sternula antillarum Least Tern	1	1	E	yes			
Tringa flavipes Lesser Yellowlegs	no	1	SC	yes			1
Tringa melanoleuca Greater Yellowlegs	2	3					1
Tringa semipalmata Willet	2	3					1

[1] Click on a species name to launch a full SGCN report summarizing associated habitats, stressors, and conservation strategies for that species.
[2] State & Federal ESA Codes: Endangered Species [E]; Threatened Species [T]; Candidate Species [C]; Special Concern Species [SC]; Species of Concern [SoC]. IUCN Codes: Critically Endangered [CR]; Endangered [EN]; Vulnerable [VU].
[3] Other potential qualifying factors for 2015 SGCN designation include: climate change, recent significant decline, understudied species, regional endemism, historic taxon with rediscovery potential, and tribal cultural significance.

Table 1-3. *continued: page 7 of 27*

CLASS Order *Scientific name*[1] Common name[1]	Maine SGCN Tier		Scale of Conservation Concern[2]				Number of Other Factors[3]
	2005	2015	State	Regional	National	Global	
AVES (birds; continued)							
Charadriiformes (plovers, sandpipers, and allies; continued)							
Tringa solitaria Solitary Sandpiper	no	2		yes			1
Uria aalge Common Murre	2	3	SC				1
Coraciiformes (kingfishers and allies; N = 1)							
Megaceryle alcyon Belted Kingfisher	no	3		yes			
Cuculiformes (cuckoos; N = 2)							
Coccyzus americanus Yellow-billed Cuckoo	no	2	SC	yes			
Coccyzus erythropthalmus Black-billed Cuckoo	2	3		yes			
Falconiformes (caracaras and falcons; N = 2)							
Falco peregrinus Peregrine Falcon	1	1	E	yes			
Falco sparverius American Kestrel	no	3		yes			
Galliformes (grouse, quail, and allies; N = 1)							
Falcipennis canadensis Spruce Grouse	no	3					2
Gaviiformes (loons; N = 2)							
Gavia immer Common Loon	2	3					1
Gavia stellata Red-throated Loon	no	3		yes			
Gruiformes (cranes and rails; N = 4)							
Coturnicops noveboracensis Yellow Rail	2	2	SC	yes			1
Fulica americana American Coot	2	3	SC				
Gallinula galeata Common Gallinule	2	2	T				1

[1] Click on a species name to launch a full SGCN report summarizing associated habitats, stressors, and conservation strategies for that species.
[2] State & Federal ESA Codes: Endangered Species [E]; Threatened Species [T]; Candidate Species [C]; Special Concern Species [SC]; Species of Concern [SoC]. IUCN Codes: Critically Endangered [CR]; Endangered [EN]; Vulnerable [VU].
[3] Other potential qualifying factors for 2015 SGCN designation include: climate change, recent significant decline, understudied species, regional endemism, historic taxon with rediscovery potential, and tribal cultural significance.

Table 1-3. *continued: page 8 of 27*

CLASS Order *Scientific name*[1] Common name[1]	Maine SGCN Tier		Scale of Conservation Concern[2]				Number of Other Factors[3]
	2005	2015	State	Regional	National	Global	
AVES (birds; continued)							
Gruiformes (cranes and rails; continued)							
Porzana carolina Sora	no	3		yes			
Passeriformes (perching birds; N = 59)							
Ammodramus caudacutus Saltmarsh Sparrow	1	1	SC	yes		VU	1
Ammodramus nelsoni Nelson's Sparrow	2	2	SC	yes			1
Ammodramus savannarum Grasshopper Sparrow	2	1	E	yes			
Anthus rubescens American Pipit	2	2	E				1
Cardellina canadensis Canada Warbler	2	2	SC	yes			
Catharus bicknelli Bicknell's Thrush	1	1	SC	yes		VU	1
Catharus fuscescens Veery	2	2	SC	yes			
Catharus ustulatus Swainson's Thrush	no	3					1
Cistothorus platensis Sedge Wren	1	1	E	yes			
Coccothraustes vespertinus Evening Grosbeak	no	2	SC	yes			1
Contopus cooperi Olive-sided Flycatcher	2	2	SC	yes			
Contopus virens Eastern Wood-Pewee	no	2	SC	yes			
Dolichonyx oryzivorus Bobolink	2	3		yes			
Empidonax flaviventris Yellow-bellied Flycatcher	no	3					1

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Table 1-3. *continued: page 9 of 27*

CLASS Order *Scientific name*[1] Common name[1]	Maine SGCN Tier		Scale of Conservation Concern[2]				Number of Other Factors[3]
	2005	2015	State	Regional	National	Global	
AVES (birds; continued)							
Passeriformes (perching birds; continued)							
Empidonax minimus Least Flycatcher	no	3	SC				
Eremophila alpestris Horned Lark	2	3	SC				
Euphagus carolinus Rusty Blackbird	2	1	SC	yes		VU	
Geothlypis philadelphia Mourning Warbler	no	3					1
Haemorhous purpureus Purple Finch	2	3		yes			
Hirundo rustica Barn Swallow	2	2	SC	yes			1
Hylocichla mustelina Wood Thrush	2	1	SC	yes			1
Icterus galbula Baltimore Oriole	2	3		yes			
Icterus spurius Orchard Oriole	no	3	SC				
Loxia curvirostra Red Crossbill	2	3					1
Loxia leucoptera White-winged Crossbill	no	3					1
Melospiza lincolnii Lincoln's Sparrow	no	3					1
Mniotilta varia Black-and-white Warbler	2	2	SC	yes			
Oreothlypis peregrina Tennessee Warbler	no	2	SC				1
Parkesia motacilla Louisiana Waterthrush	2	3		yes			
Passerella iliaca Fox Sparrow	no	3	SC				

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Table 1-3. *continued: page 10 of 27*

CLASS Order *Scientific name*[1] Common name[1]	Maine SGCN Tier		Scale of Conservation Concern[2]				Number of Other Factors[3]
	2005	2015	State	Regional	National	Global	
AVES (birds; continued)							
Passeriformes (perching birds; continued)							
Perisoreus canadensis Gray Jay	no	3					1
Petrochelidon pyrrhonota Cliff Swallow	no	3					1
Pheucticus ludovicianus Rose-breasted Grosbeak	2	3		yes			
Pinicola enucleator Pine Grosbeak	no	3					1
Pipilo erythrophthalmus Eastern Towhee	2	2	SC	yes			
Piranga olivacea Scarlet Tanager	2	3		yes			
Poecile hudsonicus Boreal Chickadee	no	2		yes			1
Progne subis Purple Martin	2	2	SC				1
Regulus calendula Ruby-crowned Kinglet	no	2					2
Riparia riparia Bank Swallow	no	1		yes			1
Setophaga americana Northern Parula	2	3					1
Setophaga caerulescens *Black-throated Blue Warbler*	2	3		yes			
Setophaga castanea Bay-breasted Warbler	2	3		yes			
Setophaga discolor Prairie Warbler	2	2	SC	yes			
Setophaga fusca Blackburnian Warbler	2	3		yes			
Setophaga pensylvanica Chestnut-sided Warbler	2	2	SC	yes			

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Table 1-3. *continued: page 11 of 27*

CLASS Order *Scientific name*[1] Common name[1]	Maine SGCN Tier		Scale of Conservation Concern[2]				Number of Other Factors[3]
	2005	2015	State	Regional	National	Global	
AVES (birds; continued)							
Passeriformes (perching birds; continued)							
Setophaga petechia Yellow Warbler	no	3	SC				
Setophaga ruticilla American Redstart	no	2	SC	yes			
Setophaga striata Blackpoll Warbler	no	3					1
Setophaga tigrina Cape May Warbler	2	3					1
Setophaga virens Black-throated Green Warbler	2	3		yes			
Spizella pusilla Field Sparrow	2	3		yes			
Stelgidopteryx serripennis Northern Rough-winged Swallow	no	3	SC				
Sturnella magna Eastern Meadowlark	2	2	SC	yes			
Tachycineta bicolor Tree Swallow	no	2	SC	yes			
Toxostoma rufum Brown Thrasher	2	2	SC	yes			
Tyrannus tyrannus Eastern Kingbird	2	2	SC	yes			
Vermivora cyanoptera Blue-winged Warbler	1	2	SC	yes			
Zonotrichia albicollis White-throated sparrow	no	3	SC				
Pelecaniformes (pelecans, herons, ibises, and allies; N = 6)							
Ardea herodias Great Blue Heron	2	2	SC				1
Botaurus lentiginosus American Bittern	2	3		yes			

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Table 1-3. *continued: page 12 of 27*

CLASS Order *Scientific name*[1] Common name[1]	Maine SGCN Tier		Scale of Conservation Concern[2]				Number of Other Factors[3]
	2005	2015	State	Regional	National	Global	
AVES (birds; continued)							
Pelecaniformes (pelecans, herons, ibises, and allies; continued)							
Egretta caerulea Little Blue Heron	2	3		yes			
Egretta thula Snowy Egret	2	3		yes			
Ixobrychus exilis Least Bittern	2	1	E	yes			
Nycticorax nycticorax Black-crowned Night-heron	2	2	E				
Piciformes (woodpeckers; N = 3)							
Colaptes auratus Northern Flicker	2	3		yes			
Picoides arcticus Black-backed Woodpecker	no	3					1
Picoides dorsalis American Three-toed Woodpecker	2	3					1
Podicipediformes (grebes; N = 2)							
Podiceps auritus Horned Grebe	no	3		yes			
Podilymbus podiceps Pied-billed Grebe	2	3		yes			
Procellariiformes (tubenoses; N = 2)							
Oceanodroma leucorhoa Leach's Storm-petrel	no	3	SC				
Puffinus gravis Great Shearwater	2	3		yes			
Strigiformes (owls; N = 4)							
Asio flammeus Short-eared Owl	1	2	T	yes			
Asio otus Long-eared Owl	2	3					1
Megascops asio Eastern Screech-Owl	2	3	SC				1

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Table 1-3. *continued: page 13 of 27*

CLASS Order *Scientific name*[1] Common name[1]	Maine SGCN Tier		Scale of Conservation Concern[2]				Number of Other Factors[3]
	2005	2015	State	Regional	National	Global	
AVES (birds; continued)							
Strigiformes (owls; continued)							
Tyto alba Barn Owl	no	3	SC				
Suliformes (frigatebirds, boobies, cormorants, darters, and allies; N = 1)							
Phalacrocorax carbo Great Cormorant	2	1	T	yes			1
BIVALVIA (marine and freshwater molluscs; N = 14)							
Myoida (saltwater clams; N = 3)							
Mya arenaria Softshell Clam	no	3					1
Mya truncata Gaper Clam	no	3					4
Zirfaea crispata Atlantic Great Piddock	no	2					3
Mytiloida (mussels; N = 1)							
Mytilus edulis Blue Mussel	no	3					1
Ostreoida (oysters, scallops, and allies; N = 1)							
Crassostrea virginica Eastern oyster	no	3					2
Pectinoida (N = 2)							
Chlamys islandica Icelandic Scallop	no	3					2
Placopecten magellanicus Atlantic Sea Scallop	no	3					1
Unionoida (freshwater mussels; N = 6)							
Alasmidonta undulata Triangle Floater	no	3		yes			
Alasmidonta varicosa Brook Floater	2	1	T	yes			
Anodonta implicata Alewife Floater	no	3		yes			

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Table 1-3. *continued: page 14 of 27*

CLASS Order *Scientific name*[1] Common name[1]	Maine SGCN Tier		Scale of Conservation Concern[2]				Number of Other Factors[3]
	2005	2015	State	Regional	National	Global	
BIVALVIA (marine and freshwater molluscs; continued)							
Unionoida (freshwater mussels; continued)							
Lampsilis cariosa Yellow Lampmussel	1	1	T	yes		EN	
Leptodea ochracea Tidewater Mucket	1	1	T	yes			
Margaritifera margaritifera Eastern Pearlshell	no	3				EN	
Veneroida (veneroids; N = 1)							
Mercenaria mercenaria Hard-shelled Clam	no	3					1
CEPHALASPIDOMORPHI (lampreys; N = 1)							
Petromyzontiformes (lampreys; N = 1)							
Lethenteron appendix American Brook Lamprey	no	3		yes			
CHONDRICHTHYES (sharks, rays, and skates; N = 9)							
Carcharhiniformes (ground sharks; N = 2)							
Prionace glauca Blue Shark	no	3					
Sphyrna zygaena Smooth Hammerhead	no	3				VU	
Lamniformes (sharks, skates, and rays ; N = 3)							
Alopias vulpinus Common Thresher Shark	no	3				VU	
Isurus oxyrinchus Shortfin Mako	no	2		yes		VU	
Lamna nasus Porbeagle	no	2		yes	SoC	VU	
Rajiformes (rays; N = 4)							
Amblyraja radiata Thorny Skate	no	2			SoC	VU	
Dipturus laevis Barndoor Skate	no	2		yes		EN	

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Table 1-3. *continued: page 15 of 27*

CLASS Order *Scientific name*[1] Common name[1]	Maine SGCN Tier		Scale of Conservation Concern[2]				Number of Other Factors[3]
	2005	2015	State	Regional	National	Global	
CHONDRICHTHYES (sharks, rays, and skates; continued)							
Rajiformes (rays; continued)							
Leucoraja ocellata Winter Skate	no	2				EN	
Malacoraja senta Smooth Skate	no	2				EN	
ECHINOIDEA (sea urchins; N = 1)							
Camarodonta (sea urchins; N = 1)							
Strongylocentrotus droebachiensis Green Sea Urchin	no	2					2
GASTROPODA (aquatic and terrestrial snails; N = 15)							
Basommatophora (air-breathing freshwater snails; N = 2)							
Stagnicola mighelsi Bigmouth Pondsnail	2	1	SC	yes			1
Stagnicola oronoensis Obese Pondsnail	no	3					1
Littorinimorpha (N = 2)							
Arrhoges occidentalis American Pelican Foot	no	2					3
Limneria undata Wavy Lamellaria	no	3					2
Neotaenioglossa (mostly sea snails; N = 5)							
Boreotrophon clathratus Clathrate Trophon	no	2					3
Boreotrophon truncatus Murex	no	2					3
Colus pygmaeus Colus Snail	no	2					3
Floridobia winkleyi New England Silt Snail	no	3					2
Ptychatractus ligatus Spindle Shell	no	2					3

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Table 1-3. *continued: page 16 of 27*

CLASS Order *Scientific name*[1] Common name[1]	Maine SGCN Tier		Scale of Conservation Concern[2]				Number of Other Factors[3]
	2005	2015	State	Regional	National	Global	
GASTROPODA (aquatic and terrestrial snails; continued)							
Stylommatophora (air-breathing snails land snails; N = 5)							
Appalachina sayana Spike-lip Crater	no	3					1
Neohelix dentifera Big-tooth Whitelip	no	3					1
Vertigo malleata Malleated Vertigo	no	3	SC				1
Vertigo morsei Six-whorl Vertigo	2	1	E				2
Vertigo paradoxa Mystery Vertigo	2	2	SC				
Thecosomata (sea butterflies; N = 1)							
Limacina helicina Limancina Snail	no	3					1
HOLOTHUROIDEA (sea cucumbers; N = 4)							
Dendrochirotida (sea cucumbers; N = 4)							
Cucumaria frondosa Orange-footed Sea Cucumber	no	2					2
Psolus fabricii Psolus	no	2					3
Psolus phantapus Psolus	no	2					3
Thyonidium drummondii Sea Cucumber	no	2					3
INSECTA (insects; N = 119)							
Coleoptera (beetles; N = 4)							
Cicindela ancocisconensis White Mountain Tiger Beetle	no	2	SC	yes			1
Cicindela marginata Salt Marsh Tiger Beetle	no	2	SC				1
Cicindela marginipennis Cobblestone Tiger Beetle	no	1	E	yes			1

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Table 1-3. *continued: page 17 of 27*

CLASS Order *Scientific name*[1] Common name[1]	Maine SGCN Tier		Scale of Conservation Concern[2]				Number of Other Factors[3]
	2005	2015	State	Regional	National	Global	
INSECTA (insects; N = 119)							
Coleoptera (beetles; continued)							
Nebria nivalis gaspesiana Gaspe Gazelle Beetle	no	3					1
Ephemeroptera (mayflies; N = 15)							
Ameletus browni A Mayfly	no	3	SC				1
Baetisca berneri A Mayfly	no	3	SC				1
Baetisca carolina A Mayfly	no	3	SC				1
Baetisca lacustris A Mayfly	no	3	SC				1
Baetisca rubescens A Mayfly	2	3	SC				2
Epeorus frisoni Roaring Brook Mayfly	1	1	T	yes			1
Hexagenia rigida A Mayfly	no	3	SC				1
Metretopus borealis A Mayfly	no	3	SC				1
Nixe horrida A Mayfly	2	3	SC	yes			1
Parameletus midas A Mayfly	no	3	SC				1
Rhithrogena undulata A Mayfly	no	3	SC				1
Siphlonisca aerodromia Tomah Mayfly	1	1	T				1
Siphlonurus barbaroides A Mayfly	no	3	SC				1
Siphlonurus barbarus A Mayfly	no	2	SC	yes			1

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Table 1-3. *continued: page 18 of 27*

CLASS Order *Scientific name*[1] Common name[1]	Maine SGCN Tier		Scale of Conservation Concern[2]				Number of Other Factors[3]
	2005	2015	State	Regional	National	Global	
INSECTA (insects; continued)							
Ephemeroptera (mayflies; continued)							
Siphlonurus demaryi A Mayfly	2	2	SC	yes			2
Hymenoptera (ants, bees, wasps and sawflies; N = 10)							
Bombus affinis Rusty-patched Bumble Bee	no	1	SC	yes			1
Bombus ashtoni Ashton's Cuckoo Bumble Bee	no	2	SC				2
Bombus citrinus Lemon Cuckoo Bumble Bee	no	3	SC				1
Bombus fernaldae Fernald's Cuckoo Bumble Bee	no	3	SC				1
Bombus fervidus Yellow Bumble Bee	no	3	SC				1
Bombus griseocollis Brown-belted Bumble Bee	no	3	SC				1
Bombus insularis Indiscriminate Cuckoo Bumble Bee	no	2	SC				2
Bombus pensylvanicus American Bumble Bee	no	2	SC				2
Bombus sandersoni Sanderson's Bumble Bee	no	3	SC				1
Bombus terricola Yellowbanded Bumble Bee	no	3	SC				1
Lepidoptera (butterflies, skippers, and moths; N = 47)							
Atrytonopsis hianna Dusted Skipper	no	3	SC				1
Boloria chariclea grandis Purple Lesser Fritillary	2	2	T				2
Boloria frigga saga Frigga Fritillary	2	1	E				2
Callophrys gryneus Juniper Hairstreak	2	2	E				1

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Table 1-3. *continued: page 19 of 27*

CLASS Order *Scientific name*[1] Common name[1]	Maine SGCN Tier		Scale of Conservation Concern[2]				Number of Other Factors[3]
	2005	2015	State	Regional	National	Global	
INSECTA (insects; continued)							
Lepidoptera (butterflies, skippers, and moths; continued)							
Callophrys hesseli Hessel's Hairstreak	1	1	E				1
Callophrys lanoraieensis Bog Elfin	no	3					1
Catocala similis Similar Underwing	no	3	SC				1
Chaetaglaea cerata A Noctuid Moth	2	2	SC				1
Chaetaglaea tremula Barrens Chaetaglaea	no	3	SC				1
Citheronia sepulcralis Pine Devil	2	2	SC				1
Cucullia speyeri A Moth	2	3					1
Cupido amyntula maritima Western Tailed Blue	no	3					1
Danaus plexippus Monarch	no	3					1
Erora laeta Early Hairstreak	2	2	SC				1
Erynnis brizo Sleepy Duskywing	2	2	T				
Hemaris gracilis Graceful Clearwing	2	3	SC				1
Hemileuca lucina New England Buckmoth	no	3					1
Hemileuca maia maia Eastern Buckmoth	2	2	SC				1
Hesperia leonardus Leonard's Skipper	2	3	SC				
Hesperia metea Cobweb Skipper	2	3	SC				1

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Table 1-3. *continued: page 20 of 27*

CLASS Order *Scientific name*[1] Common name[1]	Maine SGCN Tier		Scale of Conservation Concern[2]				Number of Other Factors[3]
	2005	2015	State	Regional	National	Global	
INSECTA (insects; continued)							
Lepidoptera (butterflies, skippers, and moths; continued)							
Lapara coniferarum Southern Pine Sphinx	no	3	SC				1
Lepipolys perscripta A Moth	no	3	SC				1
Lithophane lepida lepida Pine Pinion	2	2	SC	yes			2
Lycaena dorcas claytoni Clayton's Copper	1	2	T	yes			
Lycia rachelae Twilight Moth	1	2	T				1
Metarranthis apiciaria Barrens Metarranthis Moth	no	2	SC	yes			1
Nepytia pellucidaria A Moth	2	3	SC				1
Oeneis polixenes katahdin Katahdin Arctic	1	1	E	yes			1
Paonias astylus Huckleberry Sphinx	no	3	SC				1
Papilio brevicauda gaspeensis Short-tailed Swallowtail	no	3	SC				1
Papilio troilus Spicebush Swallowtail	2	3	SC				
Plebejus idas Northern Blue	no	2	SC				2
Plebejus idas empetri Crowberry Blue	2	2	SC				1
Polygonia satyrus Satyr Comma	no	3	SC				1
Psectraglaea carnosa Pink Sallow	2	2	SC				2
Satyrium edwardsii Edwards' Hairstreak	2	2	E				1

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Table 1-3. *continued: page 21 of 27*

CLASS Order *Scientific name*[1] Common name[1]	Maine SGCN Tier		Scale of Conservation Concern[2]				Number of Other Factors[3]
	2005	2015	State	Regional	National	Global	
INSECTA (insects; continued)							
Lepidoptera (butterflies, skippers, and moths; continued)							
Satyrium titus Coral Hairstreak	2	3	SC				
Satyrodes appalachia Appalachian Brown	no	3	SC				
Spartiniphaga inops Spartina Borer Moth	no	3					1
Speranza exonerata Barrens Itame	2	2	SC				2
Thorybes bathyllus Southern Cloudywing	no	3	SC				1
Xylena thoracica Acadian Swordgrass Moth	no	3	SC				
Xylotype capax Broad Sallow	no	3	SC				1
Xystopeplus rufago Red-winged Sallow	no	3	SC				1
Zale lunifera Bold-based Zale Moth	2	3	SC				1
Zale obliqua Oblique Zale	no	3	SC				1
Zanclognatha martha Pine Barrens Zanclognatha	2	1	T				2
Odonata (dragonflies and damselflies; N = 36)							
Aeshna juncea Sedge Darner	2	2	SC	yes			2
Aeshna sitchensis Zigzag Darner	no	3	SC	yes			
Anax longipes Comet Darner	no	3	SC				1
Argia translata Dusky Dancer	2	3	SC				1

[1] Click on a species name to launch a full SGCN report summarizing associated habitats, stressors, and conservation strategies for that species.
[2] State & Federal ESA Codes: Endangered Species [E]; Threatened Species [T]; Candidate Species [C]; Special Concern Species [SC]; Species of Concern [SoC]. IUCN Codes: Critically Endangered [CR]; Endangered [EN]; Vulnerable [VU].
[3] Other potential qualifying factors for 2015 SGCN designation include: climate change, recent significant decline, understudied species, regional endemism, historic taxon with rediscovery potential, and tribal cultural significance.

Table 1-3. *continued: page 22 of 27*

CLASS Order *Scientific name*[1] Common name[1]	Maine SGCN Tier		Scale of Conservation Concern[2]				Number of Other Factors[3]
	2005	2015	State	Regional	National	Global	
INSECTA (insects; continued)							
Odonata (dragonflies and damselflies; continued)							
Arigomphus furcifer Lilypad Clubtail	no	3	SC				
Celithemis martha Martha's Pennant	no	3		yes			1
Cordulegaster obliqua Arrowhead Spiketail	2	3	SC	yes			
Enallagma carunculatum Tule Bluet	2	3	SC				1
Enallagma durum Big Bluet	2	3	SC				1
Enallagma laterale New England Bluet	no	2		yes			1
Enallagma pictum Scarlet Bluet	2	2	SC	yes			1
Epiaeschna heros Swamp Darner	2	3	SC				1
Erythrodiplax berenice Seaside Dragonlet	no	3		yes			
Gomphus quadricolor Rapids Clubtail	1	2	E				
Gomphus vastus Cobra Clubtail	2	3	SC				1
Ischnura hastata Citrine Forktail	2	3	SC				1
Ischnura ramburii Rambur's Forktail	2	3	SC				1
Lanthus vernalis Southern Pygmy Clubtail	no	2	SC				1
Leucorrhinia patricia Canada Whiteface	2	2	SC	yes			1
Libellula needhami Needhams Skimmer	no	3	SC				1

[1] Click on a species name to launch a full SGCN report summarizing associated habitats, stressors, and conservation strategies for that species.
[2] State & Federal ESA Codes: Endangered Species [E]; Threatened Species [T]; Candidate Species [C]; Special Concern Species [SC]; Species of Concern [SoC]. IUCN Codes: Critically Endangered [CR]; Endangered [EN]; Vulnerable [VU].
[3] Other potential qualifying factors for 2015 SGCN designation include: climate change, recent significant decline, understudied species, regional endemism, historic taxon with rediscovery potential, and tribal cultural significance.

Table 1-3. *continued: page 23 of 27*

CLASS Order *Scientific name*[1] Common name[1]	Maine SGCN Tier		Scale of Conservation Concern[2]				Number of Other Factors[3]
	2005	2015	State	Regional	National	Global	
INSECTA (insects; continued)							
Odonata (dragonflies and damselflies; continued)							
Libellula semifasciata Painted Skimmer	no	3	SC				
Nannothemis bella Elfin Skimmer	no	3		yes			
Neurocordulia michaeli Broad-tailed Shadowdragon	no	3		yes			
Ophiogomphus anomalus Extra-striped Snaketail	no	3		yes			
Ophiogomphus colubrinus Boreal Snaketail	2	1	T	yes			
Ophiogomphus howei Pygmy Snaketail	2	2	SC	yes			
Progomphus obscurus Common Sanddragon	no	3	SC				
Rhionaeschna mutata Spatterdock Darner	1	3	SC				1
Somatochlora albicincta Ringed Emerald	no	3	SC				
Somatochlora brevicincta Quebec Emerald	2	2	SC	yes			1
Somatochlora incurvata Incurvate Emerald	no	3	SC	yes			
Somatochlora minor Ocellated Emerald	no	3		yes			
Stylurus spiniceps Arrow Clubtail	2	3	SC				
Tramea carolina Carolina Saddlebags	no	3	SC				1
Tramea lacerata Black Saddlebags	no	3	SC				1
Williamsonia lintneri Ringed Boghaunter	1	1	T	yes		VU	1

[1] Click on a species name to launch a full SGCN report summarizing associated habitats, stressors, and conservation strategies for that species.
[2] State & Federal ESA Codes: Endangered Species [E]; Threatened Species [T]; Candidate Species [C]; Special Concern Species [SC]; Species of Concern [SoC]. IUCN Codes: Critically Endangered [CR]; Endangered [EN]; Vulnerable [VU].
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Table 1-3. *continued: page 24 of 27*

CLASS Order *Scientific name*[1] Common name[1]	Maine SGCN Tier		Scale of Conservation Concern[2]				Number of Other Factors[3]
	2005	2015	State	Regional	National	Global	
INSECTA (insects; continued)							
Plecoptera (stoneflies; N = 3)							
Alloperla voinae A Stonefly	no	3					1
Neoperla mainensis A Stonefly	2	3	SC	yes			1
Pteronarcys comstocki Spiny Salmonfly	no	3					1
Trichoptera (caddisflies; N = 4)							
Hydroptila blicklei A Caddisfly	no	3	SC	yes			2
Hydroptila parachelops A Caddisfly	no	3	SC	yes			2
Hydroptila tomah A Caddisfly	2	3	SC	yes			2
Ochrotrichia denningi A Caddisfly	no	3					2
MALACOSTRACA (crustaceans; N = 4)							
Decapoda (decapods; N = 4)							
Lebbeus groenlandicus Spiny Lebbeid Shrimp	no	2					3
Lebbeus polaris Polar Lebbeid Shrimp	no	2					3
Orconectes limosus Spinycheek Crayfish	no	3					1
Pandalus borealis Northern Shrimp	no	1		yes			2
MAMMALIA (mammals; N = 22)							
Artiodactyla (even-toed ungulates; N = 1)							
Alces alces americanus Moose	no	3					1
Carnivora (carnivores; N = 1)							
Lynx canadensis Canada Lynx	2	2	SC		T		1

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[2] State & Federal ESA Codes: Endangered Species [E]; Threatened Species [T]; Candidate Species [C]; Special Concern Species [SC]; Species of Concern [SoC]. IUCN Codes: Critically Endangered [CR]; Endangered [EN]; Vulnerable [VU].
[3] Other potential qualifying factors for 2015 SGCN designation include: climate change, recent significant decline, understudied species, regional endemism, historic taxon with rediscovery potential, and tribal cultural significance.

Table 1-3. *continued: page 25 of 27*

CLASS Order *Scientific name*[1] Common name[1]	Maine SGCN Tier		Scale of Conservation Concern[2]				Number of Other Factors[3]
	2005	2015	State	Regional	National	Global	
MAMMALIA (mammals; continued)							
Cetacea (whales; N = 7)							
Balaenoptera borealis Sei Whale	1	2	E	yes	E	EN	
Balaenoptera musculus Blue Whale	no	2		yes	E	EN	
Balaenoptera physalus Finback Whale	1	2	E	yes	E	EN	
Eubalaena glacialis North Atlantic Right Whale	1	1	E	yes	E	EN	
Megaptera novaeangliae Humpback Whale	1	1	E	yes	E		
Phocoena phocoena Harbor Porpoise	no	2					
Physeter macrocephalus Sperm Whale	1	2	E	yes	E	VU	
Chiroptera (bats; N = 8)							
Eptesicus fuscus Big Brown Bat	no	2	SC				1
Lasionycteris noctivagans Silver-haired Bat	no	2	SC	yes			
Lasiurus borealis Eastern Red Bat	no	3	SC				
Lasiurus cinereus Hoary Bat	no	3	SC				
Myotis leibii Eastern Small-footed Myotis	2	1	T	yes			
Myotis lucifugus Little Brown Bat	no	1	E				1
Myotis septentrionalis Northern Long-eared Myotis	no	1	E	yes	T		1
Perimyotis subflavus Tri-colored Bat	no	2	SC	yes			

[1] Click on a species name to launch a full SGCN report summarizing associated habitats, stressors, and conservation strategies for that species.
[2] State & Federal ESA Codes: Endangered Species [E]; Threatened Species [T]; Candidate Species [C]; Special Concern Species [SC]; Species of Concern [SoC]. IUCN Codes: Critically Endangered [CR]; Endangered [EN]; Vulnerable [VU].
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Table 1-3. *continued: page 26 of 27*

CLASS Order *Scientific name*[1] Common name[1]	Maine SGCN Tier		Scale of Conservation Concern[2]				Number of Other Factors[3]
	2005	2015	State	Regional	National	Global	
MAMMALIA (mammals; continued)							
Lagomorpha (rabbits, hares, and pikas; N = 1)							
Sylvilagus transitionalis New England Cottontail	1	1	E	yes	C	VU	2
Rodentia (rodents; N = 3)							
Microtus pennsylvanicus shattucki Penobscot Meadow Vole	1	2	SC	yes			
Ondatra zibethicus Muskrat	no	3					1
Synaptomys borealis sphagnicola Northern Bog Lemming	2	1	T	yes			
Soricomorpha (shrews and relatives; N = 1)							
Sorex dispar Long-tailed Shrew	no	3		yes			
MAXILLOPODA (crustaceans; N = 1)							
Calanoida (calanoid copepods; N = 1)							
Calanus finmarchicus A Copepod	no	3					1
MEROSTOMATA (horseshoe crabs and sea scorpions; N = 1)							
Xiphosurida (horseshoe crabs; N = 1)							
Limulus polyphemus Horseshoe Crab	no	1		yes			1
OPHIUROIDEA (brittle stars; N = 1)							
Euryalida (basket stars; N = 1)							
Gorgonocephalus arcticus Northern Basket Starfish	no	2					3
REPTILIA (reptiles; N = 11)							
Squamata (lizards and snakes; N = 3)							
Coluber constrictor constrictor Northern Black Racer	2	1	E	yes			
Storeria dekayi dekayi Northern Brownsnake	no	2	SC				1

[1] Click on a species name to launch a full SGCN report summarizing associated habitats, stressors, and conservation strategies for that species.
[2] State & Federal ESA Codes: Endangered Species [E]; Threatened Species [T]; Candidate Species [C]; Special Concern Species [SC]; Species of Concern [SoC]. IUCN Codes: Critically Endangered [CR]; Endangered [EN]; Vulnerable [VU].
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Table 1-3. *continued: page 27 of 27*

CLASS Order *Scientific name*[1] Common name[1]	Maine SGCN Tier		Scale of Conservation Concern[2]				Number of Other Factors[3]
	2005	2015	State	Regional	National	Global	
REPTILIA (reptiles; N = 11)							
Squamata (lizards and snakes; continued)							
Thamnophis sauritus Eastern Ribbon Snake	no	2	SC	yes			
Testudines (turtles and tortoises; N = 8)							
Caretta caretta Loggerhead Seaturtle	no	2	T	yes	T	EN	
Chelonia mydas Green Seaturtle	no	2		yes	E	EN	
Clemmys guttata Spotted Turtle	2	1	T	yes		EN	
Dermochelys coriacea Leatherback Seaturtle	no	1	E	yes	E	VU	
Emydoidea blandingii Blanding's Turtle	1	1	E	yes		EN	
Glyptemys insculpta Wood Turtle	2	1	SC	yes		EN	
Lepidochelys kempii Kemp's Ridley Seaturtle	no	2	E	yes	E	CR	
Terrapene carolina carolina Eastern Box Turtle	1	2	E	yes		VU	
RHYNCHONELLATA (brachiopods; N = 1)							
Terebratulida (articulate brachiopods; N = 1)							
Terebratulina septentrionalis Lamp Shell	no	2					3

[1] Click on a species name to launch a full SGCN report summarizing associated habitats, stressors, and conservation strategies for that species.
[2] State & Federal ESA Codes: Endangered Species [E]; Threatened Species [T]; Candidate Species [C]; Special Concern Species [SC]; Species of Concern [SoC]. IUCN Codes: Critically Endangered [CR]; Endangered [EN]; Vulnerable [VU].
[3] Other potential qualifying factors for 2015 SGCN designation include: climate change, recent significant decline, understudied species, regional endemism, historic taxon with rediscovery potential, and tribal cultural significance.

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1.8 APPENDICES

Appendix 1-1. Maine's list of state-designated Endangered / Threatened plants administered by Natural Areas Program - Maine Department of Agriculture, Conservation and Forestry.

Taxa group (class) *Scientific name*	Common name	State status (updated, 2015)
Class Dicotyledoneae (Dicots)		
Adlumia fungosa	Allegheny Vine	Endangered
Agalinis neoscotica	Nova Scotia False-foxglove	Threatened
Agalinis purpurea	Large-purple False Foxglove	Endangered
Amelanchier nantucketensis	Nantucket Shadbush	Threatened
Amerorchis rotundifolia	Small Round-leaved Orchis	Threatened
Anemone multifida	Cut-leaved Anemone	Threatened
Arctous alpina	Alpine Bearberry	Threatened
Arnica lanceolata	Hairy Arnica	Threatened
Asarum canadense	Wild Ginger	Threatened
Astragalus robbinsii var. *minor*	Robbins' Milk Vetch	Endangered
Bartonia paniculata	Screwstem	Threatened
Benthamidia florida	Flowering Dogwood	Endangered
Betula glandulosa	Tundra Dwarf Birch	Endangered
Betula minor	Dwarf White Birch	Endangered
Bistorta vivipara	Alpine Bistort	Endangered
Boechera laevigata	Smooth Rockcress	Threatened
Boechera missouriensis	Missouri Rockcress	Threatened
Calystegia spithamaea	Upright Bindweed	Threatened
Cardamine bellidifolia	Alpine Bitter-cress	Endangered
Cardamine concatenata	Cut-leaved Toothwort	Endangered
Cardamine longii	Long's Bitter-cress	Threatened
Carya cordiformis	Bitternut Hickory	Endangered
Ceanothus americanus	New Jersey Tea	Threatened
Chenopodium foggii	Fogg's Goosefoot	Threatened
Chimaphila maculata	Spotted Wintergreen	Endangered
Coptidium lapponicum	Lapland Buttercup	Threatened
Cynoglossum virginianum var. *boreale*	Northern Wild Comfrey	Endangered
Dicentra canadensis	Squirrel-corn	Threatened
Draba arabisans	Rock Whitlow-grass	Threatened
Draba cana	Lance-leaved Draba	Endangered
Draba glabella	Smooth Draba	Endangered
Drosera anglica	English Sundew	Endangered
Drosera linearis	Slender-leaved Sundew	Endangered
Epilobium anagallidifolium	Alpine Willow-herb	Endangered
Epilobium hornemannii	Hornemann's Willow-herb	Endangered
Eupatorium pubescens	Hairy Boneset	Endangered
Eupatorium sessidifolium	Upland Boneset	Endangered
Euthamia caroliniana	Narrow-leaved Goldenrod	Threatened
Gentiana rubricaulis	Red-stemmed Gentian	Threatened
Gentianella amarella ssp. *acuta*	Northern Gentian	Endangered

Appendix 1-1. *continued: page 2 of 5.*

Taxa group (class) *Scientific name*	Common name	State status (updated, 2015)
Class Dicotyledoneae (Dicots) - *continued*		
Geum fragarioides	Barren-strawberry	Endangered
Hackelia deflexa ssp. *americana*	Northern Stickseed	Endangered
Harrimanella hypnoides	Moss Bell-heather	Threatened
Hieracium robinsonii	Robinson's Hawkweed	Endangered
Hieracium venosum var. *nudicaule*	Rattlesnake Hawkweed	Endangered
Hottonia inflata	Featherfoil	Threatened
Hypericum ascyron	Great Saint John's-wort	Endangered
Ilex glabra	Ink-berry	Endangered
Iva frutescens ssp. *oraria*	Marsh-elder	Endangered
Kalmia procumbens	Alpine Azalea	Threatened
Krigia virginica	Dwarf Dandelion	Endangered
Lespedeza hirta hirta	Hairy Bush-clover	Endangered
Liatris novae-angliae	Northern Blazing Star	Threatened
Lomatogonium rotatum	Marsh Felwort	Threatened
Lonicera dioica	Mountain Honeysuckle	Endangered
Micranthes foliolosa	Star Saxifrage	Endangered
Minuartia michauxii	Michaud's Stitchwort	Endangered
Minuartia rubella	Arctic Sandwort	Endangered
Nabalus boottii	Boott's Rattlesnake Root	Endangered
Nymphaea leibergii	Pygmy Water-lily	Threatened
Omalotheca supina	Alpine Cudweed	Endangered
Oxytropis campestris var. *johannensis*	Saint John Oxytrope	Threatened
Panax quinquefolius	American Ginseng	Endangered
Paronychia argyrocoma	Silverling	Threatened
Pedicularis furbishiae	Furbish's Lousewort	Endangered
Phyllodoce caerulea	Mountain Heath	Threatened
Pinguicula vulgaris	Common Butterwort	Endangered
Polemonium vanbruntiae	Bog Jacob's-ladder	Endangered
Polygala senega	Seneca Snakeroot	Endangered
Proserpinaca pectinata	Comb-leaved Mermaid-weed	Endangered
Prunus maritima	Beach Plum	Endangered
Quercus bicolor	Swamp White Oak	Threatened
Quercus coccinea	Scarlet Oak	Endangered
Quercus montana	Chestnut Oak	Threatened
Ranunculus fascicularis	Early Crowfoot	Threatened
Rhododendron lapponicum	Lapland Rosebay	Threatened
Rhododendron maximum	Great Rhododendron	Threatened
Rhododendron viscosum	Clammy Azalea	Endangered
Salix arctophila	Arctic Willow	Endangered
Salix candida	Hoary Willow	Endangered
Salix exigua ssp. *interior*	Sandbar Willow	Endangered
Salix herbacea	Dwarf Willow	Threatened
Salix myricoides	Blue-leaf Willow	Threatened
Salix planifolia	Tea-leaved Willow	Threatened

Appendix 1-1. *continued: page 3 of 5.*

Taxa group (class) *Scientific name*	Common name	State status (updated, 2015)
Class Dicotyledoneae (Dicots) - *continued*		
Salix uva-ursi	Bearberry Willow	Threatened
Sanguisorba canadensis	Canada Burnet	Threatened
Saxifraga paniculata ssp. *neogaea*	Livelong Saxifrage	Endangered
Sericocarpus asteroids	White-topped Aster	Endangered
Shepherdia canadensis	Canada Buffaloberry	Endangered
Solidago leiocarpa	Cutler's Goldenrod	Threatened
Solidago speciose	Showy Goldenrod	Threatened
Suaeda calceoliformis	American Sea-blite	Threatened
Symphyotrichum anticostense	Anticosti Aster	Endangered
Symphyotrichum subulatum	Small Salt-marsh Aster	Threatened
Thalictrum thalictroides	Rue-anemone	Endangered
Thalictrum venulosum var. *confine*	Boundary Meadow-rue	Threatened
Triosteum aurantiacum	Wild Coffee	Endangered
Veronica wormskjoldii	Alpine Speedwell	Endangered
Vitis aestivalis var. *bicolor*	Summer Grape	Threatened
Class Filicopsida (Ferns)		
Adiantum aleuticum	Aleutian Maidenhair Fern	Endangered
Asplenium viride	Green Spleenwort	Endangered
Cryptogramma stelleri	Slender Cliffbrake	Threatened
Dryopteris filix-mas ssp. *brittonii*	Male Wood Fern	Endangered
Woodsia alpine	Northern Woodsia	Threatened
Woodsia glabella	Smooth Woodsia	Threatened
Woodsia obtusa	Blunt-lobed Woodsia	Threatened
Class Isoetopsida (Quillworts & Spike-mosses)		
Isoetes prototypus	Prototype Quillwort	Threatened
Selaginella apoda	Creeping Spike-moss	Endangered
Selaginella selaginoides	Low Spike-moss	Threatened
Class Lycopodiopsida (Clubmosses)		
Diphasiastrum sitchense	Alaskan Clubmoss	Threatened
Huperzia selago	Northern Firmoss	Threatened
Lycopodiella alopecuroides	Foxtail Bog-clubmoss	Endangered
Class Monocotyledoneae (Monocots)		
Agrostis mertensii	Boreal Bentgrass	Threatened
Anthoxanthum monticola	Alpine Sweet-grass	Threatened
Bolboschoenus novae-angliae	Marsh Bulrush	Endangered
Bromus kalmia	Wild Chess	Endangered
Calamagrostis pickeringii	Pickering's Reed Bent-grass	Threatened
Calamagrostis stricta ssp. *inexpansa*	Northern Reed Grass	Endangered
Calamagrostis stricta ssp. *stricta*	Neglected Reed-grass	Threatened
Carex adusta	Swarthy Sedge	Endangered
Carex atherodes	Awned Sedge	Threatened
Carex bicknellii	Bicknell's Sedge	Endangered

Appendix 1-1. *continued: page 4 of 5.*

Taxa group (class) *Scientific name*	Common name	State status (updated, 2015)
Class Monocotyledoneae (Monocots) - *continued*		
Carex eburnea	Ebony Sedge	Endangered
Carex granularis	Meadow Sedge	Threatened
Carex laxiculmis	Spreading Sedge	Endangered
Carex media	Intermediate Sedge	Endangered
Carex muehlenbergii	Muhlenberg Sedge	Endangered
Carex oronensis	Orono Sedge	Threatened
Carex polymorpha	Variable Sedge	Endangered
Carex prairea	Prairie Sedge	Threatened
Carex saxatilis	Russett Sedge	Endangered
Carex sparganioides	Bur-reed Sedge	Endangered
Carex typhina	Cattail Sedge	Endangered
Carex vacillans	Brackish Sedge	Endangered
Carex vestita	Clothed Sedge	Endangered
Corallorhiza odontorhiza	Autumn Coral-root	Endangered
Cyperus erythrorhizos	Red-root Flatsedge	Endangered
Cypripedium arietinum	Ram's-head Lady's-slipper	Endangered
Eleocharis rostellata	Beaked Spikerush	Threatened
Eleocharis tuberculosa	Long-tubercled Spikerush	Endangered
Festuca prolifera	Arctic Red Fescue	Endangered
Galearis spectabilis	Showy Orchis	Endangered
Glyceria acutiflora	Sharp-scaled Manna-grass	Endangered
Goodyera oblongifolia	Giant Rattlesnake-plantain	Endangered
Iris prismatica	Slender Blue Flag	Threatened
Isotria medeoloides	Small Whorled Pogonia	Endangered
Juncus secundus	Secund Rush	Threatened
Juncus subtilis	Slender Rush	Endangered
Juncus vaseyi	Vasey's Rush	Endangered
Lipocarpha micrantha	Dwarf Bulrush	Threatened
Luzula confuse	Northern Wood-rush	Endangered
Luzula spicata	Spiked Wood-rush	Threatened
Malaxis monophyllos	White Adder's-mouth	Endangered
Muhlenbergia sobolifera ssp. *brachypoda*	Cliff Muhly	Endangered
Listera auriculata	Auricled Twayblade	Threatened
Phleum alpinum	Mountain Timothy	Threatened
Platanthera leucophaea	Prairie White-fringed Orchid	Endangered
Poa glauca	White Bluegrass	Threatened
Poa laxa fernaldiana	Wavy Bluegrass	Endangered
Potamogeton friesii	Fries' Pondweed	Endangered
Potamogeton pulcher	Spotted Pondweed	Threatened
Potamogeton strictifolius	Straight-leaved Pondweed	Threatened
Rhynchospora capillacea	Horned Beak-rush	Threatened
Rhynchospora macrostachya	Tall Beak-rush	Endangered
Scirpus longii	Long's Bulrush	Threatened

Appendix 1-1. *continued: page 5 of 5.*

Taxa group (class) *Scientific name*	Common name	State status (updated, 2015)
Class Monocotyledoneae (Monocots) - *continued*		
Sorghastrum nutans	Indian Grass	Endangered
Spiranthes lucida	Shining Ladies'-tresses	Threatened
Sporobolus compositus var. *drummondii*	Longleaf Dropseed	Endangered
Triphora trianthophora	Nodding Pogonia	Threatened
Vahlodea atropurpurea	Mountain Hairgrass	Endangered
Xyris smalliana	Yellow-eyed Grass	Endangered
Class Ophioglossopsida (Adder's-tongues and Grapeferns)		
Botrychium lunaria	Moonwort	Endangered
Botrychium oneidense	Blunt-lobed Grapefern	Threatened
Botrychium pallidum	Pale Moonwort	Endangered

Appendix 1-2. Maine's list of state-designated Endangered and Threatened inland fish and wildlife administered by the Maine Department of Inland Fisheries and Wildlife (in statute; see Title 12 MRSA, §12803, http://legislature.maine.gov/legis/statutes/12/title12sec12803.html).

Taxa group (class) *Scientific name*	Common name	State status (year listed)
Class Actinopterygii (Fish)		
Esox americanus americanus	Redfin Pickerel	Endangered (2007)
Etheostoma fusiforme	Swamp Darter	Threatened (1997)
Class Aves (Birds)		
Alca torda	Razorbill	Threatened (1997)
Ammodramus savannarum	Grasshopper Sparrow	Endangered (1987)
Anthus rubescens	American Pipit	Endangered (1997)
Aquila chrysaetos	Golden Eagle	Endangered (1987)
Asio flammeus	Short-eared Owl	Threatened (1987)
Bartramia longicauda	Upland Sandpiper	Threatened (1997)
Bucephala islandica	Barrow's Goldeneye	Threatened (2007)
Charadrius melodus	Piping Plover	Endangered (1987)
Chlidonias niger	Black Tern	Endangered (1997)
Cistothorus platensis	Sedge Wren	Endangered (1987)
Falco peregrinus	Peregrine Falcon	Endangered (1975)
Fratercula arctica	Atlantic Puffin	Threatened (1997)
Gallinula galeata	Common Gallinule	Threatened (2007)
Haliaeetus leucocephalus	Bald Eagle	Recovered (2009) / Threatened (1996) / Endangered (1978)
Histrionicus histrionicus	Harlequin Duck	Threatened (1997)
Ixobrychus exilis	Least Bittern	Endangered (2007)
Nycticorax nycticorax	Black-crowned Night Heron	Endangered (2015) Threatened (2007)
Phalacrocorax carbo	Great Cormorant	Threatened (2007)
Sternula antillarum	Least Tern	Endangered (1984)
Sterna paradisaea	Arctic Tern	Threatened (1997)
Sterna dougallii	Roseate Tern	Endangered (1997) / Threatened (1987)
Class Bivalvia (Molluscs)		
Alasmidonta varicose	Brook Floater	Threatened (2007)
Lampsilis cariosa	Yellow Lampmussel	Threatened (1997)
Leptodea ochracea	Tidewater Mucket	Threatened (1997)
Class Gastropoda (Snails)		
Vertigo morseii	Six-whorled Vertigo	Endangered (2015)

Appendix 1-2. *continued: page 2 of 2.*

Taxa group (class) *Scientific name*	Common name	State status (year listed)
Class Insecta (Insects)		
Boloria chariclea grandis	Purple Lesser Fritillary	Threatened (2007)
Boloria frigga	Frigga Fritillary	Endangered (2015)
Callophrys gryneus	Juniper Hairstreak	Endangered (2007)
Callophrys hesseli	Hessel's Hairstreak	Endangered (1997)
Cicindela marginipennis	Cobblestone Tiger Beetle	Endangered (2015)
Epeorus frisoni	Roaring Brook Mayfly	Threatened (2015) / Endangered (2007)
Erynnis brizo	Sleepy Duskywing	Threatened (2007)
Gomphus quadricolor	Rapids Clubtail	Endangered (2007)
Lycaena dorcas claytoni	Clayton's Copper	Threatened (2015) / Endangered (1997)
Lycia rachelae	Twilight Moth	Threatened (2007)
Oeneis polixenes katahdin	Katahdin Arctic	Endangered (1997)
Ophiogomphus colubrinus	Boreal Snaketail	Threatened (2007)
Satyrium edwardsii	Edwards' Hairstreak	Endangered (1997)
Siphlonisca aerodromia	Tomah Mayfly	Threatened (1997)
Williamsonia lintneri	Ringed Boghaunter	Threatened (2007)
Zanclognatha martha	Pine Barrens Zanclognatha	Threatened (1997)
Class Mammalia (Mammals)		
Myotis leibii	Eastern Small-footed Bat	Threatened (2015)
Myotis lucifugus	Little Brown Bat	Endangered (2015)
Myotis septentrionalis	Northern Long-eared Bat	Endangered (2015)
Sylvilagus transitionalis	New England Cottontail	Threatened (2007)
Synaptomys borealis	Northern Bog Lemming	Endangered (1987)
Class Reptilia (Reptiles)		
Clemmys guttata	Spotted Turtle	Threatened (1987)
Coluber constrictor	Black Racer	Endangered (1987)
Emydoidea blandingii	Blanding's Turtle	Endangered (1997) / Threatened (1987)
Terrapene carolina	Box Turtle	Endangered (1987)

Appendix 1-3. Maine's list of state-designated Endangered and Threatened marine fish and wildlife administered by the Maine Department of Marine Resources (in statute; see Title 12 MRSA, §6975, http://legislature.maine.gov/legis/statutes/12/title12sec6975.html).

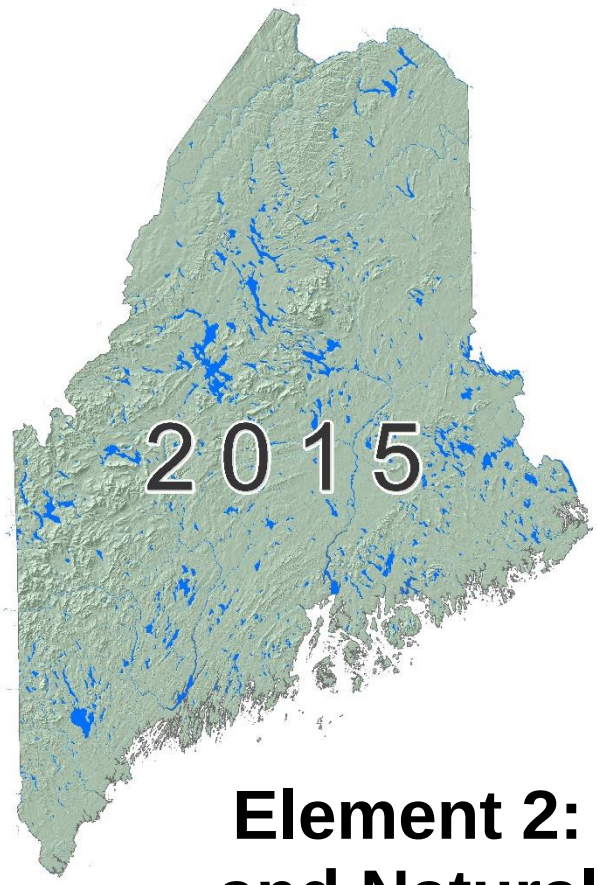
Taxa group (class) *Scientific name*	Common name	State status (year listed)
Class Actinopterygii (Fish)		
Acipenser brevirostrum	Short-nosed Sturgeon	Endangered (1975)
Class Mammalia (Mammals)		
Balaenoptera borealis	Sei Whale	Endangered (1975)
Balaenoptera physalus	Finback Whale	Endangered (1975)
Eubalaena glacialis	North Atlantic Right Whale	Endangered (1975)
Megaptera novaeangliae	Humpback Whale	Endangered (1975)
Physeter macrocephalus	Sperm Whale	Endangered (1975)
Class Reptilia (Reptiles)		
Caretta caretta	Loggerhead Sea Turtle	Threatened (1978)
Dermochelys coriacea	Leatherback Sea Turtle	Endangered (1975)
Lepidochelys kempii	Kemp's Ridley Sea Turtle	Endangered (1975)

Appendix 1-4. Maine's list of federally-designated Endangered and Threatened species administered by the U.S. Fish and Wildlife Service and National Marine Fisheries Service; see http://ecos.fws.gov/ecp/.

Taxa group (class) *Scientific name*	Common name	Federal status (year listed)
FAUNA		
Class Actinopterygii (Fish)		
Acipenser brevirostrum	Short-nosed Sturgeon	Endangered (1967)
Acipenser oxyrinchus (Gulf of Maine distinct population segment)	Atlantic Sturgeon	Threatened (2012)
Salmo salar (Gulf of Maine distinct population segment)	Atlantic Salmon	Endangered (2000)
Class Aves (Birds)		
Calidris canutus rufa	Red Knot	Threatened (2015)
Charadrius melodus	Piping Plover	Threatened (1985)
Falco peregrinus anatum	American Peregrine Falcon	Recovered (1999) / Endangered (1970)
Falco peregrinus tundrius	Arctic Peregrine Falcon	Recovered (1994) / Threatened (1984) / Endangered (1970)
Haliaeetus leucocephalus	Bald Eagle	Recovered (2007) / Threatened (1995) / Endangered (1978)
Sterna dougallii	Roseate Tern	Endangered (1987)
Class Mammalia (Mammals)		
Balaenoptera borealis	Sei Whale	Endangered (1970)
Balaenoptera musculus	Blue Whale	Endangered (1970)
Balaenoptera physalus	Finback Whale	Endangered (1970)
Canis lupus	Gray Wolf	Endangered (1967)
Eubalaena glacialis	North Atlantic Right Whale	Endangered (1970)
Lynx canadensis	Canada Lynx	Threatened (2000)
Megaptera novaeangliae	Humpback Whale	Endangered (1970)
Myotis septentrionalis	Northern Long-eared Bat	Threatened (2015)
Physeter macrocephalus	Sperm Whale	Endangered (1970)
Class Reptilia (Reptiles)		
Caretta caretta	Loggerhead Sea Turtle	Threatened (1978)
Chelonia mydas	Green Sea Turtle	Threatened (1978)
Dermochelys coriacea	Leatherback Sea Turtle	Endangered (1970)
Lepidochelys kempii	Kemp's Ridley Sea Turtle	Endangered (1970)
FLORA		
Class Dicotyledonae (Dicots)		
Isotria medeoloides	Small Whorled Pogonia	Threatened (1994) / Endangered (1982)
Pedicularis furbishiae	Furbish's Lousewort	Endangered (1978)
Class Monocotyledonae (Monocots)		
Platanthera leucophaea	Prairie White-fringed Orchid	Threatened (1989)

Appendix 1-5. Maine's 2005 SGCN that are removed from the 2015 Wildlife Action Plan.

Taxa group (class) *Scientific name*	Common name	Factors contributing to loss of SGCN status in Maine (2005 → 2015)
Class Aves (Birds)		
Anas rubripes	American Black Duck	revised regional significance criteria
Ardea alba	Great Egret	recent range expansion & low vulnerability
Bubulcus ibis	Cattle Egret	recent range expansion & low vulnerability
Cistothorus palustris	Marsh Wren	former decline insignificant in 2012 update
Egretta tricolor	Tricolored Heron	recent range expansion & low vulnerability
Empidonax traillii	Willow Flycatcher	former decline insignificant in 2012 update
Grus canadensis	Sandhill Crane	recent, general range expansion
Haliaeetus leucocephalus	Bald Eagle	full species recovery & habitat safeguards
Lanius ludoviciaus	Loggerhead Shrike	long-term extirpation
Myiarchus crinitus	Great Crested Flycatcher	former decline insignificant in 2012 update
Oxyura jamaicensis	Ruddy Duck	revised regional significance criteria
Plegadis falcinellus	Glossy Ibis	recent range expansion & low vulnerability
Pooecetes gramineus	Vesper Sparrow	revised regional significance criteria
Polioptila caerulea	Blue-gray Gnatcatcher	former decline insignificant in 2012 update
Sphyrapicus varius	Yellow-bellied Sapsucker	revised regional significance criteria
Strix varia	Barred Owl	revised regional significance criteria
Vireo flavifrons	Yellow-throated Vireo	former decline insignificant in 2012 update
Class Gastropoda (Snails)		
Amnicola decisus	A Spire Snail	errant record: mistaken identification
Catinella exile	Pleistocene Catinella	uncertain identification & taxonomy
Paravitrea lamellidens	Lamellate Supercoil	errant record: mistaken identification
Physella magnalacustris	Great Lakes Physa	uncertain identification & taxonomy
Vertigo nylanderi	Deep-throat Vertigo	relatively secure status in recent surveys
Class Insecta (Insects)		
Catocala pretiosa pretiosa	Precious Underwing	long-term extirpation
Nicrophorus americanus	American Burying Beetle	long-term extirpation
Nixe rusticalis	A Mayfly	secure status in updated assessment
Plauditus cestus	A Mayfly	uncertain taxonomy
Plebejus saepiolus amica	Greenish Blue	likely non-native & range expansion
Procloeon mendax	A Mayfly	secure status in updated assessment
Procloeon ozburni	A Mayfly	errant record: mistaken identification
Procloeon simplex	A Mayfly	secure status in updated assessment
Siphlonurus securifer	A Mayfly	secure status in updated assessment
Class Mammalia (Mammals)		
Canis lupus	Gray Wolf	long-term extirpation
Class Reptilia (Reptiles)		
Crotalus horridus	Timber Rattlesnake	long-term extirpation



MAINE'S WILDLIFE ACTION PLAN

Element 2: Key Habitats and Natural Communities

Prepared by

Maine Department of Inland Fisheries and Wildlife

In collaboration with

Maine's Conservation Partners

September 2015

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KEY TO ACRONYMS

GIS	Geographic Information System
MCP	Maine Coastal Program
MDIFW	Maine Dept. of Inland Fisheries and Wildlife
MDMR	Maine Dept. of Marine Resources
MNAP	Maine Natural Areas Program
NALCC	North Atlantic Landscape Conservation Cooperative
NETHCS	Northeast Terrestrial Habitat Classification System
SGCN	Species of Greatest Conservation Need
SWAP	State Wildlife Action Plan
TNC	The Nature Conservancy
USFWS	U.S. Fish and Wildlife Service
WMA	Wildlife Management Area

What is most striking in the Maine wilderness is the continuousness of the forest, with fewer open intervals of glades than you had imagined. Except the few burnt lands, the narrow intervals on the rivers, the bare tops of the high mountains, and the lakes and streams…the forest is uninterrupted.

Henry David Thoreau, 1846: *The Maine Woods*

2.0 ABSTRACT

Element 2 identities the extent and condition of wildlife habitats and community types essential to the conservation of Species of Greatest Conservation Need (SGCN). Maine's Wildlife Action Plan employs The Northeast Terrestrial Habitat Classification System (NETHCS) to identify the extent of habitats and community types essential to the conservation of SGCN. Federal and state agencies in the Northeast have endorsed the NETHCS as a tool for assessing habitat distribution and composition on a regional scale. The specific version of the NETHCS used in Maine includes a number of modifications made by the Maine Department of Marine Resources (MDMR) and the Maine Department of Inland Fisheries and Wildlife (MDIFW) to reflect Maine's landscape and coastal features. The basic layer within NETHCS is the habitat 'system', which corresponds to the national Ecological Systems classification. There are approximately 150 Ecological Systems in Maine. MDIFW and conservation partners used the more general 'Macrogroup' level of this hierarchical system for assigning stressors (Element 3) and some analyses; there are 42 habitat macrogroups in Maine.

Maine further consolidated the macrogroups into three broad habitat categories to facilitate development of conservation actions and ease of Plan use by conservation partners. The broad categories are Coastal and Marine, Terrestrial (including Freshwater Wetlands) and Freshwater Aquatic (Rivers, Lakes, and Ponds). The importance of various habitats to SGCN is not directly correlated to their statewide abundance; habitats such as pine barrens, open freshwater wetlands, and rivers and streams are dis-proportionately important compared to many other habitat types. It is estimated that there are presently 3,824,842 acres of conservation land in Maine, accounting for nearly 20% of the State. Much of this conserved land lies within Focus Areas of Statewide Ecological Significance, which have been identified to help prioritize conservation of Maine's landscape for SGCN and other habitat values (Element 4).

2.1 SIGNIFICANT CHANGES FROM MAINE'S 2005 PLAN

Drawing from several sources, Maine's 2005 Plan highlighted 21 habitat types and provided overviews (by ecoregions) across the State (http://www.maine.gov/ifw/wildlife/reports/wap.html). This Plan does not attempt to replicate that detailed narrative. Important changes in Element 2 of the 2015 Wildlife Action Plan include:

- Standard habitat classification: This Plan employs the NETHCS developed by The Nature Conservancy (TNC) in collaboration with fish and wildlife agencies. Habitat associations for SGCN are made with 'systems,' the finest resolution of this hierarchial system. Federal and state programs in the Northeast have endorsed the NETHCS as a standard that is compatible with nationwide classifications (http://www.landfire.gov/).

- Standard habitat mapping: NatureServe and TNC developed seamless GIS coverage to assess habitat distribution and composition terrestrial and freshwater systems in the Northeast. The specific version of the NETHCS used in Maine includes a number of minor alterations and additions made by the University of Massachusetts, as well as minor modifications made by the MDMR and MDIFW to improve resolution on some Maine's landscape and coastal features.

- SGCN - habitat associations: We evaluated SGCN occurrences at two different scales of habitat classification: approximately 150 'systems' grouped within 42 'macrogroups'. The results demonstrate that Maine's current assemblage of 378 SGCN occur disproportionately relative to the extent of habitat types within the State.

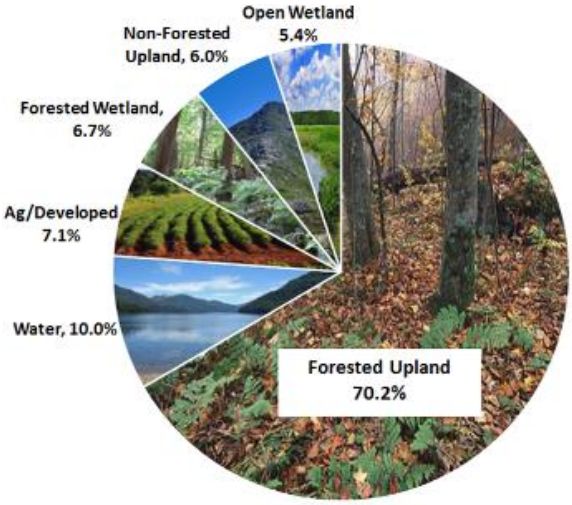
- Broad habitat groupings: We further consolidated the macrogroups into three broad ecosystem categories to facilitate discussion among conservation partners during the consideration of the extent and condition of SGCN habitats and during the development of conservation actions. The broad categories are Marine; Terrestrial, including Freshwater Wetlands; and Freshwater Rivers, Streams, Lakes, and Ponds.

- State Wildlife Action Plan database: As elsewhere in this Plan, the tabular compilation of SGCN associations in each of 42 'macrogroups' (Table 2-3) also functions as a gateway to more detailed reports. Each macrogroup summary reports compiles associated SGCN and major stressors for that system. Such information can be readily updated in the 10-year horizon of the Plan.

2.2 LANDSCAPE OVERVIEW OF MAINE

Maine encompasses approximately 21 million acres of lands and waters, from the dramatic coastline to the heights of Mount Katahdin. Maine is as large as the remaining New England states combined, and more than 31,800 miles of streams and rivers and 5,600 lakes and ponds dot the landscape. Maine's scenic, rock-bound coast is 4,100 miles long and embraces 4,613 islands between Kittery and Eastport. Roughly one quarter of the state consists of freshwater wetlands, including hardwood floodplains, freshwater marshes, and dense assemblages of vernal pools. At nearly 90% forest cover, Maine is the most heavily forested state in the United States, but it also contains some of the most significant grassland and farmlands in the Northeast. Maine's broad habitat types are shown in Figure 2-1.

Figure 2-1. Broad breakdown of habitat types in Maine (Source: NatureServe Ecological Systems GIS layer, 2012).



2.2.1 CLIMATE

Maine's climate plays a major role in determining the plant and animal assemblages within the State. The National Weather Service separates Maine into three distinct climatological divisions – coastal, southern interior, and northern interior (Brandes 2001). The coastal division runs from Kittery to Eastport and about 20 miles inland. Here the ocean moderates the climate, making coastal winters warmer and summers cooler than the interior. The southern interior division, covering the bottom one-third of the state, has the warmest summer weather and the highest numbers of clear days, whereas the northern interior (upper two-thirds of the state) boasts a mixed bag of snowy winters, warm summers, and the state's lowest rainfall.

Potential changes to Maine's climate, and their subsequent impacts on Maine's habitats and wildlife, have been the focus of recent studies by the University of Maine, conservation groups, and state agencies (Whitman et al. 2013, Fernandez et al. 2015). These changes include rising seas, altered natural disturbance processes (e.g., increased fire), changes in hydrology of wetlands and waterways, and transitions in forest composition. Despite uncertainties regarding the magnitude and timing of future changes in Maine's climate, there is a general understanding that high elevation habitats, boreal forests and peatlands, tidal marshes, and cold water fisheries are among Maine's vulnerable habitats (Whitman et al. 2013). Potential climate change impacts on SGCN are discussed in Element 3, and associated conservation actions are addressed in Element 4.

2.2.2 PHYSIOGRAPHY

Maine's western border adjoining New Hampshire and Quebec is characterized by rugged terrain with numerous glacier-scoured peaks, lakes, and valleys. The Appalachian Mountain chain, formed nearly 500 million years ago, extends into Maine from New Hampshire,

terminating at the 5,268-foot Mount Katahdin. South and east of mountain areas lie rolling hills, smaller mountains, and broad river valleys. Maine's coastline consists of long sand beaches interrupted intermittently by rocky promontories in the southwest, and a series of peninsulas, narrow estuaries, bays, and coves north and east of Portland. Tides along Maine's coast are among the highest in the world, running between 12 and 24 feet. More than 4,600 islands dot the coast, some no more than rock ledges; others are vegetated and home to fulltime and seasonal residents.

2.3 HABITAT CLASSIFICATIONS

Fish and Wildlife Agencies in the Northeast have agreed to a regional standard for evaluating habitats within each State (Terwilliger and NEFWDTC 2013). This commitment not only eliminates the >900 classifications used individually by 13 northeastern states in 2005 plans, it aids regional conservation strategies across boundaries. In fact the North Atlantic Landscape Conservation Cooperative (NALCC; Anderson et al. 2015) recently extended this NETHCHS coverage into the Canadian Maritime provinces and southern Quebec. Maine shares a longer border with both New Brunswick and Quebec than it does with the continental U.S. Therefore, many landscape analyses, SGCN assessments, and conservation efforts in Maine benefit from an international perspective with Atlantic Canada.

2.3.1 NORTHEAST TERRESTRIAL HABITAT CLASSIFICATION SYSTEM

The NETHCS, initially developed by NatureServe and TNC, is a hierarchical framework for characterizing ecological systems and mapping habitats in the region (TNC and NatureServe 2011). TNC subsequently refined the classification system with collaboration and funding from the Regional Conservation Needs Grants administered by the Northeast Association of Fish and Wildlife Agencies and U.S. Fish and Wildlife Service (USFWS). NETHCS serves as a standard for assessing habitat distribution and composition across the Northeast. The mapping effort is augmented by profiles of many common habitat systems (Anderson et al. 2013a), extent and condition analyses (Anderson et al. 2013b), and an evaluation of site resiliency (Anderson et al. 2011). Details of the NETHCS methodology are available at a TNC website: https://www.conservationgateway.org/ConservationByGeography/NorthAmerica/UnitedStates/edc/reportsdata/terrestrial/habitatmap/Pages/default.aspx.

The specific version of the NETHCS used for Maine's State Wildlife Action Plan (SWAP) includes a number of minor alterations and additions made by the University of Massachusetts (digital 'ESM Plus' layer available from NALCC), with additional minor modifications by the MDMR and MDIFW to reflect Maine's landscape and coastal features. State-based modifications include incorporation of a geographic information system (GIS) layer of impermeable surfaces by MDIFW, and finer-scaled marine classes identified by MDMR that reflect underlying substrate and biotic composition in the intertidal and subtidal areas.

The basic layer within NETHCS is the habitat 'system', which corresponds to the Ecological Systems classification. There are approximately 150 Ecological Systems in Maine, and all have been entered into the SWAP database. These include natural vegetated habitats ('Boreal Laurentian Bog'), freshwater aquatic systems ('Headwaters and Creeks'), marine systems ('Gastropod Reef'), and human-modified habitats ('Powerline Right of Way').

It is important to note that only about 50 of the 150 ecological systems are reflected in the GIS map layer because of scale limitations or difficulty of distinguishing tidal and subtidal habitats.

It should also be noted that although the classification system can accommodate structural modifiers (e.g., early successional forest), the GIS layer upon which our analyses are based does not generally distinguish between successional stages of forest. Therefore, the 'Northern Hardwood and Conifer' macrogroup, for example, includes forest stands of all successional stages. Forest condition and structure (e.g., canopy closure, vertical layering) are important habitat characteristics for many SGCN. However, the NETHCS GIS habitat layer is not an effective source for this spatial information. Other sources of information on forest condition include the U.S. Forest Service's Inventory and Analysis Program and various remote sensing data sources such as the Global Forest Change 2000-2014 project (http://earthenginepartners.appspot.com/science-2013-global-forest/download_v1.2.html).

The more general 'Macrogroup' level was used for several of our analyses. There are 42 habitat macrogroups in Maine, though not all of these are mapped (e.g., intertidal mollusc reef). Acreages for terrestrial, wetland, and freshwater macrogroups mapped in Maine are shown in Table 2-1 (shown in descending order of statewide acreage). Spatial mapping of marine habitats is particularly challenging and has not occurred.

Table 2-1. Acreages of habitat macrogroups and proportions conserved in Maine. Sources: NatureServe Ecological Systems GIS map (2012) and Maine Conserved Lands Database (2015). Extent of marine habitat macrogroups cannot be determined.

Habitat Macrogroup	Acres in state	% of State	% Conserved
Northern Hardwood & Conifer	8,787,683	39.87%	17.1%
Boreal Upland Forest	6,560,611	29.77%	26.0%
Open Water	2,206,392	10.01%	1.9%
Northern Swamp	1,435,003	6.51%	18.9%
Agricultural	802,154	3.64%	1.2%
Urban/Suburban Built	765,055	3.47%	4.6%
Emergent Marsh	438,838	1.99%	52.2%
Northern Peatland	362,022	1.64%	27.9%
Wet Meadow / Shrub Marsh	354,013	1.61%	19.4%
Central Oak-Pine	126,500	0.57%	13.3%
Outcrop & Summit Scrub	64,435	0.29%	33.5%
Cliff and Talus	43,774	0.20%	49.4%
Northeastern Floodplain Forest	29,135	0.13%	13.8%
Salt Marsh	26,213	0.12%	30.2%
Ruderal Shrubland & Grassland	22,632	0.10%	7.1%
Alpine	3,624	0.02%	99.1%
Coastal Grassland & Shrubland	4,443	0.02%	11.0%
Central Hardwood Swamp	2,790	0.01%	1.8%
Rocky Coast	3,146	0.01%	18.7%
Coastal Plain Swamp	654	0.00%	18.9%
Glade and Savanna	183	0.00%	16.4%

2.3.2 COASTAL AND MARINE CLASSIFICATION SYSTEM

Since the NETHCS focuses on habitats vegetated with vascular plants, the NETHCS marine and coastal habitat components had poor accuracy and low specificity, especially for intertidal and subtidal habitats. "Rocky coast," "coastal," and "tidal marsh" habitat macrogroups were retained from the NETHCS scheme because they have associated vegetation, but all intertidal and subtidal habitats were reclassified to increase the specificity and accuracy for these ecologically, culturally, and economically important habitats. Staff from MDMR and the Maine Coastal Program (MCP) worked with other SWAP partners to generate a coastal and marine habitat classification scheme for Maine's marine and coastal environment (Table 2-2) that encompasses all areas from the high tide line to the boundary of state waters, which extend three nautical miles offshore.

This habitat scheme was based on several existing classification systems that were either too detailed for our intended purpose or did not encompass the diverse breadth of habitats found in the coastal and marine regions in Maine (Coastal and Marine Ecological Classification Standard 2012; Brown 1993). Although this scheme was adapted to fit the particular needs of the Maine SWAP, it is written in generalized terms, where possible, in order to fit the needs of surrounding New England states. Additionally, it is possible to crosswalk this scheme with the other classification schemes listed above in order to compare existing habitat classification and maps for the limited regions where these data exist. During the development of this habitat scheme, several gaps in knowledge were identified, including the geographic locations and spatial extents of most marine and coastal habitats, the health and resiliency of these habitats, and past and projected ecosystem changes over time. Thus, mapping marine and coastal habitats and monitoring their changes over time have been highlighted as priorities for the conservation of marine SGCN over the next 10 years.

There are five broad coastal and marine habitat *formations* associated with conservation actions (tidal marsh, rocky coast, coastal, intertidal, and subtidal). The tidal marsh formation includes all peat-forming tidal marshes. The rocky coast formation encompasses rocky habitats above the high tide line. The coastal formation encompasses coastal grasslands and shrublands. The intertidal and sub-tidal formations encompass all of the benthic and pelagic (water column) habitats from the littoral zone to the open ocean. These broad habitat groups were subdivided into 15 *macrogroups* based on wave energy and the resulting physical composition of the substrate for benthic habitats (e.g. tidal marsh, mud, sand, rock, etc.); pelagic habitats are classified separately (e.g. water column).

At the more specific habitat *system* level, additional biological and physical drivers that shape the ecosystem were incorporated into the classification scheme (e.g. presence of fauna and flora, relative nutrient concentration, desiccation and temperature stressors, etc.). In Maine, certain kinds of flora and fauna, such as eelgrass, kelp beds, and soft corals, form ecologically important habitats by creating a three-dimensional structure that rises above the substrate and serves as a nursery ground or can be used for protection by fishes and invertebrates. These habitats also tend to be vulnerable to environmental stressors. To highlight the importance and relative vulnerability of these habitats, the classification scheme lists these individually at the habitat system level. The language has been generalized to "submerged aquatic vegetation," "kelp bed," and " erect epifauna" to encompass additional flora and fauna that may exist throughout the northeast region in case other New England states elect to adopt this classification scheme.

Table 2-2. Coastal / marine habitat classification developed for the Maine Wildlife Action Plan.

Formation	Macrogroup	Habitat System
Tidal Marsh	Intertidal Tidal Marsh (peat-forming)	Acadian Coastal Salt Marsh
		Coastal Plain Tidal Marsh
Rocky Coast	Rocky Coast	Acadian-North Atlantic Rocky Coast
		North Atlantic Cobble Shore
Coastal	Coastal Grassland & Shrubland	Northern Atlantic Coastal Plain Dune and Maritime Grassland
		Northern Atlantic Coastal Plain Sandy Beach
Intertidal	Intertidal Mudflat	Non-Vascular Mudflat
		Freshwater Tidal Marsh
		Submerged Aquatic Vegetation
	Intertidal Sandy Shore	Sand Flat
		Submerged Aquatic Vegetation
		Sand Beach
	Intertidal Mollusc Reefs	Oyster Reef
		Gastropod Reef
		Mussel Reef
	Intertidal Bedrock	High Intertidal
		Mid-Intertidal
		Low-Intertidal
	Intertidal Gravel Shore	High Intertidal
		Mid-Intertidal
		Lower Intertidal
	Intertidal Water Column	Confined Channel
		Embayment
		Exposed Shore
Subtidal	Subtidal Mud Bottom	Unvegetated
		Submerged Aquatic Vegetation
	Subtidal Sand Bottom	Unvegetated
		Submerged Aquatic Vegetation
	Subtidal Mollusc Reefs	Oyster Reef
		Gastropod Reef
		Mussel Reef
	Subtidal Bedrock Bottom	Bedrock
		Kelp Bed
		Erect Epifauna
	Subtidal Coarse Gravel Bottom	Coarse Gravel
		Kelp Bed
		Erect Epifauna
	Subtidal Pelagic (Water Column)	Nearshore
		Offshore
		Upwelling Zones
		Confined Channel

2.4 COASTAL AND MARINE ECOSYSTEMS

The Gulf of Maine watershed encompasses 69,115 square miles adjacent to Nova Scotia, New Brunswick, Maine, New Hampshire, Massachusetts, and Quebec. Maine is the only state or provincial jurisdiction located entirely within the watershed. The Gulf of Maine, largely created by glaciers 10,000 to 20,000 years ago, is a semi-enclosed sea bounded to the south and east by Browns Bank and Georges Bank, and includes the Bay of Fundy. Underwater valleys plunge to depths of 1,500 feet.

Tidal Marshes and Estuaries

Gulf of Maine intertidal areas include salt marsh, rocky intertidal, and mudflat. The location and extent of these habitats are influenced by substrate, wave and tidal energy, tidal range, and slope. These habitats support several commercially important species as well as numerous SGCN.

"Tidal marshes are among the most productive ecosystems on earth."

Tidal marshes occur throughout the Gulf of Maine as large estuarine complexes or small fringe marshes. Of more than 5 million acres of wetlands in the state, approximately 157,500 acres are tidal (tidal flats, salt marsh, brackish marsh, aquatic beds, beach bars and reefs), including roughly 22,000 acres of salt marsh (MDEP 1996, MEPC 1998, MNAP 2014). In fact, there are more tidal wetlands in Maine than in any state north of New Jersey (MEPC 1998).

Despite harsh growing conditions and low plant diversity, tidal marshes are among the most productive ecosystems on earth. They provide food, shelter, spawning, and nursery areas for Striped Bass (*Morono saxatilis*), Winter Flounder (*Psudopleuronectes americanus*), and Mummichogs (*Fundulus heteroclitus*). Clams and Ribbed Mussels (*Geukensia granosissima*) inhabit tidal marshes and adjacent tidal flats, and birds rely on the rich food webs of tidal marshes for breeding and during migration.

A tidal marsh estuary in Sagadahoc County, Maine. © Maine Natural Areas Program

Estuaries, places where freshwater rivers meet the ocean, receive high concentrations of nutrients that are exported from watersheds, particularly during late winter and early spring snowmelt. Land-derived nutrients combine with nutrients from tidal marshes, rockweeds, and oceanic sources to stimulate phytoplankton growth throughout the year. Eelgrass and other submerged aquatic vegetation sometimes grow in estuaries and provide a three-dimensional habitat that serve as critically important nurseries for larval and juvenile invertebrates and fish, and feeding and nesting areas for migratory fish and birds. In addition, these areas serve as coastal storm buffers and filter sediments and pollutants before they reach coastal waters. Despite their importance, up to 50% of the region's original estuarine marshes have been lost through various human activities (MEPC 1998), and many eelgrass meadows have receded dramatically over the last few years due to a myriad of known and unknown causes.

Islands, Beaches, and Dunes
Roughly 500 Maine islands support nesting wading birds, seabirds, and Common Eiders. Islands cause upwelling of deep, nutrient-rich water to the sea surface, enriching nearby waters. Currents driven by tidal action swirl around islands and surge through passages, "creating a funnel effect that increases the volume of feed available to filter feeders, as well as those species that prey on the filter feeders" (Conkling 1995).

Nearly all of Maine's larger islands were cleared in the past, primarily for sheep or cattle pasture. Many islands were burned repeatedly to remove trees and increase hay production. Human use of the islands peaked roughly 100 years ago, and since early in this century, gradual abandonment of many islands has resulted in their reforestation. In the last few decades, recreational use and construction of seasonal homes have limited the ecological recovery of some islands.

Beaches, pounded by an average 8,000 waves a day, are high-energy, climatically extreme environments. They vary from long shorelines of fine-grained silt or sand to cobbleshores and boulders. Because of geological differences between western and Downeast Maine, large sand beaches are mostly limited to southern Maine. Sand dunes, often located upslope of sand beaches, are hillocks of wind-blown sand originally brought to the rear of beaches by ocean waves and stabilized by beach grasses. Major dune systems in Maine are located at Scarborough Beach and Popham and Reid State Parks.

2.5 FRESHWATER AQUATIC ECOSYSTEMS

Maine has more than 5,000 rivers and streams, encompassing 31,800 miles of flowing waters that cover nearly half of the watershed for the Gulf of Maine. These waterways and their riparian borders are important for Maine's fisheries and wildlife, and they also serve as an important recreational resource for anglers, canoers, and rafters. More of Maine's rivers and streams are undeveloped and free-flowing than any other state in the northeastern U.S. (Bennett 1988). The state's major rivers include the Penobscot (350 mi), the St. John (211 mi), the Androscoggin (175 mi), the Kennebec (150 mi), the Saco (104 mi), and the St. Croix (75 mi).

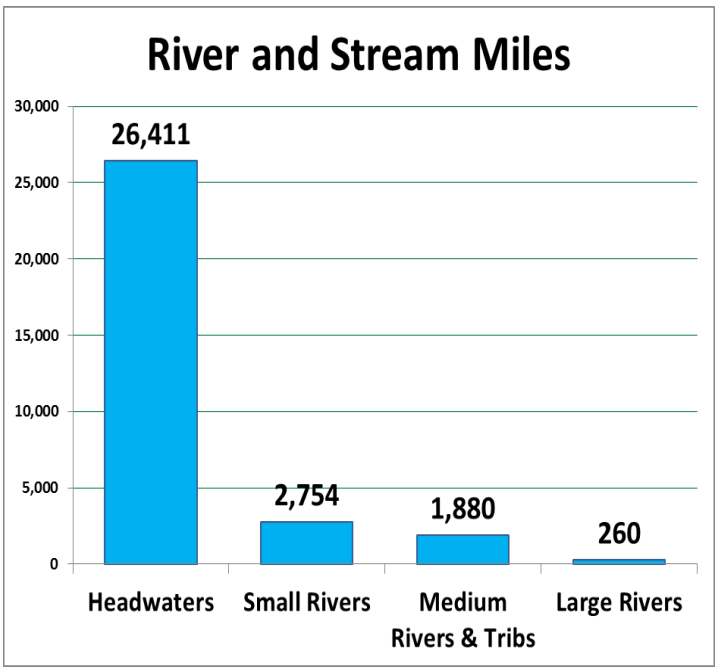
An oligotrophic lake in Somerset County, Maine. © Charlie Todd

However, the overwhelming majority of flowing water mileage in Maine is in headwater streams (Figure 2-2). Cold headwater streams and small rivers are vital habitat for Maine's brook trout, among other species, and Maine has the most extensive distribution and abundance of brook trout (*Salvelinus fontinalis*) throughout their native range in the U.S.

Maine also boasts more than 5,600 lakes and ponds, more than any other state in the Northeast. Moosehead Lake, covering about 117 mi^2, is the state's largest lake, and Sebago Lake is the deepest at 316 ft (40 ft below sea level). The availability of nutrients and oxygen at different lake depths have important implications for fish habitat, and for the purposes of this

Action Plan, Maine's lakes have been classified according to their nutrient and oxygen availability: oligotrophic (low nutrients, high oxygen), mesotrophic (intermediate nutrients and oxygen), eutrophic (nutrient-rich, low oxygen), and dystrophic (low oxygen, acidic/tannic waters). Maine also has a small number of fishless ponds, considered important for a variety of invertebrate and amphibian species.

Figure 2-2. River and stream mileage in Maine.



2.6 TERRESTRIAL AND WETLAND ECOSYSTEMS

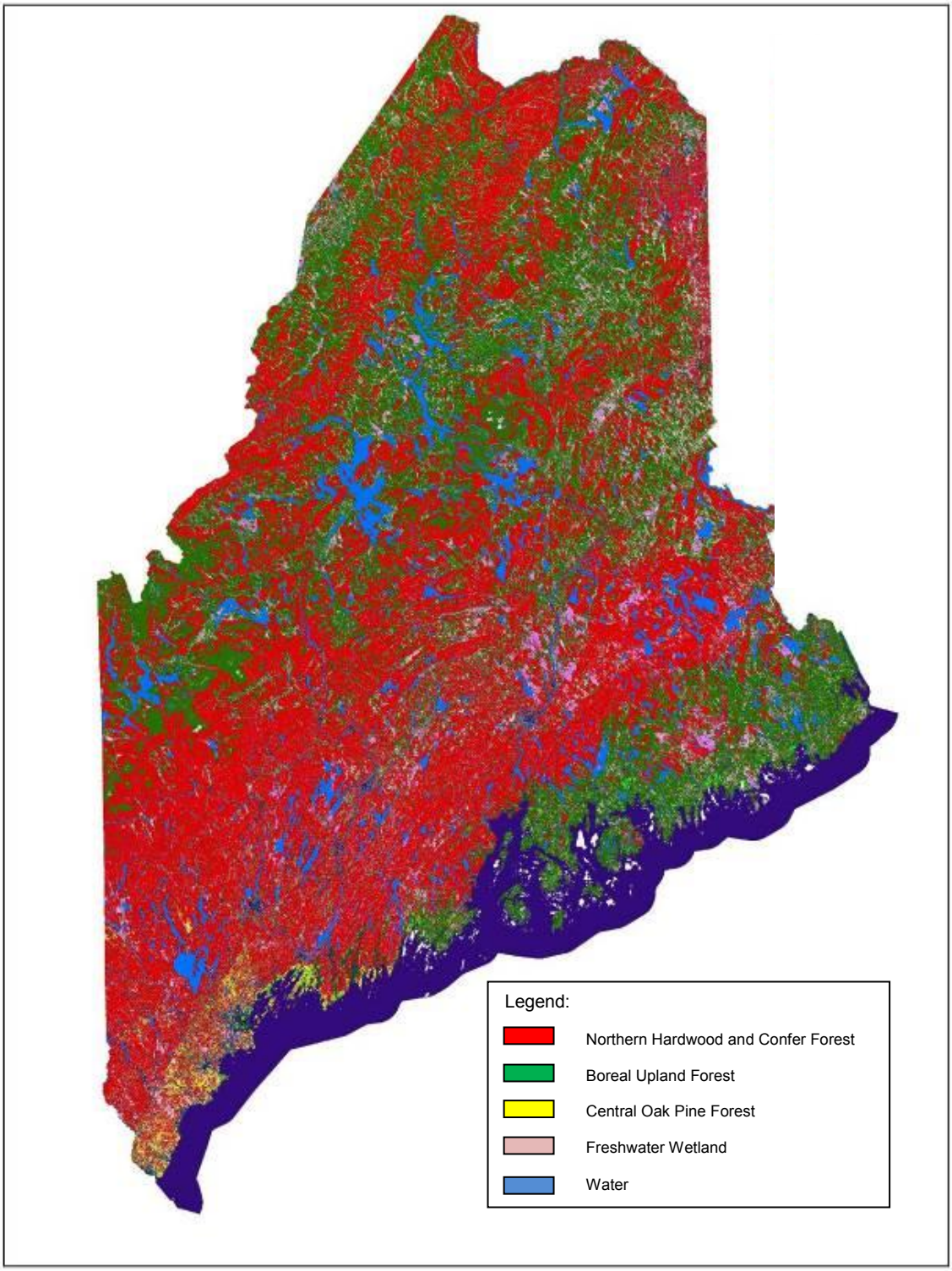
Upland Forests

Maine falls in the transition between the deciduous forest region to the south and the boreal forest region to the north. Maine's forests cover more than 17 million acres, making Maine the most heavily forested state in the nation. Unlike other regions where forest cover has been almost completely lost due to conversion to agriculture or other uses, Maine retains or has regrown much of its forest cover. Sixty-seven woody plant species reach their range limits in south-central Maine, and an additional 44 woody plant species define a coastal-inland transition zone, reaching their western range limits in a southwest-northeast belt bisecting the state (McMahon 1990). *Natural Landscapes of Maine* (Gawler and Cutko, 2010) describes 104 Natural Community types that are linked to the NatureServe's National Vegetation Classification and the Ecological Systems.

> *"Maine's forests cover more than 17 million acres, making Maine the most heavily forested state in the nation."*

At the macrogroup level, Maine's most abundant forest type is Northern Hardwood and Conifer, which accounts for approximately 40% of the state and extends from York to Aroostook County (Figure 2-3). This macrogroup consists of a mosaic of northern hardwood, spruce-fir, and mixed

Figure 2-3. Generalized map of Maine habitat types, from the Northeastern Habitat Classification System.



forest types featuring Sugar Maple, American Beech, Yellow, Red Spruce, Balsam Fir, and Eastern Hemlock. Boreal Forest, which accounts for 30% of the state, is dominated by spruce-fir types and is most common in northern Maine and along the Downeast Coast. The Central Oak Pine macrogroup, characterized by White Pine and Red Oak, occurs in southernmost Maine and accounts for less than 1% of the state.

Forest structure and condition are important attributes for many wildlife species. Both early-(young) and late-successional (old) forests are uncommon in parts of Maine. Statewide, Maine's older forests (stand age of more than 120 years) account for less than 3% of the state (U.S. Forest Service 2014), and true old growth may be as little as 0.1% of the state (Barton et al. 2012). Maine's conserved lands, in particular those classified as Gap 1 and 2, are an important resource for older forest.

Early Successional Habitats

In southern Maine, young forest is also uncommon. In York and Cumberland counties, forest younger than 40 years old accounts for less than 8% of the landscape, compared to more than 28% statewide (U.S. Forest Service 2014). In the Northeast U.S., and especially in Maine, terrestrial openings are most often the result of disturbances, whether by human activity or, historically, by wildfires (Askins et al. 2007). Open habitats increased greatly in the 18th and 19th centuries as settlers converted forests for agriculture (Todd 1940). By 1880, approximately 34% of Maine was cleared for farming (Day 1954), but that pattern reversed dramatically via reforestation during the 1900s (Powell and Dickson 1984). By 1997, only 6% of the state's land area was in agricultural use (National Agricultural Statistics 2009). That proportion has changed little during the past 30 years, but remaining farms are often row-crop agriculture. Pastures decline by 97% in the past 135 years as former pastures have re-grown. Wildfire suppression and reversion of fallow fields to forests have further reduced grasslands and shrublands.

Freshwater Wetland Ecosystems

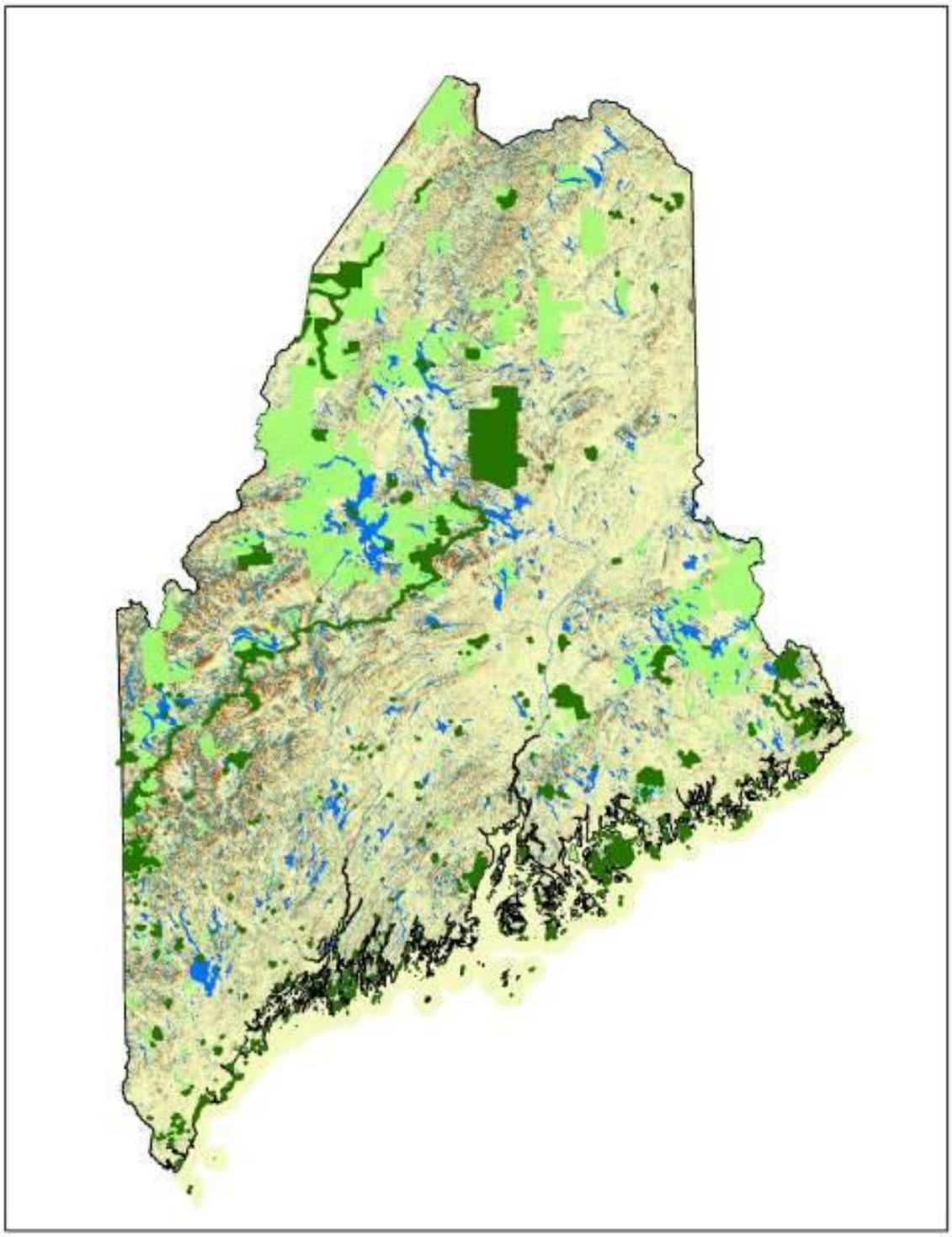
Freshwater wetlands account for roughly one quarter of the surface area of Maine (Calhoun 2001), four times the wetland area of the other New England States combined. Forested wetlands include red maple swamps, spruce flats, and cedar swamps, while non-forested wetlands range from large peatlands to emergent meadows created by beavers. In particular, Maine's diversity of peatland types is unequaled in the United States (Davis et al. 1983). The state's latitudinal, altitudinal, and coastal-inland gradients are all reflected in the varying peatland morphologies and vegetation composition. Some Maine peatland types are rare in the state (maritime slope bogs, coastal plateau bogs, circumneutral fens, patterned fens, and eccentric bogs), while others are more common (unpatterned fens, level bogs, kettlehole bogs and ponds, and some streamshore ecosystems).

> *"Freshwater wetlands account for roughly one quarter of the surface of Maine, four times the wetland area of the other New England sates combined."*

2.7 CONSERVATION LAND IN MAINE

According to the best available data, there are 3,824,842 acres of conservation land statewide, accounting for nearly 20% of Maine (Schlawin and Cutko 2014; Figure 2-4). This conservation land includes parcels with a variety of restrictions, including "working forest" conservation

Figure 2-4. Conserved lands in Maine. Dark green lands are Gap 2 (off limits to extractive uses) and light green lands are considered Gap 3 (fee lands and conservation easements managed for forest products).



easements, public lands managed for multiple uses, private conservation lands, state Ecological Reserves, and others. There are 757,450 acres of land that are considered 'Gap 1 or Gap 2' according to the USFWS classification of conserved lands. These Gap 1 and Gap 2 lands are managed for non-extractive uses (i.e., off limits to timber harvesting, gravel extraction, etc.) and account for just under 4% of Maine's conservation land.

"There are 3,824,842 acres of conservation land in Maine, accounting for nearly 20% of the state."

MDIFW holds title to approximately 106,000 acres on more than 50 Wildlife Management Areas (WMAs). Most of these lands were purchased with federal Pittman-Robertson funds, other federal matching funds, Maine citizen approved bond monies, gifts, Maine State Lottery Outdoor Heritage funds, and North Atlantic Wetland Conservation Act grants. Holdings include forested uplands, grasslands, freshwater and tidal wetlands, and seabird nesting islands. Wetlands account for more than 37% of WMAs, and several wetland types (emergent marsh, northern peatland, northern swamp, wet meadow/shrub marsh) are more than twice as well represented in WMAs than in the landscape as a whole.

For each WMA, MDIFW develops a management plan that describes the natural resources occurring on the property, history of past uses, wildlife management objectives, and future plans for additional acquisitions, habitat maintenance, and development activities. Management plans are updated every five years to reflect new land acquisitions and any changes in management objectives. WMA information and map are available at http://www.maine.gov/ifw/wildlife/land/index.html.

2.8 IMPORTANCE OF HABITATS TO SGCN

Maine identified 378 SGCN in this Plan. MDIFW and MDMR staff, in consultation with species experts and stakeholders, identified the primary and secondary habitats important to the lifecycle of each of Maine's SGCN when known. However, habitat requirements for some SGCN, especially invertebrates, are not well understood; in those cases, staff used professional knowledge to identify habitat. All Priority 1 and Priority 2 SGCN were associated with the finest scale 'habitat systems' in the hierarchical classification. Habitat assignments for Priority 3 SGCN were at the mid-scale 'habitat macrogroup' since many of the fauna in that category are poorly studied and/or handicapped by scant information.

The importance of each habitat type to SGCN varies and is not proportional to their statewide acreage. Figure 2-5 indicates that while the vast majority of the state is forested uplands, those habitats provide habitat to fewer than 35% of the state's SGCN. Conversely, open freshwater wetlands account for only 5% of Maine's area but support more than 21% of the state's SGCN.

Figure 2-5. Proportions of habitat types expressed as percentages of all state habitats and as value to SGCN.

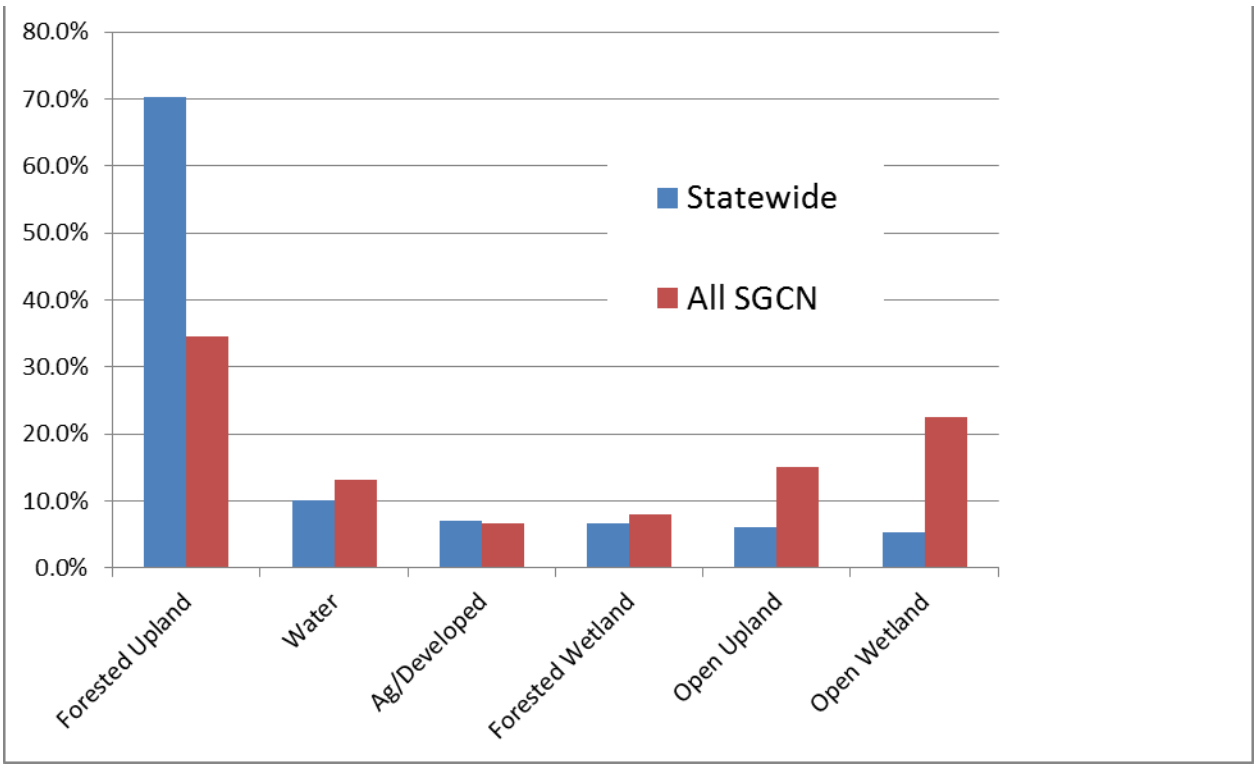


Table 2-3 summarizes the importance of various habitat macrogroups to SGCN. Northern Hardwood and Conifer Forests support 153 SGCN: more than any other type. This is not surprising, given that this habitat types is the most abundant in the state, covering nearly 40% of Maine. However, Central Oak Pine Forests provide habitat for 127 SGCN but covers *less than 1% of the state.* The importance of the Central Oak Pine Type is largely driven by the value of the Northeastern Interior Pine Barrens ecological system, which itself is home to 42 SGCN and covers less than 9,000 acres statewide, only 0.04% of Maine.

> *"Central Oak-Pine Forest provides habitat for 127 Species of Greatest Conservation Need but covers less than 1% of the state."*

All 14 of the Marine and Coastal Macrogroups support multiple SGCN, with the sub-tidal pelagic group is home to the most Priority 1 SGCN as well as total SGCN. Many marine fauna have complex life histories with varying habitat affinities at different stages of development.

Notably, habitats that are moderately to significantly altered by humans provide habitat for numerous SGCN. In particular, agricultural areas support 40 SGCN, and significant numbers of SGCN are also supported by Ruderal Grasslands and Shrublands, Urban/Suburban – Built, and Modified – Managed Marshes. Reforestation of former agricultural lands and the near demise of some types (e.g., old fields and pastures) has become a critical limitation for many SGCN.

Table 2-3. SGCN associations with NETHCS habitat macrogroups. Click on a macrogroup name to launch a full summary report of associated SGCN and for each habitat macrogroup.

Macrogroup Name	Priority 1 SGCN	Priority 2 SGCN	Priority 3 SGCN	Total # SGCN
Coastal/Marine				
Intertidal Bedrock	3	10	6	19
Intertidal Gravel Shore	1	19	15	35
Intertidal Mollusc Reefs	3	1	5	9
Intertidal Mudflat	7	13	16	36
Intertidal Sandy Shore	7	10	9	26
Intertidal Tidal Marsh (peat-forming)	6	14	16	36
Intertidal Water Column	8	4	10	22
Rocky Coast	6	10	14	30
Subtidal Bedrock Bottom	2	12	2	16
Subtidal Coarse Gravel Bottom	5	28	9	42
Subtidal Mollusc Reefs	2	3	3	8
Subtidal Mud Bottom	6	17	7	30
Subtidal Pelagic (Water Column)	17	38	25	80
Subtidal Sand Bottom	7	18	4	29
Freshwater/Aquatic				
Coastal Plain Pond	4	9	9	22
Lake & River Shore	2	3	5	10
Lakes and Ponds	10	21	43	74
Rivers and Streams	18	19	49	86
Terrestrial				
Agricultural	10	17	14	41
Alpine	3	3	13	19
Boreal Upland Forest	11	29	82	122
Central Oak-Pine	9	40	62	111
Cliff and Talus	3	3	2	8
Coastal Grassland & Shrubland	1	8	10	19
Exotic Upland Forest	4	6	3	13
Extractive	7	4	3	14
Glade, Barren and Savanna	1	7	1	9
Maintained Grasses and Mixed Cover	4	6	10	20
Northern Hardwood & Conifer	12	43	99	154
Outcrop & Summit Scrub	5	6	6	17
Plantation and Ruderal Forest	4	19	12	35
Ruderal Shrubland & Grassland	9	27	34	70
Urban-Suburban Built	3	15	15	33

Table 2-3. *continued: page 2 of 2.* Click on a macrogroup name to launch a full summary report of associated SGCN and for each habitat macrogroup.

Macrogroup Name	Priority 1 SGCN	Priority 2 SGCN	Priority 3 SGCN	Total # SGCN
Wetlands				
Boreal Forested Peatland	1	9	20	30
Central Hardwood Swamp	3	5	1	9
Coastal Plain Peat Swamp	1	2		3
Emergent Marsh	7	18	26	51
Modified-Managed Marsh	6	12	12	30
Northeastern Floodplain Forest	5	9	21	35
Northern Peatland & Fens	7	15	33	55
Northern Swamp	6	20	26	52
Wet Meadow-Shrub Marsh	11	23	27	61

2.9 ASSESSING HABITAT CONDITION AT MULTIPLE SCALES

In addition to exploring the configuration and amount of conserved habitats in Maine as well as their relative importance to SGCN, we also assessed habitat condition at multiple scales using several approaches. At the statewide scale, we assessed habitat condition for each macrogroup during our stressor analysis described in Element 3. We evaluated seven stressor characteristics (severity, actionability, reversibility, immediacy, spatial extent, certainty, and likelihood) for each habitat-stressor combination. Much of this information is contained in the linked macrogroup reports in Table 2-3 above. Additional macrogroup information is available in Maine's Wildlife Action Plan database, including all stressor characteristic values and additional notes. These notes often contain valuable regional information on where habitat condition is most affected by a given threat. Additional database information can be obtained by contacting MDIFW; online users will soon be able to access database information directly through Maine's Wildlife Action Plan Database Web Tool (available Winter 2018).

Our habitat stressor assessment describes habitat condition for individual macrogroups at the statewide scale; we employ two additional methods to examine spatially explicit habitat conditions pooled across multiple SGCN and habitat types. The fist approach, Focus Areas of Statewide Ecological Significance, identifies locations containing the highest quality habitats across Maine. The second approach, co-occurrence mapping, can be applied at multiple scales to identify the highest quality habitats at the local or regional level. Both techniques are described in more detail below.

2.9.1 HABITAT CONDITION AT THE STATE SCALE: FOCUS AREAS OF STATEWIDE ECOLOGICAL SIGNIFICANCE

Background

Over the last decade, MDIFW partnered with MNAP, MDMR, USFWS and TNC to identify concentrations of rare species, including many SGCN, and high quality habitats across Maine. Using confirmed survey data, rarity indicators, and landscape condition (size and integrity), this effort resulted in a mapped suite of nearly 140 species-at-risk Focus Areas of Statewide Ecological Significance ('Focus Areas') across Maine (Figure 2-6).

These areas include assemblages of some of the best examples of rare wildlife and plant populations and high quality natural habitats in Maine. For each species-at-risk Focus Area, there is a basic conservation plan that includes descriptions of significant features, voluntary recommendations for how best to conserve those resources and a map that delimits the area. Maps and descriptions of Focus Areas that occur in Maine's organized towns are available at:

http://www.maine.gov/dacf/mnap/focusarea/.

Criteria, Delineation, and Application

Criteria used to delineate Focus Areas include multiple locations of rare plants, animals, and natural communities; locations of the best examples of common natural communities; locations of significant wildlife habitats; and, locations where these features overlap with larger undeveloped blocks. Focus Area boundaries are based on sub-watersheds and major fragmenting features such as roads. The boundaries are strictly non-regulatory and are neither firm nor always field-delineated; rather, they are meant to indicate the general location of high value areas where voluntary land conservation and outreach measures are likely to have disproportionate benefit to Maine's vulnerable species and habitats.

Focus Areas have become integrated into a number of land conservation programs such as the Maine Natural Resources Conservation Program and the Forest Legacy Program. Focus Areas have been recognized by the land trust community and others as important indictors of ecological significance.

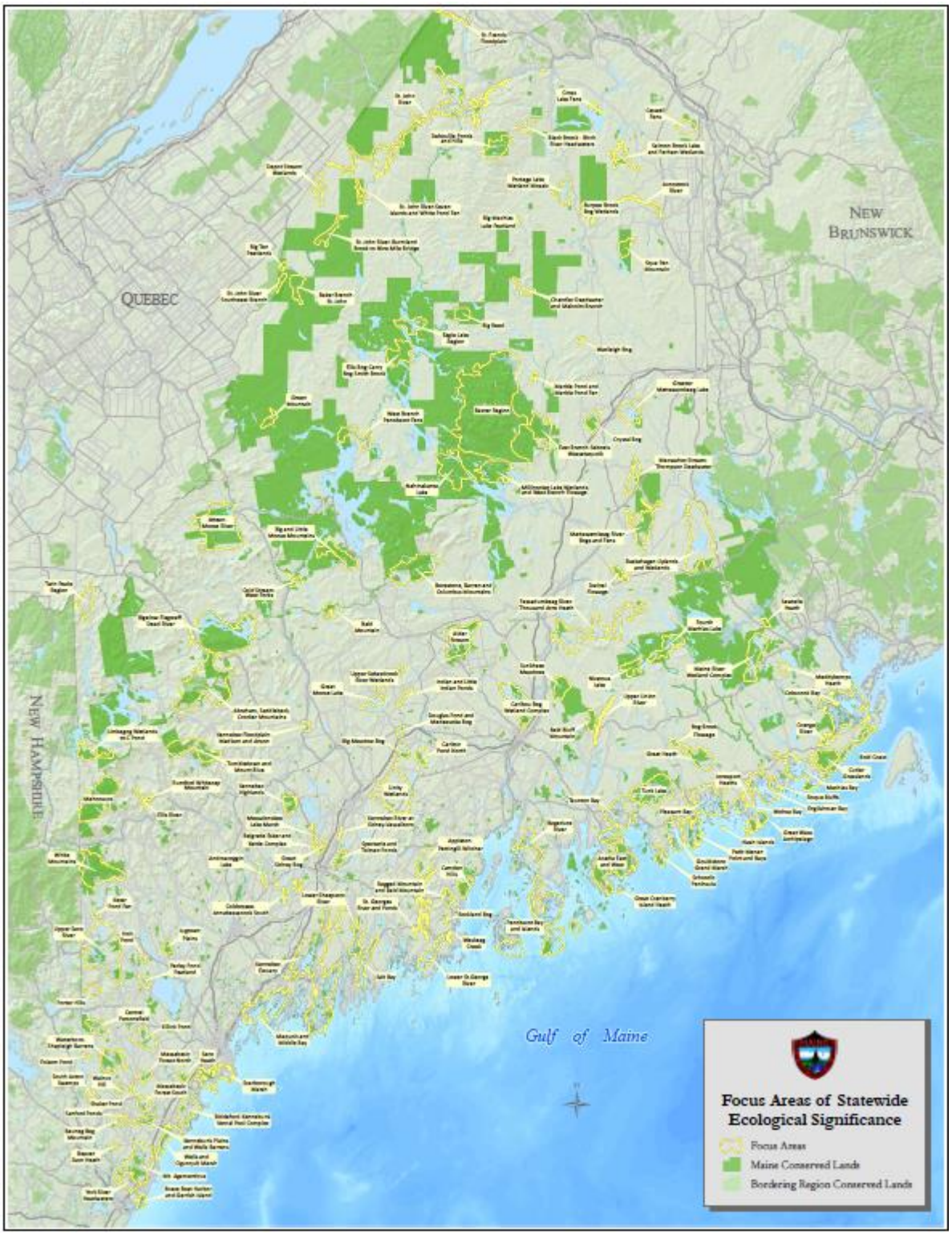
Since completion of Maine's 2005 Wildlife Action Plan, MDIFW and conservation partners (including MNAP, MDMR, USFWS, TNC, Maine Audubon, and Maine Coast Heritage Trust) developed fact sheets for most Focus Areas, which can be found at:

http://www.maine.gov/DACF/mnap/focusarea/factsheets.htm

Each factsheet contains a map of the Focus Area; a statewide map showing the location within the State; information on habitats, plants and animals likely to be present; conservation opportunities for the Focus Area; and an assessment of habitat condition. Fact sheets are updated periodically, with the last comprehensive review completed in 2011. Over the next few years, MDIFW and conservation partners will complete fact sheets for all Focus Areas (see Element 4, Table 4-21, Program 10). Beginning in August 2017, online users will be able to view Focus Area locations and access fact sheets directly using MDIFW's online Habitat MapViewer:

http://webapps2.cgis-solutions.com/beginningwithhabitat/

Figure 2-6. Distribution of Maine's Focus Areas of Statewide Ecological Significance.



Habitat Condition within Focus Areas and WMAs
In 2014, an assessment of Maine's Focus Areas and WMAs was initiated to determine their effectiveness at conserving the variety of SGCN and habitats across the state, including considerations for a changing climate. While this assessment is ongoing, a few key findings include:

- Nearly all Focus Areas meet multiple criteria; that is, most Focus Areas support a combination of rare species and important wildlife habitats.
- Almost all habitat macrogroups are well represented in Focus Areas and WMAs, and several macrogroups (e.g. alpine) are more than four times as abundant in Focus Areas relative to their overall statewide coverage.
- The network of Focus Areas generally indicates a high resilience to climate change, reflecting both high habitat connectivity and representing nearly the full variety of Maine's geophysical settings.
- In general, landscape connectivity is higher within Focus Areas than outside and is generally higher in northern than in southern or coastal Maine.

2.9.2 HABITAT CONDITION AT LOCAL AND REGIONAL SCALES: CO-OCCURRENCE MAPS

While Focus Areas highlight the highest value habitats at the statewide scale, conservation efforts often occur locally. In order to provide municipalities and other conservation partners with habitat information at scales relevant to their service areas, MDIFW and partners are developing GIS co-occurrence maps for every incorporated Maine municipality (see Figure 2-7 for an example co-occurrence map for the midcoast Maine town of Newcastle) and regional service areas (see Figure 2-8 for an example co-occurrence map for the Georges River Land Trust service area in midcoast Maine). A co-occurrence map highlights concentrations of selected data layers overlaid on the landscape. The selected data layers of interest are assigned a relative weight, or value, and then overlaid on one another. The values are then summed, classified, and symbolized, revealing the concentration of attributes in a given landscape. Its purpose is to highlight key local, high quality habitats based on the sum of relative values in a given area. Intended as an aid in planning, it provides a generalized and subjective view and should be considered as a starting point for discussion.

Figure 2-7. Example co-occurrence map for the town of Newcastle; the highest value habitats are depicted in dark green.

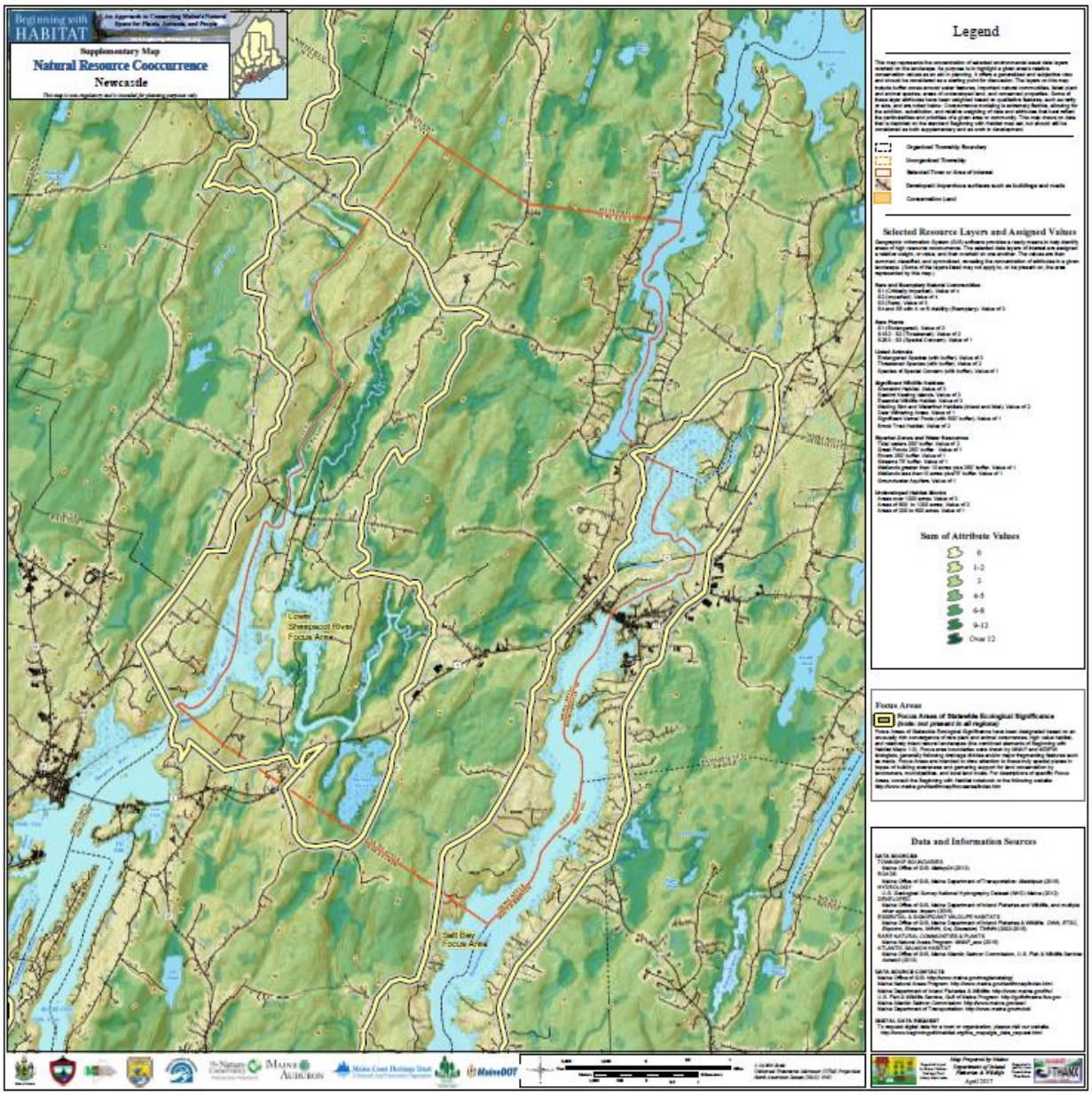
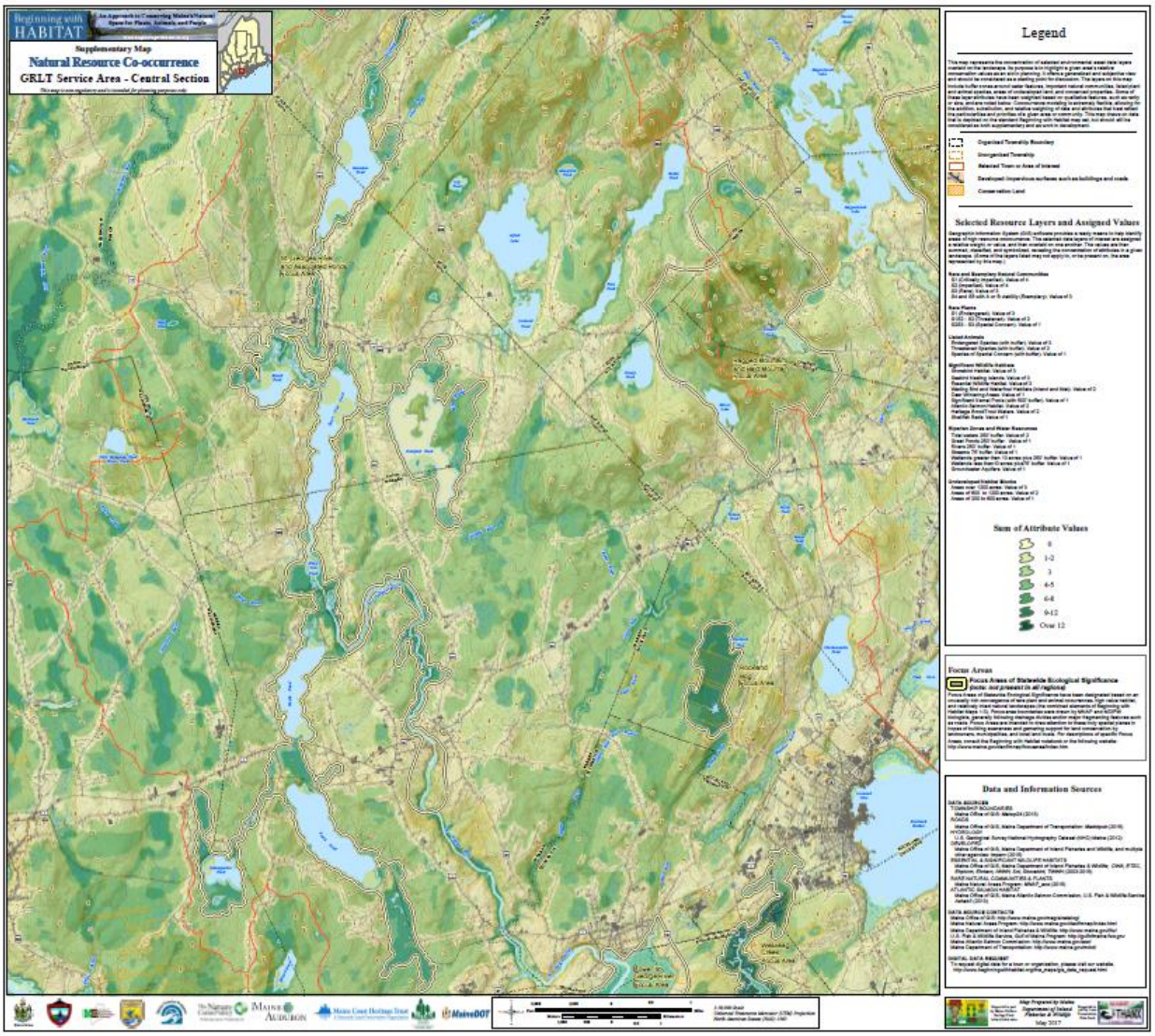


Figure 2-8. Example co-occurrence map for the Georges River Land Trust service area; the highest value habitats are depicted in dark green.



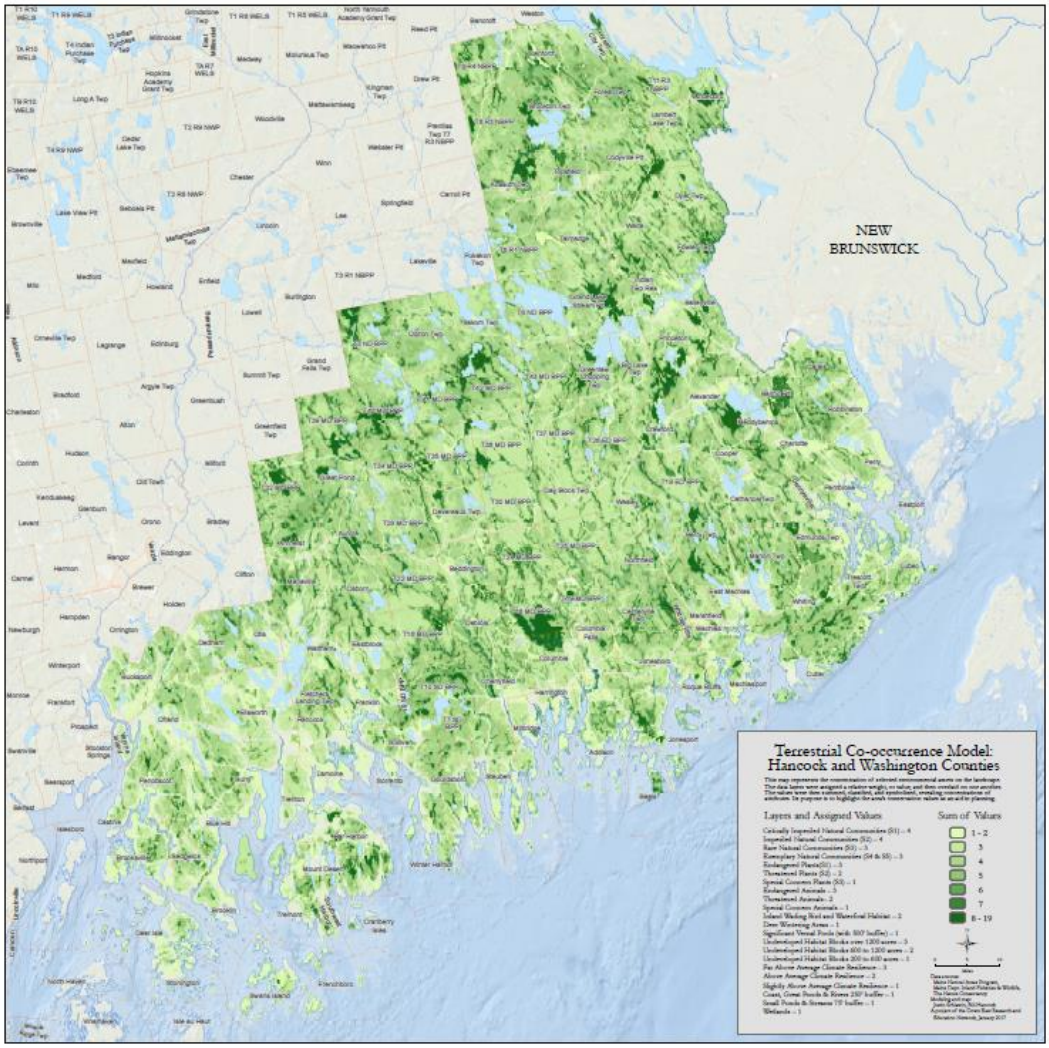
The data layers included in co-occurrence maps include buffer zones around water features, important natural communities, listed plant and animal species, areas of undeveloped land, and conserved properties. Some of these layer attributes have been weighted based on qualitative features, such as rarity or size, and are noted in Table 2-4. Co-occurrence modeling is extremely flexible, allowing for the addition, substitution, and relative weighting of data and attributes that best reflect the particularities and priorities of a given area or community.

Table 2-4. Data layers and typical values used to develop co-occurrence maps.

Data Layer	**Value**
Rare and Exemplary Natural Communities	
S1 (Critically Imperiled)	4
S2 (Imperiled)	4
S3 (Rare)	3
S4 and S5 with A or B viability (Exemplary)	3
Rare Plants	
S1 (Endangered)	3
S1S2 - S2 (Threatened)	2
S2S3 - S3 (Special Concern)	1
Listed Animals	
Endangered Species (with buffer)	3
Threatened Species (with buffer)	2
Species of Special Concern (with buffer)	1
Significant Wildlife Habitats	
Shorebird Habitat	3
Seabird Nesting Islands	3
Essential Wildlife Habitat	3
Wading Bird and Waterfowl Habitats (inland and tidal)	2
Atlantic Salmon Habitat	2
Heritage Brook Trout Waters	2
Shellfish Beds	1
Significant Vernal Pools (with 500' buffer)	1
Deer Wintering Areas	1
Riparian Zones and Water Resources	
Tidal Waters 250' buffer	2
Great Ponds 250' buffer	1
Rivers 250' buffer	1
Streams 75' buffer	1
Wetlands greater than 10 acres plus 250' buffer	1
Wetlands less than10 acres plus75' buffer	1
Groundwater Aquifers	1
Undeveloped Habitat Blocks	
Areas over 1200 acres	3
Areas of 600 to 1200 acres	2
Areas of 200 to 600 acres	1

The flexibility of co-occurrence modeling extends to the regional scale as well. In 2016, the Down East Research and Education Network (DEREN), a collaborative effort to encourage and facilitate land and resource conservation and management in Hancock and Washington Counties, partnered with MNAP and MDIFW to develop several GIS tools to aid its analysis and decision-making . Among those tools is a co-occurrence map (Figure 2-9) highlighting concentrations of conservation attributes based on two dozen terrestrial feature layers. In addition to most of the layers listed in Table 2-4, the DEREN map includes data layers representing the landscape's climate resiliency based on Anderson et al. (2011). The relative values of these resilient sites are categorized and summed in the co-occurrence map: Far Above Average Resilience with a value of 3; Above Average Resilience with a value of 2; and Slightly Above Average Resilience with a value of 1. The resulting co-occurrence map identifies areas estimated as being the most resilient to climate-induced changes and disruptions by the end of the century, thereby providing the highest habitat quality for species to persist. This same modeling approach is being applied to other regions in Maine, including southern and coastal towns.

Figure 2-9. Example co-occurrence map for Washington and Hancock Counties incorporating climate change resiliency; the highest value habitats are depicted in dark green.



2.10 MAINE FLORA AND EXEMPLARY NATURAL COMMUNITIES

Rare Plant Data

There are approximately 1,443 native and 653 introduced species of vascular plants in Maine (Gawler et al. 1996). The state's vascular plants include species at the northern edge of their range and boreal representatives at their southern limit. The Official List of Endangered and Threatened Plants in Maine is a list of native vascular plant species whose populations within the state are highly vulnerable to loss. Species on the list are typically known from a very small number of sites within the state, and many require unique habitat for survival. Roughly one third are considered vulnerable to climate change. The list is used to assist scientific research, environmental assessment, permit review, land management, and for educational purposes. Nearly one quarter of Maine's native flora (340 species) is considered possibly extirpated, rare, Threatened, or Endangered in the State, and 15 species, or fewer than two percent, of the plants native to Maine are rare throughout their worldwide range (e.g., ranked G1 or G2). The list is managed by the Maine Natural Areas Program (MNAP) and is under the jurisdiction of the Commissioner of the Department of Agriculture, Conservation and Forestry. Section 6 funding under the U.S. Endangered Species Act supports conservation of federally listed plants in Maine.

Small Round-leafed Orchis (*Amerorchis rotundifolia*): an orchid state-listed as a Threatened Species. © Maine Natural Areas Program

No plant species are included as Maine SGCN taxa because SWG funds are restricted to fauna only. There is presently no statutory protection for native plants in Maine, though natural community and landscape level conservation of SGCN and their habitats will provide secondary benefits to many rare and vulnerable plants. Informational summaries of SGCN in habitat macrogroups (Table 2-3) include E/T flora of Maine.

MNAP Rare or Exemplary Natural Communities are two broad classes of natural communities recognized as important for conservation: those that are rare and those that are common but in exemplary condition. A natural community is a system of interacting plants and their common environment, recurring across the landscape, where the effects of human intervention are minimal. There are currently 104 natural communities known in Maine, examples of which include Pitch Pine/Scrub Oak barrens, Atlantic White cedar bog, and

A Pitch Pine/Scrub Oak barrens in York County, Maine. © Maine Natural Areas Program

Spartina tidal marsh. Examples of common community types include oak/pine forest, Red Maple swamp, and cattail marsh. Most upland natural communities have been impacted by land use practices, and it is unusual to find relatively large, undisturbed examples of them. Size, disturbance, and condition are all considered when assessing the quality of common natural communities.

MNAP Rare Plant Locations designate specific points where populations of Rare, Threatened, and Endangered plants have been documented and, for some species, MNAP has identified habitat for the respective plants. Rare plants have no formal protection in Maine (rare plant legislation is for informational purposes only), thus the habitat in which these plants occur is important for their survival. Rare Plant Locations may occur outside of, or within documented MNAP Rare and Exemplary Natural Communities. Rare plants are often components of documented natural communities and can be conserved in the context of these larger systems. Populations of rare plants outside of documented natural communities will require separate conservation actions.

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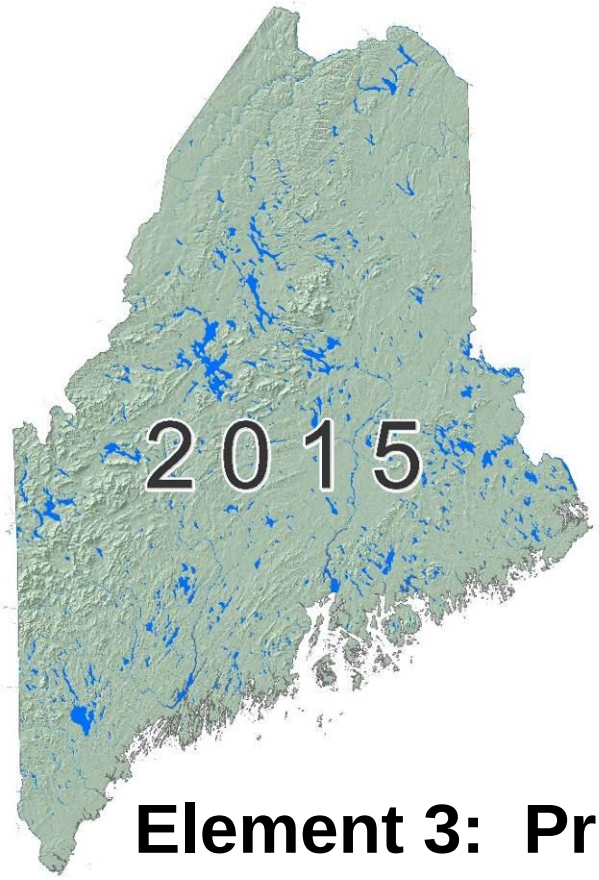

MAINE'S WILDLIFE ACTION PLAN

Element 3: Problems Affecting SGCN and Their Habitats

Prepared by

Maine Department of Inland Fisheries and Wildlife

In collaboration with

Maine's Conservation Partners

September 2015

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KEY TO ACRONYMS

IUCN	International Union for the Conservation of Nature
MDIFW	Maine Department of Inland Fisheries and Wildlife
SGCN	Species of Greatest Conservation Need

3.0 ABSTRACT

Maine's State Wildlife Action Plan (SWAP) focuses much attention on the habitats used by Species of Greatest Conservation Need (SGCN). The Plan uses a coarse filter – fine filter approach to conservation to ensure that, where possible, individual conservation initiatives benefit multiple species, while also acknowledging that some species require individualized attention. We assigned stressors to both habitats and to SGCN, in order to clearly identify the issues that should be addressed at each level in the conservation hierarchy. As with most other states in the Northeast, we identified stressors using the International Union for the Conservation of Nature (IUCN) Threat Classification Scheme. While the IUCN system is useful for categorizing stressors to SGCN and their habitats, we found that the system lacks the resolution to clearly identify the specific issues that should be considered for conservation attention. Therefore, when assigning stressors we chose to adopt the primary and secondary IUCN categories, but replaced the tertiary category with a detailed narrative that fully describes the issue and its impact on the species or habitat being considered. In addition, we adapted Table 7 (*Threat characteristics and categorical ratings)* from The Northeast Lexicon to identify characteristics for each stressor assignment.

We assigned stressors to Priority 1 and 2 SGCN, and assigned 'Severity' and 'Actionabilty' characteristics for each Stressor – SGCN interaction. We implicitly considered the concepts of 'Likelihood', 'Certainty' and 'Spatial Extent', and assigned only those stressors that were determined to have a moderate or high Impact for each of these characteristics. In addition, only those stressors with moderate or high Severity were assigned to SGCN. We developed a simple matrix to prioritize SGCN stressors, using the combination of the Impact scores for 'Severity' and 'Actionability.' We identified stressors for terrestrial and freshwater aquatic habitats using Anderson et al. (2013) as our primary reference. Because no single comprehensive source is available that describes that state of marine habitats along Maine's coast, we used a wide variety of scientific publications, as well as expert opinion of agency staff and partners, to compile information on stressors. We assumed that the habitat systems within each terrestrial and marine macrogroup all faced similar conservation problems; therefore we assigned stressors to each macrogroup, but did not identify stressors separately for each habitat system, with the exception of freshwater aquatic habitats (River and Streams, and Lakes and Ponds) were we identified stressors separately for each of systems Unlike our approach for SGCN, we assigned all seven stressor characteristics for each habitat – stressor combination.

We assigned 38 unique stressors to 190 Priority 1 and 2 SGCN species, for a total of 1,099 SGCN – stressor combinations, and 31 unique stressors to 34 habitats macrogroups, for a total of 326 habitat – stressor combinations. Development, including existing and new Roads and Railroads and Housing and Urban Areas, and Invasive Non-native/Alien Species/Diseases, impacted largest number of habitats.

3.1 INTRODUCTION

In previous elements, we summarized what we know about the abundance and distribution of Maine's fauna, described how we selected SGCN, and described how we identified and characterized Maine's key habitats. In this element, we outline how we integrated this information with information on problems facing SGCN and their habitats.

The problems that impact SGCN are often multi-faceted, with a variety of ultimate and proximate causes that lead to negative impacts on a species' habitat, behavior, or health. In some cases, issues that have negative impacts for some species, such as a particular type of agriculture, may be highly beneficial to other species. Therefore, the factors that impact SGCN must be considered thoughtfully, with recognition that measures designed to resolve problems faced by one species may have negative implications for others. This is especially important in Maine, where much of the state is privately owned and managed for the production of forestry or agricultural products; invariably these activities are less impactful on SGCN than alternate land uses, such as commercial development. Nonetheless, identifying problems for SGCN and their habitats is a fundamental step towards developing meaningful Conservation Actions that will have the greatest benefit for the full suite of SGCN that are present in Maine.

> *"The factors that impact SGCN must be considered with the understanding that measures designed to resolve problems faced by one species may have negative implications for others"*

3.1.1 SIGNIFICANT DIFFERENCES FROM MAINE'S 2005 PLAN

In 2005, the Maine Department of Inland Fisheries and Wildlife used a variety of international, national, regional, and state plans and initiatives to compile information on the problems impacting SGCN and their habitats. Efforts focused on Priority 1 and Priority 2 species, with some attention given to Priority 3 species in certain taxonomic groups. The plan identified the major known stressors to each SGCN, with recognition that additional stressors existed that were poorly understood or were of relatively low priority. The information was descriptive, and did not follow a standardized approach for stressor categorization or nomenclature.

In this plan, we made several revisions to our approach for identifying problems for SGCN and their habitats, including:

- Replaced the term 'threat' with 'stressor' to acknowledge that factors that are a problem for some SGCN may be beneficial for others. We continue to use the term 'threat' only when referring to the IUCN classification scheme (see below).
- In addition to identifying stressors for habitats, we identified stressors for Priority 1 and Priority 2 SGCN, but not Priority 3 species.
- Utilized the IUCN Threat Classification Scheme to categorize stressors.
- Used an adapted version of Table 7 (*Threat characteristics and categorical ratings)* from The Northeast Lexicon to identify characteristics for each stressor assignment.
- Categorized SGCN stressors as either Low, Medium, Medium-High, or High priority for Action.

3.1.2 ASSIGNING STRESSORS – GENERAL CONSIDERATIONS

Although Maine's Wildlife Action Plan is ultimately intended to benefit SGCN, our plan focuses much attention on the habitats used by these species. This coarse filter – fine filter approach to conservation ensures that, where possible, individual conservation initiatives benefit multiple species, while also acknowledging that some species require individualized attention. In keeping with this approach, we assigned stressors to both habitats and to SGCN, in order to clearly identify the issues that should be addressed at each level in the conservation hierarchy. We assumed that the stressors identified for habitats would apply to the SGCN that used those habitats, reducing or eliminating the need to assign these same stressors to individual SGCN. To advance our goal of developing a highly prioritized, streamlined Action Plan, we used a strategic approach to identify stressors to SGCN that included assignment of only those stressors that are currently having, or in the near future are likely to have, a significant impact on high priority SGCN (see section 3.1.4 for further detail).

> *"A coarse filter – fine filter approach to conservation ensures that where possible, individual conservation initiatives benefit multiple species, while also acknowledging that some species require individualized attention"*

To identify stressors specific to SGCN and their habitats, we consulted international, national, regional, and state plans and initiatives, including Maine's 2005 Comprehensive Wildlife Conservation Strategy (MDIFW 2005). We also consulted recent scientific literature and state surveys, particularly for marine species, which were not fully included in Maine's 2005 Plan. Our knowledge base of stressors was also supplemented from our comprehensive species planning process (Chapters 6, 7, MDIFW 2005). As part of the planning process, we developed species assessments for individual species or groups of species, which required the author (species expert) to identify known stressors to the species and their habitats. Other species experts reviewed these assessments and provided additional input, and following this review, a public working group further identified threats to the species and its habitats as they developed species management goals and objectives. We also relied on species experts within MDIFW and the Maine Dept. of Marine Resources, who through years of experience and accumulated knowledge have become very familiar with the stressors facing the species with which they work. Finally, we provided Conservation Partners the opportunity to critique these tables and provide further input. For more detailed information on sources we consulted, please refer to the *Literature Cited and References* section of this document.

Although we sought to identify the major, known stressors to each SGCN and habitat, we know that there may be stressors that we did not list. Also, our knowledge of some species is very limited, and consequently we may not clearly understand the stressors they face.

3.1.3 STRESSOR CLASSIFICATION AND CHARACTERISTICS

As did most other states in the Northeast, we identified stressors using the IUCN Threat Classification Scheme (http://www.iucnredlist.org/technical-documents/classification-schemes/threats-classification-scheme). The IUCN developed this classification scheme to provide conservationists with a universal menu of terminology to describe the "proximate human

activities or processes that have impacted, are impacting, or may impact the status of the taxon being assessed" (IUCN 2015). The IUCN classification scheme is hierarchical, and includes 11 primary (Level 1) threat categories, 44 secondary (Level 2) categories, and 76 tertiary (Level 3) categories. The categories are customizable, and may be expanded at each level in the hierarchy if necessary to adequately describe the impact being assessed. Although some categories are not applicable to Maine (e.g. earthquakes, volcanoes), our assessment of the IUCN hierarchy determined that the classification system included most factors that negatively impact SGCN in our state. Most stressors are recognized as having potentially negative and positive impacts on different wildlife species. Table 3-1 contains a list of the IUCN Level 2 threat categories that were determined to negatively impact SGCN and their habitats in Maine, a brief description of those stressors, and where applicable, examples of positive impacts that the stressor may have for other wildlife.

Improperly installed culverts can impede movement and restrict habitat connectivity for many aquatic ecosystems. In this case, a fish ladder may allow some species to traverse the barrier. © Department of Marine Resources

While the IUCN system is useful for categorizing stressors to SGCN and their habitats, and will ultimately allow multi-state summaries of these factors across the Northeast region, we found that the system lacks the resolution to clearly identify the specific issues that should be considered for conservation attention. Therefore, when assigning stressors we chose to adopt the primary and secondary IUCN categories (e.g. the first and second levels of the hierarchy), but replaced the tertiary category with a detailed narrative that describes the issue and its impact on the species or habitat being considered. This approach provided more detailed information on the stressor than the IUCN system allows, which we ultimately found important when considering whether stressors should be addressed with conservation actions. In addition, it should be noted that for some stressor categories, particularly those associated with natural resource use (such as aquaculture, wood harvesting, and fishing), it is not the presence of the activity itself that necessarily causes stress, but rather the way in which it is practiced. Although we use the standard IUCN terminology to describe these stressors, the narrative for each SGCN or habitat stressor contains more detail on the actual practice being considered.

Roads can fragment habitat and contribute to mortality for many turtles and other SGCN. © Department of Inland Fisheries and Wildlife

In addition to identifying stressors using a modified version of the IUCN system, we adapted Table 7 (*Threat characteristics and categorical ratings)* from The Northeast Lexicon to identify characteristics for each stressor assignment (Crisfield et al. 2013). This table presents six Threat Characteristics that biologists used to describe the specific nature of a particular stressor: 'Severity', 'Reversibility', 'Immediacy', 'Spatial Extent', 'Certainty', and 'Likelihood'. Each characteristic can be identified as having a low, moderate, or high level of impact (Table 3-2).

Table 3-1. Nomenclature, Descriptions, and Examples of Positive Impacts on Wildlife for IUCN Threat Categories assigned to SGCN and Habitats in Maine.

IUCN Threat Category	Description	Example of Positive Impact on Wildlife
Residential and Commercial Development		
Housing and Urban Areas	Human cities, towns, and settlements including non-housing development typically integrated with housing	Some species are adept at utilizing human-food sources and habitats provided in residential areas
Commercial and Industrial Areas	Factories and other commercial centers	Large commercial buildings may provide nesting habitat for some species (e.g. Peregrine Falcons)
Tourism and Recreational Areas	Tourism and recreation sites with a substantial footprint	These areas often enhance the public's perceptions of wildlife and the outdoors, which is important to building support for conservation
Agriculture and Aquaculture		
Annual and Perennial Non-timber crops	Crops planted for food, fodder, fiber, fuel, or other uses	Provides forage for a wide variety of wildlife species
Livestock Farming and Ranching	Domestic terrestrial animals raised in one location on farmed or non-local resources (farming); also domestic or semi-domesticated animals allowed to roam in the wild and supported by natural habitats (ranching)	Maintains grassland habitat required by many wildlife species
Marine and Freshwater Aquaculture	Aquatic animals raised in one location on farmed or non-local resources; also hatchery fish allowed to roam in the wild	Reduces reliance on wild-caught fish for human consumption
Energy Production and Mining		
Oil and Gas Drilling	Exploring for, developing, and producing petroleum and other liquid hydrocarbons	
Mining and Quarrying	Exploring for, developing, and producing minerals and rocks	
Renewable Energy	Exploring, developing, and producing renewable energy	Reduces reliance on non-renewable energy sources
Transportation and Service Corridors		
Roads and Railroads	Surface transport on roadways and dedicated tracks	

Table 3-1. *continued: page 2 of 4.*

IUCN Threat Category	Description	Example of Positive Impact on Wildlife
Transportation and Service Corridors - *continued*		
Utility and Service Lines	Transport of energy & resources	Provides early successional habitat important for some wildlife (e.g. New England Cottontail)
Shipping Lanes	Transport on and in freshwater and ocean waterways	
Biological Resource Use		
Hunting and Collecting Terrestrial Animals	Killing or trapping terrestrial wild animals or animal products for commercial, recreation, subsistence, research or cultural purposes, or for control/persecution reasons; includes accidental mortality/bycatch	Important wildlife management tool to help prevent overabundant wildlife populations
Gathering Terrestrial Plants	Harvesting plants, fungi, and other non-timber/non-animal products for commercial, recreation, subsistence, research or cultural purposes, or for control reasons	Can increase society's connection with wildlife, often leading to increased support for conservation
Logging and Wood Harvesting	Harvesting trees and other woody vegetation for timber, fiber, or fuel	Provides wildlife habitat for many species by altering forest structure and composition
Fishing and Harvesting of Aquatic Resources	Harvesting aquatic wild animals or plants for commercial, recreation, subsistence, research, or cultural purposes, or for control/persecution reasons; includes accidental mortality/bycatch	Can increase society's connection with wildlife, often leading to increased support for conservation
Human Intrusions and Disturbance		
Recreational Activities	People spending time in nature or traveling in vehicles outside of established transport corridors, usually for recreational reasons	Improves society's connection with wildlife, often leading to increased support for conservation
War, Civil Unrest and Military Exercises	Actions by formal or paramilitary forces without a permanent footprint	
Work and Other Activities	People spending time in or traveling in natural environments for reasons other than recreation or military activities	

Table 3-1. *continued: page 3 of4.*

IUCN Threat Category	Description	Example of Positive Impact on Wildlife
Natural Systems Modifications		
Fire and Fire Suppression	Suppression or increase in fire frequency and/or intensity outside of its natural range of variation	Fire (both natural and prescribed) can enhance some wildlife habitats and is required for regeneration in some forest types
Dams and Water Management/Use	Changing water flow patterns from their natural range of variation either deliberately or as a result of other activities	Can be used to enhance habitat for fish and wildlife species (e.g. waterfowl) and to provide a renewable energy source.
Other Ecosystem Modifications	Other actions that convert or degrade habitat in service of "managing" natural systems to improve human welfare	
Invasive and Other Problematic Species, Genes and Diseases		
Invasive Non-native/Alien Species/Diseases	Harmful plants, animals, pathogens and other microbes not originally found within the ecosystem(s) in question and directly or indirectly introduced and spread into it by human activities	
Problematic Native Species/Diseases	Harmful plants, animals, or pathogens and other microbes that are originally found within the ecosystem(s) in question, but have become "out-of-balance" or "released" directly or indirectly due to human activities	
Problematic Species/Diseases of Unknown Origin	Harmful plants, animals, or pathogens and other microbes of unknown origin.	
Viral/Prion-induced Diseases	Viruses are small infectious agents that replicate only inside the living cells of an organism. Prions are infectious agents composed of protein in a misfolded form.	
Pollution		
Domestic and Urban Waste Water	Water-borne sewage and non-point runoff from housing and urban areas that include nutrients, toxic chemicals and/or sediments	

Table 3-1. *continued: page 4 of 4.*

IUCN Threat Category	Description	Example of Positive Impact on Wildlife
Pollution - *continued*		
Industrial and Military Effluents	Water-borne pollutants from industrial and military sources including mining, energy production, and other resource extraction industries that include nutrients, toxic chemicals and/or sediments	
Agricultural and Forestry Effluents	Water-borne pollutants from agricultural, silivicultural, and aquaculture systems that include nutrients, toxic chemicals and/or sediments including the effects of these pollutants on the site where they are applied	
Garbage and Solid Waste	Rubbish and other solid materials including those that entangle wildlife	
Air-Bourne Pollutants	Atmospheric pollutants from point and nonpoint sources	
Excess Energy	Inputs of heat, sound, or light that disturb wildlife or ecosystems	
Climate Change and Severe Weather		
Habitat Shifting or Alteration	Major changes in habitat composition and location	Changing habitat composition will benefit species that utilize the new habitat type
Droughts	Periods in which rainfall falls below the normal range of variation	
Temperature Extremes	Periods in which temperatures exceed or go below the normal range of variation	
Storms and Flooding	Extreme precipitation and/or wind events	Wind events can result in the creation of early successional habitats, benefiting some wildlife species

Table 3-2. Characteristics and rankings used to summarize stressors assigned to SGCN and Habitats. Adapted from Crisfield et al. 2013.

Stressor Characteristic	Low Impact	Moderate Impact	High Impact
Severity	**Slight Severity**: Degree of ecological change is minor	**Moderate Severity:** Degree of ecological change is substantial	**Severe:** Degree of ecological change is major
Actionability (Consider the likelihood of implementing conservation actions to begin reducing the impact of the Stressor within the next 10 years)	**Actionable with Difficulty:** Impacts of a Stressor can only be minimally reversed, prevented, or mitigated, and cost or logistics make solutions difficult to implement	**Moderately Actionable:** Impacts of a Stressor can be reversed, prevented, or mitigated, however solutions are only partially effective or may be difficult to implement	**Highly Actionable:** Impacts of the Stressor can be reversed, prevented, or mitigated with proven strategies, at relatively low costs and with few logistical difficulties
Reversibility (Consider the likelihood of reversing the impacts within 10 years)	**Reversible:** Effects of the threat can be reversed by proven actions	**Reversible with difficulty:** effects of the threat may be reversed but costs or logistics make action impractical	**Irreversible:** Effects of the threat are irreversible
Immediacy (This characteristic assesses the time scale over which impacts of the threat will be observable)	**Long-term:** Effects of the threat are expected in 10-100 years given known ecosystem interactions or compounding threats	**Near-term:** Effects of the threat are expected within the next 1-10 years	**Immediate:** Effects of the threat are immediately observable (current or existing)
Spatial Extent (Consider the impact of threat within 10 years)	**Localized:** (<10%) A small portion of the habitat or population is negatively impacted by the threat.	**Dispersed or Patchy:** (10-50%)	**Pervasive:** (>50%) A large portion of the habitat or population is negatively impacted by the threat.
Certainty (This characteristic is used to assess the certainty surrounding the threat and its impacts)	**Low Certainty:** threat is poorly understood, data are insufficient, or the response to threat is poorly understood	**Moderate Certainty:** some information describing the threat and ecological responses to it is available, but many questions remain	**High Certainty:** Sufficient information about the threat and ecological responses to it is available
Likelihood (Consider impact of the threat within 10 years.)	**Unlikely:** Effects of the threat are unlikely to occur (less than 30% chance)	**Likely:** effects of threat are likely to occur (30-99% chance)	**Occurring:** effects of the threat are already observable (100% chance)

We added an additional characteristic – 'Actionability' – in order to more explicitly indicate the relative ease with which the impact of the stressor could be addressed through prevention, restoration, or mitigation. We determined that a stressor is 'Actionable' if either the stressor itself, or the impact of the stressor, can be reversed, prevented, or mitigated in some way. Conceptually, 'Actionability' is similar to, but distinct from the concept of 'Reversibility'. While 'Reversibility' considers only whether the impact of the stressor can be reversed once it occurs, 'Actionability' incorporates the idea that preventing or mitigating the impact of a stressor can be just as effective, and in some cases more desirable, than reversing the impact once it has

already occurred. For example, expected shifts or changes in habitats due to sea level rise may not be reversible, but the impacts of seas level rise on a salt marsh may be partially mitigated if space for the marsh to migrate inland is available. Similarly, the loss of habitat from existing housing and urban development is not reversible, but some impacts of development, such as run-off, may be actionable.

3.1.4 ASSIGNING AND PRIORITIZING STRESSORS FOR SGCN

We assigned stressors to Priority 1 and Priority 2 SGCN and assigned 'Severity' and 'Actionabilty' characteristics for each stressor – SGCN interaction (Table 3-2). We considered the concepts of 'Likelihood', 'Certainty' and 'Spatial Extent' implicitly, and only assigned those Stressors that we believed had a moderate or high impact for each of these characteristics. In addition, we only assigned those stressors with moderate or high severity to SGCN. Using this approach, we excluded those stressors with low importance for a particular species from further consideration, in recognition that these low-priority issues were not likely to be considered for conservation action if they only impacted a single SGCN or were not impacting a habitat.

In addition, we developed a simple matrix to prioritize SGCN stressors, using the combination of the Impact scores for 'Severity' and 'Actionability' (Figure 3-1). We considered these priority levels during the assignment of Conservation Actions (see Element 4).

Figure 3-1. SGCN Stressor Priority Level based on Severity and Reversibility.

		Severity	
		Moderate	**Severe**
Actionability	**Highly Actionable**	Medium - High	High
	Moderately Actionable	Medium	Medium - High
	Actionable with Difficulty	Low	Low

3.1.5 ASSIGNING STRESSORS FOR HABITATS

We identified stressors for terrestrial and freshwater aquatic habitats using Anderson et al. (2013) as our primary of reference. Because no single comprehensive source is available that describes the state of marine habitats along Maine's coast, we used a wide variety of scientific publications, which are listed in the Literature Cited, to compile information on stressors. We assumed that the habitat systems within each terrestrial and marine macrogroup all faced similar conservation problems; therefore we assigned stressors to each macrogroup, but did not identify stressors separately for each habitat system. However, because we determined that the macrogroups for freshwater aquatic habitats (River and Streams, and Lakes and Ponds) were too coarse for assigning stressors in a meaningful way, we identified stressors separately for each of these systems. Unlike our approach for SGCN, we assigned all 7 stressor characteristics (Table 3-2) for each habitat – stressor combination.

Although we acknowledge that there may be stressors that we did not list, we attempted to assign all known stressors for each habitat, regardless of severity or impact level for other characteristics. Our stressor assignments for habitats were intended to be comprehensive, in recognition that over the long term, relatively minor problems within a habitat could have important implications for large numbers of SGCN. In addition, this approach increased the likelihood that a problem would be identified for potential conservation attention if it impacted a species' habitat, even if it was not assigned for an SGCN because it was of slight severity.

Utility and service corridors, such as this powerline, may have positive benefits for SGCN by providing a source of early successional habitat that is lacking in much of southern Maine. © Department Inland Fisheries and Wildlife

In contrast to our approach for SGCN, we did not use a formal ranking system to prioritize stressors to habitats. Instead, we convened a group of experts to review the stressor information for each habitat and determine which stressors required attention (see Element 4). We considered stressor characteristics during this qualitative process, but did not use them to determine which stressors required attention.

3.2 STRESSORS TO SGCN

We assigned 38 unique stressors to 190 Priority 1 and Priority 2 SGCN species, for a total of 1,099 SGCN – stressor combinations. Because of the complexity of species-specific stressors and the sheer volume of information, we did not attempt to summarize and discuss all stressors, but instead refer the reader to reports for individual species. However, for ease of reference, we developed Table 3-3, which is includes a list of the Secondary (Level 2) IUCN threat categories and the number of Priority 1 and 2 SGCN, as well as the number of Habitat Macrogroups, that are associated with each category. Complete stressor reports can be downloaded by clicking on the hyperlinks embedded within the table.

We identified 'Habitat Shifting or Alteration' (mostly due to expected climate changes or sea level rise), 'Lack of Knowledge', and 'Fishing and Harvesting of Aquatic Resources' as stressors for the largest number of SGCN, affecting 108, 109, and 69 species, respectively (Table 3-3). Each of these stressors impacted more than one-third of all Priority 1 and Priority 2 SGCN, indicating that they are wide-spread issues that occur across taxonomic groups. However, a simple evaluation of the numbers of species impacted by each stressor does not necessarily translate into priority for conservation attention. In fact, our assessment indicated that a relatively small number of SGCN stressors were both highly severe and highly actionable, resulting in a high priority ranking (Figure 3-2). We classified only 30% of SGCN stressors as either high or medium-high priority for action, indicating that they were both severe enough to warrant immediate attention, and that solutions are available to mitigate, reverse, or prevent the impact of the stressor. In fact, of the 38 unique stressors assigned to SGCN, we determined that only 28 were of medium-high or high priority for one or more species.

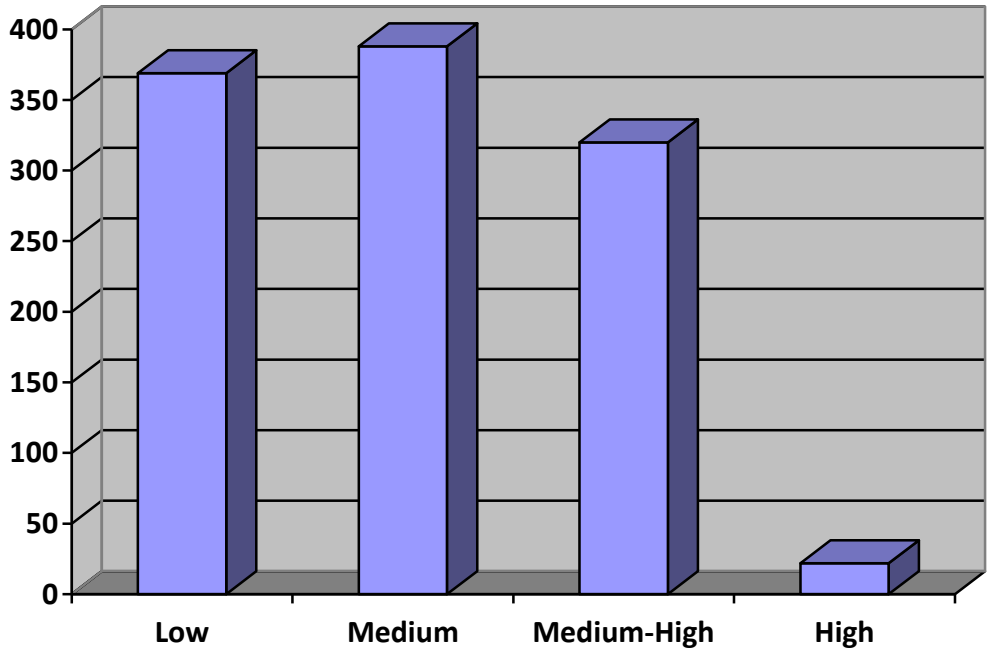
Table 3-3. IUCN Threat Category and the Number of Priority 1 SGCN, Priority 1 SGCN, and Habitat Macrogroups associated with each category. Complete stressor reports can be downloaded by clicking on the hyperlinks within the table.

IUCN Threat Category	Priority 1 SGCN	Priority 2 SGCN	Total SGCN	Habitat Macrogroups
Residential and Commercial Development				
Housing and Urban Areas	27	34	61	19
Commercial and Industrial Areas	20	17	37	18
Tourism and Recreational Areas	6	0	6	6
Agriculture and Aquaculture				
Annual and Perennial Non-timber crops	9	18	27	7
Livestock Farming and Ranching	3	3	6	6
Marine and Freshwater Aquaculture	1	0	1	5
Energy Production and Mining				
Oil and Gas Drilling	9	12	21	0
Mining and Quarrying	8	10	18	7
Renewable Energy	13	16	29	10
Transportation and Service Corridors				
Roads and Railroads	16	24	40	19
Utility and Service Lines	5	3	8	15
Shipping Lanes	4	4	8	11
Biological Resource Use				
Hunting and Collecting Terrestrial Animals	4	4	8	0
Gathering Terrestrial Plants	0	0	0	1
Logging and Wood Harvesting	12	16	28	9
Fishing and Harvesting of Aquatic Resources	21	48	69	11
Human Intrusions and Disturbance				
Recreational Activities	22	28	50	18
War, Civil Unrest and Military Exercises	2	4	6	0
Work and Other Activities	1	1	2	0
Natural Systems Modifications				
Fire and Fire Suppression	3	16	19	5
Dams and Water Management-Use	19	15	34	8
Other Ecosystem Modifications	5	5	10	0

Table 3-3. *continued: page 2 of 2.*

IUCN Threat Category	Priority 1 SGCN	Priority 2 SGCN	Total SGCN	Habitat Macrogroups
Invasive and Other Problematic Species, Genes and Diseases				
Invasive Non-native-Alien Species-Diseases	25	39	64	27
Problematic Native Species-Diseases	8	15	23	8
Problematic Species-Diseases of Unknown Origin	1	2	3	1
Viral-Prion-induced Diseases	0	2	2	2
Diseases of Unknown Cause	0	1	1	0
Pollution				
Domestic and Urban Waste Water	12	24	36	19
Industrial and Military Effluents	23	40	63	18
Agricultural and Forestry Effluents	14	53	67	17
Garbage and Solid Waste	5	7	12	7
Air-Bourne Pollutants	4	2	6	3
Excess Energy	3	7	10	0
Climate Change and Severe Weather				
Habitat Shifting or Alteration	33	75	108	20
Droughts	6	2	8	2
Temperature Extremes	20	45	65	9
Storms and Flooding	15	13	28	9
Other Options				
Other Threat	0	6	6	0
Lack of knowledge	31	78	109	1

Figure 3-2. Number of SGCN stressor assignments categorized as low, medium, medium-high, and high priority.



We identified 'Lack of Knowledge', 'Agricultural and Forestry Effluents', and 'Fishing and Harvesting of Aquatic Resources' as medium-high or high priority stressors for the largest number of SGCN (Table 3-4). Interestingly, 'Habitat Shifting or Alteration', which we found to impact a large number of SGCN, was identified as a priority stressor for only five SGCN. In most cases, impacts from 'Habitat Shifting or Alteration' were related to changes in habitat that will occur as a result of predicted levels of climate change. Common examples include the direct impacts of increasing seawater temperatures on coastal species, effects of shifts in forest composition on terrestrial species, and loss of saltmarsh habitat due to sea level rise. Although these effects are diverse and statewide in scope, most are not highly actionable at the level of individual SGCN within the scope of an individual state's Wildlife Action Plan, or are not predicted to have severe impacts on those species. However, we fully recognize the long-term implications of climate change for SGCN in Maine, and address these issues more fully at the coarse-filter (habitat) scale. We also refer readers to Whitman et al. (2013) for more information on the potential impacts of climate change on SGCN and their habitats in Maine.

Unlike 'Climate Change', 'Lack of Knowledge' is often highly actionable at the level of individual SGCN, and in many cases is one of the most severe stressors impacting species in Maine. In particular, Maine's invertebrate and marine fauna are generally poorly studied, and little information exists to describe distribution, trends in abundance, or limiting factors. Gathering basic ecological information on these species will be fundamental to advancing their conservation over the next 10 years.

Table 3-4. Secondary IUCN Threat Categories and the number of Priority 1 and Priority 2 SGCN assigned to each category where the stressor was ranked as either high or medium-high priority for action. Complete stressor reports can be downloaded by clicking on the hyperlinks within the table.

IUCN Threat Category	Number of SGCN Assignments
Residential and Commercial Development	
Housing and Urban Areas	25
Commercial and Industrial Areas	4
Tourism and Recreational Areas	1
Agriculture and Aquaculture	
Livestock Farming and Ranching	1
Marine and Freshwater Aquaculture	1
Energy Production and Mining	
Mining and Quarrying	2
Renewable Energy	12
Transportation and Service Corridors	
Roads and Railroads	12
Utility and Service Lines	1
Biological Resource Use	
Hunting and Collecting Terrestrial Animals	1
Logging and Wood Harvesting	8
Fishing and Harvesting of Aquatic Resources	39
Human Intrusions and Disturbance	
Recreational Activities	21
Work and Other Activities	1
Natural Systems Modifications	
Fire and Fire Suppression	13
Dams and Water Management-Use	12
Other Ecosystem Modifications	4
Invasive and Other Problematic Species, Genes and Diseases	
Invasive Non-native-Alien Species-Diseases	4
Problematic Native Species-Diseases	8
Viral-Prion-induced Diseases	1
Diseases of Unknown Cause	1

Table 3-4. *continued: page 2 of 2.*

IUCN Threat Category	Number of SGCN Assignments
Pollution	
Domestic and Urban Waste Water	19
Industrial and Military Effluents	18
Agricultural and Forestry Effluents	46
Air-Bourne Pollutants	1
Climate Change and Severe Weather	
Habitat Shifting or Alteration	5
Storms and Flooding	6
Other Options	
Other Threat	1
Lack of knowledge	74

The types of 'Agricultural and Forestry Effluents' that impact SGCN in Maine are diverse, and include pesticides, excessive nutrients, sedimentation, and the release of heavy metals. Many insect SGCN can be negatively impacted by the application of agricultural pesticides intended to control other species. Although these effects can be severe, they are often actionable through slight modifications to pesticide application methods, changes in the types of pesticides used, or in some cases, use of alternate pest control methods. Freshwater Aquatic and Marine habitats, and their associated SGCN, are often sensitive to declines in water quality, which can be caused by both point-source and non-point-sources. Excessive nutrients and sedimentation from agricultural activities (both crop and livestock operations) and finfish aquaculture facilities can cause elevated algae growth and lead to reduced levels of dissolved oxygen. Slight changes to farming practices are often sufficient to reduce nutrient and sediment migration to aquatic habitats and many programs currently exist to assist agricultural producers with these efforts. Established industry standards addressing feeding rates and stocking densities have successfully mitigated most effects from finfish aquaculture, drastically reducing algal growth and improving water quality.

We identified 'Fishing and Harvesting of Aquatic Resources' as a medium-high or high priority stressor for 39 SGCN. In most cases, these impacts are related to overfishing of commercial species or accidental by-catch of non-target species. Because there is no commercial harvest of terrestrial or freshwater SGCN, these impacts are limited to marine species. Often, these are historic issues that have largely been addressed through changes in regulations or fishing practices, however stocks of some species are slow to recover. Commercial fishing for marine species is a staple industry in Maine, and addressing past and current impacts will ensure that this important industry can continue to operate sustainably.

3.3 STRESSORS TO HABITATS

We assigned 31 unique stressors to 34 habitat macrogroups, for a total of 326 habitat – stressor combinations. Similar to SGCN, we do not attempt to summarize and discuss all stressors, but instead refer the reader to reports for individual habitats, and to Table 3-3 which includes links to summary reports for each stressor.

Poorly planned residential development proximate to a high value vernal pool, which has degraded terrestrial habitat for amphibians and is leaching excessive nutrients into the pool depression. © Department Inland Fisheries and Wildlife

We assigned 'Invasive Non-native/Alien Species/Diseases' and development (comprised of 'Roads and Railroads', and 'Housing and Urban Areas') to the largest number of habitats. Although all of these issues occur statewide and have the potential to impact virtually every habitat in Maine, their impacts on SGCN differ markedly depending on geography and the sensitivity of the individual speces.

Impacts from 'Invasive Non-native/Alien Species/Diseases' are most commonly related to invasive plant and animal species that degrade habitats or directly displace native species through competition or predation. These issues tend to be more prevalent in southern Maine,

where higher human populations and a moderate climate facilitate expansion of non-native species. In the marine environment, green crabs are a prevalent invasive species with deleterious impacts on a variety of habitats and SGCN. In some cases, non-native diseases, such as white-nosed syndrome in bats, have also had devastating impacts on SGCN. Impacts from 'Invasive Non-native/Alien Species/Diseases' can be severe, and in many cases it is extremely difficult to reverse the spread of invasive species or diseases; prevention is often the only feasible solution.

In contrast, 'Roads and Railroads' tend to impact habitats through fragmentation, especially for aquatic species, and by altering hydrology. Improperly installed or sized culverts can prevent or reduce passage by many SGCN, reducing connectivity between habitat patches. Both roads and railroads can also impede water flowage in seepage forests, tidal marshes, mudflats, and floodplains, reducing the function of these habitats. Construction of new roads and railroads is not prevalent in most of Maine, so addressing impacts from this stressor typically involves partial reconstruction of existing infrastructure through installation of improved culverts and bridges, and for the sake of terrestrial species such as turtles, installing signage to alert motorists to slow down.

"Development of Housing and Urban Areas is most prevalent in southern Maine, where most of Maine's human population lives, and where populations are expected to increase over the next two decades"

Development of 'Housing and Urban Areas' is most prevalent in southern Maine, where most of Maine's human population lives, and where human populations are expected to increase over the next two decades (Maine Office of Policy and Management 2015). Conversion of forest or agricultural land to residential areas causes a net loss of habitat for most species, although some SGCN are capable of adapting to development. In many cases, secondary impacts from development, such as increases in run-off, pollution, off-leash pets, traffic volumes, and even foot traffic, can have greater impacts on SGCN than the development itself. Outside of southern Maine, human populations are predicted to stabilize or decline over the next 20 years, so future impacts from new housing development are likely to be localized and should have relatively minor impacts on SGCN.

Hemlock tree in York County infected with hemlock wooly adelgid, a non-native pest. © Phillip DeMaynadier

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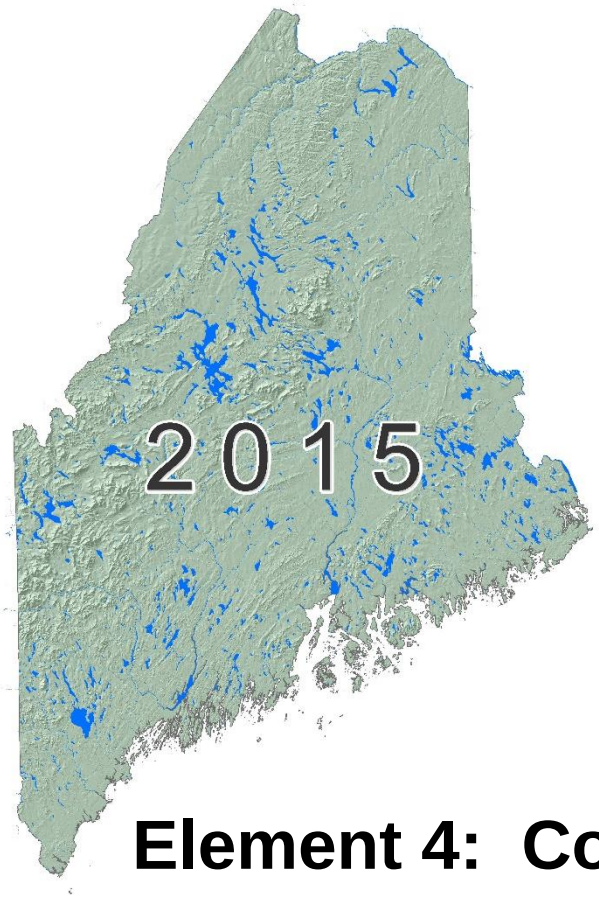

MAINE'S WILDLIFE ACTION PLAN

Element 4: Conservation Actions

Prepared by

Maine Department of Inland Fisheries and Wildlife

In collaboration with

Maine's Conservation Partners

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KEY TO ACRONYMS

CMP	Conservation Measures Partnership
COA	Conservation Opportunity Areas
CWCS	Comprehensive Wildlife Conservation Strategy
MDMR	Maine Dept. of Marine Resources
MCP	Maine Coastal Program
MDIFW	Maine Dept. of Inland Fisheries and Wildlife
MNAP	Maine Natural Areas Program
MTA2C	Mount Agamenticus to the Sea Conservation Initiative
RCN	Regional Conservation Needs
SGCN	Species of Greatest Conservation Need
SMART	Specific, Measurable, Achievable, Results-oriented, and Time-bound
SWAP	State Wildlife Action Plan
SWG	State Wildlife Grants
TNC	The Nature Conservancy

4.0 ABSTRACT

The conservation actions contained in Maine's revised State Wildlife Action Plan (SWAP) consist of complementary coarse- and fine-filter approaches that maximize limited conservation dollars. The Maine Department of Inland Fisheries and Wildlife (MDIFW), the Maine Department of Marine Resources (MDMR), the Maine Coastal Program (MCP), the Maine Natural Areas Program (MNAP), and other conservation partners worked closely to develop a thorough catalog of coarse- and fine-filter conservation actions. We attempted to balance action specificity with flexibility so that actions can be adapted as needed to emerging issues and information. Conservation actions are non-regulatory approaches undertaken voluntarily by agencies and other conservation partners. Actions are not intended to replace current management strategies, but can be used to bolster existing efforts or inspire new ones.

The actions reflect several stages of prioritization. Conservation partners identified a total of 311 actions for Species of Greatest Conservation Need (SGCN). Of these, partners applied 197 actions to individual SGCN, 88 to guilds, and 26 to one or more taxonomic groups. We assigned nine of these actions to all SGCN species. Conservation partners also identified 322 habitat actions, including 165 marine and coastal habitat actions, 54 freshwater aquatic habitat actions, and 103 terrestrial and wetland habitat actions. Given the volume of habitat conservation actions identified, workgroups developed several themes to organize actions into discrete packages of related actions that address common stressors or use similar techniques. Actions within a theme are often complementary, and when undertaken together, may be the most effective and efficient use of conservation resources. Three 'super-themes' emerged across habitat groups: Connectivity, Invasive Species, and Mapping and Outreach. Actions included in these themes will be more effective with coordinated efforts across habitats. Each conservation action is linked to its target SGCN or habitat and the stressor(s) the action is addressing in a relational database, an idea proposed in the 2005 Comprehensive Wildlife Conservation Strategy (CWCS) and successfully developed as part of this Plan. We also identified 11 programmatic actions to help guide implementation and tracking of the 2015 Action Plan; we have broadly grouped these actions as Outreach and Engagement, Funding and Tracking, Action Development, and Regional Partnerships. In this chapter, we also propose criteria partners may wish to consider if evaluating how best to direct resources to conservation actions in the plan. We also discuss differences from Maine's 2005 CWCS.

4.1 INTRODUCTION

In the previous chapter, we identified the primary issues affecting Maine's Species of Greatest Conservation Need (SGCN) and their habitats. In this chapter, we discuss strategies ('conservation actions') to address the negative effects of stressors on SGCN and habitats. **Conservation actions are non-regulatory approaches undertaken voluntarily by agencies and other conservation partners. They are not intended to replace current management strategies, but can be used to bolster existing efforts or inspire new ones.** In this chapter, we describe our approach to developing conservation actions at the SGCN, habitat, and programmatic scales and introduce a strategy for prioritizing conservation projects over the next ten years.

Maine's 2015 Wildlife Action Plan consists of complementary coarse- and fine-filter conservation actions that maximize limited conservation dollars. Coarse-filter conservation actions are those applied broadly at large spatial scales (e.g., habitats) or groupings (e.g., communities) and benefit most species associated with that habitat or group. Coarse-filter actions focus largely on conserving plant and animal communities and the interactions among them. However, certain SGCN require 'fine-filter' actions designed to alleviate stressors not adequately addressed through coarse-filter actions.

> *"Conservation actions are non-regulatory approaches undertaken voluntarily by agencies and other conservation partners."*

Conservation partners worked closely to develop a thorough catalog of coarse- and fine-filter conservation actions. We attempted to balance action specificity with flexibility so that actions can be adapted to emerging issues and information. These actions are extensive and comprehensive, and thus, their implementation will require a truly statewide collaborative effort among partners. Maine's conservation actions present a diverse set of opportunities from which conservation partners can select actions that reflect their interests and abilities. For example, some actions are suitable for private citizens while others are best accomplished by large regional inter-agency partnerships. We hope partners will see a role for themselves in the 2015 Wildlife Action Plan and identify new opportunities for collaboration.

4.1.1 SIGNIFICANT DIFFERENCES FROM MAINE'S 2005 PLAN

Both Maine's 2005 CWCS (MDIFW 2005) and the 2015 Wildlife Action Plan incorporate fine- and coarse-filter approaches to SGCN conservation. For SGCN in 2005, MDIFW relied heavily on the comprehensive species planning process to identify SGCN and habitat-scale actions. Our coarse-filter conservation efforts in the 2005 CWCS relied heavily on providing SGCN information to municipalities and land trusts for land-use planning and voluntary conservation. In the 2015 Wildlife Action Plan, however, MDIFW and MDMR species experts identified both broad and species-specific SGCN actions. We also worked with partners to expand our coarse-filter habitat conservation approaches to include a variety of education, outreach, management, and research actions aimed at multiple habitat scales.

In this Plan, we also:

1. Identified and developed actions (especially for habitats) collaboratively among agencies and other conservation partners; MDIFW also provided all conservation partners an opportunity to review and comment on conservation actions before posting the Wildlife Action Plan for the 30-day public comment period.

2. Developed habitat actions that directly address habitat stressors and not just stressors to SGCN.

3. Developed habitat action themes to help organize habitat actions into discrete packages that address a common set of stressors or use similar approaches to do so.

4. Added the action type 'new' or 'on-going' to distinguish between existing programs and those that need to be initiated.

5. Developed programmatic actions to guide Wildlife Action Plan implementation, reporting, and partner involvement.

6. Prioritized actions based on biological priority for SGCN and habitats.

Conservation partners coordinated on all aspects of Plan development. © George Matula

7. Developed a prioritization approach to evaluate SWG-funded project proposals.

8. Linked conservation actions to SGCN, habitats, and stressors in a relational database.

4.1.2 GENERAL CONSIDERATIONS FOR DEVELOPMENT OF CONSERVATION ACTIONS

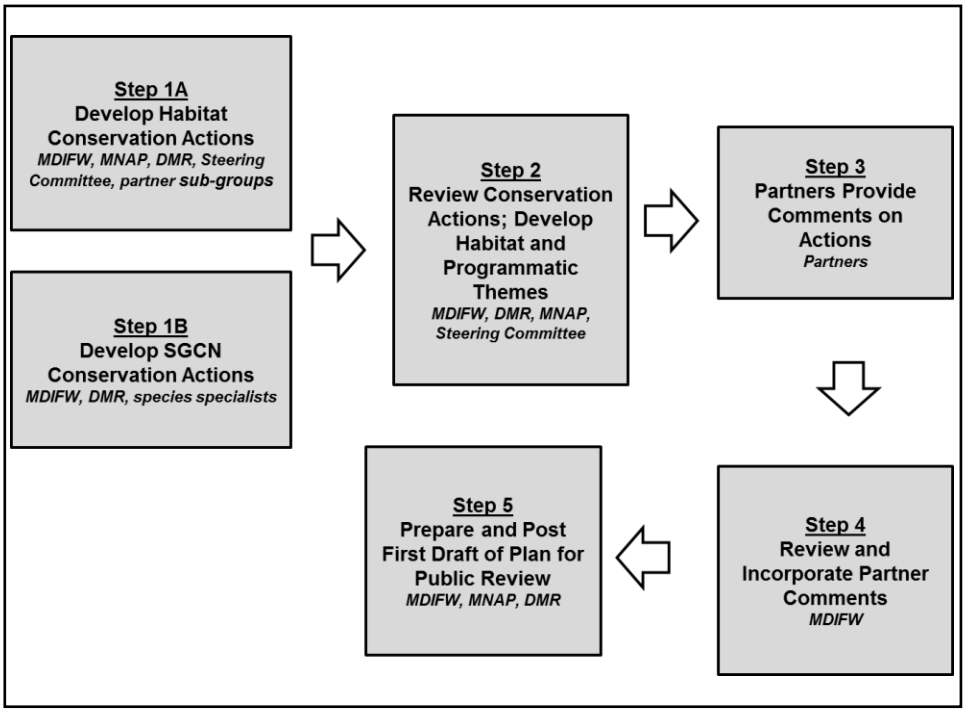
MDIFW collaborated closely with partners, species specialists, and habitat experts over a five-month period (February-July 2015) to develop SGCN and habitat conservation actions. While MDIFW used slightly different but parallel approaches to develop SGCN and habitat actions (Figure 4-1), conservation actions at both scales address specific stressor(s) to SGCN and habitats. We wrote conservation action descriptions broadly enough to allow for adaptive management over the next ten years, but with enough specificity to help assess performance (AFWA 2012). We also developed 11 programmatic actions that will guide SWAP implementation of the over the next ten years.

We identified comprehensive lists of 311 SGCN and 322 habitat conservation actions. These lists reflect several stages of consolidation and prioritization. First, we developed SGCN-

specific actions only for Priority 1 and Priority 2 species and addressed Priority 3 species at the guild level. Second, we only developed conservation actions for priority habitat and SGCN stressors, which we defined as stressors that were at least moderately actionable and moderately severe (Figure 4-1).

"MDIFW collaborated closely with partners, species specialists, and habitat experts over a five-month period (February-July 2015) to develop SGCN and habitat conservation actions."

Figure 4-1. Overall process for developing SGCN, habitat, and programmatic conservation actions. Agencies and partners involved at each stage are noted in italics.



Finally, we further prioritized our comprehensive list of actions based on biological priority (see below for further explanation).

We used the following categories to help organize and prioritize SGCN and habitat conservation actions:

1. **Action Category:** MDIFW assigned conservation actions to one of the following six broad categories to help organize related actions. While some actions fit into multiple categories, we assigned the best-fitting category for each action.

    a. **Habitat management:** Addresses stressors to SGCN habitats through habitat conservation, management, or stewardship.

    b. **Policy:** Addresses existing policies or the need for new policies that encourage conservation of SGCN and habitats; all actions in this category are strictly non-regulatory.

c. **Public outreach:** Addresses the need to raise the public's awareness of the stressors to SGCN and their habitats.

d. **Research:** Addresses gaps in our understanding of life history, productivity, mortality, habitat requirements, limiting factors, interactions with other species, and conservation needs of SGCN.

e. **Species Management:** Addresses management needs at the species or population level.

f. **Surveys and Monitoring:** Addresses data gaps and informational needs on the distribution, abundance, and status of SGCN.

2. **Biological Priority:** MDIFW assigned actions a biological priority based on how essential that action will be toward conserving a species or habitat over the next ten years. Biological priority does not take into account the economic or practical feasibility of actions. Because MDIFW developed actions only for priority stressors, there is no 'low' level of biological priority.

   a. **Critical**: Actions that are necessary for sustaining species or habitats in order to prevent the loss of populations or significant portions of habitats or habitat integrity in the next ten years.

   b. **High**: Actions that are important for conserving habitats or preventing the loss of SGCN populations but would not result in dire losses if not enacted over the next ten years.

   c. **Moderate:** Actions that would benefit habitats or SGCN but alone may not be crucial for their continued existence over the next ten years.

3. **Action Type:** This category indicates whether an action is already underway ('**on-going**') or if a new effort is needed ('**new**'). We included on-going actions in the 2015 Plan to acknowledge and provide continued support for on-going conservation efforts.

"Each conservation action is linked to its target SGCN or habitat and the stressor(s) the action is addressing in a relational database, an idea proposed in the 2005 CWCS and successfully developed as part of the 2015 Action Plan."

Each conservation action is linked to its target SGCN or habitat, the stressor(s) the action is addressing, and the above categories in a relational database, an idea proposed in the 2005 CWCS and successfully developed as part of the 2015 Wildlife Action Plan. This database allows users to quickly search by 1) habitat, SGCN, or stressor and 2) group actions by categories or programs of interest. MDIFW hopes to add additional information to habitat and SGCN conservation actions in the database (e.g., contact information for partners or agencies coordinating projects and information on project progress). Programmatic actions may eventually be added to the database, but are currently housed in this chapter.

4.2 SGCN CONSERVATION ACTIONS

4.2.1 SGCN ACTION BACKGROUND

Conservation actions for Maine's SGCN represent the Wildlife Action Plan's fine-filter approach to species conservation. Although we anticipate that coarse-filter, habitat-based actions will ultimately address most of the important problems facing SGCN, there are some species that require individual attention. In some cases, stressors impacting SGCN are not directly related to that species' habitat (e.g., white-nosed syndrome in bats), or individual SGCN have specific habitat requirements that cannot be reasonably addressed by generic conservation actions for habitats. Additionally, some SGCN have pre-existing conservation plans (e.g., Atlantic Salmon) where mangers have already determined actions to monitor and conserve the species. In these cases, MDIFW adopted actions from these established plans. In assigning conservation actions to SGCN, we hope to ensure that no SGCN 'falls through the cracks' over the next 10 years. At the same time, we attempted to limit the application of species-specific conservation actions to those SGCN with pressing conservation needs.

4.2.2 DEVELOPMENT OF SGCN CONSERVATION ACTIONS

We developed conservation actions as follows:

1. Species specialists within MDIFW and MDMR developed 23 species 'guilds' in order to streamline the assignment of conservation actions. These guilds consisted of groups of species facing similar conservation problems, and for which conservation actions could be developed concurrently. Guilds included Priority 1, Priority 2, and Priority 3 SGCN.

2. Using professional knowledge, species specialists assigned conservation actions to address stressors of medium-high or high priority (see Element 3) that had been assigned to Priority 1 or Priority 2 SGCN. Conservation actions that species specialists assigned to guilds applied to all species within the guild, regardless of the species priority level. For each conservation action, specialists assigned a rank for biological priority, action type, and action category using the criteria described in this chapter's introduction.

3. Once specialists completed initial assignments, a small group of MDIFW and marine species experts reviewed the draft list of conservation actions and identified several similar actions that had been applied to many species within a single taxonomic group, and in some cases, to multiple species across taxonomic groups. They refined these actions and applied them either to all SGCN species or to all SGCN within a taxonomic group, as appropriate.

4. A small group of staff reviewed and edited the full list of SGCN conservation actions to improve editorial consistency and ensure accuracy.

5. MDIFW presented the draft list of SGCN conservation actions to conservation partners at a meeting on June 16, 2015 and distributed them by email for review and feedback. MDIFW modified SGCN conservation actions as appropriate.

6. On July 13, 2015, MDIFW posted the entire draft Wildlife Action Plan online for a 30-day public comment period (see Elements 7/8 for more information). MDIFW, agency partners, and the Steering Committee reviewed the comments received addressing SGCN conservation actions. MDIFW and the Steering Committee modified conservation actions as appropriate.

4.2.3 SUMMARY OF SGCN CONSERVATION ACTIONS

MDIFW and partners identified a total of 311 conservation actions for SGCN. Of these, we applied 26 actions to one or more taxonomic groups (Table 4-1), 88 to guilds of species (Tables 4-2 to 4-6), and 197 to individual SGCN (Tables 4-7 to 4-11). We assigned nine actions to all SGCN species and applied three to multiple taxonomic groups (Table 4-1). Of the remaining 299 actions, MDIFW and partners applied 127 to birds, 65 to reptiles, amphibians, or invertebrates, 16 to inland fish, 20 to mammals, and 78 to marine species (Table 4-12). We classified most actions as research or survey and monitoring, reflecting the pervasive need to gather more information on SGCN in order to facilitate their conservation. Nearly half of the SGCN conservation actions are already on-going in some form (although they may require enhancement). MDIFW and partners viewed approximately 20% of actions as critical to habitat conservation over the next ten years (Tables 4-13 and 4-14).

Table 4-1. Conservation Actions assigned to Taxonomic Groups.

Taxonomic Groups	Category	Biological Priority	Type	Description
All Terrestrial and Freshwater SGCN (Birds; Reptiles, Amphibians, and Invertebrates; Inland Fish; Mammals)	Habitat Management	High	On-going	Map and distribute information on species distribution, habitat requirements, and conservation actions with a goal of increased voluntary conservation by landowners, towns, and land trusts.
All SGCN (Birds; Reptiles, Amphibians, and Invertebrates; Inland Fish; Mammals; Marine)	Policy	High	New	Develop conservation actions for all medium-ranked stressors assigned to Priority 1 and Priority 2 SGCN
				Collaborate with partners to develop habitat management recommendations for all Priority 1 and Priority 2 SGCN and Guilds that are sensitive to certain intensive forest management practices.
				Review and update SGCN distribution maps on a regular basis throughout the Wildlife Action Plan implementation period.
				Ensure ETSC database tracking is in place and accurate for all Priority 1 SGCN, and develop a system for prioritizing ETSC database tracking for a higher proportion of Priority 2 SGCN than are currently tracked.
				Integrate SGCN habitat needs and Conservation Actions more explicitly into MDIFW Wildlife Management Area Plan reviews and updates, while maintaining the original management goals for each property.
			On-going	Conduct a comprehensive review of S-ranks and share with NatureServe
				Continue and improve quality of mapping and tracking of documented populations using MDIFW's ETSC database.
	Public Outreach	High	New	Provide increased partner and public access to SGCN species reports, maps, and conservation actions through MEGIS, or other venues.
			On-going	Increase public awareness of the economic and ecological value of SGCN and their conservation needs.
All Marine SGCN	Habitat Management	High	On-going	Assess new aquaculture sites for potential positive, benign, or negative species interactions. Continue to review the presence of and impacts to ecologically sensitive species and areas during the review process.
	Public Outreach	High	On-going	Increase capacity for collaborative data collection and management that fosters partnerships among harvesters, citizens, scientists, and managers.
				Increased leadership and education regarding climate change mitigation and adaptation

Table 4-1. *continued: page 2 of 2.*

Taxonomic Groups	Category	Biological Priority	Type	Description
All Marine SGCN (continued)	Research	Critical	On-going	Create species distribution maps to facilitate reduced response time to potential oil spills by creating 'hot' zones.
		High	New	Conduct laboratory and in situ research to understand the direct and indirect impacts of climate change (e.g. warming ocean temperatures, decreased salinity, increased eutrophication) and ocean acidification on individual species, food webs, and ecosystems.
				Conduct research to better understand impacts on marine SGCN and recovery from mechanical disturbances at various scales (e.g. dredging, dredge disposal, offshore infrastructure construction, mineral mining, etc.).
			On-going	Improve understanding of non-harvested species through targeted data collection, habitat surveys, and other efforts
				Map species distributions and abundances to track changes over time, identify ecologically important areas for multiple SGCN, and examine ecosystem interactions and predator-prey relationships.
				Conduct research to evaluate the impacts (including sublethal/lethal effects) of nutrients, chemicals, and other pollutants on marine SGCN to better understand risks to exposure, and monitor natural environments to understand where these stressors may be occurring.
				Investigate biological effects (both lethal and sublethal) of oil spills and related treatments and response techniques including oil dispersants, burning, etc., as well as the short and long term effect of oil spills.
				Determine accuracy of harvester and dealer reported landings for target species and bycatch.
		Moderate	On-going	Research the impacts of diversifying Maine's marine fisheries on both non-commercial and commercially important SGCN.
	Species Management	High	On-going	Improve evaluation of commercially-harvested intertidal and subtidal SGCN through designation of conserved areas and rotational management (e.g., scallops).
	Survey and Monitoring	High	On-going	Conduct surveys to monitor and better understand distribution and abundance.
		Moderate	On-going	Create an incentive-based reporting tool for non-commercial bycatch.
All Bird SGCN	Survey and Monitoring	High	New	Improve documentation of breeding status and distribution through an update to the Maine Breeding Bird Atlas.
All Reptile, Amphibian, and Invertebrate SGCN	Survey and Monitoring	High	On-going	Implement targeted professional surveys to better understand species distribution and status and to help direct conservation actions to newly documented populations.

Table 4-2. Conservation Actions assigned to Bird Guilds.

Guild	Species	Category	Biological Priority	Type	Description
Grassland birds	Northern Harrier, Upland Sandpiper, American Kestrel, Horned Lark, Grasshopper Sparrow, Field Sparrow, Bobolink, Eastern Meadowlark, Short-eared Owl, Barn Owl	Public Outreach	High	New	Develop a program to inform small landowners of the best methods for keeping fields open for grassland wildlife.
		Species Management	High	New	Collaborate with partners to develop a BMP guide for farmers to minimize negative effects of cutting hay/silage during the grassland bird nesting season. NRCS recommendations should be viewed as a start with increased emphasis on timing, field size, and bird behavioral cues.
Island Nesting Seabirds	Razorbill, Atlantic Puffin, Laughing Gull, Roseate Tern, Common Tern, Arctic Tern, Leach's Storm-petrel, Great Cormorant	Research	High	New	Determine the association with commercial fisheries and climate-induced changes to food availability.
				On-going	Determine which factors influence breeding success and productivity.
		Survey and Monitoring	High	On-going	Continue seabird restoration activities at historic nesting sites using social attraction, vegetation management, and predator control.
Marsh birds	Black Tern, Yellow Rail, American Coot, Common Gallinule, Sora, Sedge Wren, American Bittern, Least Bittern, Pied-billed Grebe	Habitat Management	High	New	Work with landowners to maximize hemi-marsh conditions and maintain stable water levels.
		Species Management	Moderate	New	Work with landowners to develop and post signs or other strategies for discouraging recreational users from disturbing nesting birds.
		Survey and Monitoring	High	New	Implement targeted surveys to better understand the distribution and status of this species and to help direct conservation actions to newly documented populations.

Table 4-2. *continued: page 2 of 2.*

Guild	Species	Category	Biological Priority	Type	Description
Shorebirds	Black-bellied Plover, American Oystercatcher, Ruddy Turnstone, Sanderling, Dunlin, Red Knot, Purple Sandpiper, Least Sandpiper, Semipalmated Sandpiper, Short-billed Dowitcher, Whimbrel, Red Phalarope, Lesser Yellowlegs, Greater Yellowlegs	Habitat Management	Moderate	New	Use voluntary agreements, conservation easements, conservation tax abatements and incentives to protect important habitats.
		Public Outreach	High	On-going	Provide outreach to pet owners, beachgoers, kayakers, beach managers, and landowners to raise public awareness on shorebirds and on the impacts of disturbance from recreational activities in coastal areas.
		Research	High	On-going	Work with the Maine Department of Marine Resources to conduct research to determine the impact of macroalgae harvest on wintering waterfowl.
					Identify prey resources in significant staging areas to determine potential limiting factors and optimal management techniques to promote these resources.
					Determine length of stay at stopover areas, site fidelity, local movements and premigration condition to determine if coastal habitats are meeting shorebird requirements for successful migration.
					Gain a better understanding of the extent and impacts of algae harvesting on staging and wintering shorebirds. Conduct long-term monitoring of ecosystem-wide impacts of cutting algae to determine potential impacts to shorebird habitats and invertebrate prey.
			Moderate	New	Determine limiting factors for SGCN shorebird species on breeding, migratory, or wintering areas.
		Species Management	High	New	Place symbolic stake and twine fencing around important beach roosting areas with signage to identify roosting areas.
		Survey and Monitoring	High	On-going	Identify and map priority feeding and roosting areas including offshore habitats, and implement protection initiatives. Enter data in IFW ETSC database.
					To determine population status, continue monitoring program for SGCN shorebird species at high priority migration sites coastwide. Continue to coordinate with ISS, PRISM, Atlantic Flyway ESMP programs.

Table 4-3. Conservation Actions assigned to Reptile, Amphibian, and Invertebrate Guilds.

Guild	Species	Category	Biological Priority	Type	Description
Bumble Bees	Rusty-patched Bumble Bee, Ashton's Cuckoo Bumble Bee, Lemon Cuckoo Bumble Bee, Fernald's Cuckoo Bumble Bee, Yellow Bumble Bee, Brownbelted Bumble Bee, Indiscriminate Cuckoo Bumble Bee, American Bumble Bee, Sanderson's Bumble Bee, Yellowbanded Bumble Bee	Public Outreach	Moderate	New	Develop and implement outreach materials to raise public awareness of native pollinator ecology, threats and conservation needs, and to encourage use of Integrated Pest Management practices.
		Research	High	New	Produce a statewide atlas and conservation assessment.
		Survey and Monitoring	High	On-going	Conduct statewide surveys to document species diversity, distribution and relative abundance.
Dry Barrens Lepidoptera	Dusted Skipper, Sleepy Duskywing, Leonard's Skipper, Cobweb Skipper, Southern Cloudywing, Edwards' Hairstreak, Coral Hairstreak, Similar Underwing, Oblique Zale, Barrens Itame, Twilight Moth, Barrens Metarranthis Moth, Nepytia pellucidaria, Chaetaglaea ce	Habitat Management	Critical	New	Conduct a statewide review of potential high quality barrens habitat that is threatened by succession and identify strategic habitat restoration actions for implementation by key conservation partners.
		Species Management	Critical	New	Prepare occurrence maps and pesticide spray consultation guidelines for rare Lepidoptera and distribute to strategic partners including Maine Bureau of Pesticides Control.

Table 4-3. *continued: page 2 of 3.*

Guild	Species	Category	Biological Priority	Type	Description
Forested Wetlands Lepidoptera	Hessel's Hairstreak, Satyr Comma, Appalachian Brown, Spicebush Swallowtail	Research	High	New	Prepare a statewide atlas and conservation assessment.
Lacustrine Odonates	Comet Darner, Dusky Dancer, Tule Bluet, Big Bluet, New England Bluet, Scarlet Bluet, Citrine Forktail, Rambur's Forktail, Ringed Emerald, Lilypad Clubtail, Common Sanddragon, Needhams Skimmer, Carolina Saddlebags, Black Saddlebags, Martha's Pennant	Research	High	New	Prepare a statewide atlas and conservation assessment.
Palustrine Odonates	Sedge Darner, Swamp Darner, Spatterdock Darner, Quebec Emerald, Ringed Boghaunter, Canada Whiteface, Painted Skimmer, Zigzag Darner, Incurvate Emerald, Elfin Skimmer	Research	High	New	Prepare a statewide atlas and conservation assessment.

Table 4-3. *continued: page 3 of 3.*

Guild	Species	Category	Biological Priority	Type	Description
Peatland Lepidoptera	Bog Elfin, Clayton's Copper, Crowberry Blue, Frigga Fritillary, New England Buckmoth	Species Management	Critical	New	Prepare occurrence maps and pesticide spray consultation guidelines for rare Lepidoptera and distribute to strategic partners including Maine Bureau of Pesticides Control.
Riverine Odonates	Arrowhead Spiketail, Broadtailed Shadowdragon, Rapids Clubtail, Cobra Clubtail, Southern Pygmy Clubtail, Extra-striped Snaketail, Boreal Snaketail, Pygmy Snaketail, Arrow Clubtail, Ocellated Emerald	Research	High	New	Prepare a statewide atlas and conservation assessment.

Table 4-4. Conservation Actions assigned to Inland Fish Guilds.

Guild	Species	Category	Biological Priority	Type	Description
Rare Minnows	Creek Chubsucker, Eastern Silvery Minnow, Pearl Dace, Bridle Shiner, Blacknose Shiner, Longnose Dace	Research	Critical	New	Determine population abundance, habitat use, size and age structure and interaction with other fish species in representative waters.
					Develop a robust, reliable method to assess population trends, habitat associations, and geographic distribution.
					Determine susceptibility and risks associated with certain disease scenarios.
Whitefishes	Lake Whitefish, Round Whitefish	Research	Critical	On-going	Determine population abundance, habitat use, size and age structure and interaction with other fish species in representative waters.
		Research Species Management	High	On-going	Identify factors that have contributed to declining populations of lake whitefish.
			Critical	On-going	Develop and implement rehabilitation programs for fisheries that have declined.

Table 4-5. Conservation Actions assigned to Mammal Guilds.

Guild	Species	Category	Biological Priority	Type	Description
Cave bats	Big Brown Bat, Eastern Smallfooted Myotis, Little Brown Bat, Northern Long-eared Myotis, Tricolored Bat	Public Outreach	Moderate	New	Investigate the feasibility of gating known hibernaculum.
		Research	High	On-going	Conduct research and monitoring to address knowledge gaps, with a focus on developing baseline presence/absence data, monitoring and identifying new hibernacula, and furthering our understanding of habitat selection by cave bat species, including the use of cavity trees.

Table 4-6. Conservation Actions assigned to Marine Guilds.

Guild	Category	Biological Priority	Type	Description
Bivalves	Policy	Critical	On-going	Through education and collaboration, reduce the use of antifouling agents and biocides that negatively affect SGCN, and investigate alternative biofouling agents.
Brachiopod	Policy	Critical	New	Reduce the collection and possession of live specimens.
				Through education and collaboration, reduce the use of antifouling agents and biocides that negatively affect SGCN, and investigate alternative biofouling agents.
	Public Outreach	High	On-going	Encourage the use of more targeted fishing gear in order to reduce bycatch and habitat disturbance.
	Research	High	New	Develop molecular tools to identify where specimens are collected.
Cnidaria	Policy	Critical	New	Reduce the collection and possession of live specimens.
				Through education and collaboration, reduce the use of antifouling agents and biocides that negatively affect SGCN, and investigate alternative biofouling agents.
	Public Outreach	High	On-going	Encourage the use of more targeted fishing gear in order to reduce bycatch and habitat disturbance.
	Research	High	New	Develop molecular tools to identify where specimens are collected.
Diadromous Fish	Policy	High	On-going	Encourage improved municipal planning for siting for new or retrofitting development, taking into account future environmental change, to improve connectivity for diadromous fish passage.
	Public Outreach	High	On-going	Conduct education to increase awareness of the importance of these species to maintaining productive ecosystem functioning.
				Encourage the use of more targeted fishing gear in order to reduce bycatch and habitat disturbance.
		Moderate	On-going	Continue to work with the fishing industry to develop gear modifications that reduce bycatch of diadromous fishes.
	Research	Critical	On-going	Determine the location and timing of critical habitat use (for endangered species) and important habitat use for diadromous fishes at different life history stages.
		High	New	Investigate methods to reduce incidental bycatch in commercial and recreational fisheries.
				Improve understanding of the relative roles of natural predation, fishing mortality, and climate change in stock dynamics.
			On-going	Improve understanding of species distribution especially in regards to ecosystem interactions, predator-prey relationships, and prey buffering concepts. Gather information to support management, including stock assessments, population genetics, population monitoring, etc.
	Survey and Monitoring	Critical	On-going	Monitor population stock status through surveys and sampling programs.

Table 4-6. *continued: page 2 of 3.*

Guild	Category	Biological Priority	Type	Description
Echinoderms	Policy	Critical	On-going	Through education and collaboration, reduce the use of antifouling agents and biocides that negatively affect SGCN, and investigate alternative biofouling agents.
	Public Outreach	High	On-going	Encourage the use of more targeted fishing gear in order to reduce bycatch and habitat disturbance.
	Research	High	New	Investigate the effect of various harvesting practices on the integrity of habitats and trophic and ecological systems.
				Research to understand how effects such as habitat modifications, population changes, and pollution can influence SGCN.
				Identify species that are resilient to ocean acidification (OA) and rises in sea surface temperature (SST).
			On-going	Expand existing education and research among researchers and managers to improve understanding and management ability.
				Conduct research to support management, including but not limited to stock assessments, population genetics, population monitoring, etc.
	Survey and Monitoring	High	New	Ground-truth mapped habitat and compare to historical maps to monitor change over time, may require updating mapping plans to map more frequently.
Gastropods	Policy	Critical	New	Reduce the collection and possession of live specimens.
				Reduce the use of tributyltin compounds as a biocide and antifouling prophylactic.
	Public Outreach	High	On-going	Encourage the use of more targeted fishing gear in order to reduce bycatch and habitat disturbance.
	Research	High	New	Develop molecular tools to identify where specimens are collected.
	Survey and Monitoring	High	New	Ground-truth mapped habitat and compare to historical maps to monitor change over time, may require updating mapping plans to map more frequently.
Seaturtles	Habitat Management	Moderate	On-going	Reduce the amount of ghost gear that could increase the risk of entanglement for sea turtles.
	Public Outreach	High	New	Conduct outreach with fishermen to increase reporting for entangled turtles.

Table 4-6. *continued: page 3 of 3.*

Guild	Category	Biological Priority	Type	Description
Seaturtles (continued)	Public Outreach (continued)	Moderate	New	Conduct outreach and trainings to improve the detection of and response time to entangled turtles in Maine waters.
			On-going	Continue to work with the fishing industry to develop gear modifications that reduce the risk of entanglement and conduct outreach on gear best practices to use.
	Survey and Monitoring	Critical	On-going	Conduct baseline surveys to determine the seasonal density and distribution of fixed fishing gear.
		High	On-going	Gather baseline data on the configurations of fixed fishing gear used as a function of seasonality and distance from shore.
		Moderate	New	Conduct surveys (aerial, boat based) to determine the distribution of sea turtles in the coastal waters of Maine.
Shrimp	Policy	Critical	New	Through education and collaboration, reduce the use of antifouling agents and biocides that negatively affect SGCN, and investigate alternative biofouling agents.
	Research	High	New	Develop molecular tools to identify where specimens are collected.
			On-going	Expand existing education and research among researchers and managers to improve understanding and close data gaps in order to inform management.
	Survey and Monitoring	High	New	Ground-truth mapped habitat and compare to historical maps to monitor change over time, may require updating mapping plans to map more frequently.
Whales	Habitat Management	Moderate	On-going	Reduce the amount of ghost gear that could increase the risk of entanglement for large whales.
	Public Outreach	High	On-going	Continue to work with the fishing industry to develop gear modifications that reduce the risk of entanglement and conduct outreach on gear best practices to use.
		Moderate	On-going	Conduct outreach and trainings to improve the detection of and response time to entangled whales in Maine waters.
	Survey and Monitoring	Critical	New	Conduct surveys (aerial, boat based and/or passive acoustic) to determine the distribution of large whales in the coastal waters of Maine.
			On-going	Conduct baseline surveys to determine the seasonal density and distribution of fixed fishing gear.
		High	On-going	Gather baseline data on the configurations of fixed fishing gear used as a function of seasonality and distance from shore.
				Determine the high overlap areas between whales, high risk behaviors or persistent habitat use and fixed fishing gear.

Table 4-7. Conservation Actions assigned to Bird SGCN.

Scientific Name	Common Name	Category	Biological Priority	Type	Description
Aythya marila	Greater Scaup	Public Outreach	High	On-going	Install signage at boat ramps
		Survey and Monitoring	High	On-going	Continue monitoring through the mid-winter waterfowl survey
Histrionicus histrionicus	Harlequin Duck	Habitat Management	Critical	New	Continue to work with the Maine Department of Marine Resources to coordinate macroalgae harvest in important wintering sites and determine the level of impact on wintering birds
Bartramia longicauda	Upland Sandpiper	Survey and Monitoring	Critical	New	Support state and regional efforts to survey/inventory populations of Upland Sandpiper leading to an estimate of population trend
Calidris canutus rufa	Red Knot	Species Management	High	New	Partner with municipalities and BP&L to develop beach management agreements to minimize impacts to feeding and roosting red knots using beach habitats.
Calidris maritima	Purple Sandpiper	Habitat Management	Critical	On-going	Continue to work with the Maine Department of Marine Resources to coordinate macroalgae harvest in important wintering sites and determine the level of impact on wintering birds
		Survey and Monitoring	Critical	On-going	Continue annual long term monitoring plan to determine if the Purple Sandpiper population is in severe decline. Combine annual survey with a coastwide survey to be conducted every 5 years.
Charadrius melodus	Piping Plover	Habitat Management	High	On-going	Collaborate with partners to develop long-term, non-regulatory habitat protection via management agreements or conservation easements.
		Public Outreach	High	On-going	Continue efforts to educate beach recreationalists, landowners and municipal officials regarding ecology and life history requirements.
		Species Management	Critical	On-going	Continue current management activities including: stake and twine symbolic fencing around nesting areas, exclosures around nests, posting signage to identify nesting areas, and locating and monitoring nesting pairs.
					Conduct intensive predator management including lethal and nonlethal removal of native and nonnative predators from nesting and brood rearing areas.
		Survey and Monitoring	High	On-going	Continue efforts to annually monitor abundance, distribution, and productivity.
			Moderate	On-going	Continue efforts to recruit and provide training sessions for volunteer beach monitors.

Table 4-7. *continued: page 2 of 6.*

Scientific Name	Common Name	Category	Biological Priority	Type	Description
Numenius phaeopus	Whimbrel	Research	High	New	Determine population status, pre migration body condition, and importance of commercial blueberry barrens to staging whimbrels.
					Determine potential impacts from hazing and disturbance occurring on commercial blueberry barrens
Sterna dougallii	Roseate Tern	Species Management	High	On-going	Increase breeding population distribution and productivity
Sternula antillarum	Least Tern	Habitat Management	High	On-going	Develop long-term, non-regulatory habitat protection via management agreements or conservation easements.
		Public Outreach	High	On-going	Continue efforts to educate beach recreationalists, landowners and municipal officials regarding ecology and life history requirements.
		Species Management	Critical	On-going	Continue current management activities including: stake and twine symbolic fencing around nesting areas, exclosures around colonies, posting signage to identify nesting areas, and locating and monitoring nesting pairs.
					Continue targeted management of native and nonnative predators at nesting and brood rearing areas, including lethal and nonlethal methods
		Survey and Monitoring	High	On-going	Continue efforts to annually monitor abundance, distribution, and productivity.
		Survey and Monitoring	Moderate	On-going	Continue efforts to recruit and provide training sessions for volunteer beach monitors.
Tringa flavipes	Lesser Yellowlegs	Research	High	New	To determine if recent population declines are due to impacts occurring in Maine, conduct research to: identify food quality and quantity at lesser yellowleg staging areas; assess premigration body condition; length of stay; other potential limiting
		Survey and Monitoring	High	New	Survey inland wetlands to identify and map important inland staging areas.
Tringa solitaria	Solitary Sandpiper	Survey and Monitoring	High	New	Survey inland wetlands to identify and map important inland staging areas.
Falco peregrinus	Peregrine Falcon	Public Outreach	Moderate	New	Develop an information pamphlet and website content focused on the importance of hikers and rock climbers limiting disturbance to nesting peregrines.
		Species Management	High	On-going	Work with landowners to reduce seasonal disturbances within 1/4 mile of occupied nests
					Encourage voluntary trail closures until five weeks after the last bird has fledged

Table 4-7. *continued: page 3 of 6.*

Scientific Name	Common Name	Category	Biological Priority	Type	Description
Ammodramus caudacutus	Saltmarsh Sparrow	Habitat Management	High	On-going	Support current Phragmites control efforts in southern Maine and expand to other regions as needed. Monitor effectiveness by conducting point counts to determine bird response.
		Research	High	New	Determine the relative impacts of point source (river-born) vs non-point source (atmospheric) contamination by Mercury.
					Investigate what role, if any, non-native invasive species have in habitat loss or reduction in habitat quality. Determine mitigation measures appropriate for Maine saltmarshes.
			Moderate	New	Determine whether the restoration of tidal action would improve resiliency to sea level rise and whether restricted areas would serve as High marsh refugia, at least temporarily
		Species Management	Moderate	New	Determine whether gene flow from Nelson's sparrow will lead to loss of Saltmarsh Sparrow genotype from Maine, and whether certain marshes may be more resistant to hybridization?
		Survey and Monitoring	Critical	New	Develop a long-term monitoring program which allows for evaluation of effects of human perturbations, natural changes to habitat and management actions to reverse/mitigate such actions.
Ammodramus nelson	Nelson's Sparrow	Research	High	New	Investigate what role, if any, non-native invasive species have in habitat loss or reduction in habitat quality. Determine mitigation measures appropriate for Maine saltmarshes.
			Moderate	New	Assess whether Mercury is a problem at marshes across Maine and whether certain marshes pose a Higher risk
			Moderate	New	Determine the relative impacts of point source (landfills) vs non-point source (atmospheric) contamination by Mercury on post-fledgling survival
		Survey and Monitoring	High	New	Develop a long-term monitoring program which allows for evaluation of effects of human perturbations, natural changes to habitat and management actions to reverse/mitigate such actions.
Ammodramus savannarum	Grasshopper Sparrow	Habitat Management	Critical	New	Conduct landscape analysis to determine potential for other sites for this species, what management would be necessary, and current ownership
			High	On-going	Maintain known nesting areas in native grasses, little bluestem, or low-growing shrubs like lowbush blueberry and prevent conversion to other land uses
			Moderate	New	Restore old, unused gravel pits and agricultural fields to grasslands and low shrubs

Table 4-7. *continued: page 4 of 6.*

Scientific Name	Common Name	Category	Biological Priority	Type	Description
Ammodramus savannarum (continued)	Grasshopper Sparrow (continued)	Public Outreach	Critical	New	Contact landowners at formerly occupied (Wells, Sanford) and potential sites (near Poland) to examine opportunities for habitat enhancement and management of species.
		Research	Critical	New	Conduct research on population status, productivity levels, and limiting factors at individual sites, and use this information to update a Population Viability Analysis
			High	New	Assess effects of past and present management practices at the Kennebunk Plains by comparing with long-term population data by management unit over time
		Survey and Monitoring	Critical	On-going	Continue to monitor populations at Kennebunk Plains and the former Naval Air Station in Brunswick
			High	New	Expand monitoring effort to other potential or previously occupied sites (Sanford Airport, Wells Barrens, Poland Spring fields)
		Habitat Management	High	New	Encourage landowners to manage the amount and timing of pre-commercial thinning in areas occupied by this species, and to leave residual patches in areas that are thinned
					Encourage land managers to rotate harvests and create a mixed distribution of stand ages, which might undergo pre-commercial thinning and cutting at different times, thus temporally balancing the amount of habitat available at a given time.
		Policy	High	New	For suitable/occupied habitat on public lands (BPL) incorporate stand management BMPs into public land management policy.
Catharus bicknelli	Bicknell's Thrush	Research	High	New	Determine how this species responds to specific forestry practices on the landscape.
					Assess the effects of climate change on habitat loss, occupancy, and predicted range shift.
		Species Management	Critical	New	Work to ensure that developments at high elevation that entail land clearing, specifically permanent conversion of forest to non-forest (road, gravel, grass) avoid areas occupied by Bicknell's Thrush
			High	On-going	Participate in work of International Bicknell's Thrush Conservation Group (IBTCG) to track progress on conservation and research actions, discuss funding needs and revise the wildlife action plan as appropriate to ensure that emerging information is used to inform
		Survey and Monitoring	High	On-going	Support Mountain Birdwatch 2.0, an international, volunteer-based program to track Bicknell's Thrush populations across their breeding range.

Table 4-7. *continued: page 5 of 6.*

Scientific Name	Common Name	Category	Biological Priority	Type	Description
Euphagus carolinus	Rusty Blackbird	Research	High	New	Examine the food web of boreal forest wetlands and determine the role of aquatic invertebrates (Tricoptera, Odonata) in maintaining Rusty Blackbird abundance and productivity.
					Investigate postfledging habitat use relative to timber harvest practices
					Evaluate the effects of precommercial thinning on nesting habitat quality and determine whether nesting success is more sensitive to pre-commercial thinning in some landscapes than in others
				On-going	Support cross-agency data sharing to better understand breeding range-wide survival and fecundity.
		Species Management	High	New	Work with partners on wintering grounds to develop a full life cycle model of demography
Progne subis	Purple Martin	Habitat Management	High	New	Support further development, and increase awareness of, existing BMPs for purple martin colony management in concert with Purple Martin Conservation Association
		Public Outreach	High	On-going	Increase public awareness of the Purple Martin Conservation Association and its activities
		Research	High	On-going	Support Scout Arrival Study, monitoring of arrival times, through Purple Martin Conservation Association
					Support Purple Martin Nest Cavity Research Project which uses mini martin cams to monitor nestling development and engage volunteers; consider a live web cam
		Species Management	High	New	Provide support or otherwise increase awareness of the mentor program for Purple Martin colony landlords consistent with efforts of the Purple Martin Conservation Association
		Survey and Monitoring	Critical	New	Conduct an inventory of breeding colonies, possibly using eBird.
			High	On-going	Promote the registration of existing colonies through Purple Martin Conservation Association
				On-going	Support Project Martinwatch, a weekly nest monitoring program, through Purple Martin Conservation Association
Riparia riparia	Bank Swallow	Public Outreach	High	New	Collaborate with gravel pit operators to develop Best Management Practices for reclamation of abandoned pits
		Research	Critical	New	Gather more information on the influence of Neonicotinoid (systemic) pesticides on populations of aerial insectivores.

Table 4-7. *continued: page 6 of 6.*

Scientific Name	Common Name	Category	Biological Priority	Type	Description
Sturnella magna	Eastern Meadowlark	Habitat Management	Critical	New	Improve habitat quality and abundance.
Nycticorax nycticorax	Black-crowned Night-heron	Research	High	New	Determine whether prefledging success and productivity rates are contributing to declining numbers
			Moderate	New	Investigate effect of aerial predators (gulls, crows, eagles) on nesting success.
		Species Management	Moderate	New	Develop outreach program to educate landowners and recreational users about black-crowned night herons' breeding habitat requirements and sensitivity to disturbance.
					In cooperation with landowners and partners, develop and post signs at colonies encouraging users to keep a wide berth during nesting.
		Survey and Monitoring	High	New	Implement targeted surveys to better understand the distribution and status of this species and to help direct conservation actions to Newly documented populations

Table 4-8. Conservation Actions assigned to Reptile, Amphibian, and Invertebrate SGCN.

CLASS Scientific Name	Common Name	Category	Biological Priority	Type	Description
AMPHIBIA (Amphibians)					
Ambystoma laterale	Blue-spotted Salamander	Policy	Moderate	On-going	Cooperate with University of Maine and the Maine Department of Environmental Protection to research and implement a voluntary Special Area Management Program (SAMP) by towns.
		Research	High	On-going	Develop an improved understanding of habitat and movement ecology with the goal of informing Best Management Practices and other targeted species conservation actions
		Survey and Monitoring	High	On-going	Pure diploid (and non-hybrid) populations of Ambystoma laterale are believed to be rare in Maine and throughout their range. Systematic tissue sampling is needed to document the extent and distribution of all genotypes within the species complex, with a focus on identifying cryptic diploid populations requiring potential targeted conservation attention.
REPTILIA (Reptiles)					
Coluber constrictor constrictor	Northern Black Racer	Habitat Management	Critical	On-going	Manage black racer habitat to improve and expand upon habitat that is available where populations occur.
		Survey and Monitoring	Moderate	New	Identify potential road crossing hotspots using GIS and monitor mortality at those locations with road surveys to prioritize the most problematic road segments for mitigation measures such as cautionary signage, exclusionary fencing, and under-road passages.
Storeria dekayi dekayi	Northern Brownsnake	Survey and Monitoring	Moderate	New	Implement targeted professional surveys to better understand the distribution and status of this species and to help direct conservation actions to Newly documented populations
Thamnophis sauritus	Eastern Ribbon Snake	Policy	Moderate	On-going	Cooperate with University of Maine and the Maine Department of Environmental Protection to research and implement a voluntary Special Area Management Program (SAMP) by towns.
		Research	High	New	Develop an improved understanding of habitat and movement ecology to help develop Best Management Practices and other targeted species conservation actions

Table 4-8. *continued: page 2 of 5.*

CLASS Scientific Name	Common Name	Category	Biological Priority	Type	Description
REPTILIA (Reptiles) *continued*					
Clemmys guttata	Spotted Turtle	Habitat Management	High	New	Research and coordinate the development of a publically available Potential Vernal Pool map product that covers the entire State, or at least all organized townships
		Policy	Moderate	On-going	Cooperate with University of Maine and the Maine Department of Environmental Protection to research and implement a voluntary Special Area Management Program (SAMP) by towns.
		Public Outreach	High	On-going	Continue to build public awareness of risks posed by roadways with seasonally appropriate press release that also warns motorists to be on the lookout for turtles during spring/early summer.
		Species Management	Critical	New	Identify potential road crossing hotspots using GIS and monitor mortality at those locations with road surveys to prioritize the most problematic road segments for mitigation measures such as cautionary signage and exclusionary fencing.
					Install road crossing structures consisting of under-road passageways and guidance fencing where High-mortality road segments bisect habitat that hosts High priority populations
			High	On-going	Continue the cautionary road crossing signage program, and expand the number of locations with signs as additional road crossing hotspots are identified.
					Deter casual collection by educating the public on the importance of leaving turtles where they find them
Emydoidea blandingii	Blanding's Turtle	Habitat Management	High	New	Manage and where necessary create nesting habitat to improve viability of High-priority Blanding's turtle populations
			High	New	Research and coordinate the development of a publicly available Potential Vernal Pool map product that covers the entire State, or at least all organized townships
		Policy	Moderate	On-going	Cooperate with University of Maine and the Maine Department of Environmental Protection to research and implement a voluntary Special Area Management Program (SAMP) by towns.
		Public Outreach	High	On-going	Continue to build public awareness of risks posed by roadways with seasonally appropriate press release that also warns motorists to be on the lookout for turtles during spring/early summer.

Table 4-8. *continued: page 3 of 5.*

CLASS Scientific Name	Common Name	Category	Biological Priority	Type	Description
REPTILIA (Reptiles) *continued*					
Emydoidea blandingii (continued)	Blanding's Turtle (continued)	Research	Critical	On-going	Identify potential road crossing hotspots using GIS and monitor mortality at those locations with road surveys to prioritize the most problematic road segments for mitigation measures such as cautionary signage, exclusionary fencing, and under-road passages.
		Species Management	Critical	New	Install road crossing structures consisting of under-road passageways and guidance fencing where high-mortality road segments bisect habitat that hosts high priority populations.
			High	On-going	Continue the cautionary road crossing signage program, and expand the number of locations with signs as additional road crossing hotspots are identified.
Glyptemys insculpta	Wood Turtle	Policy	High	On-going	Deter casual collection by educating the public on the importance of leaving turtles where they find them
		Public Outreach	Moderate	On-going	Continue to build public awareness of risks to wood turtles posed by roadways with seasonally appropriate press release that also warns motorists to be on the lookout for turtles during spring/early summer.
		Species Management	High	New	Install road crossing structures consisting of under-road passageways and guidance fencing where High-mortality road segments bisect habitat that hosts High priority populations
			High	On-going	Identify potential road crossing hotspots using GIS and monitor mortality at those locations with road surveys to prioritize the most problematic road segments for mitigation measures such as cautionary signage and exclusionary fencing.
			Moderate	On-going	Expand cautionary road crossing signage program to include wood turtle as important road crossing hotspots are identified for this species.
BIVALVIA (Bivalves)					
Alasmidonta varicosa	Brook Floater	Survey and Monitoring	Critical	On-going	Develop and implement a systematic protocol for monitoring population size, demographics, and trends.
Lampsilis cariosa	Yellow Lampmussel	Survey and Monitoring	Critical	New	Develop and implement a systematic protocol for monitoring population size, demographics, and trends.
Leptodea ochracea	Tidewater Mucket	Survey and Monitoring	Critical	New	Develop and implement a systematic protocol for monitoring population size, demographics, and trends.

Table 4-8. *continued: page 4 of 5.*

CLASS Scientific Name	Common Name	Category	Biological Priority	Type	Description
GASTRPODA (Gastropods)					
Stagnicola mighelsi	Bigmouth Pondsnail	Research	High	New	Examine effects of dams as well as water quality changes from residential and agricultural pollutant and nutrient runoff on bigmouth pondsnail populations
				On-going	Develop an improved understanding of habitat and movement ecology with the goal of informing Best Management Practices and other targeted species conservation actions
Cicindela marginipennis	Cobblestone Tiger Beetle	Research	High	New	Develop an improved understanding of habitat and movement ecology with the goal of informing Best Management Practices and other targeted species conservation actions
INSECTA (Insects)					
Epeorus frisoni	Roaring Brook Mayfly	Survey and Monitoring	High	On-going	Develop and implement a systematic protocol for monitoring population size, demographics, and trends.
Siphlonisca aerodromia	Tomah Mayfly	Survey and Monitoring	High	On-going	Develop and implement a systematic protocol for monitoring population size, demographics, and trends.
Boloria chariclea grandis	Purple Lesser Fritillary	Research	High	New	Prepare a statewide atlas and conservation assessment.
		Species Management	Critical	New	Prepare occurrence maps and pesticide spray consultation guidelines for rare Lepidoptera and distribute to strategic partners including Maine Bureau of Pesticides Control.
			Moderate	New	Collaborate with the Maine Forest Service and other partners to develop Forestry Species Management Guidelines for distribution to cooperative landowners and the forest management community.
Callophrys gryneus	Juniper Hairstreak	Habitat Management	Critical	New	Research host tree regeneration ecology and develop site restoration management strategies for distribution to cooperative landowners.
		Research	High	New	Prepare a statewide atlas and conservation assessment.
Callophrys hesseli	Hessel's Hairstreak	Habitat Management	Moderate	New	Conduct a comprehensive review of silvicultural effects on Atlantic White Cedar habitat (e.g., regeneration, composition, structure)
		Species Management	Moderate	New	Collaborate with the Maine Forest Service and other partners to develop Forestry Species Management Guidelines for distribution to cooperative landowners and the forest management community.
Erora laeta	Early Hairstreak	Research	High	New	Prepare a statewide atlas and conservation assessment.

Table 4-8. *continued: page 5 of 5.*

CLASS Scientific Name	Common Name	Category	Biological Priority	Type	Description
INSECTA (Insects) *continued*					
Erynnis brizo	Sleepy Duskywing	Research	High	New	Prepare a statewide atlas and conservation assessment.
Lycaena dorcas claytoni	Clayton's Copper	Habitat Management	Critical	New	Conduct selective thinning at sites where forest canopy is encroaching and shading out host plant stands.
		Research	High	New	Prepare a statewide atlas and conservation assessment.
		Survey and Monitoring	Critical	On-going	Develop and implement a systematic protocol for monitoring population size, demographics, and trends.
Lycia rachelae	Twilight Moth	Research	High	New	Identify host plant(s) and document extent of habitat use outside Pitch Pine - Scrub Oak barrens
		Survey and Monitoring	High	New	Develop and implement a systematic protocol for monitoring population size, demographics, and trends.
Oeneis polixenes katahdin	Katahdin Arctic	Habitat Management	High	New	Work with BSP and MNAP to develop tundra habitat monitoring procedures for assessing potential impacts from off-trail recreation.
		Research	High	New	Prepare a statewide atlas and conservation assessment.
		Survey and Monitoring	High	New	Work with Baxter State Park to develop species monitoring protocols that are robust enough to detect potential trends in population size.
Plebejus idas	Northern Blue	Research	High	New	Prepare a statewide atlas and conservation assessment.
		Species Management	Critical	New	Prepare occurrence maps and pesticide spray consultation guidelines for rare Lepidoptera and distribute to strategic partners including Maine Bureau of Pesticides Control.
Plebejus idas empetri	Crowberry Blue	Research	High	New	Prepare a statewide atlas and conservation assessment.
Satyrium edwardsii	Edwards' Hairstreak	Research	High	New	Prepare a statewide atlas and conservation assessment.
Zanclognatha martha	Pine Barrens Zanclognatha	Survey and Monitoring	High	New	Develop and implement a systematic protocol for monitoring population size, demographics, and trends.
Gomphus quadricolor	Rapids Clubtail	Survey and Monitoring	Critical	New	Conduct surveys to determine the status of the historic population(s) on the Saco River. This species may no longer be extant in Maine.
Williamsonia lintneri	Ringed Boghaunter	Research	High	New	Develop an improved understanding of habitat and movement ecology with the goal of informing Best Management Practices and other targeted species conservation actions

Table 4-9. Conservation Actions assigned to Inland Fish SGCN.

Scientific Name	Common Name	Category	Biological Priority	Type	Description
Esox americanus americanus	Redfin Pickerel	Habitat Management	Critical	On-going	Work with landowners to enhance and restore riparian buffers on redfin pickerel occupied streams within agricultural lands.
					Enhance and improve fish passage to proximal habitats so redfin pickerel can migrate to and colonize new habitats as necessary.
			High	On-going	Work with agricultural landowners to restrict or eliminate livestock access to streams occupied by redfin pickerel.
Etheostoma fusiforme	Swamp Darter	Research	High	New	Conduct research to develop an improved understanding of seasonal habitat requirements for all size and age classes
					Conduct research to develop an improved understanding of spawning ecology
					Conduct research to develop an improved understanding of trophic ecology
		Survey and Monitoring	High	On-going	Implement targeted professional surveys to better understand the distribution and status of this species and to help direct conservation actions to newly documented populations
Salvelinus alpinus oquassa	Arctic Charr	Habitat Management	High	On-going	Identify key aquatic habitats such as spawning sites and coordinate protection with federal, state, or NGOs and willing private landowners
					Identify key terrestrial habitats connected or adjacent to aquatic habitats that are essential to maintaining viability of populations
		Research	High	On-going	Investigate and describe all life history and life cycle requirements of each population to provide for maximum protection of each population
		Species Management	Critical	On-going	Assess population status at each location where the species is present
			High	On-going	Assess the utilization of charr by recreational anglers, including harvest rates and the attitudes of participating anglers

Table 4-10. Conservation Actions assigned to Mammal SGCN.

Scientific Name	Common Name	Category	Biological Priority	Type	Description
Sylvilagus transitionalis	New England Cottontail	Habitat Management	Critical	On-going	Restore early successional habitat in southern Maine following guidance in the New England Cottontail Conservation Strategy.
		Public Outreach	High	On-going	Improve public perception of the value of early successional habitat following guidance in the New England Cottontail Conservation Strategy.
		Species Management	High	On-going	Conduct a captive breeding program following guidance in the New England Cottontail Conservation Strategy.
		Survey and Monitoring	High	New	Conduct active restoration of early-successional brushy habitat on both private and public lands in southern Maine, and monitor the success of habitat restoration using methodologies identified in the Rangewide Conservation Strategy.
					Monitor released individuals from the captive breeding program using radio telemetry to determine survival and use of landscape. Alternatively, populations may be monitored using mark-recapture techniques that rely on genotype.
Synaptomys borealis sphagnicola	Northern Bog Lemming	Policy	Moderate	On-going	Develop a policy where the Maine Forest Service or LURC would notify IFW of forest management plans where cutting was planned on High elevation sites (above 2,700 feet).
		Research	Moderate	New	Develop a technique to identify northern bog lemmings using e-DNA found in small water bodies associated with alpine sites.

Table 4-11. Conservation Actions assigned to Marine SGCN.

CLASS Scientific Name	Common Name	Category	Biological Priority	Type	Description
ACTINOPTERYGII (Ray-finned fishes)					
Pseudopleuronectes americanus	Winter Flounder	Research	Moderate	New	Identify areas where winter flounder spawn
				On-going	Conduct research regarding winter flounder habitat needs for various life stages and determine the importance of unique habitat systems such as eelgrass on survivability
		Survey and Monitoring	High	On-going	Monitor water quality at winter flounder habitats to determine effect of changing water quality on winter flounder biology and survivability (e.g. temperature and sex ratio relationships).
CHONDRICHTHYES (Sharks and skates)					
Isurus oxyrinchus	Shortfin Mako	Research	High	New	Determine the location and timing of important habitat use at different life history stages
					Identify methods to reduce incidental bycatch by recreational anglers
					Develop an improved understanding of discard mortality rates
Lamna nasus	Porbeagle	Research	Critical	New	Determine the location and timing of important habitat use at different life history stages
					Identify methods to reduce incidental bycatch by recreational anglers
					Develop an improved understanding of discard mortality rates
Amblyraja radiata	Thorny Skate	Research	Critical	New	Develop an improved understanding of discard mortality rates
					Determine the location and timing of important habitat use at different life history stages
					Update life history data across species range
Dipturus laevis	Barndoor Skate	Research	High	New	Develop an improved understanding of discard mortality rates
					Update life history data across species range
			Moderate	New	Determine the location and timing of important habitat use at different life history stages
Leucoraja ocellata	Winter Skate	Research	High	New	Update life history data across species range
Malacoraja senta	Smooth Skate	Research	Critical	New	Develop an improved understanding of discard mortality rates
					Determine the location and timing of important habitat use at different life history stages

Table 4-11. *continued: page 2 of 3.*

CLASS Scientific Name	Common Name	Category	Biological Priority	Type	Description
ECHINOIDEA (Echinoderms)					
Strongylocentrotus droebachiensis	Green Sea Urchin	Public Outreach	High	On-going	Design and encourage the use of more size-selective fishing gear
		Research	High	New	Determine the relative roles of natural predation, fishing mortality, and climate change in stock dynamics
					Assess the feasibility and advantages of local or area species management approaches
				On-going	Conduct research to support stock assessment and population dynamics modeling
			Moderate	New	Determine the feasibility of reseeding programs
		Species Management	High	On-going	Support community engagement in developing a fisheries management plan
		Survey and Monitoring	Critical	On-going	Monitor stock status through surveys and sampling programs
HOLOTHUROIDEA (Sea cucumbers)					
Cucumaria frondosa	Orange-footed Sea Cucumber	Public Outreach	High	On-going	Design and encourage the use of more size-selective fishing gear
		Research	High	New	Conduct research to support management, including stock assessments, reproduction, growth and aging data, and habitat mapping
			Moderate	New	Assess the feasibility and advantages of local or area species management approaches
		Species Management	Moderate	New	Support community engagement in developing a fisheries management plan
		Survey and Monitoring	High	New	Monitor stock status through surveys and sampling programs

Table 4-11. *continued: page 3 of 3.*

CLASS Scientific Name	Common Name	Category	Biological Priority	Type	Description
MALACOSTRACA (Crabs, lobsters, and shrimp)					
Pandalus borealis	Northern Shrimp	Public Outreach	High	On-going	Design and encourage the use of more size-selective fishing gear
		Research	High	New	Conduct research to support stock assessment and population dynamics modeling
				On-going	Determine the relative roles of natural predation, fishing mortality, and climate change in stock dynamics
		Survey and Monitoring	Critical	On-going	Monitor stock status through surveys and sampling programs
MAMMALIA (Mammals)					
Phocoena phocoena	Harbor Porpoise	Public Outreach	Moderate	On-going	Continue to work with the fishing industry to develop gear modifications that reduce the risk of entanglement and conduct outreach on gear best practices to use
MEROSTOMATA (Horseshoe crabs)					
Limulus polyphemus	Horseshoe Crab	Habitat Management	High	On-going	Collaborate with partners to conserve undeveloped shoreline and adjacent areas that is known or potential habitat for horseshoe crab
		Public Outreach	High	On-going	Encourage use of selective fishing gear that minimizes bycatch and impacts to habitat.
		Research	High	On-going	Promote research to fill data gaps and inform managers
			Moderate	On-going	Identify areas where degraded water quality may adversely impact horseshoe crabs
		Survey and Monitoring	High	New	Conduct surveys to monitor and better understand distribution and abundance

Table 4-12. SGCN conservation actions by Action Category.

Taxonomic Group	Habitat Management	Policy	Public Outreach	Research	Species Management	Survey and Monitoring	Total
Birds	24	9	12	34	21	25	**125**
Inland Fish	5	0	0	6	2	3	**16**
Mammals	3	4	1	4	3	5	**20**
Marine	1	0	8	44	12	13	**78**
Reptiles, Amphibians, and Invertebrates	9	5	3	17	13	13	**60**
Total	**42**	**18**	**24**	**105**	**51**	**59**	**299**

Table 4-13. SGCN conservation actions by Type.

Taxonomic Group	New	On-going	Total
Birds	65	60	**125**
Inland Fish	3	13	**16**
Mammals	10	10	**20**
Marine	35	43	**78**
Reptiles, Amphibians, and Invertebrates	38	22	**60**
Total	**151**	**148**	**299**

Table 4-14. SGCN conservation actions by Biological Priority.

Taxonomic Group	Critical	High	Moderate	Total
Birds	19	73	33	**125**
Inland Fish	4	12	0	**16**
Mammals	3	14	3	**20**
Marine	15	42	21	**78**
Reptiles, Amphibians, and Invertebrates	14	35	11	**60**
Total	**55**	**176**	**68**	**299**

4.3 HABITAT CONSERVATION ACTIONS

4.3.1 HABITAT ACTION BACKGROUND

Maine's 2015 Wildlife Action Plan takes a holistic approach to SGCN conservation by focusing on both species and habitats. Habitat-scale conservation uses a coarse-filter approach whereby strategies applied to habitats likely benefit many of the species that occur there. Because habitat-scale actions simultaneously benefit multiple species, they often are an efficient way to stretch limited conservation dollars and often complement species-specific approaches. While this Plan identifies over 300 SGCN actions, many of the most common stressors to Maine's SGCN are associated with habitats (see Element 3).

Maine's landscape is diverse, from subtidal gravel beds to alpine tundra, and the issues facing these habitats are complex, from localized land-use conversion to regional impacts of climate change. In order to systematically address these complexities, MDIFW, the Steering Committee, and conservation partner representatives worked in small groups (10-15 people) to draft habitat-scale conservation actions based on The Open Standards for the Practice of Conservation (hereafter referred to as 'Open Standards'; Conservation Measures Partnership [CMP] 2013). While widespread conservation partner involvement was crucial at all stages of Wildlife Action Plan development, the Steering Committee and MDIFW chose this small workgroup approach out of respect for partners' limited time. We felt the most efficient approach was to first create draft actions to which the full partner group could modify as needed.

"Maine's landscape is diverse, from subtidal gravel beds to alpine tundra, and the issues facing these habitats are equally complex..."

4.3.2 DEVELOPMENT OF HABITAT CONSERVATION ACTIONS

Maine developed its habitat conservation actions as follows:

1. MDIFW, the Steering Committee, and several conservation partners attended an Open Standards introductory training led by a local CMP Conservation Coach in mid-February 2015.

2. MDIFW, MNAP, MCP, MDMR, and members of the Steering Committee assigned all habitat macrogroups to one of 14 'habitat groupings' (Table 4-15), based on similar ecology, spatial distribution, and/or stressors. Certain macrogroups (e.g., vernal pools, northeastern floodplain forests, central oak pine barrens) did not fit cleanly into habitat groupings due to their ecological uniqueness or nuances of stressors facing them; we pulled these macrogroups out separately into their own habitat grouping. We then assigned habitat groupings to one of three workgroups for discussion: 1) terrestrial/wetland habitats; 2) marine/coastal habitats; or 3) freshwater aquatic habitats.

Table 4-15. Habitat groupings addressed by conservation action workgroups.

Workgroup	Habitat Grouping	Habitats (Macrogroups)
Terrestrial/Freshwater Wetlands	Northern Forests and Swamps	boreal forested peatland; boreal upland forest; northern swamp, plantation and ruderal forest, northern hardwood and conifer; northern peatland and fens
	Rocky Summits-Outcrops-Mountaintops	alpine; cliff and talus; outcrop and summit scrub
	Floodplain Forests	northeastern floodplain forest
	Freshwater Marshes	wet meadow-shrub marsh; emergent marsh; modified-managed marsh; coastal plain pond
	Vernal Pools	vernal pools
	Grassland-shrubland-early Successional	agricultural; maintained grasses and mixed cover; ruderal shrubland and grassland
	South-Central Forests and Swamps	central hardwood swamp; glade, barren and savanna; northern hardwood and conifer; northern swamp; coastal plain peat swamp
	Pine Barrens	central oak pine
Marine/Coastal	Tidal Marsh	intertidal tidal marsh (peat forming)
	Intertidal	bedrock; gravel shore; mollusc reefs; mudflat; sandy shore; water column
	Subtidal	bedrock bottom; coarse gravel bottom; mollusc reefs; mud bottom; sand bottom; pelagic (water column)
	Rocky Coast	rocky coast/islands
	Coastal	coastal grasslands and shrublands
Freshwater Aquatics	Streams, Rivers, Lakes, and Ponds	dystrophic lakes and ponds; eutrophic lakes and ponds; mesotrophic or intermediate lakes and ponds; oligotrophic lakes and ponds; lakeshore beach; large, medium, and small rivers, headwaters and creeks

3. In late February 2015, MDIFW, MNAP, MCP, MDMR, the Steering Committee, and partners nominated by the Steering Committee participated in two full-day Open Standards work sessions to begin developing conservation actions for each habitat grouping. Each work session was led by a CMP Conservation Coach who also was a member of the Steering Committee or a conservation partner. As a group, we created a conceptual model for each habitat grouping, linking key stressors to actions using the following approach:

   a. **Conservation Targets:** For each habitat grouping, the workgroup identified conservation targets, such as maintaining the current distribution of the habitat or its ecological integrity.

   b. **Key Stressors:** We then identified the key stressors to the habitat grouping. We began this discussion by first looking at stressors assigned to habitat macrogroups within the grouping that were at least moderately actionable and moderately severe. If the workgroup felt this list of stressors sufficiently captured the major challenges facing the habitat grouping as a whole, we moved onto the next step. If not, we used our best professional judgement to decide whether we should address additional stressors with conservation actions.

      We recognize that certain activities identified as 'stressors' to certain habitats or SGCN can also have positive effects or no effects at all. For example, aquaculture activities like shellfish seeding and macroalgae can help improve water quality and help form substrate for important habitats like eelgrass. For this exercise, however, we limited our scope of conservation actions to address only the negative effects of stressors.

   c. **Contributing Factors:** For each stressor, the workgroup identified the contributing factors that exacerbated the stressor for a particular habitat grouping. For example, we identified Fire Suppression as a key stressor to central oak pine barrens. This stressor is exacerbated by the public's perception of fire and its lack of understanding of the role of fire in maintaining this habitat. These are key factors inhibiting the use of fire as a management tool, especially near developed areas.

Conservation partners used an Open Standards approach to develop habitat conservation actions. © Mark Stadler

   d. **Conservation Actions:** For each stressor, we developed conservation actions designed to alleviate or mitigate that stressor and its contributing factors. For each conservation action, we strived to create a clear link between the action, stressor, and the action's intended benefit to the habitat grouping. We diagrammed these

relationships based on Open Standards models. Figure 4-2 depicts a draft conceptual diagram linking stressors and actions for central oak pine barrens.

e. **Categorization:** For each conservation action, we assigned a rank for Biological Priority, Action Type, and Action Category using the criteria described in section 4.1.2.

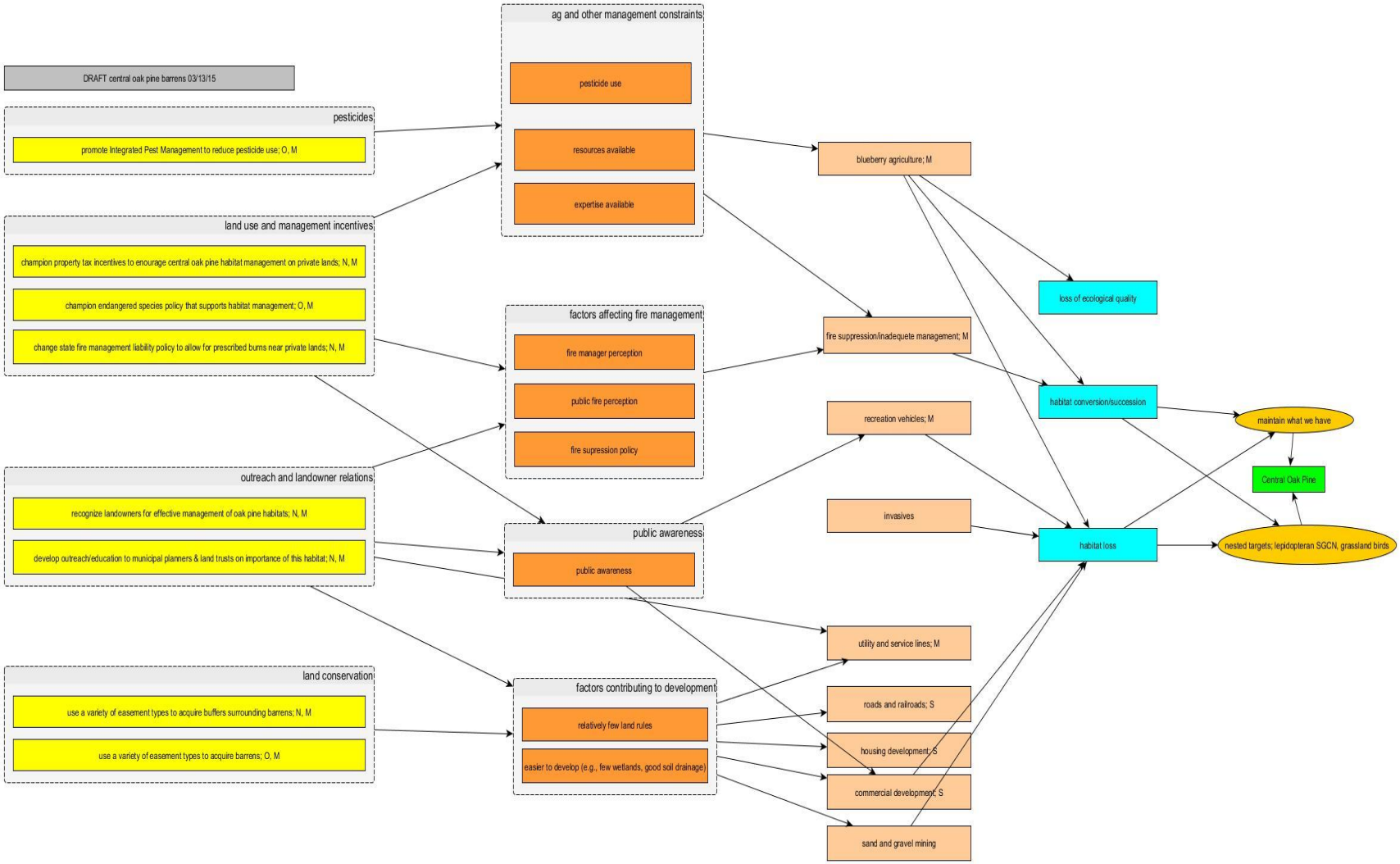
f. **Review:** Each workgroup reviewed and provided feedback on the conceptual diagrams for each habitat grouping in mid-March 2015.

4. We presented the draft list of habitat conservation actions to conservation partners at a meeting on June 16, 2015; we also distributed actions by email for review and feedback. We modified habitat conservation actions as appropriate, based upon partner review comments.

5. We posted the draft Wildlife Action Plan online on July 13, 2015 for a 30-day public comment period (see Elements 7/8 for more information). MDIFW and agency partners reviewed habitat action comments and modified conservation actions as appropriate, again, based on review comments.

Restoring habitat connectivity at road crossings is an important conservation action for many SGCN and often involves coordination among state and local transportation agencies, biologists, landowners, and other partners. © John Perry

Figure 4-2. Example Open Standards conceptual model diagram for the central oak pine barren habitat. Text boxes are as follows: yellow boxes (conservation actions); orange boxes (contributing factors); peach boxes (key stressors); blue boxes (specific issues caused by stressors; green box (target habitat) and yellow ovals (specific conservation targets). Arrows indicate relationships among elements in the model.



4.3.3 SUMMARY OF HABITAT CONSERVATION ACTIONS

We identified 322 habitat actions that address stressors in all habitat groupings, including 54 freshwater aquatic habitat actions, 165 marine and coastal habitat actions, and 103 terrestrial and freshwater wetland habitat actions (Table 4-16). In general, we classified most actions as habitat management, policy, or public outreach (Table 4-17), and more than half are already on-going (Table 4-18). While all actions included on our list are important, we viewed approximately 25% as critical to habitat conservation over the next ten years (Table 4-19).

Creation and management of early successional habitat is important for many SGCN. This restored New England Cottontail (*Sylvilagus transitionalis*, SGCN Priority 1) habitat at Camp Ketcha in Scarborough, Maine, was made possible by partnerships among landowners, agencies, and biologists. © U.S. Fish and Wildlife Service

Table 4-16. 2015 Maine Wildlife Action Plan Habitat Conservation Actions. Actions are sorted by Habitat Workgroup (FW=freshwater habitats, M=marine and coastal habitats, TW=terrestrial and freshwater wetland habitats), Habitat Grouping (see Table 4-15), Action Category, then by Biological Priority (C=critical, H=high, M=moderate). Themes are described in Table 4-20. The Action ID # will allow users to search the relational database (once it becomes publically available) for a specific action.

*Stressor names are from Level 2 of the IUCN Threat Classification Scheme; these are broad categories that may not capture all the nuances of stressor-SGCN-habitat interactions, including beneficial effects. Readers are urged to refer to species and habitat reports for more details on interactions among stressors, habitats, and SGCN.

Habitat Workgroup	Action ID#	Habitat Group	Action Category	Biol. Priority	Action Type	Description	Theme 1	Theme 2	Theme 3	Stressors Addressed*
FW	82	Headwaters and Creeks	Public Outreach	H	new	Encourage improved road maintenance to reduce road gravel input and other pollutants into streams	F5			Roads and Railroads, Logging & Wood Harvesting
FW	83	Headwaters and Creeks	Public Outreach	H	new	Collaborate with partners to develop best management practices and provide technical assistance to landowners for riparian management in forest and agricultural lands	F4			Logging & Wood Harvesting, Agricultural and Forestry Effluents
FW	84	Headwaters and Creeks	Public Outreach	H	on-going	Provide outreach and education to forest landowners on the value of maintaining >60% tree cover in watersheds with high value SGCN habitats	F4	F1		Logging & Wood Harvesting
FW	85	Headwaters and Creeks	Public Outreach	H	on-going	Encourage wood addition as a management objective for riparian areas	F4			Logging & Wood Harvesting
FW	87	Headwaters and Creeks	Survey and Monitoring	M	new	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	F4	F1		Logging and Wood Harvesting
FW	121	Streams, Rivers, Lakes, and Ponds	Habitat Mgmt.	H	new	Identify and conserve coldwater resilient areas and waterbodies that are not amenable to the spread of invasive species	F3	F1		Invasive Non-native/Alien Species/Diseases

Table 4-16. *continued: page 2 of 41.*

Habitat Workgroup	Action ID#	Habitat Group	Action Category	Biol. Priority	Action Type	Description	Theme 1	Theme 2	Theme 3	Stressors Addressed*
FW	130	Streams, Rivers, Lakes, and Ponds	Habitat Mgmt.	H	on-going	Encourage implementation of the Standards for Placing Wood Into Stream Channels to Enhance Cold Water Fisheries Habitat, also known as the Chop and Drop Rule, to replace lost natural habitat structure in streams and lakes	F4			Logging & Wood Harvesting
FW	131	Streams, Rivers, Lakes, and Ponds	Habitat Mgmt.	H	on-going	Construct crossings to pass storm flows and ensure enduring aquatic SGCN organism passage	F2			Roads & Railroads
FW	104	Streams, Rivers, Lakes, and Ponds	Habitat Mgmt.	M	new	Encourage installation of constructed wetlands to buffer waterways from wastewater contamination	F5			Domestic and Urban Waste Water, Industrial and Military Effluents, Agricultural and Forestry Effluents
FW	122	Streams, Rivers, Lakes, and Ponds	Habitat Mgmt.	M	new	Use habitat modifications to reduce the vulnerability of habitats to species invasions, such as returning impoundments to free-flowing river conditions	F3	F2		Invasive Non-native/Alien Species/Diseases
FW	105	Streams, Rivers, Lakes, and Ponds	Policy	C	new	Provide incentives for landowners to maintain riparian buffers	F4			Domestic & Urban Waste Water, Agricultural and Forestry Effluents
FW	118	Streams, Rivers, Lakes, and Ponds	Policy	C	new	Encourage septic inspections when a house sells to ensure that it is functioning properly	F5			Domestic & Urban Waste Water
FW	124	Streams, Rivers, Lakes, and Ponds	Policy	C	on-going	Improve enforcement of existing laws related to the transport of invasive species by boats, anglers, and through the pet trade	F3			Invasive Non-native/Alien Species/Diseases
FW	125	Streams, Rivers, Lakes, and Ponds	Policy	C	on-going	Expand targeted inspections of boats and the pet trade in order to reduce the spread of invasives and raise awareness	F3			Invasive Non-native/Alien Species/Diseases

Table 4-16. *continued: page 3 of 41.*

Habitat Workgroup	Action ID#	Habitat Group	Action Category	Biol. Priority	Action Type	Description	Theme 1	Theme 2	Theme 3	Stressors Addressed*
FW	135	Streams, Rivers, Lakes, and Ponds	Policy	C	on-going	Provide support for municipalities implementing road stream crossing improvements	F2			Roads & Railroads
FW	89	Streams, Rivers, Lakes, and Ponds	Policy	H	new	Continue efforts to identify barriers to aquatic organism passage	F6	F1		Dams & Water Management/Use
FW	91	Streams, Rivers, Lakes, and Ponds	Policy	H	new	Identify funding to construct passage structures at dams	F6			Dams & Water Management/Use
FW	92	Streams, Rivers, Lakes, and Ponds	Policy	H	new	Provide outreach to practitioners on technologies that are effective at passing fish	F6			Dams & Water Management/Use
FW	93	Streams, Rivers, Lakes, and Ponds	Policy	H	new	Collaborate with partners to develop monitoring standards for SGCN fish passage efficiency	F6			Dams & Water Management/Use
FW	97	Streams, Rivers, Lakes, and Ponds	Policy	H	new	Apply state Streamflow standards to dams	F6			Dams & Water Management/Use
FW	106	Streams, Rivers, Lakes, and Ponds	Policy	H	new	Collaborate with partners to develop incentives to encourage homeowners near lake/river shores to replace their old septic systems	F5			Domestic & Urban Waste Water
FW	132	Streams, Rivers, Lakes, and Ponds	Policy	H	new	Collaborate with partners to develop standards for new/replacement road stream crossings	F2			Roads & Railroads

Table 4-16. *continued: page 4 of 41.*

Habitat Workgroup	Action ID#	Habitat Group	Action Category	Biol. Priority	Action Type	Description	Theme 1	Theme 2	Theme 3	Stressors Addressed*
FW	133	Streams, Rivers, Lakes, and Ponds	Policy	H	new	Collaborate with partners to develop a state road stream crossing restoration program with dedicated staff	F2			Roads & Railroads
FW	136	Streams, Rivers, Lakes, and Ponds	Policy	H	on-going	Conduct statewide/watershed scale connectivity planning	F2			Roads & Railroads
FW	137	Streams, Rivers, Lakes, and Ponds	Policy	H	on-going	Enhance coordination of agencies and NGOs to facilitate road stream crossing improvements	F2			Roads & Railroads
FW	109	Streams, Rivers, Lakes, and Ponds	Policy	M	new	Encourage municipalities to increase the capacity of their treatment facilities	F5			Domestic and Urban Waste Water
FW	139	Streams, Rivers, Lakes, and Ponds	Public Outreach	C	on-going	Continue Stream Smart general and technical training	F2			Roads & Railroads
FW	46	Streams, Rivers, Lakes, and Ponds	Public Outreach	H	new	Provide outreach and education to horticulturalists and landscape architects on the importance of maintaining riparian vegetation during the course of their work	F4	F1		Domestic & Urban Waste Water
FW	47	Streams, Rivers, Lakes, and Ponds	Public Outreach	H	new	Provide outreach and education to town planning boards on the importance of maintaining riparian vegetation to prevent declines in water quality	F4	F1		Domestic & Urban Waste Water, Industrial and Military Effluents, Agricultural and Forestry Effluents
FW	95	Streams, Rivers, Lakes, and Ponds	Public Outreach	H	new	Provide outreach and education to dam operators on ways to facilitate SGCN fish passage at dams	F6			Dams & Water Management/Use

Table 4-16. *continued: page 5 of 41.*

Habitat Workgroup	Action ID#	Habitat Group	Action Category	Biol. Priority	Action Type	Description	Theme 1	Theme 2	Theme 3	Stressors Addressed*
FW	112	Streams, Rivers, Lakes, and Ponds	Public Outreach	H	new	Provide outreach and education to residents living on lake or river shores on the importance of maintaining riparian buffers, including options that allow water views (i.e. unmowed grass, shrubs)	F4	F1		Domestic & Urban Waste Water
FW	113	Streams, Rivers, Lakes, and Ponds	Public Outreach	H	new	Provide outreach and education to code enforcement officers and town planners on wastewater discharge	F5	F1		Domestic & Urban Waste Water
FW	114	Streams, Rivers, Lakes, and Ponds	Public Outreach	H	new	Work with municipalities to increase treatment capacity of wastewater facilities to reduce wastewater impacts to aquatic habitats	F5			Domestic & Urban Waste Water
FW	138	Streams, Rivers, Lakes, and Ponds	Public Outreach	H	new	Provide online tools to prioritize road crossing upgrades	F2	F1		Roads & Railroads
FW	140	Streams, Rivers, Lakes, and Ponds	Public Outreach	H	on-going	Encourage the use of temporary and permanent bridges rather than culverts	F2			Roads & Railroads
FW	141	Streams, Rivers, Lakes, and Ponds	Public Outreach	H	on-going	Encourage information exchange forums such as Fisheries Improvement Network (FIN) and Small Woodlot Owners Association of Maine (SWOAM)	F2			Roads & Railroads
FW	142	Streams, Rivers, Lakes, and Ponds	Public Outreach	H	on-going	Encourage alternative road routes that do not interfere with streams or riparian areas	F2	F1		Roads & Railroads
FW	143	Streams, Rivers, Lakes, and Ponds	Public Outreach	H	on-going	Continue advanced aquatic SGCN organism passage training	F2			Roads & Railroads

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Habitat Workgroup	Action ID#	Habitat Group	Action Category	Biol. Priority	Action Type	Description	Theme 1	Theme 2	Theme 3	Stressors Addressed*
FW	96	Streams, Rivers, Lakes, and Ponds	Public Outreach	M	on-going	Train new and existing engineers on proper ways to design fish passage structures through universities and training programs	F6			Dams and Water Management/Use
FW	115	Streams, Rivers, Lakes, and Ponds	Public Outreach	M	new	Collaborate with partners to develop best management practices for development near waterways	F4	F5		Domestic and Urban Waste Water
FW	116	Streams, Rivers, Lakes, and Ponds	Public Outreach	M	new	Find ways to support communities addressing sewer overflow (e.g., treat storm water differently than sewage where appropriate)	F5			Domestic and Urban Waste Water
FW	99	Streams, Rivers, Lakes, and Ponds	Research	H	on-going	Investigate alternative technologies to promote passage of aquatic organisms	F6	F2		Dams & Water Management/Use
FW	100	Streams, Rivers, Lakes, and Ponds	Research	H	on-going	Research fish behavior and movement to identify ways to improve the design of fish passage structures	F6			Dams & Water Management/Use
FW	120	Streams, Rivers, Lakes, and Ponds	Research	H	new	Solicit help from experts in septic system design to determine solutions to septic seepage into waterways	F5			Domestic & Urban Waste Water
FW	127	Streams, Rivers, Lakes, and Ponds	Research	H	on-going	Conduct research on the economic impact of invasive species, mitigation strategies, and containment strategies in aquatic ecosystems	F3			Invasive Non-native/Alien Species/Diseases
FW	144	Streams, Rivers, Lakes, and Ponds	Research	M	on-going	Increase understanding of climate change/infrastructure threats to freshwater aquatic ecosystems	F2			Roads and Railroads, Habitat Shifting and Alteration, Dams and Water Management/Use

Table 4-16. *continued: page 7 of 41.*

Habitat Workgroup	Action ID#	Habitat Group	Action Category	Biol. Priority	Action Type	Description	Theme 1	Theme 2	Theme 3	Stressors Addressed*
FW	128	Streams, Rivers, Lakes, and Ponds	Species Mgmt.	H	on-going	Expand efforts to suppress and control invasive species, including through reclamation of water bodies	F3			Invasive Non-native/Alien Species/Diseases
FW	129	Streams, Rivers, Lakes, and Ponds	Species Mgmt.	M	on-going	Promote native species abundance in aquatic SGCN habitats in order to foster competition that may reduce or slow the spread of invasives	F3			Invasive Non-native/Alien Species/Diseases
FW	102	Streams, Rivers, Lakes, and Ponds	Survey and Monitoring	H	new	Identify priority locations for ecological flow management in aquatic habitats	F6	F1		Dams & Water Management/Use
FW	145	Streams, Rivers, Lakes, and Ponds	Survey and Monitoring	H	on-going	Increase habitat surveys and models for road stream crossings	F2	F1		Roads & Railroads
FW	146	Streams, Rivers, Lakes, and Ponds	Survey and Monitoring	H	on-going	Complete a statewide inventory of the status and condition of road and railroad crossings, including on headwater streams	F2	F1		Roads & Railroads
FW	103	Streams, Rivers, Lakes, and Ponds	Survey and Monitoring	M	new	Develop better methods to map potential barriers in priority watersheds	F2	F6	F1	Dams and Water Management/Use, Roads and Railroads
FW	147	Streams, Rivers, Lakes, and Ponds	Survey and Monitoring	M	on-going	Track completed road stream crossing projects	F2			Roads and Railroads
M	170	Coastal	Habitat Mgmt.	C	on-going	Develop and implement best management practices or beach management agreements with municipalities and beach managers	M10	M5		Commercial & Industrial Areas , Housing & Urban Areas, Other Ecosystem Modifications, Roads & Railroads, Tourism & Recreational Areas

Table 4-16. *continued: page 8 of 41.*

Habitat Workgroup	Action ID#	Habitat Group	Action Category	Biol. Priority	Action Type	Description	Theme 1	Theme 2	Theme 3	Stressors Addressed*
M	171	Coastal	Habitat Mgmt.	C	on-going	Implement predator control programs near SGCN nesting areas in coastal and rocky coast habitats	M8			Commercial & Industrial Areas , Housing & Urban Areas, Other Ecosystem Modifications, Roads & Railroads, Tourism & Recreational Areas
M	168	Coastal	Habitat Mgmt.	H	on-going	Use voluntary agreements and incentives to conserve important coastal and rocky coast SGCN habitats	M10			Commercial & Industrial Areas , Housing & Urban Areas, Other Ecosystem Modifications, Roads & Railroads, Tourism & Recreational Areas
M	174	Coastal	Habitat Mgmt.	M	on-going	Assist municipalities in identifying areas that will allow coastal habitats to migrate inland as sea level rise occurs	M5	M3M4		Habitat Shifting or Alteration, Storms and Flooding, Temperature Extremes
M	173	Coastal	Public Outreach	C	on-going	Provide outreach to recreationalists regarding effects of human disturbance on beach nesting birds and roosting/feeding shorebirds	M8	M10		Recreational Activities
M	175	Coastal	Research	M	new	Research and identify management actions that may minimize impacts to coastal SGCN habitats from climate change	M3M4			Storms and Flooding, Temperature Extremes, Habitat Shifting or Alteration
M	167	Coastal	Survey and Monitoring	H	on-going	Work with municipalities to identify important SGCN nesting and migratory areas in rocky coast and coastal habitats during comprehensive planning	M1			Commercial & Industrial Areas , Housing & Urban Areas, Other Ecosystem Modifications, Roads & Railroads, Tourism & Recreational Areas
M	221	Intertidal	Habitat Mgmt.	C	on-going	Encourage partnership projects among transportation agencies, utility companies, etc. to facilitate fish passage and maintain connectivity in or near subtidal, intertidal, and tidal marsh habitats especially in cases where structures have different purposes for different users	M5			Dams & Water Management/Use, Roads & Railroads, Shipping Lanes, Utility & Service Lines
M	257	Intertidal	Habitat Mgmt.	C	on-going	Decommission remnant or unused roads and dams in or near tidal marsh, intertidal, and subtidal habitats	M5			Dams & Water Management/Use, Roads & Railroads, Shipping Lanes, Utility & Service Lines

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Habitat Workgroup	Action ID#	Habitat Group	Action Category	Biol. Priority	Action Type	Description	Theme 1	Theme 2	Theme 3	Stressors Addressed*
M	262	Intertidal	Habitat Mgmt.	C	new	Use transportation bonds to provide funding for culvert replacement in or near intertidal, subtidal, and tidal marsh habitats using best management practices	M5			Dams & Water Management/Use, Roads & Railroads, Shipping Lanes, Utility & Service Lines
M	209	Intertidal	Habitat Mgmt.	H	on-going	Promote voluntary baywide (or scale of ecological relevance) coordination of shared resources and education addressing the impacts of fishing and harvesting aquatic resources on SGCN intertidal and subtidal habitats	M9			Fishing & Harvesting of Aquatic Resources
M	225	Intertidal	Habitat Mgmt.	H	on-going	Restore and improve conservation management at state and municipal levels to reduce impacts of effluents and wastewater on intertidal and subtidal SGCN habitats	M3M4			Agricultural & Forestry Effluents, Domestic & Urban Waste Water, Industrial & Military Effluents
M	369	Intertidal	Habitat Mgmt.	H	on-going	Assess new aquaculture sites for potential positive, benign, or negative species interactions with the surrounding habitat and ecological systems	M1	M10		Marine & Freshwater Aquaculture
M	370	Intertidal	Habitat Mgmt.	H	on-going	Increase riparian and coastal buffer zones by limiting development in these areas to minimize damage to these properties due to flooding/waves and to maintain pervious surfaces for improved water management	M3M4			Habitat Shifting or Alteration, Storms & Flooding, Temperature Extremes
M	249	Intertidal	Habitat Mgmt.	H	on-going	Mitigate coastal acidification of intertidal and subtidal habitats using strategies similar to those for reducing effects of effluents/wastewater	M2			Habitat Shifting or Alteration, Storms & Flooding, Temperature Extremes
M	261	Intertidal	Habitat Mgmt.	H	on-going	Use technology to reduce discharge of wastewater and effluents into intertidal and subtidal SGCN habitats	M2			Agricultural & Forestry Effluents, Domestic & Urban Waste Water, Industrial & Military Effluents
M	365	Intertidal	Habitat Mgmt.	H	on-going	Investigate the effects of commercial trawling within the intertidal zone	M2	M9	M10	Fishing & Harvesting of Aquatic Resources

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Habitat Workgroup	Action ID#	Habitat Group	Action Category	Biol. Priority	Action Type	Description	Theme 1	Theme 2	Theme 3	Stressors Addressed*
M	371	Intertidal	Habitat Mgmt.	M	new	Alter shipping lanes and dredging plans in intertidal and subtidal habitats to minimize biological and ecological impacts to SGCN	M1	M10		Agricultural and Forestry Effluents, Domestic and Urban Waste Water, Industrial and Military Effluents
M	219	Intertidal	Habitat Mgmt.	M	on-going	Conduct law enforcement training and workshops to support knowledge of SGCN and how existing regulations affect SGCN and their habitats	M6			Recreational Activities, Fishing and Harvesting
M	236	Intertidal	Habitat Mgmt.	M	on-going	Improve response plans for industrial spills (e.g., oil spills) in intertidal and subtidal habitats and support research on oil dispersants and short and long term effect of oil spills	M2			Agricultural and Forestry Effluents, Domestic and Urban Waste Water, Industrial and Military Effluents
M	242	Intertidal	Habitat Mgmt.	M	new	Increase pH of mudflats (e.g., using harvested shell waste) to restore more favorable habitat conditions for intertidal and subtidal SGCN	M2			Fishing and Harvesting of Aquatic Resources
M	372	Intertidal	Policy	H	on-going	Increase capacity for enforcement of current laws and regulations regarding proper infrastructure (e.g., roads, dams, utility lines, shipping lanes) construction, maintenance, water quality, and fish passage in tidal marsh, intertidal, and subtidal SGCN habitats	M5	M6		Dams & Water Management/Use, Roads & Railroads, Shipping Lanes, Utility & Service Lines
M	245	Intertidal	Policy	H	on-going	Increase enforcement for dumping/litter/gear abandonment in intertidal and subtidal habitats	M6			Garbage & Solid Waste
M	252	Intertidal	Policy	H	new	Provide incentives for building Stream Smart structures and road crossings in or near intertidal, subtidal, and tidal marsh habitats that allow for changing environmental conditions such as sea level rise and increased flooding	M5			Dams & Water Management/Use, Roads & Railroads, Shipping Lanes, Utility & Service Lines
M	259	Intertidal	Policy	H	on-going	Increase awareness about invasive species and problems following the introduction of invasive species in the shipping, transportation, and other industries to prevent introductions and spread of invasive species in intertidal and subtidal habitats	M6	M7		Invasive Non-native/Alien Species/Diseases, Problematic Native Species/Diseases, Viral/Prion-induced Diseases

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Habitat Workgroup	Action ID#	Habitat Group	Action Category	Biol. Priority	Action Type	Description	Theme 1	Theme 2	Theme 3	Stressors Addressed*
M	223	Intertidal	Policy	M	on-going	Expand existing education and incentive programs for lawn care companies, homeowners, and municipalities to reduce wastewater and effluent inputs and effects on intertidal and subtidal SGCN habitats	M2			Agricultural and Forestry Effluents, Domestic and Urban Waste Water, Industrial and Military Effluents
M	224	Intertidal	Policy	M	new	Explore value of utilizing conservation leases to limit uses/stresses in intertidal and subtidal habitats	M9			Fishing and Harvesting of Aquatic Resources
M	234	Intertidal	Policy	M	on-going	Increase capacity for municipal planning for siting of new or retrofit developments (i.e., Smart Growth)to reduce wastewater and effluent effects on intertidal and subtidal SGCN habitats while also accounting for future environmental change	M3M4			Agricultural and Forestry Effluents, Domestic and Urban Waste Water, Industrial and Military Effluents
M	239	Intertidal	Policy	M	on-going	Provide incentives for and education on using green infrastructure for preventing erosion and loss/damage of property near intertidal habitats	M2			Commercial and Industrial Areas , Housing and Urban Areas, Livestock Farming and Ranching
M	373	Intertidal	Policy	M	new	Update permit requirements for new and retrofitted developments in, near, or adjacent to intertidal habitats with up-to-date data/models of climate predictions	M3M4			Commercial and Industrial Areas , Housing and Urban Areas, Livestock Farming and Ranching
M	256	Intertidal	Policy	M	on-going	Retrofit existing effluent and wastewater treatment infrastructure and plan for sea level rise by providing economic incentives and education	M3M4			Agricultural and Forestry Effluents, Domestic and Urban Waste Water, Industrial and Military Effluents
M	258	Intertidal	Policy	M	on-going	Provide stewardship/conservation incentives to harvesters working in intertidal and subtidal SGCN habitats	M9			Fishing and Harvesting of Aquatic Resources
M	211	Intertidal	Public Outreach	H	on-going	Continue/expand litter reduction programs/public education in intertidal and subtidal habitats	M2			Garbage & Solid Waste

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Habitat Workgroup	Action ID#	Habitat Group	Action Category	Biol. Priority	Action Type	Description	Theme 1	Theme 2	Theme 3	Stressors Addressed*
M	212	Intertidal	Public Outreach	H	on-going	Continue/expand marine debris recovery programs in intertidal and subtidal habitats and education to fishermen	M2			Garbage & Solid Waste
M	218	Intertidal	Public Outreach	H	on-going	Provide education and outreach through local meetings and trainings (e.g., Stream Smart) on techniques, problems and ecological effects of dams, roads, shipping lanes, and utility corridors on intertidal, subtidal, and tidal marsh habitats and publicize completed projects	M5	M3M4		Dams & Water Management/Use, Roads & Railroads, Shipping Lanes, Utility & Service Lines
M	231	Intertidal	Public Outreach	H	new	Improve knowledge of effects of renewable energy on intertidal and subtidal SGCN habitats and convey this information to the public	M2			Renewable Energy
M	240	Intertidal	Public Outreach	H	on-going	Increase outreach and education on preventing the spread of invasive/problematic species and diseases in intertidal, subtidal, and tidal marsh habitats	M7			Invasive Non-native/Alien Species/Diseases, Problematic Native Species/Diseases, Viral/Prion-induced Diseases
M	244	Intertidal	Public Outreach	H	on-going	Increase capacity for local engagement in data collection, surveys, and management of intertidal and subtidal SGCN and their habitats that fosters partnerships among harvesters, citizens, scientists, and managers	M9			Fishing & Harvesting of Aquatic Resources
M	246	Intertidal	Public Outreach	H	on-going	Increase leadership opportunities and education regarding climate change mitigation and adaptation in intertidal and subtidal habitats	M3M4			Habitat Shifting or Alteration, Storms & Flooding, Temperature Extremes
M	208	Intertidal	Public Outreach	M	on-going	At popular sites, increase education and outreach on the effects of recreation on sensitive intertidal ecosystems, spread of invasive species, etc.	M1	M7		Recreational Activities
M	215	Intertidal	Public Outreach	M	new	Develop best management practices for maintaining energy facilities in intertidal and subtidal habitats	M2			Renewable Energy

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Habitat Workgroup	Action ID#	Habitat Group	Action Category	Biol. Priority	Action Type	Description	Theme 1	Theme 2	Theme 3	Stressors Addressed*
M	222	Intertidal	Public Outreach	M	new	Expand existing education and research at the management level to improve understanding and management ability to reduce wastewater and effluent inputs and effects into intertidal and subtidal SGCN habitats	M2			Agricultural and Forestry Effluents, Domestic and Urban Waste Water, Industrial and Military Effluents
M	251	Intertidal	Public Outreach	M	on-going	Post signs describing specific usage constraints (e.g. avoid certain areas during breeding seasons, pick up dog waste, don't disturb flora and fauna) to minimize impacts of recreational activities on intertidal SGCN habitats	M8			Recreational Activities
M	260	Intertidal	Public Outreach	M	on-going	Promote use of more targeted fishing techniques in intertidal and subtidal habitats (e.g., bycatch reduction and not disturbing habitat) by encouraging discussions between harvesters, ecologists, and managers	M9			Fishing and Harvesting of Aquatic Resources
M	210	Intertidal	Research	C	new	Create a coastal acidification budget to determine which factors (i.e. point, non-point source pollution, atmospheric CO2, etc.) are most important in driving acidification nearshore in intertidal and subtidal habitats	M2			Habitat Shifting or Alteration, Storms & Flooding, Temperature Extremes
M	226	Intertidal	Research	C	new	Identify local intertidal and subtidal ocean acidification and sea surface temperature refuges and resilient species	M3M4			Habitat Shifting or Alteration, Storms & Flooding, Temperature Extremes
M	214	Intertidal	Research	H	on-going	Develop better understanding of climate change effects on intertidal and subtidal SGCN and ecosystem interactions	M3M4			Lack of knowledge
M	220	Intertidal	Research	H	new	Encourage installation of lower cost SGCN-friendly infrastructure in and near subtidal, intertidal, and tidal marsh habitats through technology development and transfer of technology	M2			Dams & Water Management/Use, Roads & Railroads, Shipping Lanes, Utility & Service Lines
M	228	Intertidal	Research	H	on-going	Improve understanding of distribution, biology, and ecology of non-commercially harvested intertidal and subtidal SGCN	M1			Lack of knowledge

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Habitat Workgroup	Action ID#	Habitat Group	Action Category	Biol. Priority	Action Type	Description	Theme 1	Theme 2	Theme 3	Stressors Addressed*
M	230	Intertidal	Research	H	on-going	Improve knowledge of intertidal and subtidal SGCN habitat use and migration patterns to better inform renewable energy project siting	M1	M10		Renewable Energy
M	233	Intertidal	Research	H	on-going	Improve modeling (at local and Gulf of Maine scales) of sea level rise effects on intertidal and subtidal SGCN habitats and incorporate into planning	M3M4			Habitat Shifting or Alteration, Storms & Flooding, Temperature Extremes
M	235	Intertidal	Research	H	on-going	Improve mapping of intertidal and subtidal habitats and include information on SGCN movements	M1	M10		Renewable Energy
M	255	Intertidal	Research	H	on-going	Research the feasibility of diversifying Maine's marine fisheries of SGCN in response to changing environmental variables	M3M4			Habitat Shifting or Alteration, Storms & Flooding, Temperature Extremes
M	366	Intertidal	Research	H	on-going	Monitor coastal streams, rivers, and sediments for excessive nutrients and chemical therapeutants	M2			Agricultural & Forestry Effluents, Domestic & Urban Waste Water, Industrial & Military Effluents, Storms & Flooding
M	213	Intertidal	Research	M	on-going	Determine accuracy of commercial harvester- and dealer-reported landings and recreational fishing reports and surveys for target intertidal and subtidal SGCN and bycatch	M9			Fishing and Harvesting of Aquatic Resources
M	227	Intertidal	Research	M	on-going	Improve understanding of effects of energy development on bird and other SGCN use of migration corridors in intertidal and subtidal habitats	M1	M2		Renewable Energy
M	229	Intertidal	Research	M	on-going	Improve understanding of intertidal and subtidal SGCN distributions especially in regards to ecosystem interactions and predator prey relationships	M1			Lack of knowledge

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Habitat Workgroup	Action ID#	Habitat Group	Action Category	Biol. Priority	Action Type	Description	Theme 1	Theme 2	Theme 3	Stressors Addressed*
M	238	Intertidal	Research	M	on-going	Continue to work with industry to minimize escape of aquaculture-raised individuals	M7			Marine and Freshwater Aquaculture
M	247	Intertidal	Research	M	on-going	Investigate the effects of various harvesting practices on intertidal and subtidal SGCN habitats and on trophic and ecological processes	M9			Fishing and Harvesting of Aquatic Resources
M	217	Intertidal	Survey and Monitoring	H	on-going	Develop monitoring systems and rapid response plans to prevent the colonization of invasive/problematic species and diseases in intertidal, subtidal, and tidal marsh habitats	M7			Invasive Non-native/Alien Species/Diseases, Problematic Native Species/Diseases, Viral/Prion-induced Diseases
M	107	Intertidal	Survey and Monitoring	H	new	Develop coastal focus areas encompassing marine habitats with high concentrations of SGCN using improved species occurrence maps	M1			Lack of knowledge
M	367	Intertidal	Survey and Monitoring	H	on-going	Continue underwater surveillance of potential and active aquaculture lease sites with a focus on SGCN and important habitats	M2			Fishing & Harvesting of Aquatic Resources
M	248	Intertidal	Survey and Monitoring	M	on-going	More frequently update intertidal and subtidal SGCN habitat maps and compare to historical maps to monitor changes in distribution over time	M1			Fishing and Harvesting of Aquatic Resources
M	161	Rocky Coast	Habitat Mgmt.	C	on-going	Implement predator control programs near SGCN nesting areas in coastal and rocky coast habitats	M8			Commercial & Industrial Areas , Housing & Urban Areas
M	152	Rocky Coast	Habitat Mgmt.	H	on-going	Minimize disturbances around rocky coast SGCN nesting and roosting habitat through voluntary agreements	M10	M8		Fishing & Harvesting of Aquatic Resources, Recreational Activities

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Habitat Workgroup	Action ID#	Habitat Group	Action Category	Biol. Priority	Action Type	Description	Theme 1	Theme 2	Theme 3	Stressors Addressed*
M	153	Rocky Coast	Habitat Mgmt.	H	on-going	Limit disturbance of shorebird roosting areas and seabird nesting islands through signage, closure to foot traffic, and other effective means	M8			Fishing & Harvesting of Aquatic Resources, Recreational Activities
M	163	Rocky Coast	Habitat Mgmt.	M	on-going	Implement invasive species eradication programs where appropriate (e.g., not in areas where invasive plants provide cover for SGCN and reestablishment of native plants is unlikely), and encourage growth of native species	M7			Invasive Non-native/Alien Species/Diseases
M	164	Rocky Coast	Habitat Mgmt.	M	on-going	Identify conservation and restoration opportunities that allow for rocky coast habitat migration to higher elevations	M3M4	M1		Habitat Shifting or Alteration, Storms and Flooding
M	165	Rocky Coast	Habitat Mgmt.	M	on-going	Identify conservation and restoration opportunities at historic but currently unused nesting sites in rocky coast habitats	M1	M8		Habitat Shifting or Alteration, Storms and Flooding
M	166	Rocky Coast	Habitat Mgmt.	M	on-going	Deploy armoring structures on state-owned lands at high value nesting areas along the rocky coast where migration of nesting habitat is not possible	M3M4			Habitat Shifting or Alteration, Storms and Flooding
M	150	Rocky Coast	Policy	H	on-going	Seasonally close rocky coast SGCN nesting and roosting areas to foot traffic on state-owned lands	M8			Recreational Activities
M	154	Rocky Coast	Policy	H	on-going	Encourage safe operational procedures and spill clean-up and rehabilitation of oiled birds	M1	M6	M10	Industrial & Military Effluents, Shipping Lanes
M	156	Rocky Coast	Policy	H	on-going	Enhance oil spill contingency planning and response efforts in rocky coast habitats including purchasing survey and hazing equipment	M10			Industrial & Military Effluents, Shipping Lanes

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Habitat Workgroup	Action ID#	Habitat Group	Action Category	Biol. Priority	Action Type	Description	Theme 1	Theme 2	Theme 3	Stressors Addressed*
M	159	Rocky Coast	Policy	H	on-going	Use voluntary agreements, conservation easements, and tax abatements and incentives to conserve important coastal and rocky coast SGCN habitats	M3M4	M10	M8	Commercial & Industrial Areas , Housing & Urban Areas
M	149	Rocky Coast	Public Outreach	H	on-going	Erect signage at important nesting and roosting areas in rocky coast habitats to discourage destructive effects of human recreation	M8			Recreational Activities
M	148	Rocky Coast	Public Outreach	M	on-going	Provide outreach to recreationalists regarding effects of human disturbance on nesting colonies and roosting shorebirds	M8			Recreational Activities
M	157	Rocky Coast	Survey and Monitoring	H	on-going	Identify and prioritize significant nesting, migratory, and wintering areas in rocky coast habitats for contingency planning	M10			Industrial & Military Effluents, Shipping Lanes
M	158	Rocky Coast	Survey and Monitoring	H	on-going	Work with municipalities to identify important SGCN nesting and migratory areas in rocky coast and coastal habitats during comprehensive planning	M10	M1		Commercial & Industrial Areas , Housing & Urban Areas
M	162	Rocky Coast	Survey and Monitoring	M	on-going	Identify invasive plant hot spots in rocky coast habitats	M7			Invasive Non-native/Alien Species/Diseases
M	279	Subtidal	Habitat Mgmt.	C	on-going	Encourage partnership projects among transportation agencies, utility companies, etc. to facilitate fish passage and maintain connectivity in or near subtidal, intertidal, and tidal marsh habitats especially in cases where structures have different purposes for different users	M5			Dams & Water Management/Use, Roads & Railroads, Shipping Lanes, Utility & Service Lines
M	314	Subtidal	Habitat Mgmt.	C	on-going	Decommission remnant or unused roads and dams in or near tidal marsh, intertidal, and subtidal habitats	M5			Dams & Water Management/Use, Roads & Railroads, Shipping Lanes, Utility & Service Lines

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Habitat Workgroup	Action ID#	Habitat Group	Action Category	Biol. Priority	Action Type	Description	Theme 1	Theme 2	Theme 3	Stressors Addressed*
M	321	Subtidal	Habitat Mgmt.	C	new	Find ways to support culvert replacement in or near intertidal, subtidal, and tidal marsh habitats using best management practices	M5			Dams & Water Management/Use, Roads & Railroads, Shipping Lanes, Utility & Service Lines
M	264	Subtidal	Habitat Mgmt.	H	on-going	Promote voluntary baywide (or scale of ecological relevance) coordination of shared resources and education addressing the impacts of fishing and harvesting aquatic resources on SGCN intertidal and subtidal habitats	M9			Fishing & Harvesting of Aquatic Resources
M	285	Subtidal	Habitat Mgmt.	H	on-going	Restore and improve conservation management at state and municipal levels to reduce impacts of effluents and wastewater on intertidal and subtidal SGCN habitats	M3M4			Agricultural & Forestry Effluents, Domestic & Urban Waste Water, Industrial & Military Effluents
M	374	Subtidal	Habitat Mgmt.	H	on-going	Assess new aquaculture sites for potential positive, benign, or negative species interactions with the surrounding habitat and ecological systems	M1	M10		Marine & Freshwater Aquaculture
M	308	Subtidal	Habitat Mgmt.	H	on-going	Mitigate coastal acidification of intertidal and subtidal habitats using strategies similar to those for reducing effects of effluents/wastewater	M2			Habitat Shifting or Alteration, Storms & Flooding, Temperature Extremes
M	309	Subtidal	Habitat Mgmt.	H	on-going	Model effects of sea level rise and other climate change factors on subtidal SGCN patterns including physiology, migration patterns, and trophic changes	M3M4			Habitat Shifting or Alteration, Storms & Flooding, Temperature Extremes
M	320	Subtidal	Habitat Mgmt.	H	on-going	Use technology to reduce discharge of wastewater and effluents into intertidal and subtidal SGCN habitats	M2			Agricultural & Forestry Effluents, Domestic & Urban Waste Water, Industrial & Military Effluents
M	375	Subtidal	Habitat Mgmt.	M	new	Alter shipping lanes and dredging plans in intertidal and subtidal habitats to minimize biological and ecological impacts to SGCN	M1	M10		Agricultural and Forestry Effluents, Domestic and Urban Waste Water, Industrial and Military Effluents

Table 4-16. *continued: page 19 of 41.*

Habitat Workgroup	Action ID#	Habitat Group	Action Category	Biol. Priority	Action Type	Description	Theme 1	Theme 2	Theme 3	Stressors Addressed*
M	277	Subtidal	Habitat Mgmt.	M	on-going	Conduct law enforcement training and workshops to support knowledge of SGCN and how existing regulations affect SGCN and their habitats	M6			Recreational Activities, Fishing and Harvesting
M	296	Subtidal	Habitat Mgmt.	M	on-going	Improve response plans for industrial spills (e.g., oil spills) in intertidal and subtidal habitats and support research on oil dispersants and short and long term effect of oil spills	M2			Agricultural and Forestry Effluents, Domestic and Urban Waste Water, Industrial and Military Effluents
M	376	Subtidal	Policy	H	on-going	Increase capacity for enforcement of current laws and regulations regarding proper infrastructure (e.g., roads, dams, utility lines, shipping lanes) construction, maintenance, water quality, and fish passage in tidal marsh, intertidal, and subtidal SGCN habitats	M5	M6		Dams & Water Management/Use, Roads & Railroads, Shipping Lanes, Utility & Service Lines
M	310	Subtidal	Policy	H	new	Provide incentives for building Stream Smart structures and road crossings in or near intertidal, subtidal, and tidal marsh habitats that allow for changing environmental conditions such as sea level rise and increased flooding	M5			Dams & Water Management/Use, Roads & Railroads, Shipping Lanes, Utility & Service Lines
M	317	Subtidal	Policy	H	on-going	Increase awareness about invasive species regulations and problems following the introduction of invasive species in the shipping, transportation, and other industries to prevent introductions and spread of invasive species in intertidal and subtidal habitats	M6	M7		Invasive Non-native/Alien Species/Diseases, Problematic Native Species/Diseases, Viral/Prion-induced Diseases
M	377	Subtidal	Policy	H	on-going	Time dredging projects in subtidal and tidal marsh habitats to minimize harm to SGCN based on migration and spawning cycles	M1	M10		Mining & Quarrying, Shipping Lanes
M	282	Subtidal	Policy	M	on-going	Expand existing education and incentive programs for lawn care companies, homeowners, and municipalities to reduce wastewater and effluent inputs and effects on intertidal and subtidal SGCN habitats	M2			Agricultural and Forestry Effluents, Domestic and Urban Waste Water, Industrial and Military Effluents
M	284	Subtidal	Policy	M	new	Explore value of utilizing conservation leases to limit uses/stresses in intertidal and subtidal habitats	M9			Fishing and Harvesting of Aquatic Resources

Table 4-16. *continued: page 20 of 41.*

Habitat Workgroup	Action ID#	Habitat Group	Action Category	Biol. Priority	Action Type	Description	Theme 1	Theme 2	Theme 3	Stressors Addressed*
M	294	Subtidal	Policy	M	on-going	Increase capacity for municipal planning for siting of new or retrofit developments (i.e., Smart Growth)to reduce wastewater and effluent effects on intertidal and subtidal SGCN habitats while also accounting for future environmental change	M3M4			Agricultural and Forestry Effluents, Domestic and Urban Waste Water, Industrial and Military Effluents
M	302	Subtidal	Policy	M	on-going	Increase enforcement for dumping/litter/gear abandonment in intertidal and subtidal habitats	M6			Garbage and Solid Waste
M	313	Subtidal	Policy	M	on-going	Retrofit existing effluent and wastewater treatment infrastructure and plan for sea level rise by providing economic incentives and education	M3M4			Agricultural and Forestry Effluents, Domestic and Urban Waste Water, Industrial and Military Effluents
M	378	Subtidal	Policy	M	on-going	Site shipping lanes and dredging projects to minimize negative impacts to intertidal and subtidal SGCN and their habitats	M1	M10		Mining and Quarrying, Shipping Lanes
M	316	Subtidal	Policy	M	on-going	Provide stewardship/conservation incentives to harvesters working in intertidal and subtidal SGCN habitats	M9			Fishing and Harvesting of Aquatic Resources
M	267	Subtidal	Public Outreach	C	on-going	Continue/expand litter reduction programs/public education in intertidal and subtidal habitats	M2			Garbage & Solid Waste
M	268	Subtidal	Public Outreach	H	on-going	Continue/expand marine debris recovery programs in intertidal and subtidal habitats and education to fishermen	M2			Garbage & Solid Waste
M	275	Subtidal	Public Outreach	H	on-going	Provide education and outreach through local meetings and trainings (e.g., Stream Smart) on techniques, problems and ecological effects of dams, roads, shipping lanes, and utility corridors on intertidal, subtidal, and tidal marsh habitats and publicize completed projects	M5	M3M4		Dams & Water Management/Use, Roads & Railroads, Shipping Lanes, Utility & Service Lines

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Habitat Workgroup	Action ID#	Habitat Group	Action Category	Biol. Priority	Action Type	Description	Theme 1	Theme 2	Theme 3	Stressors Addressed*
M	291	Subtidal	Public Outreach	H	new	Improve knowledge of effects of renewable energy on intertidal and subtidal SGCN habitats and convey this information to the public	M2			Renewable Energy
M	299	Subtidal	Public Outreach	H	on-going	Increase outreach and education on preventing the spread of invasive/problematic species and diseases in intertidal, subtidal, and tidal marsh habitats	M7			Invasive Non-native/Alien Species/Diseases, Problematic Native Species/Diseases, Viral/Prion-induced Diseases
M	303	Subtidal	Public Outreach	H	on-going	Increase leadership opportunities and education regarding climate change mitigation and adaptation in intertidal and subtidal habitats	M3M4			Habitat Shifting or Alteration, Storms & Flooding, Temperature Extremes
M	304	Subtidal	Public Outreach	H	on-going	Increase capacity for local engagement in data collection, surveys, and management of intertidal and subtidal SGCN and their habitats that fosters partnerships among harvesters, citizens, scientists, and managers	M9			Fishing & Harvesting of Aquatic Resources
M	271	Subtidal	Public Outreach	M	new	Develop best management practices for maintaining energy facilities in intertidal and subtidal habitats	M2			Renewable Energy
M	274	Subtidal	Public Outreach	M	on-going	Continue partnerships between anglers, guides, scientists, and managers to collect biological information and catch data to use in population assessments and identifying species habitat use and behavior	M9			Recreational Activities
M	276	Subtidal	Public Outreach	M	on-going	Provide outreach and education to recreational marine harvesters on proper catch and release methods to minimize trauma (including barotrauma)	M9			Recreational Activities
M	280	Subtidal	Public Outreach	M	on-going	Continue to work with recreational marine charter captains to collect accurate data that can be used to assess SGCN populations	M9			Recreational Activities

Table 4-16. *continued: page 22 of 41.*

Habitat Workgroup	Action ID#	Habitat Group	Action Category	Biol. Priority	Action Type	Description	Theme 1	Theme 2	Theme 3	Stressors Addressed*
M	281	Subtidal	Public Outreach	M	new	Expand existing education and research at the management level to improve understanding and management ability to reduce wastewater and effluent inputs and effects into intertidal and subtidal SGCN habitats	M2			Agricultural and Forestry Effluents, Domestic and Urban Waste Water, Industrial and Military Effluents
M	319	Subtidal	Public Outreach	M	on-going	Promote use of more targeted fishing techniques in intertidal and subtidal habitats (e.g., bycatch reduction and not disturbing habitat) by encouraging discussions between harvesters, ecologists, and managers	M9			Fishing and Harvesting of Aquatic Resources
M	265	Subtidal	Research	C	new	Create a coastal acidification budget to determine which factors (i.e. point, non-point source pollution, atmospheric CO2, etc.) are most important in driving acidification nearshore in intertidal and subtidal habitats	M2			Habitat Shifting or Alteration, Storms & Flooding, Temperature Extremes
M	286	Subtidal	Research	C	new	Identify local intertidal and subtidal ocean acidification and sea surface temperature refuges and resilient species	M3M4			Habitat Shifting or Alteration, Storms & Flooding, Temperature Extremes
M	295	Subtidal	Research	C	on-going	Improve mapping of intertidal and subtidal habitats and include information on SGCN movements and mortality due to turbines	M1	M10		Renewable Energy
M	305	Subtidal	Research	C	new	Investigate offshore changes in circulation patterns, plankton distribution and abundance, and other bio-chemical and physical processes	M2			Habitat Shifting or Alteration, Storms & Flooding, Temperature Extremes
M	270	Subtidal	Research	H	on-going	Develop better understanding of climate change effects on intertidal and subtidal SGCN and ecosystem interactions	M3M4			Lack of knowledge
M	278	Subtidal	Research	H	new	Encourage installation of lower cost SGCN-friendly infrastructure in and near subtidal, intertidal, and tidal marsh habitats through technology development and transfer of technology	M2			Dams & Water Management/Use, Roads & Railroads, Shipping Lanes, Utility & Service Lines

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Habitat Workgroup	Action ID#	Habitat Group	Action Category	Biol. Priority	Action Type	Description	Theme 1	Theme 2	Theme 3	Stressors Addressed*
M	289	Subtidal	Research	H	on-going	Improve understanding of distribution, biology, and ecology of non-commercially harvested intertidal and subtidal SGCN	M1			Lack of knowledge
M	290	Subtidal	Research	H	on-going	Improve knowledge of intertidal and subtidal SGCN habitat use and migration patterns to better inform renewable energy project siting	M3M4			Renewable Energy
M	293	Subtidal	Research	H	on-going	Improve modeling (at local and Gulf of Maine scales) of sea level rise effects on intertidal and subtidal SGCN habitats and incorporate into planning	M3M4			Habitat Shifting or Alteration, Storms & Flooding, Temperature Extremes
M	312	Subtidal	Research	H	on-going	Research the feasibility of diversifying Maine's marine fisheries of SGCN in response to changing environmental variables	M3M4			Habitat Shifting or Alteration, Storms & Flooding, Temperature Extremes
M	269	Subtidal	Research	M	on-going	Determine accuracy of commercial harvester- and dealer-reported landings and recreational fishing reports and surveys for target intertidal and subtidal SGCN and bycatch	M9			Fishing and Harvesting of Aquatic Resources
M	287	Subtidal	Research	M	on-going	Improve understanding of intertidal and subtidal SGCN distributions especially in regards to ecosystem interactions and predator prey relationships	M1			Lack of knowledge
M	288	Subtidal	Research	M	on-going	Improve understanding of effects of energy development on bird and other SGCN use of migration corridors in intertidal and subtidal habitats	M1	M2		Renewable Energy
M	298	Subtidal	Research	M	on-going	Continue to work with industry to minimize escape of aquaculture-raised individuals	M7			Marine and Freshwater Aquaculture

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Habitat Workgroup	Action ID#	Habitat Group	Action Category	Biol. Priority	Action Type	Description	Theme 1	Theme 2	Theme 3	Stressors Addressed*
M	301	Subtidal	Research	M	new	Expand research and pilot studies to test the efficacy of increasing pH of mudflats (e.g., using harvested shell waste) to restore more favorable habitat conditions for intertidal and subtidal SGCN	M2			Fishing and Harvesting of Aquatic Resources
M	306	Subtidal	Research	M	on-going	Investigate the effects of various harvesting practices on intertidal and subtidal SGCN habitats and on trophic and ecological processes	M9			Fishing and Harvesting of Aquatic Resources
M	272	Subtidal	Survey and Monitoring	M	on-going	Develop coastal focus areas encompassing marine habitats with high concentrations of SGCN using improved species occurrence maps	M1			Lack of knowledge
M	273	Subtidal	Survey and Monitoring	H	on-going	Develop monitoring systems and rapid response plans to prevent the colonization of invasive/problematic species and diseases in intertidal, subtidal, and tidal marsh habitats	M7			Invasive Non-native/Alien Species/Diseases, Problematic Native Species/Diseases, Viral/Prion-induced Diseases
M	368	Subtidal	Survey and Monitoring	H	on-going	Continue underwater surveillance of potential and active aquaculture lease sites with a focus on SGCN and important habitats	M2			Fishing & Harvesting of Aquatic Resources
M	266	Subtidal	Survey and Monitoring	M	on-going	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	M1	M10		Mining and Quarrying, Shipping Lanes
M	283	Subtidal	Survey and Monitoring	M	on-going	Expand surveys of recreational fishing efforts to include SGCN that are not targeted in current survey efforts	M9			Recreational Activities
M	307	Subtidal	Survey and Monitoring	M	on-going	More frequently update intertidal and subtidal SGCN habitat maps and compare to historical maps to monitor changes in distribution over time	M1			Fishing and Harvesting of Aquatic Resources

Table 4-16. *continued: page 25 of 41.*

Habitat Workgroup	Action ID#	Habitat Group	Action Category	Biol. Priority	Action Type	Description	Theme 1	Theme 2	Theme 3	Stressors Addressed*
M	180	Tidal Marsh	Habitat Mgmt.	C	on-going	Work with land conservation organizations and private landowners to conserve tidal marshes, adjacent uplands, and marsh migration corridors	M3M4			Annual & Perennial Non-timber crops, Commercial & Industrial Areas , Housing & Urban Areas, Livestock Farming & Ranching, Utility & Service Lines
M	183	Tidal Marsh	Habitat Mgmt.	C	on-going	Conserve lands that are upland and inland of marshes to allow for marsh migration and maintain habitat connectivity	M3M4			Habitat Shifting or Alteration
M	194	Tidal Marsh	Habitat Mgmt.	C	new	Use transportation bonds to provide funding for culvert replacement in or near intertidal, subtidal, and tidal marsh habitats using best management practices	M5			Dams & Water Management/Use, Roads & Railroads
M	196	Tidal Marsh	Habitat Mgmt.	C	on-going	Decommission remnant or unused roads and dams in or near tidal marsh, intertidal, and subtidal habitats	M5			Dams & Water Management/Use, Roads & Railroads
M	198	Tidal Marsh	Habitat Mgmt.	H	on-going	Encourage installation of lower cost SGCN-friendly infrastructure in and near subtidal, intertidal, and tidal marsh habitats through technology development and transfer of technology	M2			Dams & Water Management/Use, Roads & Railroads
M	379	Tidal Marsh	Habitat Mgmt.	H	on-going	Time dredging projects in subtidal and tidal marsh habitats to minimize harm to SGCN based on migration and spawning cycles	M10	M1		Shipping Lanes
M	179	Tidal Marsh	Habitat Mgmt.	M	on-going	Maintain or create corridors between tidal marshes and other habitats used by tidal marsh SGCN	M3M4			Annual and Perennial Non-timber crops, Commercial and Industrial Areas , Housing and Urban Areas, Livestock Farming and Ranching, Utility and Service Lines
M	182	Tidal Marsh	Habitat Mgmt.	M	new	Employ technology to reduce nutrient discharge adjacent to tidal marshes, e.g. storm water remediation measures including SmartSponge, infiltration chambers, and storm water settling areas	M2	M10		Agricultural and Forestry Effluents, Domestic and Urban Waste Water, Industrial and Military Effluents, Storms and Flooding

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Habitat Workgroup	Action ID#	Habitat Group	Action Category	Biol. Priority	Action Type	Description	Theme 1	Theme 2	Theme 3	Stressors Addressed*
M	192	Tidal Marsh	Habitat Mgmt.	M	on-going	Re-route existing trails and/or boardwalks around tidal marshes to minimize foot traffic and disturbance to SGCN habitats	M10			Recreational Activities
M	195	Tidal Marsh	Policy	C	new	Provide incentives for building Stream Smart structures and road crossings in or near intertidal, subtidal, and tidal marsh habitats that allow for changing environmental conditions such as sea level rise and increased flooding	M5			Dams & Water Management/Use, Roads & Railroads
M	197	Tidal Marsh	Policy	H	new	Implement through voluntary or regulatory means best standards for road/stream crossings in or near tidal marshes	M5			Dams & Water Management/Use, Roads & Railroads
M	380	Tidal Marsh	Policy	H	on-going	Increase capacity for enforcement of current laws and regulations regarding proper infrastructure (e.g., roads, dams, utility lines, shipping lanes) construction, maintenance, water quality, and fish passage in tidal marsh, intertidal, and subtidal SGCN habitats	M5	M6		Dams & Water Management/Use, Roads & Railroads
M	381	Tidal Marsh	Policy	H	new	Site shipping lanes and dredging projects to minimize negative impacts to intertidal and subtidal SGCN and their habitats	M1	M10		Shipping Lanes
M	204	Tidal Marsh	Policy	H	on-going	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	M1	M10		Shipping Lanes
M	188	Tidal Marsh	Policy	M	on-going	Increase awareness about invasive species regulations and problems following the introduction of invasive species in the shipping, transportation, and other industries to prevent introductions and spread of invasive species in intertidal and subtidal habitats	M6	M7		Invasive Non-native/Alien Species/Diseases, Problematic Native Species/Diseases
M	201	Tidal Marsh	Policy	M	on-going	Develop and provide model best practice maintenance and operating procedures (e.g., maintenance frequency, replacement schedules) for municipal, state, and private managers of infrastructure in tidal marshes	M5	M3M4		Dams and Water Management/Use, Roads and Railroads

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Habitat Workgroup	Action ID#	Habitat Group	Action Category	Biol. Priority	Action Type	Description	Theme 1	Theme 2	Theme 3	Stressors Addressed*
M	181	Tidal Marsh	Public Outreach	H	on-going	Encourage partnership projects among transportation agencies, utility companies, etc. to facilitate fish passage and maintain connectivity in or near subtidal, intertidal, and tidal marsh habitats especially in cases where structures have different purposes for different users	M5			Dams & Water Management/Use, Roads & Railroads
M	200	Tidal Marsh	Public Outreach	H	on-going	Provide education and outreach through local meetings and trainings (e.g., Stream Smart) on techniques, problems and ecological effects of dams, roads, shipping lanes, and utility corridors on intertidal, subtidal, and tidal marsh habitats and publicize completed projects	M5	M3M4		Dams & Water Management/Use, Roads & Railroads
M	176	Tidal Marsh	Public Outreach	M	on-going	Provide outreach and education to homeowners and businesses to reduce their wastewater and storm water inputs into and effects on tidal marshes, including increased buffers and minimal fertilizer use	M1	M10		Agricultural and Forestry Effluents, Domestic and Urban Waste Water, Industrial and Military Effluents, Storms and Flooding
M	178	Tidal Marsh	Public Outreach	M	new	Research the efficacy of tidal marsh conversion	M3M4			Annual and Perennial Non-timber crops, Commercial and Industrial Areas , Housing and Urban Areas, Livestock Farming and Ranching, Utility and Service Lines
M	186	Tidal Marsh	Public Outreach	M	new	Provide outreach and education to planners, developers, and homeowners about best management practices for site design, property maintenance, and landscaping adjacent to tidal marshes and their buffers	M1	M10		Annual and Perennial Non-timber crops, Commercial and Industrial Areas , Housing and Urban Areas, Livestock Farming and Ranching, Utility and Service Lines
M	187	Tidal Marsh	Public Outreach	M	on-going	Provide outreach and education to homeowners and municipalities regarding proper installation, maintenance, and removal of septic systems	M10	M1		Agricultural and Forestry Effluents, Domestic and Urban Waste Water, Industrial and Military Effluents, Storms and Flooding
M	189	Tidal Marsh	Public Outreach	M	on-going	Increase outreach and education on preventing the spread of invasive/problematic species and diseases in intertidal, subtidal, and tidal marsh habitats	M7			Invasive Non-native/Alien Species/Diseases, Problematic Native Species/Diseases
M	190	Tidal Marsh	Public Outreach	M	new	Provide incentives for converting land into tidal marsh or protecting existing tidal marsh	M7			Annual and Perennial Non-timber crops, Commercial and Industrial Areas , Housing and Urban Areas, Livestock Farming and Ranching, Utility and Service Lines

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Habitat Workgroup	Action ID#	Habitat Group	Action Category	Biol. Priority	Action Type	Description	Theme 1	Theme 2	Theme 3	Stressors Addressed*
M	193	Tidal Marsh	Public Outreach	M	on-going	Deploy signage to notify recreationalists to the sensitivity of tidal marsh habitat	M10			Recreational Activities
M	184	Tidal Marsh	Research	M	on-going	Research and model marsh migration scenarios resulting from sea level rise	M10			Habitat Shifting or Alteration
M	177	Tidal Marsh	Survey and Monitoring	H	on-going	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	M3M4			Annual & Perennial Non-timber crops, Commercial & Industrial Areas , Housing & Urban Areas, Livestock Farming & Ranching, Utility & Service Lines
M	191	Tidal Marsh	Survey and Monitoring	H	on-going	Develop monitoring systems and rapid response plans to prevent the colonization of invasive/problematic species and diseases in intertidal, subtidal, and tidal marsh habitats	M5	M3M4		Invasive Non-native/Alien Species/Diseases, Problematic Native Species/Diseases
M	185	Tidal Marsh	Survey and Monitoring	M	on-going	Continue and expand monitoring programs that track tidal marsh changes over time	M3M4			Habitat Shifting or Alteration
TW	322	Floodplain Forests	Habitat Mgmt.	H	new	Encourage conservation owners to address floodplain forests in management plans	TW9			Dams & Water Management/Use, Invasive Non-native/Alien Species/Diseases, Logging & Wood Harvesting
TW	327	Floodplain Forests	Habitat Mgmt.	H	on-going	Conserve at-risk high value floodplain forests using a variety of voluntary approaches	TW8			Annual & Perennial Non-timber crops, Commercial & Industrial Areas , Housing & Urban Areas, Logging & Wood Harvesting, Roads & Railroads, Utility & Service Lines
TW	323	Floodplain Forests	Habitat Mgmt.	M	New	Work collaboratively with the Maine Forest Service and other partners to review current Maine Forestry Best Management Practices to determine if floodplain forest SGCN are adequately considered and revise, if needed	TW10			Logging and Wood Harvesting

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Habitat Workgroup	Action ID#	Habitat Group	Action Category	Biol. Priority	Action Type	Description	Theme 1	Theme 2	Theme 3	Stressors Addressed*
TW	324	Floodplain Forests	Habitat Mgmt.	M	New	Work collaboratively with the Maine Forest Service and other partners to develop logging and wood harvesting Habitat Management Guidelines for sensitive floodplain forest SGCN, if needed	TW10			Logging and Wood Harvesting
TW	325	Floodplain Forests	Habitat Mgmt.	M	new	Work with forest landowners to implement revised Habitat Management Guidelines in floodplain forests	TW10	TW1		Logging and Wood Harvesting
TW	328	Floodplain Forests	Habitat Mgmt.	M	new	Support floodplain forest management in forest certification program	TW10			Logging and Wood Harvesting
TW	339	Floodplain Forests	Habitat Mgmt.	M	new	Support efforts to restore hydrologic connections to floodplain forests isolated by roads	TW8	TW2	TW5	Roads and Railroads
TW	341	Floodplain Forests	Habitat Mgmt.	M	new	Support statewide invasive species monitoring and education programs in floodplain forests	TW6			Invasive Non-native/Alien Species/Diseases
TW	333	Floodplain Forests	Policy	H	on-going	Support incentives that discourage conversion of floodplain forests to other uses	TW2			Annual & Perennial Non-timber crops, Logging & Wood Harvesting
TW	334	Floodplain Forests	Policy	H	on-going	Improve non-federal match ratio for floodplain forest conservation projects	TW2			Annual & Perennial Non-timber crops, Commercial & Industrial Areas , Housing & Urban Areas, Logging & Wood Harvesting
TW	335	Floodplain Forests	Policy	H	on-going	Support habitat incentive programs by providing additional technical assistance for SGCN habitat management in floodplain forests	TW2			Annual & Perennial Non-timber crops, Logging & Wood Harvesting

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Habitat Workgroup	Action ID#	Habitat Group	Action Category	Biol. Priority	Action Type	Description	Theme 1	Theme 2	Theme 3	Stressors Addressed*
TW	337	Floodplain Forests	Policy	H	on-going	Collaborate with partners to develop state landowner incentive programs for floodplain forests	TW2			Annual & Perennial Non-timber crops, Housing & Urban Areas, Logging & Wood Harvesting
TW	338	Floodplain Forests	Policy	M	new	Consider buffers to floodplain forests in prioritizing conservation opportunities	TW8	TW2		Agricultural and Forestry Effluents, Annual and Perennial Non-timber crops
TW	340	Floodplain Forests	Policy	M	new	Find sources of non-federal match for federal programs offering riparian easements (e.g., USDA-Conservation Reserve Enhancement Program) especially for floodplain forests	TW2	TW8		Agricultural and Forestry Effluents, Annual and Perennial Non-timber crops, Logging and Wood Harvesting
TW	343	Floodplain Forests	Policy	M	new	Account for deer impacts to SGCN habitats in southern Maine floodplains during deer management planning process	TW7			Problematic Native Species/Diseases
TW	331	Floodplain Forests	Public Outreach	H	new	Provide high value floodplain location information to municipalities and land trusts	TW1			Annual & Perennial Non-timber crops, Commercial & Industrial Areas , Domestic & Urban Waste Water, Housing & Urban Areas, Industrial & Military Effluents, Logging & Wood Harvesting, Roads & Railroads, Utility & Service Lines
TW	329	Floodplain Forests	Public Outreach	M	new	Consider mapping SGCN habitats within floodplains	TW1			Annual and Perennial Non-timber crops, Commercial and Industrial Areas , Housing and Urban Areas, Logging and Wood Harvesting, Roads and Railroads, Utility and Service Lines
TW	332	Floodplain Forests	Public Outreach	M	new	Develop outreach materials focused on community benefits derived from floodplain forests	TW1			Commercial and Industrial Areas, Housing and Urban Areas

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Habitat Workgroup	Action ID#	Habitat Group	Action Category	Biol. Priority	Action Type	Description	Theme 1	Theme 2	Theme 3	Stressors Addressed*
TW	342	Floodplain Forests	Survey and Monitoring	M	new	Identify aggressive invasives in floodplain forests and pre-treat to prevent spread	TW6			Invasive Non-native/Alien Species/Diseases
TW	62	Freshwater Marshes	Habitat Mgmt.	H	on-going	Conserve freshwater marsh buffers using a variety of voluntary approaches	TW8	TW5		Agricultural & Forestry Effluents, Commercial & Industrial Areas , Domestic & Urban Waste Water, Housing & Urban Areas, Roads & Railroads, Utility & Service Lines
TW	59	Freshwater Marshes	Habitat Mgmt.	M	new	Target invasive species control at high value wetlands	TW6			Invasive Non-native/Alien Species/Diseases
TW	64	Freshwater Marshes	Habitat Mgmt.	M	on-going	Encourage conservation of freshwater marshes and other high value SGCN wetland habitats using a variety of approaches	TW8			Commercial and Industrial Areas , Housing and Urban Areas, Roads and Railroads, Utility and Service Lines
TW	66	Freshwater Marshes	Habitat Mgmt.	M	new	Work collaboratively with partners to develop water control level standards for freshwater marshes in wildlife management areas	TW9	TW10		Annual and Perennial Non-timber crops, Habitat Shifting or Alteration, Livestock Farming and Ranching
TW	68	Freshwater Marshes	Policy	M	on-going	Support incentives for agricultural practices that benefit freshwater marshes	TW2			Annual and Perennial Non-timber crops, Livestock Farming and Ranching
TW	61	Freshwater Marshes	Public Outreach	H	on-going	Provide information to municipalities and land trusts on high priority freshwater wetlands near or bisected by roads	TW1	TW5		Agricultural & Forestry Effluents, Commercial & Industrial Areas , Domestic & Urban Waste Water, Livestock Farming & Ranching, Roads & Railroads, Utility & Service Lines
TW	60	Freshwater Marshes	Survey and Monitoring	C	new	Identify high priority road segments/culverts for organism passage among freshwater wetlands	TW1	TW5		Roads & Railroads

Table 4-16. *continued: page 32 of 41.*

Habitat Workgroup	Action ID#	Habitat Group	Action Category	Biol. Priority	Action Type	Description	Theme 1	Theme 2	Theme 3	Stressors Addressed*
TW	345	Grassland-shrubland-early Successional	Habitat Mgmt.	C	on-going	Promote management of grasslands, shrublands, and early successional SGCN habitats on conservation lands, wildlife management areas, etc.	TW9	TW3	TW4	Annual & Perennial Non-timber crops, Other Ecosystem Modifications
TW	346	Grassland-shrubland-early Successional	Habitat Mgmt.	H	new	Focus conservation of grassland, shrub, and early successional SGCN habitat in areas not in conflict with landowner economics and are compatible with existing management practices	TW3	TW2	TW4	Annual & Perennial Non-timber crops, Commercial & Industrial Areas , Housing & Urban Areas
TW	351	Grassland-shrubland-early Successional	Habitat Mgmt.	H	on-going	Encourage conservation of grass/shrub habitats using a variety of voluntary approaches	TW8	TW3	TW2	Annual & Perennial Non-timber crops, Commercial & Industrial Areas , Housing & Urban Areas, Utility & Service Lines
TW	344	Grassland-shrubland-early Successional	Habitat Mgmt.	M	on-going	Promote Integrated Pest Management to reduce pesticide use in blueberry barrens	TW7	TW6	TW3	Annual and Perennial Non-timber crops
TW	349	Grassland-shrubland-early Successional	Habitat Mgmt.	M	on-going	Work collaboratively with partners to develop best management practices for retaining a shrub component around agricultural fields	TW3	TW10		Annual and Perennial Non-timber crops
TW	350	Grassland-shrubland-early Successional	Policy	H	new	Research the practicality and feasibility of term easements for grassland, shrub, and early-successional SGCN habitats	TW8	TW3	TW2	Annual & Perennial Non-timber crops, Housing & Urban Areas, Utility & Service Lines
TW	352	Grassland-shrubland-early Successional	Policy	H	new	Establish formal assurance agreements for landowners managing for SGCN (e.g., Safe Harbor Agreements) in grassland, shrub, and early successional habitats	TW2	TW3	TW4	Annual & Perennial Non-timber crops, Housing & Urban Areas, Utility & Service Lines
TW	353	Grassland-shrubland-early Successional	Policy	H	on-going	Support habitat incentive programs by providing additional technical assistance for SGCN habitat management in grasslands, shrublands, and early-successional habitats	TW2	TW3	TW4	Annual & Perennial Non-timber crops, Housing & Urban Areas, Utility & Service Lines

Table 4-16. *continued: page 33 of 41.*

Habitat Workgroup	Action ID#	Habitat Group	Action Category	Biol. Priority	Action Type	Description	Theme 1	Theme 2	Theme 3	Stressors Addressed*
TW	354	Grassland-shrubland-early Successional	Policy	M	on-going	Provide better forgone income incentives (e.g., deferred harvest of hay, deferred grazing of portions of pasture, harvest trees earlier than usual) to encourage grassland, shrub, and early successional habitat management practices beneficial to SGCN	TW2	TW3	TW4	Annual and Perennial Non-timber crops
TW	361	Grassland-shrubland-early Successional	Policy	M	new	Work with municipalities/towns to reduce conflicts that impede needed habitat management in grasslands, shrublands, and early successional SGCN habitat	TW3	TW2	TW4	Annual and Perennial Non-timber crops, Commercial and Industrial Areas , Housing and Urban Areas, Utility and Service Lines
TW	357	Grassland-shrubland-early Successional	Public Outreach	M	on-going	Promote community and land trust stewardship of grassland, shrub, and early-successional SGCN habitats through outreach programs	TW1	TW3	TW9	Commercial and Industrial Areas , Housing and Urban Areas
TW	358	Grassland-shrubland-early Successional	Public Outreach	M	on-going	Target outreach to Soil Water Conservation Districts, Maine Farmland Trust, landowners, and others on the importance of grasslands, shrublands, and early successional SGCN habitats	TW3	TW1	TW10	Annual and Perennial Non-timber crops, Housing and Urban Areas
TW	359	Grassland-shrubland-early Successional	Public Outreach	M	on-going	Incorporate more public outreach information on multiple species (e.g., not just New England Cottontail) that are declining due to lack of suitable grassland, shrub, or early successional habitat	TW3	TW1	TW10	Annual and Perennial Non-timber crops, Commercial and Industrial Areas , Housing and Urban Areas, Roads and Railroads, Utility and Service Lines
TW	360	Grassland-shrubland-early Successional	Public Outreach	M	new	Reinforce and acknowledge good management practices by utility companies along utility corridors that contain grasslands, shrublands, and early successional SGCN habitats	TW3	TW4		Utility and Service Lines
TW	362	Grassland-shrubland-early Successional	Public Outreach	M	on-going	Deploy improved signage promoting conservation of grassland, shrub, early successional habitats, and their associated SGCN	TW3	TW1		Annual and Perennial Non-timber crops, Housing and Urban Areas
TW	363	Grassland-shrubland-early Successional	Public Outreach	M	on-going	Promote better communication tools and training on grassland/shrub habitat conservation	TW3			Annual and Perennial Non-timber crops, Commercial and Industrial Areas , Housing and Urban Areas, Roads and Railroads, Utility and Service Lines

Table 4-16. *continued: page 34 of 41.*

Habitat Workgroup	Action ID#	Habitat Group	Action Category	Biol. Priority	Action Type	Description	Theme 1	Theme 2	Theme 3	Stressors Addressed*
TW	364	Grassland-shrubland-early Successional	Public Outreach	M	new	Establish and promote demonstration areas highlighting habitat management for grassland, shrub, and early successional SGCN	TW3			Annual and Perennial Non-timber crops, Commercial and Industrial Areas , Housing and Urban Areas, Utility and Service Lines
TW	347	Grassland-shrubland-early Successional	Survey and Monitoring	C	new	Research and identify explicit areas and amounts of grassland, shrub, and early successional habitats needed to conserve target SGCN	TW1	TW3	TW4	Housing & Urban Areas, Utility & Service Lines, Annual & Perennial Non-timber crops, Commercial & Industrial Areas
TW	348	Grassland-shrubland-early Successional	Survey and Monitoring	H	on-going	Assist municipal efforts to identify key grassland, shrub, and early successional SGCN habitats	TW1	TW3	TW4	Annual & Perennial Non-timber crops, Commercial & Industrial Areas , Housing & Urban Areas, Utility & Service Lines
TW	355	Grassland-shrubland-early Successional	Survey and Monitoring	H	new	Map and distribute information on existing ruderal habitats likely to be high value for SGCN	TW1	TW3	TW4	Annual & Perennial Non-timber crops, Commercial & Industrial Areas , Housing & Urban Areas, Roads & Railroads, Utility & Service Lines
TW	356	Grassland-shrubland-early Successional	Survey and Monitoring	H	new	Map potential ruderal habitats likely to be high value for SGCN	TW1	TW3	TW4	Annual & Perennial Non-timber crops, Commercial & Industrial Areas , Housing & Urban Areas, Roads & Railroads, Utility & Service Lines
TW	35	Northern Forests and Swamps	Habitat Mgmt.	C	on-going	Encourage conservation of northern forest and swamp habitats, including late successional forests, using a variety of approaches such as easements and leases	TW8			Commercial & Industrial Areas , Housing & Urban Areas, Logging & Wood Harvesting, Roads & Railroads, Tourism & Recreational Areas, Utility & Service Lines
TW	36	Northern Forests and Swamps	Habitat Mgmt.	C	new	Provide support for landowner incentives for SGCN habitat management in northern forests and swamps and south-central forests and swamps	TW2			Commercial & Industrial Areas , Logging & Wood Harvesting, Roads & Railroads, Tourism & Recreational Areas, Utility & Service Lines
TW	42	Northern Forests and Swamps	Habitat Mgmt.	C	on-going	Offer collaboration and technical expertise to forest certification systems for a subset of applicable SGCN and their forest habitats	TW10	TW2		Logging & Wood Harvesting

Table 4-16. *continued: page 35 of 41.*

Habitat Workgroup	Action ID#	Habitat Group	Action Category	Biol. Priority	Action Type	Description	Theme 1	Theme 2	Theme 3	Stressors Addressed*
TW	43	Northern Forests and Swamps	Habitat Mgmt.	C	new	Collaborate with forest landowners and managers to discuss options for voluntary integration of SGCN habitat conservation actions into outcome-based forestry practices	TW10	TW2		Logging & Wood Harvesting
TW	33	Northern Forests and Swamps	Habitat Mgmt.	H	on-going	Consider alternate chemicals or techniques to control invasive species and diseases in northern forests and swamps (especially spruce budworm) and south-central forests and swamps	TW7	TW6		Problematic Native Species/Diseases, Invasive Non-native/Alien Species/Diseases
TW	40	Northern Forests and Swamps	Policy	C	new	Provide support for existing tree growth tax law to discourage conversion of northern forest and swamp SGCN habitats to other non-forested land types	TW2	TW5		Commercial & Industrial Areas , Housing & Urban Areas, Logging & Wood Harvesting, Roads & Railroads, Utility & Service Lines
TW	26	Northern Forests and Swamps	Public Outreach	C	new	Provide outreach to landowners and the public on the effects of roads on northern forest and swamp SGCN habitats	TW1			Roads & Railroads
TW	44	Northern Forests and Swamps	Public Outreach	C	on-going	Provide outreach and education to the general public on the importance of societal consumption of forest products for providing SGCN habitat through forest habitat management	TW1			Logging & Wood Harvesting
TW	21	Northern Forests and Swamps	Public Outreach	M	on-going	Increase outreach and education to the public and landowners on the role of fire in maintaining northern forest and swamp SGCN habitats	TW4	TW1		Fire and Fire Suppression, Habitat Shifting or Alteration
TW	45	Northern Forests and Swamps	Public Outreach	M	on-going	Provide outreach and education to recreationalists on reducing impacts to northern forest and swamp SGCN habitats	TW1			Recreational Activities, Tourism and Recreational Areas
TW	20	Northern Forests and Swamps	Research	C	new	Continue research to better understand and mitigate impacts of climate change on northern forest and swamp SGCN habitats	TW11	TW5		Habitat Shifting or Alteration

Table 4-16. *continued: page 36 of 41.*

Habitat Workgroup	Action ID#	Habitat Group	Action Category	Biol. Priority	Action Type	Description	Theme 1	Theme 2	Theme 3	Stressors Addressed*
TW	31	Northern Forests and Swamps	Survey and Monitoring	C	new	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	TW5			Habitat Shifting or Alteration
TW	32	Northern Forests and Swamps	Survey and Monitoring	C	new	Identify and conserve through a variety of voluntary approaches boreal forest refugia associated with SGCN	TW5			Habitat Shifting or Alteration
TW	30	Northern Forests and Swamps	Survey and Monitoring	H	on-going	Continue stewardship/habitat monitoring on conserved northern forest and swamp lands	TW9	TW11		Recreational Activities
TW	34	Northern Forests and Swamps	Survey and Monitoring	H	on-going	Continue monitoring for invasive and problematic species and diseases, especially forest insect pests, in northern forest and swamps and south-central forests and swamps	TW6	TW7		Invasive Non-native/Alien Species/Diseases, Problematic Native Species/Diseases
TW	38	Northern Forests and Swamps	Survey and Monitoring	H	on-going	Continue long-term monitoring of SGCN habitat condition and forest structure in northern forests and swamps through programs such as the annual Forest Inventory and Analysis	TW11	TW4		Commercial & Industrial Areas , Housing & Urban Areas, Logging & Wood Harvesting, Roads & Railroads, Utility & Service Lines
TW	48	Pine Barrens	Habitat Mgmt.	H	on-going	Encourage conservation of pine barrens through a variety of voluntary approaches	TW8	TW5		Annual & Perennial Non-timber crops, Recreational Activities
TW	49	Pine Barrens	Habitat Mgmt.	M	new	Provide support for property tax incentives to encourage pine barren habitat management on private land	TW2	TW5		Annual and Perennial Non-timber crops, Recreational Activities
TW	56	Pine Barrens	Habitat Mgmt.	M	new	Recognize pine barren landowners for effective habitat management	TW2	TW5	TW1	Fire and Fire Suppression, Invasive Non-native/Alien Species/Diseases, Recreational Activities

Table 4-16. *continued: page 37 of 41.*

Habitat Workgroup	Action ID#	Habitat Group	Action Category	Biol. Priority	Action Type	Description	Theme 1	Theme 2	Theme 3	Stressors Addressed*
TW	58	Pine Barrens	Habitat Mgmt.	M	new	Use a variety of incentives to conserve or buffers surrounding pine barrens	TW8	TW5		Commercial and Industrial Areas , Housing and Urban Areas, Mining and Quarrying, Roads and Railroads, Utility and Service Lines
TW	52	Pine Barrens	Policy	C	new	Secure stable funding for fire management in pine barrens	TW2			Fire & Fire Suppression
TW	53	Pine Barrens	Policy	C	new	Provide cost-share for mechanical treatments where fire management is not practical in pine barrens	TW9	TW2		Fire & Fire Suppression
TW	54	Pine Barrens	Policy	C	new	Use agreements (e.g., MOU's) and partnerships to increase fire management capacity in pine barrens	TW9	TW2		Fire & Fire Suppression
TW	55	Pine Barrens	Policy	C	new	Promote inter-agency prescribed fire training and assistance in pine barrens	TW9	TW2		Fire & Fire Suppression
TW	57	Pine Barrens	Public Outreach	M	new	Develop outreach/education to municipal planners and land trusts on the importance of pine barrens and the positive effects of fire and mechanical management on biodiversity	TW1	TW5		Fire and Fire Suppression, Invasive Non-native/Alien Species/Diseases, Recreational Activities, Utility and Service Lines
TW	17	Rocky Summits-Outcrops-Mountaintops	Public Outreach	H	on-going	Provide outreach and education to recreationalists on reducing impacts to rocky summits, outcrops, and mountaintop SGCN habitats	TW1	TW8		Recreational Activities
TW	16	Rocky Summits-Outcrops-Mountaintops	Research	C	new	Continue research to better understand and mitigate impacts of climate change on rocky summits, outcrops, and mountaintop SGCN habitats	TW11	TW5		Habitat Shifting or Alteration

Table 4-16. *continued: page 38 of 41.*

Habitat Workgroup	Action ID#	Habitat Group	Action Category	Biol. Priority	Action Type	Description	Theme 1	Theme 2	Theme 3	Stressors Addressed*
TW	15	Rocky Summits-Outcrops-Mountaintops	Survey and Monitoring	C	new	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	TW5			Habitat Shifting or Alteration
TW	18	Rocky Summits-Outcrops-Mountaintops	Survey and Monitoring	H	on-going	Continue habitat/recreational monitoring stewardship on conserved rocky summit, outcrop, and mountaintop SGCN habitats	TW11			Recreational Activities
TW	65	South-Central Forests and Swamps	Habitat Mgmt.	C	new	Provide landowner incentives for SGCN habitat management in northern forests and swamps and south-central forests and swamps	TW2			Commercial & Industrial Areas , Housing & Urban Areas, Roads & Railroads, Utility & Service Lines
TW	67	South-Central Forests and Swamps	Habitat Mgmt.	H	on-going	Identify, map, and provide information to the public on SGCN habitats in south-central forests and swamps	TW1			Commercial & Industrial Areas , Housing & Urban Areas, Roads & Railroads, Utility & Service Lines
TW	69	South-Central Forests and Swamps	Habitat Mgmt.	H	new	Work collaboratively with partners to develop and distribute habitat management guidelines for south-central forests and swamp SGCN habitats	TW1	TW10		Commercial & Industrial Areas , Housing & Urban Areas, Logging & Wood Harvesting, Roads & Railroads, Utility & Service Lines
TW	63	South-Central Forests and Swamps	Habitat Mgmt.	M	on-going	Encourage conservation of south-central forest and swamp habitats using a variety of approaches such as easements and leases	TW8			Commercial and Industrial Areas , Housing and Urban Areas, Recreational Activities, Roads and Railroads, Utility and Service Lines
TW	80	South-Central Forests and Swamps	Habitat Mgmt.	M	on-going	Collaborate with on-going invasive species eradication/early identification efforts in south central forest and swamp SGCN habitats	TW6			Invasive Non-native/Alien Species/Diseases
TW	70	South-Central Forests and Swamps	Public Outreach	C	on-going	Increase outreach and education to landowners, municipal staff, town council/selectman, and other members of the public on the effects of development (e.g., housing, roads, utility lines) on south-central forest and swamp SGCN habitats	TW1			Commercial & Industrial Areas , Housing & Urban Areas, Roads & Railroads, Utility & Service Lines

Table 4-16. *continued: page 39 of 41.*

Habitat Workgroup	Action ID#	Habitat Group	Action Category	Biol. Priority	Action Type	Description	Theme 1	Theme 2	Theme 3	Stressors Addressed*
TW	72	South-Central Forests and Swamps	Public Outreach	H	on-going	Develop outreach and location information on SGCN habitats in south-central forests and swamps for land trusts, municipalities, and landowners	TW1			Commercial & Industrial Areas , Housing & Urban Areas, Roads & Railroads, Utility & Service Lines
TW	77	South-Central Forests and Swamps	Public Outreach	H	on-going	Increase outreach and education to the public, landowners, and hunters and trappers on the effects of over-abundant native species (e.g., deer, beaver) on south-central forest and swamp SGCN habitats	TW7	TW1		Problematic Native Species/Diseases of Unknown Origin
TW	76	South-Central Forests and Swamps	Public Outreach	M	new	Provide spatial information on invasive species to landowners, towns, land trusts, etc., especially for south-central forest and swamp SGCN habitats	TW6	TW1		Invasive Non-native/Alien Species/Diseases
TW	73	South-Central Forests and Swamps	Research	H	on-going	Consider alternate chemicals or techniques to control invasive species and diseases in northern forests and swamps (especially for spruce budworm) and south-central forests and swamps	TW6			Invasive Non-native/Alien Species/Diseases
TW	78	South-Central Forests and Swamps	Species Mgmt.	C	on-going	Increase deer hunting/beaver trapping opportunity to reduce impacts of these species on south-central forest and swamp SGCN habitats	TW7			Problematic Native Species/Diseases
TW	79	South-Central Forests and Swamps	Species Mgmt.	H	on-going	Account for deer/beaver impacts to SGCN habitats in south-central forests and swamps during species management planning process	TW7			Problematic Native Species/Diseases
TW	71	South-Central Forests and Swamps	Survey and Monitoring	H	on-going	Undertake long-term monitoring of SGCN and their habitats in south-central forests and swamps	TW11			Commercial & Industrial Areas , Housing & Urban Areas, Roads & Railroads, Utility & Service Lines
TW	74	South-Central Forests and Swamps	Survey and Monitoring	H	on-going	Continue monitoring for invasive and problematic species and diseases, especially forest insect pests, in northern forests and swamps and south-central forests and swamps	TW6	TW7	TW11	Invasive Non-native/Alien Species/Diseases, Problematic Native Species

Table 4-16. *continued: page 40 of 41.*

Habitat Workgroup	Action ID#	Habitat Group	Action Category	Biol. Priority	Action Type	Description	Theme 1	Theme 2	Theme 3	Stressors Addressed*
TW	75	South-Central Forests and Swamps	Survey and Monitoring	M	new	Partner with state and local agencies to identify invasive plant "hotspots" along roads and bridges, especially in south-central forests and swamps	TW6			Invasive Non-native/Alien Species/Diseases
TW	9	Vernal Pools	Habitat Mgmt.	C	on-going	Encourage conservation of high value vernal pool complexes using a variety of voluntary approaches	TW8	TW5		Commercial & Industrial Areas , Habitat Shifting or Alteration, Housing & Urban Areas, Logging & Wood Harvesting, Roads & Railroads, Utility & Service Lines
TW	2	Vernal Pools	Habitat Mgmt.	M	new	Identify on-going opportunities/partnerships for invasive plant species management in vernal pools	TW6			Invasive Non-native/Alien Species/Diseases
TW	14	Vernal Pools	Habitat Mgmt.	M	on-going	Continue work with forestry community on vernal pool Habitat Management Guidelines	TW1	TW10		Logging and Wood Harvesting
TW	4	Vernal Pools	Policy	H	new	Develop vernal pool organism passage recommendations for new and existing road crossing structures	TW5	TW8		Roads & Railroads
TW	7	Vernal Pools	Public Outreach	M	on-going	Update statewide roads and riparian connectivity layer and include models specific to SGCN	TW1			Commercial and Industrial Areas , Habitat Shifting or Alteration, Housing and Urban Areas, Roads and Railroads, Utility and Service Lines
TW	12	Vernal Pools	Public Outreach	M	on-going	Use event-specific (e.g., big night, turtle nesting) outreach to draw greater public attention to vernal pools	TW1			Housing and Urban Areas, Roads and Railroads
TW	13	Vernal Pools	Public Outreach	M	new	Integrate the positive impacts of vernal pools (e.g., economic benefits and relation to game species) into vernal pool outreach messaging	TW1			Commercial and Industrial Areas , Housing and Urban Areas, Roads and Railroads, Utility and Service Lines

Table 4-16. *continued: page 41 of 41.*

Habitat Workgroup	Action ID#	Habitat Group	Action Category	Biol. Priority	Action Type	Description	Theme 1	Theme 2	Theme 3	Stressors Addressed*
TW	6	Vernal Pools	Research	C	new	Identify connectivity hotspots among developable high value vernal pools, pool complexes, and non-breeding habitat	TW1			Commercial & Industrial Areas , Habitat Shifting or Alteration, Logging & Wood Harvesting, Roads & Railroads
TW	8	Vernal Pools	Research	H	new	Research vernal pool remote sensing techniques and field verify on public lands	TW1			Commercial & Industrial Areas , Habitat Shifting or Alteration, Housing & Urban Areas, Logging & Wood Harvesting, Roads & Railroads, Utility & Service Lines
TW	10	Vernal Pools	Research	H	on-going	Identify and implement research opportunities exploring ecosystem requirements of specialized vernal pool taxa	TW11			Commercial & Industrial Areas , Droughts, Habitat Shifting or Alteration, Housing & Urban Areas, Roads & Railroads, Storms & Flooding, Temperature Extremes, Utility & Service Lines
TW	1	Vernal Pools	Research	M	new	Research and identify likely climate change impacts to high value vernal pools	TW5	TW8	TW10	Droughts, Habitat Shifting or Alteration, Storms and Flooding, Temperature Extremes
TW	3	Vernal Pools	Research	M	new	Identify and implement research opportunities investigating effects of invasive species on vernal pool organisms and hydrology	TW6	TW11		Invasive Non-native/Alien Species/Diseases, Roads and Railroads

Table 4-17. Habitat conservation actions by Action Category.

Habitat Category	Habitat Management	Policy	Public Outreach	Research	Species Management	Survey and Monitoring	Total
Freshwater	5	16	19	5	2	7	**54**
Marine / Coastal	47	33	37	32	0	16	**165**
Terrestrial / Freshwater Wetlands	34	19	24	8	2	16	**103**
Total	**86**	**68**	**80**	**45**	**4**	**39**	**322**

Table 4-18. Habitat conservation actions by Type.

Habitat Category	New	On-going	Total
Freshwater	30	24	**54**
Marine / Coastal	33	132	**165**
Terrestrial / Freshwater Wetlands	54	49	**103**
Total	**117**	**205**	**322**

Table 4-19. Habitat conservation actions by Biological Priority.

Habitat Category	Critical	High	Moderate	Total
Freshwater	6	37	11	**54**
Marine / Coastal	22	73	70	**165**
Terrestrial / Freshwater Wetlands	24	35	44	**103**
Total	**52**	**145**	**125**	**322**

4.3.4 DEVELOPMENT OF HABITAT THEMES

Given the volume of habitat conservation actions identified in the 2015 Wildlife Action Plan, habitat workgroups developed several themes to organize these actions into discrete packages of related actions that address common stressors or use similar techniques (Table 4-20). Actions within a theme are often complementary, and thus, simultaneously undertaking multiple actions within a theme may be the most effective and efficient use of limited conservation dollars. We assigned each habitat action to as many as three themes within its respective habitat workgroup (i.e., marine/coastal, terrestrial/freshwater wetlands, or freshwater aquatic habitats) with up to 36 actions per theme.

In order to better illustrate the connection between habitat actions and SGCN, we quantified the minimum number of SGCN likely to benefit from a given theme (Table 4-20). We use the term 'minimum' because we assume that habitat actions benefit most, if not all, SGCN associated with a given habitat; however, some species may derive greater benefit than others. We used the approach below to determine the minimum number of SGCN likely to benefit from each theme:

"Given the volume of habitat conservation actions identified in the 2015 Action Plan, habitat workgroups developed several themes to organize these actions into discrete packages of related actions that address common stressors or use similar techniques."

1. We identified all habitat macrogroups associated with a theme.

2. We identified the SGCN (by priority level) associated with each macrogroup. We counted SGCN associated with multiple macrogroups only once.

3. For Priority 1 and 2 SGCN, we identified species with stressors common to those addressed by the habitat theme.

    a. If we ranked the common stressor as moderate or high severity for the SGCN, we assumed the species would likely benefit from a habitat action addressing that stressor. We tallied these species in columns 'P1' and 'P2' of Table 4-20.

        i. For example, we identified Housing and Urban Areas as a severe stressor for Spotted Turtles (Priority 1 SGCN). A theme that includes actions addressing Housing and Urban Areas at the habitat scale would also benefit Spotted Turtles.

    b. If we ranked the common stressor as low severity for the SGCN, we assumed the species may benefit from a habitat theme addressing that stressor, but the link may not be as direct. We tallied these species in the column 'Total SGCN' of Table 4-20. In many cases, we did not assign low severity stressors to SGCN because they are unlikely to be priorities in the next ten years.

    c. We did not assign stressors to Priority 3 SGCN, but these species would likely benefit from habitat actions undertaken in their habitats. We tallied these species in the column 'Total SGCN' of Table 4-20.

Table 4-20. Habitat conservation action themes.

Code	Theme Description (Total No. Conservation Actions per Theme)	Habitat Groups Directly Addressed by Theme	Min. No. of SGCN Likely to Benefit from a Theme		
			P1[1]	P2[1]	Total SGCN[2]
Freshwater Aquatic Themes					
F1 Mapping and Outreach[3]	Map the distribution of SGCN, their habitats, and their stressors, and provide this information to landowners, land trusts, municipal governments, and conservation partners to aid in spatial planning (14)	Streams; Rivers; Lakes; Ponds	20	27	72
F2 Connectivity[3]	Maintain and improve (where practicable) connectivity for SGCN and their habitats through mapping, outreach, and town/municipal collaboration while considering impacts of climate change and invasive species (19)	Streams; Rivers; Lakes; Ponds	20	27	72
F3 Invasive Species[3]	Monitor, contain, and control the spread of invasive species that negatively impact SGCN or their habitats through surveys, research, public outreach, habitat management, and reclamation (7)	Streams; Rivers; Lakes; Ponds	0	0	72
F4	Maintain and restore (where practicable) riparian habitats used by SGCN by providing technical assistance and education to municipalities and natural resource professionals, providing technical assistance and incentives to landowners, and collaborating with interested parties to develop BMPs, in order to mitigate climate change and land-use effects (10)	Streams; Rivers; Lakes; Ponds	20	27	72
F5	Reduce pollution and degradation of important SGCN habitats by working with landowners and municipalities to improve wastewater treatment and reduce impacts from development near lake and river shores (10)	Streams; Rivers; Lakes; Ponds	20	27	72
F6	Improve passage of fish SGCN at dams by providing outreach and technical assistance to dam owners and operators, researching fish behavior and alternative technologies, and conducting a statewide inventory of dams (11)	Streams; Rivers; Lakes; Ponds	20	27	72
Marine Themes					
M1 Mapping and Outreach[3]	Map and provide outreach/technical assistance for SGCN occurrence and habitat location information for marine spatial planning and other uses (32)	Intertidal; Subtidal; Tidal marsh; Rocky coast; Coastal	25	62	108
M2	Research, implement, and provide outreach/technical assistance for new and underutilized technologies designed to reduce impacts to SGCN habitats including, but not limited to, litter reduction, ghost gear removal, bycatch reduction, pollution mitigation, climate change and ocean acidification, alternative energies, and aquaculture (34)	Intertidal; Subtidal; Tidal marsh	25	62	104
M3M4	Research the effects of climate change on SGCN and their habitats and incorporate this information and other climate change concepts (e.g., buffering for marsh migration and extreme storms) into coastal development and infrastructure planning, spatial modeling, fishable stock management, habitat restoration, and other efforts to reduce impacts of climate change to SGCN, SGCN habitats, and coastal communities (36)	Intertidal; Subtidal; Tidal marsh; Rocky coast; Coastal	25	62	108

Table 4-20. *continued: page 2 of 4.*

Code	Theme Description (Total No. Conservation Actions per Theme)	Habitat Groups Directly Addressed by Theme	Min. No. of SGCN Likely to Benefit from a Theme		
			P1[1]	P2[1]	Total SGCN[2]
Marine Themes (continued)					
M5 Connectivity[3]	Maintain and improve habitat connectivity while also considering impacts of climate change for SGCN aquatic organisms through mapping, outreach, town/municipal collaboration, and voluntary habitat conservation (23)	Intertidal; Subtidal; Tidal marsh; Coastal	18	48	107
M6	Conduct law enforcement training and workshops to support knowledge of SGCN and their habitats (11)	Intertidal; Subtidal; Tidal marsh; Rocky coast	23	54	105
M7 Invasive Species[3]	Monitor, contain, and control the spread of invasive species that are negatively affecting SGCN habitats through research, management, public outreach, and enforcement of existing policies and regulations (14)	Intertidal; Subtidal; Tidal marsh; Rocky coast	25	62	105
M8	Minimize impacts to SGCN waterbird feeding, roosting and nesting habitats from activities including but not limited to fishing and recreation (11)	Intertidal; Rocky coast; Coastal	14	26	66
M9	Evaluate and implement new and existing methods to monitor and manage commercial and recreational harvest of SGCN to ensure ecological sustainability (including ecosystem or bay scale management) (19)	Intertidal; Subtidal	23	54	93
M10	Minimize loss of marine SGCN habitats due to development (e.g., structures, dwellings, docks, piers, aquaculture facilities, and marinas) and mitigate for associated impacts such as contaminants (e.g., oil, gas, and chemical spills) and disturbance associated with human activity (30)	Intertidal; Subtidal; Tidal marsh; Coastal; Rocky coast	25	62	108
Terrestrial/Freshwater Wetland Themes					
TW1 Mapping and Outreach[3]	Identify, map, distribute information, and provide technical assistance and outreach to landowners, towns, land trusts, etc. on the location and management of selected high-value, at-risk habitats important to the conservation of SGCN (33)	Vernal pools; South-central forests and swamps; Grassland, shrubland, early successional; Pine barrens; Freshwater marshes; Floodplain forest	23	64	139
TW2	Identify potential additions or improvements to existing financial and non-financial incentives to encourage landowner participation in the restoration, retention, and management of habitats important to SGCN, analyze these ideas for effectiveness, and encourage implementation of those with the greatest potential for use and benefit (26)	Northern forests and swamps; South-central forests and swamps; Grassland, shrubland, early successional; Pine barrens; Freshwater marshes; Floodplain forest	22	60	147
TW3	Identify opportunities for expansion of ruderal habitat in southern Maine, which includes determining the amount needed for SGCN conservation, identifying where habitat expansion could most practically occur, and collaborating with conservation partners to develop habitat management guidelines (21)	Grassland, shrubland, early successional	11	25	57

Table 4-20. *continued: page 3 of 4.*

Code	Theme Description (Total No. Conservation Actions per Theme)	Habitat Groups Directly Addressed by Theme	Min. No. of SGCN Likely to Benefit from a Theme		
			P1[1]	P2[1]	Total SGCN[2]
Terrestrial/Freshwater Wetland Themes (continued)					
TW4	Identify opportunities for expansion of early successional forest habitats in southern Maine and ecologically mature forests in northern Maine needed by SGCN dependent on those habitats, which includes determining the amount needed, and collaborating with conservation partners to develop habitat management guidelines (13)	Northern forests and swamps; Grassland, shrubland, early successional	19	51	108
TW5 Connectivity[3]	Facilitate the persistence and range expansion of SGCN in Maine in the face of a changing climate by ensuring landscape connectivity (both terrestrial and aquatic) through reducing habitat fragmentation and promoting the voluntary conservation of diverse and resilient landscapes and watersheds (18)	Northern forests and swamps; Pine barrens; Freshwater marshes; Rocky summits, outcrops; Vernal pools	22	64	130
TW6 Invasive Species[3]	Monitor, prevent, contain, and control invasive species (plant and animal) and diseases with potential for significant detrimental impact on SGCN and their primary habitats (13)	Vernal pools; Northern forests and swamps; South-central forests and swamps; Freshwater marshes; Floodplain forests; Grasslands, shrublands, early successional	3	3	143
TW7	Monitor and manage the impact of problematic native species and diseases on SGCN and their habitats (8)	Northern forests and swamps; South-central forests and swamps; Floodplain forest; Grasslands, shrublands, early successional	0	0	130
TW8	Minimize habitat loss and fragmentation by guiding detrimental land-use activities away from the most sensitive and limited SGCN habitats and by conserving lands and buffers surrounding sensitive SGCN habitats (16)	Freshwater marshes; Grasslands, shrublands, early successional; Northern forests and swamps; Pine barrens, South-central forests and swamps; Vernal pools; Floodplain forests	25	68	147
TW9	Promote voluntary SGCN habitat management on both private and public lands, especially habitats that are limited and hard to manage economically, such as ruderal habitats, grasslands, pine barrens, floodplains, early and late successional forest habitats (8)	Pine barrens; Rocky summits, outcrops; Grasslands, shrublands, early successional; Northern forests and swamps; Freshwater marshes; Floodplain forest	11	29	144
TW10	Collaborate with conservation partners to develop habitat management guidelines for SGCN and encourage their voluntary incorporation into forest certification systems and outcome-based forestry (13)	Vernal pools; Northern forests and swamps; Floodplain forest; South-central forests and swamps	14	40	76

Table 4-20. *continued: page 4 of 4.*

Code	Theme Description (Total No. Conservation Actions per Theme)	Habitat Groups Directly Addressed by Theme	Min. No. of SGCN Likely to Benefit from a Theme		
			P1[1]	P2[1]	Total SGCN[2]
Terrestrial/Freshwater Wetland Themes (continued)					
TW11	Conduct biological monitoring as required to guide the conservation of SGCN and their habitats especially for habitats requiring active management (e.g., grasslands, shrublands, early successional habitats) or are vulnerable to adjacent activities (9)	Grasslands, shrublands, early successional; vernal pools, Northern forests and swamps; South-central forests and swamps; Rocky summits, outcrops	22	60	134

[1]SGCN included in this tally are most likely to benefit from a theme because actions within that theme address habitat stressors that also were identified as 'moderate' or 'severe' stressors at the species scale; SGCN for which a stressor was determined to be of 'slight' severity are not included in this tally.
[2]This is the total number of SGCN that occur in habitats addressed by a theme.
[3]Cell shading indicates a cross-cutting theme common among the three habitat categories; these cross-cutting themes are abbreviated as: 1) Mapping and Outreach, 2) Connectivity, and 3) Invasive Species

While the number of SGCN likely to benefit from themes can help readers assess the relative breadth of themes, these tallies should not be used to evaluate the relative merits of themes. For example, Terrestrial/Wetland Theme 8 (TW8) is broad (minimizing habitat loss and fragmentation by guiding detrimental land-use activities away from the most sensitive and limited SGCN habitats) and encompasses 16 actions, seven habitat groupings, and likely benefits a minimum of 25, 68, and 147 Priority 1, Priority 2, and total SGCN, respectively. In contrast, Terrestrial/Wetland Theme 7 (TW7) has a narrower scope (monitoring and managing impacts of problematic native species) in four terrestrial/wetland habitats. This theme likely benefits at least 160 SGCN associated with these habitats, but using our approach outlined above, does not link directly with any Priority 1 or Priority 2 SGCN. In this case, we identified Problematic Native Species as a moderate stressor in some habitats but ranked it as a low severity stressor (or not ranked at all) for SGCN associated with these habitats.

Three 'super-themes' emerged across habitat groups; actions included in these themes will likely benefit from coordinated efforts across habitats. The themes are:

1. **Connectivity:** This super-theme addresses habitat connectivity with a focus on facilitating the persistence and range expansion of SGCN and their habitats in the face of climate change. While Habitat Shifting and Alteration related to climate change was not a priority stressor for most SGCN, it is the second most common stressor assigned to habitat macrogroups. This super-theme also addresses other common causes of habitat fragmentation.

2. **Invasive Species:** Actions in this super-theme consist of monitoring, containment, and control of invasive species. We assigned the Invasive Non-native/Alien Species/Diseases stressor to the largest number of habitat macrogroups and it has the potential to affect nearly every habitat in Maine. This stressor also affects many SGCN.

Monitoring, containment, and control of invasive species, such as the Asiatic bittersweet (*Celastrus orbiculata*) pictured here, were identified as important conservation actions across SGCN habitats. © Maine Natural Areas Program.

3. **Mapping and Outreach:** Actions in this super-theme address mapping and outreach needs for SGCN and habitats. We identified Lack of Knowledge as a priority stressor for SGCN. For example, many marine SGCN distributions and habitats are largely unknown and therefore unmapped. Many negative effects of stressors can be minimized or avoided by simply knowing where SGCN and habitats are located and conveying this information to local decision makers, landowners, and conservation stewards.

4.4 PROGRAMMATIC CONSERVATION ACTIONS

MDIFW and the Steering Committee identified 11 programmatic actions to guide implementation and tracking of the 2015 Wildlife Action Plan (Table 4-21). Target start dates for each programmatic action (short-term: within the first few years of Plan implementation; mid-term: within the first half of Plan implementation; long-term: within the second half of Plan implementation) are given. We categorized programmatic actions as follows:

1. **Outreach and Engagement (Programmatic Actions 1-3):** Actions to inform and engage the public and partners on Action Plan accomplishments and opportunities for involvement. We describe these actions in Elements 7-8.

2. **Funding and Tracking (Programmatic Actions 4-8):** Actions to bolster funding, capacity, and tracking of SGCN-related projects. We discuss Programs 4 and 6 briefly below, Program 5 in Elements 7-8, and Programs 7 and 8 in Elements 5-6.

   a. **Program 4:** This action supports efforts to establish stable state and federal funding sources for SGCN and habitat conservation. At the state level, MDIFW and partners will continue to investigate stable funding sources for SGCN conservation.
   b. At the federal level, groups of conservation partners, such as Maine's Teaming with Wildlife Coalition (http://www.teaming.com/state-tribal-wildlife-grants-swg-program), may continue to seek sources of federal funding for SGCN conservation.
   c. **Program 6:** This action focuses on increasing long-term agency support for Wildlife Action Plan implementation. While many staff in MDIFW work on projects related to SGCN conservation, there currently are no dedicated SWAP staff or programs to coordinate Plan administration, tracking, or outreach.

> *"MDIFW and the Steering Committee identified 11 programmatic actions to help guide implementation and tracking of the 2015 Wildlife Action Plan."*

3. **Action Development (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. We discuss this action in Elements 5-6.

4. **Regional Partnerships (Programmatic Actions 10-11):** These actions address continued MDIFW and partner involvement in existing conservation efforts.

   a. **Program 10:** This action supports efforts to identify new and update existing SGCN Conservation Opportunity Areas (COAs). One such effort is already underway. MDIFW, MNAP, MCP, MDMR and other partners are reviewing and revising Maine's Focus Areas of Statewide Ecological Significance. Focus Areas are 140 natural areas of statewide ecological significance that contain unusually rich concentrations of at-risk species and habitats (http://beginningwithhabitat.org/about_bwh/focusareas.html). These areas support rare plants, animals, and natural communities, high-quality common natural communities, significant wildlife habitats, and their intersections with large blocks of undeveloped habitat. We delineate Focus Area boundaries based on the species

and natural communities that occur within them and the supporting landscape conditions that contribute to the long-term viability of the species, habitats, and community types. MDIFW and partners are revising existing Focus Areas with 2015 SGCN distribution and habitat information and are exploring ways to incorporate resilient landscapes and connectivity among Focus Areas. We expect this revision to be completed within the first few years of this Plan's implementation. We also expect to create a framework that will guide and standardize periodic updates to Focus Areas.

MDIFW and conservation partners also are engaged in several on-going efforts to adapt broad-scale climate change resiliency information to local and regional scales. For example, MDIFW, MNAP, The Nature Conservancy (TNC), and the 10 partners of Mount Agamenticus to the Sea Conservation Initiative (MTA2C) are assessing the resilience of the MTA2C Focus Area using climate change resilience data and revised SGCN distribution information (http://www.osiny.org/site/DocServer/Catalyst_GranteesToDate_All.pdf?docID=14401). They will use the results of this project to inform local landscape planning and to serve as a model for other communities wishing to incorporate climate change information into their planning efforts. A similar effort also is underway in several Downeast Maine communities.

b. **Program 11:** This action supports MDIFW and partner participation in the Northeast Regional Conservation Needs (RCN) Grant Program. The RCN Grant Program addresses critical landscape-scale wildlife conservation needs by combining multi-state resources, leveraging funds, and regionally prioritizing SWAP conservation actions; http://rcngrants.org/content/northeast-regional-conservation-needs-grant-program). RCN grants funded several products (e.g., the Northeast Terrestrial Habitat Classification System [Anderson et al. 2013]) used in Maine's 2015 Wildlife Action Plan. MDIFW will work with the Implementation Committee to evaluate, at least annually, continued participation in and endorsement of the RCN program.

Table 4-21. 2015 Maine Wildlife Action Plan Programmatic Actions.

Program Type	Program Code	Program Description	Target Start Timeframe		
			Short Term	Mid Term	Long Term
Outreach and Engagement	Program 1	Establish a Wildlife Action Plan Implementation Committee comprised of conservation partners and agency staff to help guide implementation of the Plan	X		
	Program 2	Devise and implement outreach strategies, including periodic meetings, to inform and engage conservation partners and the general public on 2015 Wildlife Action Plan information, accomplishments, and opportunities for involvement		X	
	Program 3	Develop a public survey of SWAP and non-game species awareness, concerns, and priorities	X		X
Funding and Tracking	Program 4	Secure stable and additional sources of federal and state funding for SGCN and habitat conservation		X	
	Program 5	Consider establishing a competitive small grants program to make a portion of SWG funds available to partners implementing priority actions identified in the 2015 Wildlife Action Plan		X	
	Program 6	Support MDIFW and DMR nongame fish and wildlife staff to help with SGCN conservation action implementation			X
	Program 7	Annually compile agency and partner expenditures and seek additional match opportunities to maximize efficiency and impact of 2015 Wildlife Action Plan implementation	X		
	Program 8	Track SWAP conservation action implementation accomplishments by agencies and partners	X		
Action Development	Program 9	Develop SMART (Specific, Measurable, Achievable, Results-oriented, and Time-bound) style objectives for high priority habitat-scale and SGCN conservation actions		X	
Regional Partnerships	Program 10	Identify new and review/update existing SGCN Conservation Opportunity Areas, including Focus Areas of Statewide Significance, using SGCN distribution data, resilient landscapes analyses, and landscape planning concepts	X		
	Program 11	Participate in the Northeast Regional Conservation Needs (RCN) Grant Program following annual endorsements from Maine's Wildlife Action Plan implementation committee (*tentative*)		X	

4.5 AN APPROACH TO PRIORITIZING CONSERVATION EFFORTS

4.5.1 USES FOR PRIORITIZATION CONSIDERATIONS

Maine's 2015 Wildlife Action Plan needs to be a tightly prioritized plan because State Wildlife Grant (SWG) funds are limited and the number of SGCN is large. As discussed in 4.1.2, we have already prioritized in a number of important ways:

1. We assigned SGCN to three priority levels.

2. We ranked stressors and did not comprehensively develop conservation proposals for any stressors that we ranked less than high or medium-high.

3. We also ranked conservation actions on behalf of SGCN and habitats by biological priority (e.g., Critical, High, Moderate).

With regard to the approximately 30 habitat conservation themes (Section 4.3.4), rather than prioritizing among these per se, we have provided information for each on the number and priority level of the SGCN and habitats they are designed to address. We hope this will help partners evaluate the nature and scope of these themes.

In the sections below, we propose a suite of criteria for conservation partners to use in focusing their conservation resources toward selected conservation actions during implementation of the Wildlife Action Plan. These criteria could also form the basis for MDIFW to select proposals for SWG funding, although for proposals competing for SWG funding, there are likely to be additional criteria and considerations, such as whether the proposal has clear and measurable objectives and the amount of non-federal, non-MDIFW funds offered.

4.5.2 POTENTIAL CRITERIA FOR PRIORITIZING CONSERVATION ACTIONS

1. **Biological Impact Considerations**
   The overarching concept is that, all other things being equal, actions that benefit Priority 1 SGCN (i.e., those at most immediate risk of extirpation from Maine) should be higher priority than those for Priority 2 and Priority 3. Actions that benefit multiple SGCN should have priority over those that benefit only a single species. Actions that impact a larger geographic scale should have priority over those that impact only a small area.

   a. **Degree of Impact:** Will the proposed action or suite of actions significantly affect the conservation status of the SGCN(s) and/or its habitat (e.g., improved distribution, abundance, or viability essential to avoiding extirpation)?

   b. **Scope of Impact:** Will the proposed action or suite of actions significantly affect the conservation status of multiple SGCN or multiple habitats or facilitate multiple actions for multiple SGCN and their habitats at a state-wide level?

c. **Endurance of Impact:** Will the proposed actions likely have lasting impact (e.g., even in the face of significant sea level rise or other impacts of a changing climate)?

d. **Regional/National Collaboration:** Are the proposed actions recommended through an established regional or national conservation initiative, such that the certainty of impact is greater through increased peer review of approach, experience in implementation or evidence of success, as well as amplification of impact through regional networking?

2. **Feasibility Considerations**

a. **Partnership:** Does the proposal enhance opportunities for conservation partner collaboration, and are partners willing and able to participate?

b. **Public Support:** Does the proposal conserve SGCN of high economic, social, or cultural value such that it is likely to have strong support from relevant sectors and/or the general public?

c. **Capacity:** Does MDIFW and/or conservation partners have the necessary expertise, staff capacity and resources to successfully complete the proposal?

d. **Value (Cost-Benefit Ratio)**: How do the proposal's likely costs compare to its likely impact? (Figure 4-3).

Figure 4-3. Cost-benefit matrix of conservation proposals.

COST	**BENEFIT**		
	HIGH – long lasting, very high improvement in viability for multiple highly ranked SGCN	**MEDIUM**	**LOW**
Low	Worth the effort	Likely worth the effort	Proposal needs revision, or consider other actions
Medium	Likely worth the effort	Find ways to increase benefit and reduce cost	Proposal needs revision, or consider other actions
High	Find funds to do it	Proposal needs revision, or consider other actions	Likely not worth the effort

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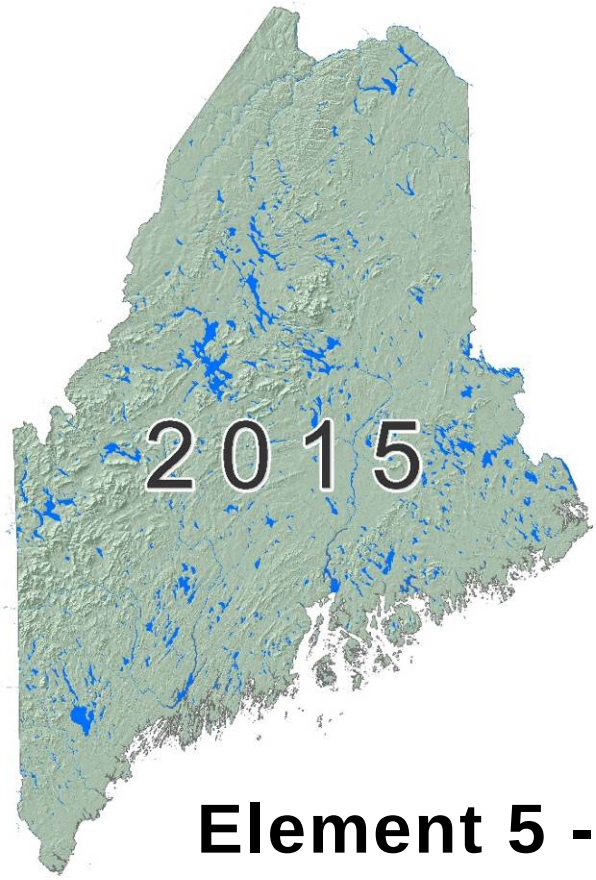

MAINE'S WILDLIFE ACTION PLAN

Element 5 - Monitoring & Element 6 - Periodic Review

Prepared by

Maine Department of Inland Fisheries and Wildlife

In collaboration with

Maine's Conservation Partners

September 2015

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KEY TO ACRONYMS

BwH	Beginning with Habitat
GIS	Geographic Information System
HMG	Habitat Management Guidelines
NMFS	National Marine Fisheries Service
MAMP	Maine Amphibian Monitoring Program
MARAP	Maine Amphibian and Reptile Atlasing Project
MBS	Maine Butterfly Survey
MBBA	Maine Bumble Bee Atlas
MDDS	Maine Damselfly and Dragonfly Survey
MDIFW	Maine Dept. of Inland Fisheries and Wildlife
MDMR	Maine Dept. of Marine Resources
NOAA-Fisheries	National Oceanic and Atmospheric Administration - Fisheries
PRISM	Program for Regional and International Shorebird Monitoring
SGCN	Species of Greatest Conservation Need
SMART	Specific, Measurable, Achievable, Results-oriented, and Time-bound
SWAP	State Wildlife Action Plan
SWG	State Wildlife Grants
TRACS	Tracking and Reporting Actions for the Conservation of Species
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey

5/6.0 ABSTRACT

In these elements, we outline the methods we will use to monitor Species of Greatest Conservation Need (SGCN) and their habitats, describe how we will monitor the progress made in implementing the Action Plan over the next ten years, and address the procedures we will use to review and update the Action Plan. To accomplish these goals, we work closely with federal, state, and private conservation partners to develop and participate in 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. We include a table for each of the five taxonomic groups that are referenced throughout this plan.

The Maine Dept. 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 these habitat monitoring objectives.

Finally, MDIFW and partners developed 11 programmatic actions to help guide Action Plan implementation over the next ten years. Three of these actions address monitoring and are described in greater detail.

MDIFW will use the programmatic actions to monitor conservation action progress at least annually. MDIFW will also establish an Implementation Committee in the Fall of 2015, comprised of agency staff and conservation partners. This committee will review Action Plan accomplishments and address emerging issues or adaptive management needs. We will undertake a comprehensive plan review beginning in year eight of the 2015 Action Plan.

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 stressors 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 Action Plan over the next 10 years. Finally, we address the procedures we will use to review and update the Action Plan.

5/6.1.1 SIGNIFICANT DIFFERENCES FROM MAINE'S 2005 PLAN

In 2005, MDIFW identified the species-specific monitoring programs that were in place for SGCN, and provided extensive detail on the Department's approach to species planning (Chapters 6, 7, MDIFW 2005). MDIFW's species plans provide a framework for monitoring both

individual species and their habitats, and the 2005 Action Plan referenced this process as the primary mechanism by which we would conduct this work. For some species that had not been ushered through the formal species planning process, the 2005 Action Plan identified additional programs by which we would assess progress in achieving conservation outcomes. The 2005 Plan also described an approach for monitoring statewide changes in habitat, which focused on the use of satellite imagery to measure changes in land cover.

While this plan follows a similar framework as used in 2005 for monitoring SGCN and their habitats, we made several substantive revisions, including:

- Removed references to MDIFW's species planning process, which has evolved since 2005 and has been replaced by the State Wildlife Action Plan (SWAP) as the primary planning tool for SGCN conservation.
- Streamlined the descriptions of SGCN monitoring programs, and provided most of this information in tabular format rather than in the body of the text.
- Added a description of how we will monitor the success of implementing conservation actions.
- Describe the process we will use to review and update the Plan as required by Congress.

5/6.2 MONITORING SGCN

SGCN species 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 participate in 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 for SGCN in Maine. We include a table for each of the following taxonomic groups (Tables 5/6-1 to 5/6-6):

"We work closely with federal, state, and private conservation partners to develop and participate in cooperative species monitoring programs."

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

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

Currently, 14 distinct programs are used to monitor 101 of the 130 bird SGCN in Maine (Table 5/6-1). In addition, MDIFW monitors 16 SGCN birds using individual, species-specific protocols. Only 12 SGCN birds are not currently subject to some type of formal monitoring program, although monitoring protocols for 7 of these species (American Oystercatcher, Red Phalarope, Red-necked Phalarope, Solitary Sandpiper, Yellow Rail, Saltmarsh Sparrow, and Sedge Wren) may be implemented in the near future.

Many of these protocols are statewide in scope. Others, such as the Christmas Bird Count, and the Breeding Bird Survey, occur nationwide. The following describes some of these programs.

MDIFW staff collaborate with U.S. Fish and Wildlife Service (USFWS) to implement the Coastal Waterbird Survey, which provides information on the distribution and abundance of several waterbird SGCN nesting on coastal islands. This program consists of a series of both ground nest counts and aerial surveys of coastal waterbirds along the entire coast of Maine. Ideally, these surveys are designed to cover the entire coast once every five years.

The Maine Owl Survey uses a series of established survey routes to document the distribution and relative abundance of owls within the state. Trained observers make brief roadside stops along survey routes play short recordings of owl calls for 15 minutes at each survey point and note the owls responding.

A Canadian / U.S. Shorebird Working Group and the U.S. Shorebird Council (Bart et al. 2002) implement the Program for Regional and International Shorebird Monitoring (PRISM), based on Canadian and U.S. shorebird conservation plans (Brown et al. 2001, Donaldson et al. 2000). MDIFW is a participant in this monitoring program (Tudor 2002).

Annually, MDIFW conducts Maine Waterfowl Brood Counts and uses the results to develop a long-term index of the size of the breeding waterfowl population found in 36 wetlands (Corr 1988).

MDIFW conducts the Mid-winter Waterfowl Survey, an aerial inventory, annually during the first week of January. It is an index to the total number of waterfowl present in Maine each winter (Corr 1988).

The Vermont Institute of Natural Science (VINS) launched Mountain Birdwatch in the spring of 2000 to establish a monitoring program for Bicknell's Thrush and other montane forest birds. VINS 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.

The annual island-nesting tern survey is a collaborative effort by the USFWS, the National Audubon Society, MDIFW, and others. The Gulf of Maine Tern Working Group has developed standardized census methods that surveyors use to estimate the total number of individual terns and species composition of terns using each island. Surveyors conduct the assessments annually in June.

Table 5/6-1. Status of Population Monitoring for Maine's Bird Species of Greatest Conservation Need.

Order Scientific Name	**Common Name**	**Priority**	**Species-Specific Monitoring**	**Maine River Bird Survey**	**Breeding Bird Survey**	**Christmas Bird count**	**Mountain Birdwatch**	**Kennebunk Plains / TNC Annual Survey**	**Secretive Marsh Bird Surveys**	**Island Nesting Tern Survey**	**Maine Owl Survey**	**Wading Bird Colony Surveys and Monitoring**	**Migratory Shorebird Survey (PRISM/ISS)**	**Waterfowl Brood Counts**	**Mid-winter Waterfowl Survey**	**IFW regional shorebird surveys for SWH designation and mapping**	**Grassland Bird Surveys**
Accipitriformes (hawks, eagles, and vultures)																	
Aquila chrysaetos	Golden Eagle	2															
Buteo platypterus	Broad-winged Hawk	3															
Circus cyaneus	Northern Harrier	3							I								O
Anseriformes (waterfowl)																	
Aythya marila	Greater Scaup	2		O													
Bucephala islandica	Barrow's Goldeneye	1	O	I		I											
Clangula hyemalis	Long-tailed Duck	3		O		I											
Histrionicus histrionicus	Harlequin Duck	1	O														
Somateria mollissima	Common Eider	3	O												O		
Apodiformes (swifts and hummingbirds)																	
Chaetura pelagica	Chimney Swift	2		O	O												
Caprimulgiformes (nighthawks and nightjars)																	
Antrostomus vociferus	Eastern Whip-poor-will	2	O														
Chordeiles minor	Common Nighthawk	3		I													I

Table 5/6-1. *continued: page 2 of 12.*

Order Scientific Name	Common Name	Priority	Species-Specific Monitoring	Maine River Bird Survey	Breeding Bird Survey	Christmas Bird count	Mountain Birdwatch	Kennebunk Plains / TNC Annual Survey	Secretive Marsh Bird Surveys	Island Nesting Tern Survey	Maine Owl Survey	Wading Bird Colony Surveys and Monitoring	Migratory Shorebird Survey (PRISM/ISS)	Waterfowl Brood Counts	Mid-winter Waterfowl Survey	IFW regional shorebird surveys for SWH designation and mapping	Grassland Bird Surveys
Charadriiformes (waders, gulls, and auks)																	
Alca torda	Razorbill	2								O							
Arenaria interpres	Ruddy Turnstone	2		O									O			N	
Bartramia longicauda	Upland Sandpiper	1	O		O			O									O
Calidris alba	Sanderling	2	O										O			N	
Calidris alpina	Dunlin	3											O			N	
Calidris canutus rufa	Red Knot	1	N										O			N	
Calidris maritima	Purple Sandpiper	1	O														
Calidris minutilla	Least Sandpiper	3											O			N	
Calidris pusilla	Semipalmated Sandpiper	2											O			N	
Charadrius melodus	Piping Plover	1	O														
Chlidonias niger	Black Tern	2	O						I								
Chroicocephalus philadelphia	Bonaparte's Gull	3		I													
Fratercula arctica	Atlantic Puffin	2								O							
Haematopus palliatus	American Oystercatcher	3	N														

Table 5/6-1. *continued: page 3 of 12.*

Order Scientific Name	Common Name	Priority	Species-Specific Monitoring	Maine River Bird Survey	Breeding Bird Survey	Christmas Bird count	Mountain Birdwatch	Kennebunk Plains / TNC Annual Survey	Secretive Marsh Bird Surveys	Island Nesting Tern Survey	Maine Owl Survey	Wading Bird Colony Surveys and Monitoring	Migratory Shorebird Survey (PRISM/ISS)	Waterfowl Brood Counts	Mid-winter Waterfowl Survey	IFW regional shorebird surveys for SWH designation and mapping	Grassland Bird Surveys
Charadriiformes (waders, gulls, and auks) *continued*																	
Leucophaeus atricilla	Laughing Gull	3								O							
Limnodromus griseus	Short-billed Dowitcher	3											O			N	
Numenius phaeopus	Whimbrel	2	N										O			N	
Phalaropus fulicarius	Red Phalarope	3	N														
Phalaropus lobatus	Red-necked Phalarope	2	N														
Pluvialis squatarola	Black-bellied Plover	3		O									O			N	
Scolopax minor	American Woodcock	3	O														
Sterna dougallii	Roseate Tern	1								O							
Sterna hirundo	Common Tern	2								O							
Sterna paradisaea	Arctic Tern	1								O							
Sternula antillarum	Least Tern	1	O														
Tringa flavipes	Lesser Yellowlegs	1	N										O			N	
Tringa melanoleuca	Greater Yellowlegs	3											O			N	

Table 5/6-1. *continued: page 4 of 12.*

Order Scientific Name	Common Name	Priority	Species-Specific Monitoring	Maine River Bird Survey	Breeding Bird Survey	Christmas Bird count	Mountain Birdwatch	Kennebunk Plains / TNC Annual Survey	Secretive Marsh Bird Surveys	Island Nesting Tern Survey	Maine Owl Survey	Wading Bird Colony Surveys and Monitoring	Migratory Shorebird Survey (PRISM/ISS)	Waterfowl Brood Counts	Mid-winter Waterfowl Survey	IFW regional shorebird surveys for SWH designation and mapping	Grassland Bird Surveys
Charadriiformes (waders, gulls, and auks) *continued*																	
Tringa semipalmata	Willet	3	N						N				O			N	
Tringa solitaria	Solitary Sandpiper	2	N														
Uria aalge	Common Murre	3															
Coraciiformes (kingfishers, bee-eaters, rollers, motmots, and todies)																	
Megaceryle alcyon	Belted Kingfisher	3		O	O												
Coccyzus americanus	Yellow-billed Cuckoo	2			O												
Coccyzus erythropthalmus	Black-billed Cuckoo	3			O												
Falconiformes (falcons and kestrels)																	
Falco peregrinus	Peregrine Falcon	1	O														
Falco sparverius	American Kestrel	3															I
Galliformes (game birds)																	
Falcipennis canadensis	Spruce Grouse	3				I											

Table 5/6-1. *continued: page 5 of 12.*

Order Scientific Name	Common Name	Priority	Species-Specific Monitoring	Maine River Bird Survey	Breeding Bird Survey	Christmas Bird count	Mountain Birdwatch	Kennebunk Plains / TNC Annual Survey	Secretive Marsh Bird Surveys	Island Nesting Tern Survey	Maine Owl Survey	Wading Bird Colony Surveys and Monitoring	Migratory Shorebird Survey (PRISM/ISS)	Waterfowl Brood Counts	Mid-winter Waterfowl Survey	IFW regional shorebird surveys for SWH designation and mapping	Grassland Bird Surveys
Gaviiformes (loons)																	
Gavia immer	Common Loon	3	O	O													
Gavia stellata	Red-throated Loon	3		O		O											
Gruiformes (cranes and rails)																	
Coturnicops noveboracensis	Yellow Rail	2							N								
Fulica americana	American Coot	3		I					N								
Gallinula galeata	Common Gallinule	2		I					N								
Porzana carolina	Sora	3		I					N								
Passeriformes (passerines)																	
Ammodramus caudacutus	Saltmarsh Sparrow	1							N								
Ammodramus nelsoni	Nelson's Sparrow	2	O						N								
Ammodramus savannarum	Grasshopper Sparrow	1						O									O
Anthus rubescens	American Pipit	2	N				O										
Cardellina canadensis	Canada Warbler	2			O												

Table 5/6-1. *continued: page 6 of 12.*

Order Scientific Name	Common Name	Priority	Species-Specific Monitoring	Maine River Bird Survey	Breeding Bird Survey	Christmas Bird count	Mountain Birdwatch	Kennebunk Plains / TNC Annual Survey	Secretive Marsh Bird Surveys	Island Nesting Tern Survey	Maine Owl Survey	Wading Bird Colony Surveys and Monitoring	Migratory Shorebird Survey (PRISM/ISS)	Waterfowl Brood Counts	Mid-winter Waterfowl Survey	IFW regional shorebird surveys for SWH designation and mapping	Grassland Bird Surveys
Passeriformes (passerines) *continued*																	
Catharus bicknelli	Bicknell's Thrush	1					O										
Catharus fuscescens	Veery	2			O												
Catharus ustulatus	Swainson's Thrush	3			O		O										
Cistothorus platensis	Sedge Wren	1							N								
Coccothraustes vespertinus	Evening Grosbeak	2			O	O											
Contopus cooperi	Olive-sided Flycatcher	2			O		O										
Contopus virens	Eastern Wood-Pewee	2			O												
Dolichonyx oryzivorus	Bobolink	3			O			O									O
Empidonax flaviventris	Yellow-bellied Flycatcher	3		I	O		O										
Empidonax minimus	Least Flycatcher	3		I	O												
Eremophila alpestris	Horned Lark	3			O	O		O									O

Table 5/6-1. *continued: page 7 of 12.*

Order Scientific Name	Common Name	Priority	Species-Specific Monitoring	Maine River Bird Survey	Breeding Bird Survey	Christmas Bird count	Mountain Birdwatch	Kennebunk Plains / TNC Annual Survey	Secretive Marsh Bird Surveys	Island Nesting Tern Survey	Maine Owl Survey	Wading Bird Colony Surveys and Monitoring	Migratory Shorebird Survey (PRISM/ISS)	Waterfowl Brood Counts	Mid-winter Waterfowl Survey	IFW regional shorebird surveys for SWH designation and mapping	Grassland Bird Surveys
Passeriformes (passerines) *continued*																	
Euphagus carolinus	Rusty Blackbird	1	O														
Geothlypis philadelphia	Mourning Warbler	3			O												
Haemorhous purpureus	Purple Finch	3			O	O	O										
Hirundo rustica	Barn Swallow	2		O	O												I
Hylocichla mustelina	Wood Thrush	1			O												
Icterus galbula	Baltimore Oriole	3			O												
Icterus spurius	Orchard Oriole	3			O												
Loxia curvirostra	Red Crossbill	3			O	O	O										
Loxia leucoptera	White-winged Crossbill	3			O	O	O										
Melospiza lincolnii	Lincoln's Sparrow	3			O												
Mniotilta varia	Black-and-white Warbler	2			O		O										
Oreothlypis peregrina	Tennessee Warbler	2			O												

Table 5/6-1. *continued: page 8 of 12.*

Order Scientific Name	Common Name	Priority	Species-Specific Monitoring	Maine River Bird Survey	Breeding Bird Survey	Christmas Bird count	Mountain Birdwatch	Kennebunk Plains / TNC Annual Survey	Secretive Marsh Bird Surveys	Island Nesting Tern Survey	Maine Owl Survey	Wading Bird Colony Surveys and Monitoring	Migratory Shorebird Survey (PRISM/ISS)	Waterfowl Brood Counts	Mid-winter Waterfowl Survey	IFW regional shorebird surveys for SWH designation and mapping	Grassland Bird Surveys
Passeriformes (passerines) *continued*																	
Parkesia motacilla	Louisiana Waterthrush	3			O												
Passerella iliaca	Fox Sparrow	3			O												
Perisoreus canadensis	Gray Jay	3			O	O											
Petrochelidon pyrrhonota	Cliff Swallow	3		O	O												
Pheucticus ludovicianus	Rose-breasted Grosbeak	3			O												
Pinicola enucleator	Pine Grosbeak	3			O	O											
Pipilo erythrophthalmus	Eastern Towhee	2			O			O									I
Piranga olivacea	Scarlet Tanager	3		I	O		O										
Poecile hudsonicus	Boreal Chickadee	2			O	O											
Progne subis	Purple Martin	2	N	I	O												
Regulus calendula	Ruby-crowned Kinglet	2			O		O										

Table 5/6-1. *continued: page 9 of 12.*

Order Scientific Name	Common Name	Priority	Species-Specific Monitoring	Maine River Bird Survey	Breeding Bird Survey	Christmas Bird count	Mountain Birdwatch	Kennebunk Plains / TNC Annual Survey	Secretive Marsh Bird Surveys	Island Nesting Tern Survey	Maine Owl Survey	Wading Bird Colony Surveys and Monitoring	Migratory Shorebird Survey (PRISM/ISS)	Waterfowl Brood Counts	Mid-winter Waterfowl Survey	IFW regional shorebird surveys for SWH designation and mapping	Grassland Bird Surveys
Passeriformes (passerines) *continued*																	
Riparia riparia	Bank Swallow	1		O	O												I
Setophaga americana	Northern Parula	3			O												
Setophaga caerulescens	Black-throated Blue Warbler	3			O												
Setophaga castanea	Bay-breasted Warbler	3			O		O										
Setophaga discolor	Prairie Warbler	2			O												
Setophaga fusca	Blackburnian Warbler	3			O												
Setophaga pensylvanica	Chestnut-sided Warbler	2			O												
Setophaga petechia	Yellow Warbler	3			O												
Setophaga ruticilla	American Redstart	2			O												
Setophaga striata	Blackpoll Warbler	3			O		O										
Setophaga tigrina	Cape May Warbler	3			O		O										

Table 5/6-1. *continued: page 10 of 12.*

Order Scientific Name	Common Name	Priority	Species-Specific Monitoring	Maine River Bird Survey	Breeding Bird Survey	Christmas Bird count	Mountain Birdwatch	Kennebunk Plains / TNC Annual Survey	Secretive Marsh Bird Surveys	Island Nesting Tern Survey	Maine Owl Survey	Wading Bird Colony Surveys and Monitoring	Migratory Shorebird Survey (PRISM/ISS)	Waterfowl Brood Counts	Mid-winter Waterfowl Survey	IFW regional shorebird surveys for SWH designation and mapping	Grassland Bird Surveys
Passeriformes (passerines) *continued*																	
Setophaga virens	Black-throated Green Warbler	3			O		O										
Spizella pusilla	Field Sparrow	3			O												O
Stelgidopteryx serripennis	Northern Rough-winged Swallow	3		O	O												I
Sturnella magna	Eastern Meadowlark	2			O			O									O
Tachycineta bicolor	Tree Swallow	2		O	O												I
Toxostoma rufum	Brown Thrasher	2			O			O									
Tyrannus tyrannus	Eastern Kingbird	2		O	O												I
Vermivora cyanoptera	Blue-winged Warbler	2	N		O			O									
Zonotrichia albicollis	White-throated sparrow	3			O		O										

Table 5/6-1. *continued: page 11 of 12.*

Order Scientific Name	Common Name	Priority	Species-Specific Monitoring	Maine River Bird Survey	Breeding Bird Survey	Christmas Bird count	Mountain Birdwatch	Kennebunk Plains / TNC Annual Survey	Secretive Marsh Bird Surveys	Island Nesting Tern Survey	Maine Owl Survey	Wading Bird Colony Surveys and Monitoring	Migratory Shorebird Survey (PRISM/ISS)	Waterfowl Brood Counts	Mid-winter Waterfowl Survey	IFW regional shorebird surveys for SWH designation and mapping	Grassland Bird Surveys
Pelecaniformes (Pelicans, tropicbirds, and relatives)																	
Ardea herodias	Great Blue Heron	2		I								O					
Botaurus lentiginosus	American Bittern	3		I					N								I
Egretta caerulea	Little Blue Heron	3		I								N					
Egretta thula	Snowy Egret	3		I								N					
Ixobrychus exilis	Least Bittern	1		I					O								
Nycticorax nycticorax	Black-crowned Night-heron	2		I								O					
Piciformes (woodpeckers)																	
Colaptes auratus	Northern Flicker	3			O	O											
Picoides arcticus	Black-backed Woodpecker	3			O	O	O										
Picoides dorsalis	American Three-toed Woodpecker	3			O	O	O										
Podicipediformes (grebes)																	
Podiceps auritus	Horned Grebe	3				I											
Podilymbus podiceps	Pied-billed Grebe	3		I					N								

Table 5/6-1. *continued: page 12 of 12.*

Order Scientific Name	Common Name	Priority	Species-Specific Monitoring	Maine River Bird Survey	Breeding Bird Survey	Christmas Bird count	Mountain Birdwatch	Kennebunk Plains / TNC Annual Survey	Secretive Marsh Bird Surveys	Island Nesting Tern Survey	Maine Owl Survey	Wading Bird Colony Surveys and Monitoring	Migratory Shorebird Survey (PRISM/ISS)	Waterfowl Brood Counts	Mid-winter Waterfowl Survey	IFW regional shorebird surveys for SWH designation and mapping	Grassland Bird Surveys
Podicipediformes (grebes) *continued*																	
Oceanodroma leucorhoa	Leach's Storm-petrel	3															
Puffinus gravis	Great Shearwater	3															
Strigiformes (owls)																	
Asio flammeus	Short-eared Owl	2									I						O
Asio otus	Long-eared Owl	3									O						
Megascops asio	Eastern Screech-Owl	3									O						
Tyto alba	Barn Owl	3									O						
Suliformes (darters, frigatebirds, cormorants, shags, gannets, and boobies)																	
Phalacrocorax carbo	Great Cormorant	1	O														

5/6.2.2 REPTILES, AMPHIBIANS, AND INVERTEBRATES

Currently, biologists use 9 distinct programs to monitor 87 of the 148 (60%) reptile, amphibian, and invertebrate SGCN in Maine (Tables 5-2 and 5-3). In addition, biologists monitor 56 SGCN in these taxonomic groups using individual, species-specific protocols. Forty-six of the SGCN are not currently subject to some type of formal monitoring program, although species-specific monitoring protocols for four of these species (Big-tooth Whitelip, Gaspe Gazelle Beetle, Graceful Clearwing, and Spike-lip Crater) may be implemented in the near future.

Wood Turtles are one of Maine's priority SGCN species that is monitored using standardized regional protocols developed by a Northeast Wood Turtle Working Group. © Philip DeMaynadier

The Maine Amphibian Monitoring Program (MAMP) is a volunteer program that gathers information on the distribution and abundance of calling amphibians, including two SGCN, the Mink Frog and Northern Leopard Frog (Maine Audubon Society 2015). The MAMP is a component of the North American Amphibian Monitoring Program (NAAMP), and is ongoing in Maine since 1997. Currently, volunteers survey approximately 60 road-side routes across the state. Biologists recently analyzed data from the NAAMP and they detected several significant species-specific results in Maine (Weir et al. 2014), including negative population trends for Wood Frog, Spring Peeper, Bullfrog, Northern Leopard Frog, and American Toad.

The Maine Amphibian and Reptile Atlasing Project (MARAP) is one of the longest standing wildlife atlasing projects in Maine. Initiated in 1984, MARAP is currently a cooperative venture between MDIFW and the University of Maine. The MARAP database contains over 10,000 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.

Monitoring of invertebrate SGCN lags behind that of 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 2005, 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), and most recently Hymenoptera (bumble bees). A series of volunteer wildlife atlasing programs now provide distribution baselines for many of Maine's invertebrate

"Monitoring of invertebrate SGCN lags behind that of reptiles, amphibians, and other vertebrate taxa. This is due to the high diversity of SGCN invertebrates, and a lower level of knowledge about their distribution and habitat relationships…"

SGCN. Biologists have designed the Maine Butterfly Survey (MBS), Maine Damselfly and Dragonfly Survey (MDDS), Maine Mussel Baseline Atlas, and Maine Bumble Bee Atlas (MBBA) to collect sighting information from trained volunteer citizen scientists, to help map the distribution and relative abundance of these species groups across the state. In many cases, these programs are among the first of their kind in the country, and have helped to gather critical information on these understudied and poorly understood taxa. In the future MDIFW hopes to collaborate with partners to develop the Maine Tiger Beetle Atlas, which would gather similar data on three additional SGCN: Cobblestone Tiger Beetle, Saltmarsh Tiger Beetle, and the White Mountain Tiger Beetle.

5/6.2.3 INLAND FISH

MDIFW monitors the 17 inland fish SGCN through the application of 17 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 six species in this group. In addition, two new monitoring protocols (eDNA and Trawling) may be applicable to several SGCN in the future. In particular, eDNA, which relies on the detection of DNA in water samples to determine the presence or absence of species within the water body, could prove to be an extremely powerful approach for monitoring rare aquatic taxa as well as the presence of invasive fish species.

5/6.2.4 MAMMALS

Monitoring New England Cottontails with radiotelemetry. © Department of Inland Fisheries and Wildlife

Mammals often occur at relatively low densities and occupy large landscapes, making the application of comprehensive, multi-species monitoring protocols challenging. Of Maine's 15 mammal SGCN, four currently are subject to a species-specific monitoring protocol or a multi-species monitoring program (Table 5/6-5). In addition, MDIFW ultimately will use a new initiative, the North American Bat Survey, to monitor all eight bat SGCN. MDIFW has yet to develop monitoring protocols for three mammal SGCN (the Penobscot Meadow Vole, the Long-tailed Shrew, and the Northern Bog Lemming).

Table 5/6-2. Status of Population Monitoring for Maine's Amphibian and Reptile Species of Greatest Conservation Need.

CLASS **Order** **Scientific Name**	**Common Name**	**Priority**	**Species-specific Monitoring**	**Maine Amphibian Monitoring Project (MAMP)**	**NE Regional Blanding's and Wood Turtle Survey & Monitoring**	**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		O	N
Lithobates septentrionalis	Mink Frog	3		O		O	N
Caudata (salamanders)							
Ambystoma laterale	Blue-spotted Salamander	2	O			O	N
Gyrinophilus porphyriticus porphyriticus	Northern Spring Salamander	2	O			O	N
REPTILIA (reptiles)							
Squamata (lizards and snakes)							
Coluber constrictor constrictor	Northern Black Racer	1	O			O	N
Storeria dekayi dekayi	Northern Brownsnake	2				O	N
Thamnophis sauritus	Eastern Ribbon Snake	2	O			O	N
Testudines (turtles and tortoises)							
Clemmys guttata	Spotted Turtle	1	O			O	N
Emydoidea blandingii	Blanding's Turtle	1	O		O	O	N
Glyptemys insculpta	Wood Turtle	1	O		O	O	N
Terrapene carolina carolina	Eastern Box Turtle	2	O			O	N
Alasmidonta undulata	Triangle Floater	3	O				
Anodonta implicata	Alewife Floater	3	O				
Margaritifera margaritifera	Eastern Pearlshell	3	O				
Clemmys guttata	Spotted Turtle	1	O			O	N

Table 5/6-3. Status of Population Monitoring for Maine's Non Marine Invertebrate Species of Greatest Conservation Need.

CLASS **Order** **Scientific Name**	**Common Name**	**Priority**	**Species-specific Monitoring**	**Maine Butterfly Survey (MBS)**	**Maine Damselfly & Dragonfly Survey (MDDS)**	**Maine Mussel Baseline Atlas & Surveys**	**Maine Bumble Bee Atlas (MBBA)**	**Maine Tiger Beetle Atlas**
BIVALVIA (mussels and clams)								
Unionoida (freshwater mussels)								
Alasmidonta undulata	Triangle Floater	3	O			O		
Alasmidonta varicosa	Brook Floater	1	O			O		
Anodonta implicata	Alewife Floater	3	O			O		
Lampsilis cariosa	Yellow Lampmussel	1	O			O		
Leptodea ochracea	Tidewater Mucket	1	O			O		
Margaritifera margaritifera	Eastern Pearlshell	3	O			O		
GASTROPODA (aquatic and terrestrial snails)								
Basommatophora (air-breathing freshwater snails)								
Stagnicola mighelsi	Bigmouth Pondsnail	1	O					
Stagnicola oronoensis	Obese Pondsnail	3	O					
Neotaenioglossa (mostly sea snails)								
Floridobia winkleyi	New England Silt Snail	3	O					
Stylommatophora (air-breathing land snails)								
Appalachina sayana	Spike-lip Crater	3	N					
Neohelix dentifera	Big-tooth Whitelip	3	N					
Vertigo malleata	Malleated Vertigo	3	O					
Vertigo morsei	Six-whorl Vertigo	1	O					
Vertigo paradoxa	Mystery Vertigo	2	O					
INSECTA (insects)								
Coleoptera (beetles)								
Cicindela ancocisconensis	White Mountain Tiger Beetle	2	O					N
Cicindela marginata	Salt Marsh Tiger Beetle	2	O					N

Table 5/6-3. *continued: page 2 of 8.*

CLASS **Order** **Scientific Name**	**Common Name**	**Priority**	**Species-specific Monitoring**	**Maine Butterfly Survey (MBS)**	**Maine Damselfly & Dragonfly Survey (MDDS)**	**Maine Mussel Baseline Atlas & Surveys**	**Maine Bumble Bee Atlas (MBBA)**	**Maine Tiger Beetle Atlas**
Coleoptera (beetles) *continued*								
Cicindela marginipennis	Cobblestone Tiger Beetle	1	O					N
Nebria nivalis gaspesiana	Gaspe Gazelle Beetle	3	N					
Ephemeroptera (mayflies)								
Ameletus browni	A Mayfly	3						
Baetisca berneri	A Mayfly	3						
Baetisca carolina	A Mayfly	3						
Baetisca lacustris	A Mayfly	3						
Baetisca rubescens	A Mayfly	3						
Epeorus frisoni	Roaring Brook Mayfly	1	O					
Hexagenia rigida	A Mayfly	3						
Metretopus borealis	A Mayfly	3						
Nixe horrida	A Mayfly	3						
Parameletus midas	A Mayfly	3						
Rhithrogena undulata	A Mayfly	3						
Siphlonisca aerodromia	Tomah Mayfly	1	O					
Siphlonurus barbaroides	A Mayfly	3						
Siphlonurus barbarus	A Mayfly	2						
Siphlonurus demaryi	A Mayfly	2						
Hymenoptera (ants, bees, wasps, and sawflies)								
Bombus affinis	Rusty-patched Bumble Bee	1					O	
Bombus ashtoni	Ashton's Cuckoo Bumble Bee	2					O	
Bombus citrinus	Lemon Cuckoo Bumble Bee	3					O	

Table 5/6-3. *continued: page 3 of 8.*

CLASS Order Scientific Name	Common Name	Priority	Species-specific Monitoring	Maine Butterfly Survey (MBS)	Maine Damselfly & Dragonfly Survey (MDDS)	Maine Mussel Baseline Atlas & Surveys	Maine Bumble Bee Atlas (MBBA)	Maine Tiger Beetle Atlas
Hymenoptera (ants, bees, wasps, and sawflies) *continued*								
Bombus fernaldae	Fernald's Cuckoo Bumble Bee	3					O	
Bombus fervidus	Yellow Bumble Bee	3					O	
Bombus griseocollis	Brown-belted Bumble Bee	3					O	
Bombus insularis	Indiscriminate Cuckoo Bumble Bee	2					O	
Bombus pensylvanicus	American Bumble Bee	2					O	
Bombus sandersoni	Sanderson's Bumble Bee	3					O	
Bombus terricola	Yellowbanded Bumble Bee	3					O	
Lepidoptera (butterflies, skippers, and moths)								
Atrytonopsis hianna	Dusted Skipper	3	O	O				
Boloria chariclea grandis	Purple Lesser Fritillary	2	O	O				
Boloria frigga saga	Frigga Fritillary	1	O	O				
Callophrys gryneus	Juniper Hairstreak	2	O	O				
Callophrys hesseli	Hessel's Hairstreak	1	O	O				
Callophrys lanoraieensis	Bog Elfin	3	O	O				
Catocala similis	Similar Underwing	3						
Chaetaglaea cerata	A Noctuid Moth	2						
Chaetaglaea tremula	Barrens Chaetaglaea	3						
Citheronia sepulcralis	Pine Devil	2						
Cucullia speyeri	A Moth	3						

Table 5/6-3. *continued: page 4 of 8.*

CLASS **Order** **Scientific Name**	**Common Name**	**Priority**	**Species-specific Monitoring**	**Maine Butterfly Survey (MBS)**	**Maine Damselfly & Dragonfly Survey (MDDS)**	**Maine Mussel Baseline Atlas & Surveys**	**Maine Bumble Bee Atlas (MBBA)**	**Maine Tiger Beetle Atlas**
Lepidoptera (butterflies, skippers, and moths) *continued*								
Cupido amyntula maritima	Western Tailed Blue	3		O				
Danaus plexippus	Monarch	3		O				
Erora laeta	Early Hairstreak	2	O	O				
Erynnis brizo	Sleepy Duskywing	2	O	O				
Hemaris gracilis	Graceful Clearwing	3						
Hemileuca lucina	New England Buckmoth	3	N					
Hemileuca maia maia	Eastern Buckmoth	2						
Hesperia leonardus	Leonard's Skipper	3		O				
Hesperia metea	Cobweb Skipper	3	O	O				
Lapara coniferarum	Southern Pine Sphinx	3						
Lepipolys perscripta	A Moth	3						
Lithophane lepida lepida	Pine Pinion	2						
Lycaena dorcas claytoni	Clayton's Copper	2	O	O				
Lycia rachelae	Twilight Moth	2						
Metarranthis apiciaria	Barrens Metarranthis Moth	2						
Nepytia pellucidaria	A Moth	3						
Oeneis polixenes katahdin	Katahdin Arctic	1	O	O				
Paonias astylus	Huckleberry Sphinx	3						

Table 5/6-3. *continued: page 5 of 8.*

CLASS Order Scientific Name	Common Name	Priority	Species-specific Monitoring	Maine Butterfly Survey (MBS)	Maine Damselfly & Dragonfly Survey (MDDS)	Maine Mussel Baseline Atlas & Surveys	Maine Bumble Bee Atlas (MBBA)	Maine Tiger Beetle Atlas
Lepidoptera (butterflies, skippers, and moths) *continued*								
Papilio brevicauda gaspeensis	Short-tailed Swallowtail	3	O	O				
Oeneis polixenes katahdin	Katahdin Arctic	1	O	O				
Paonias astylus	Huckleberry Sphinx	3						
Papilio brevicauda gaspeensis	Short-tailed Swallowtail	3	O	O				
Papilio troilus	Spicebush Swallowtail	3	O	O				
Plebejus idas	Northern Blue	2		O				
Plebejus idas empetri	Crowberry Blue	2	O	O				
Polygonia satyrus	Satyr Comma	3		O				
Psectraglaea carnosa	Pink Sallow	2						
Satyrium edwardsii	Edwards' Hairstreak	2	O	O				
Satyrium titus	Coral Hairstreak	3	O	O				
Satyrodes appalachia	Appalachian Brown	3		O				
Spartiniphaga inops	Spartina Borer Moth	3						
Speranza exonerata	Barrens Itame	2						
Thorybes bathyllus	Southern Cloudywing	3		O				
Xylena thoracica	Acadian Swordgrass Moth	3						
Xylotype capax	Broad Sallow	3						
Xystopeplus rufago	Red-winged Sallow	3						
Zale lunifera	Bold-based Zale Moth	3						

Table 5/6-3. *continued: page 6 of 8.*

CLASS **Order** **Scientific Name**	**Common Name**	**Priority**	**Species-specific Monitoring**	**Maine Butterfly Survey (MBS)**	**Maine Damselfly & Dragonfly Survey (MDDS)**	**Maine Mussel Baseline Atlas & Surveys**	**Maine Bumble Bee Atlas (MBBA)**	**Maine Tiger Beetle Atlas**
Lepidoptera (butterflies, skippers, and moths) *continued*								
Zale obliqua	Oblique Zale	3						
Zanclognatha martha	Pine Barrens Zanclognatha	1						
Odonata (dragonflies and damselflies)								
Aeshna juncea	Sedge Darner	2			O			
Aeshna sitchensis	Zigzag Darner	3			O			
Anax longipes	Comet Darner	3	O		O			
Argia translata	Dusky Dancer	3			O			
Arigomphus furcifer	Lilypad Clubtail	3			O			
Celithemis martha	Martha's Pennant	3			O			
Cordulegaster obliqua	Arrowhead Spiketail	3	O		O			
Enallagma carunculatum	Tule Bluet	3			O			
Enallagma durum	Big Bluet	3			O			
Enallagma laterale	New England Bluet	2	O		O			
Enallagma pictum	Scarlet Bluet	2	O		O			
Epiaeschna heros	Swamp Darner	3	N		O			
Erythrodiplax berenice	Seaside Dragonlet	3			O			
Gomphus quadricolor	Rapids Clubtail	2	O		O			
Gomphus vastus	Cobra Clubtail	3			O			
Ischnura hastata	Citrine Forktail	3			O			
Ischnura ramburii	Rambur's Forktail	3			O			
Lanthus vernalis	Southern Pygmy Clubtail	2			O			
Leucorrhinia patricia	Canada Whiteface	2	O		O			

Table 5/6-3. *continued: page 7 of 8.*

CLASS **Order** **Scientific Name**	**Common Name**	**Priority**	**Species-specific Monitoring**	**Maine Butterfly Survey (MBS)**	**Maine Damselfly & Dragonfly Survey (MDDS)**	**Maine Mussel Baseline Atlas & Surveys**	**Maine Bumble Bee Atlas (MBBA)**	**Maine Tiger Beetle Atlas**
Odonata (dragonflies and damselflies) *continued*								
Libellula needhami	Needhams Skimmer	3			O			
Libellula semifasciata	Painted Skimmer	3			O			
Nannothemis bella	Elfin Skimmer	3			O			
Neurocordulia michaeli	Broad-tailed Shadowdragon	3			O			
Ophiogomphus anomalus	Extra-striped Snaketail	3			O			
Ophiogomphus colubrinus	Boreal Snaketail	1	O		O			
Ophiogomphus howei	Pygmy Snaketail	2	O		O			
Progomphus obscurus	Common Sanddragon	3			O			
Rhionaeschna mutata	Spatterdock Darner	3	O		O			
Somatochlora albicincta	Ringed Emerald	3			O			
Somatochlora brevicincta	Quebec Emerald	2	O		O			
Somatochlora incurvata	Incurvate Emerald	3			O			
Somatochlora minor	Ocellated Emerald	3			O			
Stylurus spiniceps	Arrow Clubtail	3			O			
Tramea carolina	Carolina Saddlebags	3			O			
Tramea lacerata	Black Saddlebags	3			O			
Williamsonia lintneri	Ringed Boghaunter	1	O		O			

Table 5/6-3. *continued: page 8 of 8.*

CLASS **Order** **Scientific Name**	**Common Name**	**Priority**	**Species-specific Monitoring**	**Maine Butterfly Survey (MBS)**	**Maine Damselfly & Dragonfly Survey (MDDS)**	**Maine Mussel Baseline Atlas & Surveys**	**Maine Bumble Bee Atlas (MBBA)**	**Maine Tiger Beetle Atlas**
Plecoptera (stoneflies)								
Alloperla voinae	A Stonefly	3						
Neoperla mainensis	A Stonefly	3						
Pteronarcys comstocki	Spiny Salmonfly	3						
Trichoptera (caddisflies)								
Hydroptila blicklei	A Caddisfly	3						
Hydroptila parachelops	A Caddisfly	3						
Hydroptila tomah	A Caddisfly	3						
Ochrotrichia denningi	A Caddisfly	3						
MALACOSTRACA (crabs, krill, pill bugs, shrimp, and relatives)								
Decapoda (decapods)								
Orconectes limosus	Spinycreek Crayfish	3	N					

Table 5/6-4. Status of Population Monitoring for Maine's Inland Fish Species of Greatest Conservation Need.

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	N	O	O	O					O					
Coregonus clupeaformis	Lake Whitefish	2	O	O	O		N	N	O	O					N	N	N	O		O
Culaea inconstans	Brook Stickleback	3	N				O				N	N	N	O	N					
Erimyzon oblongus	Creek Chubsucker	3	N			O	O	N	N	O	N	N	O	O	N					
Esox americanus americanus	Redfin Pickerel	2	O	O			O	N		N			N							
Etheostoma fusiforme	Swamp Darter	2	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								
Lota lota	Burbot	3	N	O	O		O	N	N	N	N	N			N			N		
Margariscus margarita	Pearl Dace	3	N			O	O	O					O	O	N					
Notropis bifrenatus	Bridle Shiner	2	N			O	O	O			N	N	O	O	N					

Table 5/6-4. *continued: page 2 of 2.*

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
Notropis heterolepis	Blacknose Shiner	3	N			O	O	O			N	N	O	O	N					
Prosopium cylindraceum	Round Whitefish	2	O	O	O		N	N	O	O					N	N	N	N		N
Rhinichthys cataractae	Longnose Dace	3	N			O	O	O					O	O	N					
Salvelinus alpinus oquassa	Arctic Charr	1	O	O	O				O	O	O	N					O	O		O
Salvelinus fontinalis	Brook Trout	3	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	O	O		O

Table 5/6-5. Status of Population Monitoring for Maine's Mammal Species of Greatest Conservation Need.

Scientific Name	Common Name	Priority	Species-specific Monitoring	North American Bat Survey	N England Cottontail Range-Wide Conservation Strategy Monitoring
Alces alces americanus	Moose	3	O		
Eptesicus fuscus	Big Brown Bat	2		N	
Lasionycteris noctivagans	Silver-haired Bat	2		N	
Lasiurus borealis	Eastern Red Bat	3		N	
Lasiurus cinereus	Hoary Bat	3		N	
Lynx canadensis	Canada Lynx	2	O		
Microtus pennsylvanicus shattucki	Penobscot Meadow Vole	2			
Myotis leibii	Eastern Small-footed Myotis	1		N	
Myotis lucifugus	Little Brown Bat	1		N	
Myotis septentrionalis	Northern Long-eared Myotis	1		N	
Ondatra zibethicus	Muskrat	3	O		
Perimyotis subflavus	Tri-colored Bat	2		N	
Sorex dispar	Long-tailed Shrew	3			
Sylvilagus transitionalis	New England Cottontail	1	O		O
Synaptomys borealis sphagnicola	Northern Bog Lemming	1			

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. In the pages that follow 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

Programs that monitor marine mammals and sea turtles occur largely through reports from entanglements and gear modification studies. The Maine Department of Marine Resources (MDMR) Marine Mammal Strandings and Sightings Program was a component of the conservation and monitoring work until the fall of 2011. The program did not receive the necessary federal funding through the Prescott Grant Program and without funds to support the program MDMR discontinued it. In collaboration with Maine's commercial fishing industries, MDMR developed a Comprehensive Marine Wildlife Conservation Strategy for Large Whales and Sea Turtles in the State of Maine to reduce the risk posed by these fisheries to Right Whales and other protected resources. The Bureau of Marine Patrol and the advanced trained lobsterman use special disentanglement tools, based on those created for the Large Whale Disentanglement Network. Recent efforts have focused on understanding baseline amounts of gear utilized seasonally, specifically vertical lines, in Maine's lobster fishery. These efforts have enabled both state and federal regulators the ability to focus potential regulations to areas where they make the most positive impact for reducing co-occurrence between whales and fishing gear.

MDMR and collaborators at the University of Maine also investigate whale habitat through a monitoring program that samples habitat characteristics in Midcoast and Downeast Maine using plankton and water column sampling. The project will help determine the inshore/offshore and seasonal distributions of Right Whale prey species. Additionally, MDMR completed a Dtag project in Maine coastal fishing habitats that successfully tagged two Humpback Whales near Mount Desert Island. Dive profiles show the whales diving to the bottom during foraging events in addition to using the upper 20 meters of the water column.

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. Until this survey began in 2000, Maine and New Hampshire were the only states on the east coast that did not conducti a near-shore assessment. While the U.S. Congress provided this funding for economic relief to the groundfish industry, the assessment is more than a groundfish survey. Marine biologists also assess lobsters, recreational finfish, and non-commercial species of ecological interest. 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.

Table 5/6-6. Status of Population Monitoring for Maine's Marine Species of Greatest Conservation Need.

CLASS 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	Monitoring Salmon Traps & Lifts	Spawning Stock Surveys	Habitat Mapping	Species Interaction Studies	Environmental/Habitat Change Effect Studies
ACTINOPTERYGII (ray-finned fishes)																					
Acipenser brevirostrum	Shortnose sturgeon	1	O						O		O							O	O		
Acipenser oxyrinchus	Atlantic Sturgeon	1	O						O		O		O					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	2	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		
Alcyonium digitatum	Dead Man's Fingers	3	N																N	N	N
Gadus morhua	Atlantic Cod	1	O	O	O	O							O					O			
Melanogrammus aeglefinus	Haddock	1		O	O	O							O					O	N		
Osmerus mordax	Rainbow Smelt	1	O	O	O	O				O	O		O					O	O	N	N
Ammodytes americanus	American Sand Lance	3											O								
Anarhichas lupus	Atlantic Wolffish	2											O					O	N		

Table 5/6-6. *continued: page 2 of 7.*

CLASS 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	Monitoring Salmon Traps & Lifts	Spawning Stock Surveys	Habitat Mapping	Species Interaction Studies	Environmental/Habitat Change Effect Studies
ACTINOPTERYGII (ray-finned fishes) *continued*																					
Anarhichas minor	Spotted Wolffish	3	N																		
Morone saxatilis	Striped Bass	2	O	O	O						O		O					O	O		
Thunnus thynnus	Atlantic Bluefin Tuna	2		O	O	O												O			
Pseudopleuronectes americanus	Winter Flounder	2	O			O							O					O	O		O
Salmo salar	Atlantic Salmon	1	O				O					O		O			O	O	O	N	O
ANTHOZOA (anthozoans)																					
Crassostrea virginica	Eastern oyster	3	O			O													O	N	N
Gersemia rubiformis	Sea Strawberry	2	O											O					N		N
ASTEROIDEA (sea stars)																					
Asterias forbesi	Forbes's Starfish	2	O											O					N		N
Asterias rubens	Common Sea Star	2	O										O	O					N		N
Stephanasterias albula	White Sea Star	2	O											O					N		N

Table 5/6-6. *continued: page 3 of 7.*

CLASS 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	Monitoring Salmon Traps & Lifts	Spawning Stock Surveys	Habitat Mapping	Species Interaction Studies	Environmental/Habitat Change Effect Studies
ASTEROIDEA (sea stars) *continued*																					
Crossaster papposus	Common Sun Star	2	O										O	O					N		N
Solaster endeca	Purple Sunstar	2	O										O	O					N		N
BIVALVIA (mussels and clams)																					
Mya arenaria	Softshell Clam	3	O			O													O	N	N
Mya truncata	Gaper Clam	3	O											O					N	N	N
Zirfaea crispata	Atlantic Great Piddock	2	O											O					N		N
Mytilus edulis	Blue Mussel	3	O			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	3	O			O							O	O					O	N	N
Mercenaria mercenaria	Hard-shelled Clam	3	O			O							O						O	N	N
CHONDRICHTHYES (cartilaginous fishes)																					
Prionace glauca	Blue Shark	3	O	O																	

Table 5/6-6. *continued: page 4 of 7.*

CLASS 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	Monitoring Salmon Traps & Lifts	Spawning Stock Surveys	Habitat Mapping	Species Interaction Studies	Environmental/Habitat Change Effect Studies
CHONDRICHTHYES (cartilaginous fishes) *continued*																					
Sphyrna zygaena	Smooth Hammerhead	3	O	O																	
Alopias vulpinus	Common Thresher Shark	3	O	O																	
Isurus oxyrinchus	Shortfin Mako	2	O	O																	
Lamna nasus	Porbeagle	2	O	O																	
Amblyraja radiata	Thorny Skate	2	O										O								
Dipturus laevis	Barndoor Skate	2	O										O								
Leucoraja ocellata	Winter Skate	2	O										O								
Malacoraja senta	Smooth Skate	2	O										O								
ECHINOIDEA (Sea urchins)																					
Strongylocentrotus droebachiensis	Green Sea Urchin	2	O			O							O	O					O	N	N
GASTROPODA (gastropods)																					
Arrhoges occidentalis	American Pelican Foot	2	O											O					N		N
Limneria undata	Wavy Lamellaria	3	O											O					N		N

Table 5/6-6. *continued: page 5 of 7.*

CLASS 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	Monitoring Salmon Traps & Lifts	Spawning Stock Surveys	Habitat Mapping	Species Interaction Studies	Environmental/Habitat Change Effect Studies
GASTROPODA (gastropods) *continued*																					
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
HOLOTHUROIDEA (sea cucumbers)																					
Cucumaria frondosa	Orange-footed Sea Cucumber	2	O			O							O								
Psolus fabricii	Psolus	2	O											O					N		N
Psolus phantapus	Psolus	2	O											O					N		N
Thyonidium drummondii	Sea Cucumber	2	O										O								
MALACOSTRACA (crabs, krill, pill bugs, shrimp, and relatives)																					
Lebbeus groenlandicus	Spiny Lebbeid Shrimp	2	O										O	O					N		N

Table 5/6-6. *continued: page 6 of 7.*

CLASS 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	Monitoring Salmon Traps & Lifts	Spawning Stock Surveys	Habitat Mapping	Species Interaction Studies	Environmental/Habitat Change Effect Studies
MALACOSTRACA (crabs, krill, pill bugs, shrimp, and relatives)																					
Lebbeus polaris	Polar Lebbeid Shrimp	2	O										O	O					N		N
Pandalus borealis	Northern Shrimp	1	O			O							O						O		O
Balaenoptera borealis	Sei Whale	2	O													O			O		
MAMMALIA (mammals)																					
Balaenoptera musculus	Blue Whale	2														O					
Balaenoptera physalus	Finback Whale	2	O													O					
Eubalaena glacialis	North Atlantic Right Whale	1	O													O			O		
Megaptera novaeangliae	Humpback Whale	1	O													O			O		
Phocoena phocoena	Harbor Porpoise	2	O													O			O		
Physeter macrocephalus	Sperm Whale	2	O													O					

Table 5/6-6. *continued: page 7 of 7.*

CLASS 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	Monitoring Salmon Traps & Lifts	Spawning Stock Surveys	Habitat Mapping	Species Interaction Studies	Environmental/Habitat Change Effect Studies
MAXILLIPODA (barnacles and copepods)																					
Calanus finmarchicus	A Copepod	3	N																	N	N
MEROSTOMATA (horseshoe crabs)																					
Limulus polyphemus	Horseshoe Crab	1	O																O		N
OPHIUROIDEA (brittle stars)																					
Gorgonocephalus arcticus	Northern Basket Starfish	2	O										O	O					N		N
REPTILIA (reptiles)																					
Caretta caretta	Loggerhead Seaturtle	2														O					
Chelonia mydas	Green Seaturtle	2														O					
Dermochelys coriacea	Leatherback Seaturtle	1														O					
Lepidochelys kempii	Kemp's Ridley Seaturtle	2														O					
RHYNCHONELLATA																					
Terebratulina septentrionalis	Lamp Shell	2	O											O					N		N

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) program (Marine Recreational Information Program) to estimate the impact of recreational fishing on marine resources. Sampling in Washington County continues with the assistance of Maine Sea Grant's Marine Extension Agent and students from the University of Maine at Machias. MDMR staff also monitor the winter Rainbow Smelt recreational fishery throughout the state through creel surveys and a catch card program.

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 Tuna permit holders. Additionally, Volunteer Logbook Programs for Striped Bass and Rainbow Smelt 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.

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 shad, alewives, and Blueback Herring, as well as Striped Bass, Rainbow Smelt, and other 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 this survey since 1979 and it used the data to monitor species assemblages, population trends, and habitat use.

MDMR monitors diadromous fish passage efficiency through collaborative efforts between agencies, universities, and hydropower companies. For example, the U.S. Geological Survey (USGS) Conte Anadromous Fish Research Lab completed three years (2002-2004) of field work on a collaborative project with MDMR, the Penobscot Indian Nation, National Oceanic and Atmospheric Administration – Fisheries (NOAA-Fisheries), and the University of Maine, documenting the upstream migration of adult Atlantic Salmon in the Penobscot River. The research used Passive Integrated Transponder tag technology to gather data on movements of individual adult salmon, Fishery managers use this information to evaluate upstream movements and distribution of salmon within the drainage, the probability that fish are able to access spawning habitat, broodstock management, and the effectiveness of current juvenile stocking practices. Current projects (2014-2015) include monitoring American Shad passage at the Benton Falls Dam on the Sebasticook River and measuring the passage efficiency of fishways in Phippsburg and Bristol for alewife passage.

Monitoring diadromous fish in coastal Maine.
© Department of Marine Resources

MDMR conducts routine monitoring of the abundance and status of juvenile and adult diadromous fishes in most of Maine's large watersheds. MDMR operates traps to monitor adult returns on the Penobscot, Narraguagus, and Sebasticook rivers. Brookfield Renewable Energy Group operates traps in the upper Penobscot, Union, Kennebec, Androscoggin, and Saco rivers that provide counts of adult fish, and to a lesser extent, information on juveniles. The St. Croix Waterway Commission operates a trap on the St. Croix River and Algonquin Power operates a trap on the Aroostook River.

MDMR directs its Atlantic Salmon monitoring at determining the causes of the precipitous decline in Atlantic Salmon returning to Maine waters. The focus of ongoing projects is to determine survival among freshwater life stages and understanding the biological and environmental factors affecting survival. These include parr density and relative abundance, estimates of smolt emigration, smolt physiology, effects of marine and estuarine smolt trawling, and smolt tracking through estuaries. Redd counts are used to track spawning escapement in the Gulf of Maine Distinct Population Segment rivers without adult traps.

MDMR assess the population status of Shortnose and Atlantic Sturgeon on the Saco, Kennebec, Androscoggin, and Penobscot Rivers. They encompass determining sturgeon abundance, 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 passages, and examining the relationship between dam discharge levels and spawning success.

Annually, MDMR assesses spawning smelt runs to determine population status. The survey produces a fishery-independent index of abundance by collecting biological data from spawning runs, including information on size and age composition, catch-per-unit-effort, and mortality. As part of this project, fishery managers sample fyke-net stations at specific coastal rivers in Maine, New Hampshire, and Massachusetts. The project has collected standardized data since 2008.

MDMR monitors American Eel populations using two fishery-independent surveys; a young-of-year survey and yellow eel count. Each spring, for a period of six weeks, MDMR scientists enumerate all young-of-year (glass) eels that migrate upstream into West Harbor Pond and collect biological information (length, weight, pigmentation) on subsamples. From June to September each year, MDMR concuts the Yellow Eel survey in the Kennebec River watershed, at two hydropower facilities on the Sebasticook River and one facility on the Kennebec River. This survey provides an annual index of recruitment (multiple year classes) to the Kennebec River watershed.

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 species through fishery-independent surveys.

Marine scientists monitor the northern shrimp population using multiple surveys. Scientists from NMFS, Maine, New Hampshire, and Massachusetts collaborate to conduct a series of tows for northern shrimp in the Gulf of Maine each summer. The survey provides fishery-independent data that are an important component of the assessment of the Gulf of Maine shrimp stock. In the winter of 2014-2015, in an effort to collect information about winter populations of northern

shrimp during the fishery closure, MDMR worked with local fishermen in Maine to collect trawl and trap samples to document the species' maturity schedules and size distribution.

MDMR uses dive surveys to monitor Green Sea Urchins and assess the status of urchin larvae. 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. To monitor larval settlement, MDMR divers deploy settlement plates at Pemaquid Point each spring, collect them during the summer, and examine the plates in the laboratory to enumerate the number of new young-of-the-year sea urchins. This continues a time series begun at that site in the mid-1990s by the University of Maine, which tracks annual sea urchin larval settlement.

With the drastic depletion of the Horseshoe Crab in the Mid-Atlantic States and the resultant increased harvest in Maine, anecdotal information suggested that Maine's population had also experienced a decline. Since 2001, MDMR, several coastal watershed volunteer monitoring groups, and a private contractor have conducted annual surveys of Horseshoe Crab spawning populations and breeding sites. Biologists make a visual count of spawning Horseshoe Crabs at three sites along the coast annually during May and June spring tides. This survey relies on volunteers who walk a standard-survey transect at high tide counting crabs observed within a one meter band. Since 2005, MDMR has reduced the number of sites from 14 to three, and in recent years, relied entirely on volunteer monitoring. These surveys are intended to update the last assessment of Maine Horseshoe Crabs and breeding locations, which fishery managers conducted in 1977 for the Maine State Planning Office.

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.

The National Park Service monitors rocky shores in Maine as part of their Northeast Temperature 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; http://mit.sea-grant.net/mitis/mitis_map). 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 a number of 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.

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 5/6-7 with 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.

The Maine Bumble Bee Atlas, launched in 2015 with citizen scientists, will establish a baseline assessment for future monitoring of a potentially declining group of significant pollinators. © Kalyn Bickerman

Table 5/6-7. Proposed habitat monitoring approaches.

Habitat Group	Conservation Action Description (Action ID #)	Examples of Potential Monitoring and Survey 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 (#87)	SGCN and habitat surveys, GIS models, remote sensing, Maine Department of Environmental Protection (MaineDEP) 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 (#146) • Conduct a statewide inventory of dams, including on headwater streams (#101) • Identify priority locations for ecological flow management in aquatic habitats (#102) • Increase habitat surveys & models for road stream crossings (#145) • Develop better methods to map potential barriers in priority watersheds (#103) • Track completed road stream crossing projects (#147)	Stream Smart, National Lakes Condition Assessment, stream barrier assessments, GIS models, remote sensing. MaineDEP water quality and 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 with assistance from programs such as Beginning with Habitat (#167)	SGCN and habitat surveys, Beginning with Habitat
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 (#217) • More frequently update intertidal and subtidal SGCN habitat maps and compare to historical maps to monitor changes in distribution over time (#248) • Continued underwater surveillance of potential and active aquaculture lease sites with a focus on SGCN and important habitats (new)	Maine Invasive Species Network, iMapinvasives, Beginning with Habitat, eel grass surveys, remote sensing, SGCN and habitat surveys

Table 5/6-7. *continued: page 2 of 4.*

Habitat Group	Conservation Action Description (Action ID #)	Examples of Potential Monitoring and Survey Programs and Collaborations[1]
Rocky Coast	• Identify and prioritize significant nesting, migratory, and wintering areas in rocky coast habitats for contingency planning (#157) • Work with municipalities to identify important SGCN nesting and migratory areas in rocky coast and coastal habitats during comprehensive planning with assistance from programs such as Beginning with Habitat (#158) • Identify invasive plant hot spots in rocky coast habitats (#162)	SGCN and habitat surveys, Beginning with Habitat, 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 (#273) • 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 (#266) • Expand surveys of recreational fishing efforts to include SGCN that are not targeted in current survey efforts (#283) • More frequently update intertidal and subtidal SGCN habitat maps and compare to historical maps to monitor changes in distribution over time (#307) • Continued underwater surveillance of potential and active aquaculture lease sites with a focus on SGCN and important habitats (new)	Maine Invasive Species Network, iMapinvasives, citizen scientist or volunteer monitoring programs, remote sensing, eel grass monitoring
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 (#177) • Develop monitoring systems and rapid response plans to prevent the colonization of invasive/problematic species and diseases in intertidal, subtidal, and tidal marsh habitats (#191) • Continue and expand monitoring programs that track tidal marsh changes over time (#185)	GIS models, remote sensing, sediment accretion monitoring (Rod Surface Elevation Tables), Saltmarsh Habitat and Avian Research Program, Maine Invasive Species Network, iMapinvasives, Global Programme of Action Coalition (GPAC), National Wetland Condition Assessment, baseline and long-term ecological marsh monitoring, LiDAR models

Table 5/6-7. *continued: page 3 of 4.*

Habitat Group	Conservation Action Description (Action ID #)	Examples of Potential Monitoring and Survey Programs and Collaborations[1]
Terrestrial and Freshwater Wetland Habitats		
Floodplain Forests	• Identify aggressive invasives in floodplain forests and pre-treat to prevent spread (#342)	Maine Invasive Species Network, iMapinvasives, citizen scientist or volunteer monitoring programs, National Wetland Condition Assessment, Ecological Reserve Monitoring, development of reference wetland dataset
Freshwater Marshes	• Identify high priority road segments/culverts for organism passage among freshwater wetlands (#60)	Road Watch, Beginning with Habitat, SGCN and habitat surveys, GIS models, remote sensing, National Wetland Condition Assessment, Ecological Reserve Monitoring, development of reference wetland dataset
Grassland-shrubland-early Successional	• Research and identify explicit areas and amounts of grassland, shrubland, and early successional habitats needed to conserve target SGCN (#347) • Assist municipal planning, through programs such as Beginning with Habitat, to identify key grassland, shrubland, and early successional SGCN habitats (#348) • Map and distribute information on existing ruderal habitats (#355) • Map potential ruderal habitats (#356)	GIS models, remote sensing, SGCN and habitat surveys, Beginning with Habitat

Table 5/6-7. *continued: page 4 of 4.*

Habitat Group	Conservation Action Description (Action ID #)	Examples of Potential Monitoring and Survey Programs and Collaborations[1]
Northern Forests and Swamps	• 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 (#31) • Identify and conserve boreal forest refugia associated with SGCN (#32) • Continue long-term monitoring of SGCN and SGCN habitats associated with northern forests and swamps (#38) • Continue monitoring for invasive and problematic species and diseases, especially forest insect pests, in northern forest and swamps and south-central forests and swamps (#34) • Continue stewardship/habitat monitoring on conserved northern forest and swamp lands (#30)	GIS models, remote sensing, SGCN and habitat surveys, Maine Invasive Species Network, iMapinvasives, Forest Inventory and Assessment, Ecological Reserve monitoring, National Wetland Condition Assessment
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 (#15) • Continue habitat/recreational monitoring stewardship on conserved rocky summit, outcrop, and mountaintop SGCN habitats (#18)	GIS models, remote sensing, SGCN and habitat surveys, citizen science or volunteer monitoring programs
South-Central Forests and Swamps	• Continue monitoring for invasive and problematic species and diseases, especially forest insect pests, in northern forests and swamps and south-central forests and swamps (#74) • Undertake long-term monitoring of SGCN and their habitats in south-central forests and swamps (#71) • Partner with Maine Department of Transportation to identify invasive plant "hotspots" along roads and bridges, especially in south-central forests and swamps (#75)	Maine Invasive Species Network, iMapinvasives, citizen science or volunteer monitoring programs, Forest Inventory and Assessment, Ecological Reserve monitoring, National Wetland Condition Assessment

[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 STATEWIDE HABITAT AND CONSERVATION MONITORING

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.

1. **Beginning with Habitat (BwH)**
   a. **Description:** BwH is a non-regulatory, habitat-based model that provides wildlife and habitat information to local decision-makers, conservation organizations, and landowners interested in their local wildlife and habitats. BwH provides these individuals with the necessary habitat information to voluntarily balance growth with conservation of natural spaces needed for wildlife, recreation, agriculture, forestry, and other resources. In the first decade of the program, BwH worked closely with towns to fulfill this goal. Over the next ten years, BwH will continue to work with towns while also providing enhanced/updated online mapping resources, searchable information on SGCN and conservation actions, and increased technical assistance for landowners and others implementing voluntary SGCN conservation measures. Under the direction of the Action Plan Implementation Committee, the BwH Steering Committee will revise BwH's strategic plan over the next two years to include measurable objectives and performance measures to monitor delivery, utilization, and effectiveness of BwH in supporting local voluntary efforts to conserve Maine's wildlife resources.
   b. **Periodically Assessed Metrics**
      i. Number of towns and regions mapped.
      ii. Number of towns, land trusts, and landowners receiving BwH information and technical assistance.
      iii. Ease of access to up-to-date habitat data for all user groups (government agencies, towns, conservation groups, and landowners).
      iv. Number of users accessing online mapping tools.
      v. Development of improved outreach modules for different user groups, especially landowners.
      vi. Number of conserved acres (including easements) in BwH Focus Areas.
      vii. Number of acres in BwH Focus Areas in "Tree Growth" or "Farm and Open Space" current use tax programs.
      viii. Successful creation of new incentives for towns and landowners to conserve priority SGCN habitats.

2. **Spatial Data Updates**
   a. **Description:** Since Maine's 2005 Plan, multiple partners have updated or created numerous habitat-related spatial datasets. The Maine Office of Geographic Information System data catalog (http://www.maine.gov/megis/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.

b. Periodically Assessed Metrics

i. Impervious/Developed Areas: Areas of impervious surfaces including buildings and roads.

ii. Rare, Threatened, and Endangered Wildlife Data (includes some SGCN): Includes known rare, Endangered, and Threatened species occurrences and/or the associated habitats based on species sightings.

iii. Undeveloped Habitat Blocks: Blocks of undeveloped land, including those greater than 100 acres.

iv. 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.

v. Riparian Connectors: Modeled crossing locations for wetland dependent species moving between waterways and wetlands divided by roads.

vi. Conserved Lands: The State of Maine's conserved lands database includes lands in federal, state, and non-profit ownership.

3. Habitat Management Guidelines

a. Description: MDIFW and partners will develop voluntary, non-regulatory habitat management guidelines for priority habitats and species and 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 develop of HMGs statewide.

b. Periodically Assessed Metrics

i. The number of SGCN for which HMGs are developed and published.

ii. The number of landowners, land managers, towns, land trusts, and others that receive HMGs.

iii. The number of landowners, etc., that implement habitat management according to the guidelines.

4. Land Conservation, Stewardship, and Management

a. Description: 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/expanding landowner incentives. This is an extremely important aspect of Maine's efforts to conserve habitats for SGCN, and we have included this topic here in order to track efforts at a statewide scale.

b. **Periodically Assessed Metrics:** To monitor the success of these efforts collectively, we will develop a way to periodically monitor the number of acres under habitat conservation through:

i. Fee acquisition

ii. Conservation easement

iii. Purchase of development rights

iv. Cooperative management agreements and management plans

5/6.4 PROGRAMMATIC MONITORING

MDIFW and conservation partners developed 11 programmatic actions to help guide Action Plan implementation over the next ten years (see Element 4, Table 4-21). Each is summarized below.

In addition, 3 of these -- Programs 7, 8, and 9 -- address monitoring. Programs 7 and 9 are described in detail.

Outreach and Engagement (Programmatic Actions 1-3): Actions to inform and engage the public and partners on Action Plan accomplishments and opportunities for involvement.

> **Program 1**: Establish an Action Plan implementation committee comprised of conservation partners and agency staff to help guide implementation of the 2015 Action Plan (short-term). (Elements 7/8)
>
> **Program 2**: Devise and implement outreach strategies, including periodic meetings, to inform and engage conservation partners and the general public on 2015 Action Plan information, accomplishments, and opportunities for involvement (mid-term). (Elements 7/8)
>
> **Program 3**: Develop a public survey of SWAP and non-game species awareness, concerns, and priorities (initial survey: short-term; second survey: long-term [tentative]). (Elements 7/8)

Funding and Tracking (Programmatic Actions 4-8): Actions to bolster funding, capacity, and tracking of SGCN-related projects.

> **Program 4:** This action supports efforts to establish stable state and federal funding sources for SGCN and habitat conservation. (Element 4)
>
> **Program 5**: Consider establishing a competitive small grants program to make a portion of State Wildlife Grant (SWG) funds available to partners implementing priority actions identified in the 2015 Action Plan (mid-term). (Elements 7/8)
>
> **Program 6:** This action focuses on increasing long-term agency staffing and capacity needs for Action Plan implementation. (Element 4)
>
> **Program 7:** Annually compile agency and partner expenditures and seek additional match opportunities to maximize efficiency and impact of 2015 Action Plan implementation (short-term). (Elements 5/6)
>
> **Program 8:** Track SWAP conservation action implementation accomplishments by agencies and partners (short-term). (Elements 5/6)

> *"Within the first few years of Plan implementation, MDIFW will work closely with partners to develop tracking systems for conservation expenditures and expenses. MDIFW will develop feedback mechanisms to track partner efforts and accomplishments and use this information to periodically assess the effectiveness of the 2015 Action Plan."*

With over 600 SGCN and habitat-related conservation actions, successful implementation of Maine's 2015 Action Plan will require collaborative efforts between MDIFW and its many conservation partners. Furthermore, State Wildlife Grant funds are limited and, as a state, we need to ensure these dollars are being spent efficiently to achieve desired conservation outcomes. Within the first few years of Plan implementation, MDIFW will work closely with partners to develop tracking systems for conservation expenditures and expenses. MDIFW will develop feedback mechanisms to track partner efforts and accomplishments and use this information to periodically assess the effectiveness of the 2015 Action Plan. MDIFW is currently developing a Tracking and Reporting Actions for the Conservation of Species (TRACS) compliant tracking system for agency projects and may develop a similar mechanism for partners. MDIFW also will highlight Action Plan progress and successes at periodic meetings with partners and through media as part of Programmatic Theme 2. To further leverage limited funds, MDIFW also will work with partners to maximize existing match opportunities and identify new ones, especially for volunteer time that MDIFW has not previously tracked. Additional information is provided in Section 5/6.5 below.

Action Development (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. (Elements 5/6)

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 stressors). This is due to several reasons. First, Maine has a wide range of habitats, from subtidal mollusk reefs to high altitude alpine meadows. The stressors affecting these habitats and their SGCN are extremely nuanced and often habitat-specific. Furthermore, we are fortunate to have a broad partner base with diverse interests and missions, from habitat conservation and research to advocacy. Rather than present a restricted list applicable to only a subset of partners, we opted to present the full suite of actions so that partners across the state can find a nexus to some aspect of the plan.

We recognize that we cannot implement every action in the plan, even with broad partner support. In order to focus our efforts, we will use the prioritization approach presented in Element 4 to evaluate proposed conservation actions that are not already underway. We may first focus on the 20% of actions ranked as 'critical' for Biological Priority, but we also will consider lower-ranked partner-driven efforts. 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 above. Additional information is provided in Section 5/6.5 below.

Regional Partnerships (Programmatic Actions 10-11): These actions address continued MDIFW and partner involvement in existing conservation efforts.

> **Program 10:** This action supports efforts to identify new and update existing SGCN Conservation Opportunity Areas (COAs). (Element 4)
>
> **Program 11:** This action supports MDIFW and partner participation.

5/6.5 MEASURING THE EFFECTIVENESS OF ACTIONS

In the sections above, we describe specific SGCN, habitat, and programmatic monitoring approaches we will use over the next ten years of Maine's 2015 Wildlife Action Plan. These monitoring programs provide crucial information on the effectiveness of our actions and progress toward our conservation goals. In the sections below, we describe how these monitoring programs are incorporated into conservation action implementation and our overall approach to measuring the effectiveness of priority conservation actions. With over 600 conservation actions for SGCN and habitats and over 100 conservation partners implementing these actions, it is impractical to track progress on every conservation action in the Plan. Therefore, we present below a generalized approach for developing SMART objectives and measuring the effectiveness of individual priority conservation actions as well two spatially-explicit examples for two applied scenarios: 1) conservation of multiple SGCN habitats in a central Maine Wildlife Management Area (WMA) and, 2) conservation of New England Cottontail in a southern Maine WMA and surrounding lands.

A General Approach for Developing SMART Objectives and Effectiveness Measures for Priority Conservation Actions

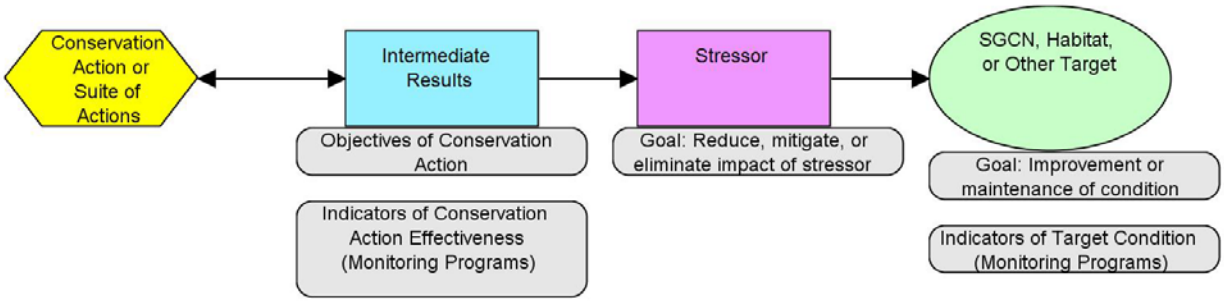
Our 600-plus conservation actions reflect a strategic approach to conservation planning and reflect the best professional judgement of our partners and species specialists. However, most of our conservation actions are fairly general and require the development of SMART objectives to effectively track their impact. As described for Programmatic Action 9 above, SMART objectives will be developed with feedback from partners for a subset of priority conservation actions deemed 'critical' biological priority and for those that address an immediate or emerging need for an SGCN or habitat.

For individual actions or suites of related actions, we will first assess the feasibility and biological impact of the action(s) using the criteria for prioritizing conservation actions described in Element 4, Section 4.5.2. If an action is determined to be feasible and impactful, we will develop a results chain to address SMART objectives using the original SGCN or habitat targets and stressors originally identified by species specialists and conservation partners during development of Element 4. Results chains graphically depict and test the logic behind a 'theory of change', whereby a user can specify all the components needed for a conservation action to have a desired effect on a target. A generalized results chain for priority conservation actions is depicted in Figure 5/6-1.

Wherever possible, we will utilize existing results chain templates and indicators for common conservation actions developed by the Association of Fish and Wildlife Agencies (2011). For actions primarily within MDIFW jurisdiction, we will solicit feedback on our results chains from

our Steering Committee. For actions that are undertaken by other partners, we will work with partners to develop results chains based on their expertise and knowledge of the issue. As described below, we also intend to continue partnering with a University of Maine, Orono, graduate conservation planning course to develop results chains for our more complex conservation scenarios.

Figure 5/6-1. Generalized results chain for priority conservation actions and suites of actions (in cases where multiple, related actions are undertaken simultaneously to enhance effectiveness or feasibility). The monitoring programs described earlier in this chapter will be essential for tracking key indicators of conservation action effectiveness, both in examining the intermediate results of an action as well as the ultimate goal of improving or maintaining a certain SGCN or habitat condition. The two-way arrow between the conservation action and intermediate results suggests an adaptive management approach where the effectiveness of conservation actions will be continuously monitored and adjusted as needed to ensure they are meeting the objectives of the action.



An Applied Approach for Developing SMART Objectives and Effectiveness Measures for Target SGCN and Habitats

In the examples that follow, we provide two scenarios for developing results chains that are likely more applicable to most planning efforts than the action-by-action approach described above. In March 2017, we partnered with a weeklong graduate level conservation planning course at the University of Maine, Orono to develop results chains for high priority conservation actions using the Open Standards for the Practice of Conservation (CMP 2013) for two WMAs owned and managed by MDIFW. With the help of coaches from the Conservation Coaches Network and MDIFW staff, graduate students developed conceptual model to identify priority SGCN and habitat conservation targets for each WMA and built results chains for relevant conservation actions. Because the course afforded us time to explore multiple issues in detail, these results chains are immediately transferable to other WMAs and high priority conservation actions in Maine's 2015 Plan. We hope to continue collaborating at least annually with the University of Maine to apply this process to additional conservation targets throughout the life of the Plan. We also intend to use the results chains produced by this collaboration as templates to help guide new internal and partner-led conservation projects.

Applied Case Study 1: Conservation of SGCN Habitats in a Central Maine Wildlife Management Area

Background: The Bud Leavitt Wildlife Management Area (BLWMA) encompasses over 6,500 acres spanning four towns (Dover-Foxcroft, Atkinson, Garland, Charleston) in central Maine. It is comprised predominately of forested habitats (e.g., northern hardwoods and conifers) but also grasslands and freshwater wetlands (e.g., domed bog ecosystem) (Figure 5/6-2). While there are few mapped SGCN occurrences in the BLWMA, there is a known Great Blue Heron (SGCN Priority 2) colony and predicted occurrences of freshwater wetland and early successional-associated SGCN. Bud Leavitt is management primarily for wildlife and timber, but it also provides recreational opportunities such as hunting and all-terrain-vehicle (ATV) trails (MDIFW 2006). The BLWMA is characteristic of many central and northern Maine forested landscapes that contain some habitat fragmentation and large data gaps for SGCN.

Results: Based on the 2015 Plan and MDIFW knowledge of the BLWMA, students determined that recreational activities (particularly unauthorized ATV use in off-trail areas) were the greatest stressor to SGCN habitats throughout the WMA. Students developed a conceptual model and associated results chains to engage ATV clubs and support law enforcement to reduce the impact of unauthorized recreational vehicle use on SGCN target habitats, including vernal pools, freshwater wetlands, streams, and grasslands (Figure 5/6-3). Each objective was developed based on SMART principles, and results chains contain several interrelated feedback loops that allow for adaptive management based on the effectiveness of actions.

Applied Case Study 2: Conservation of New England Cottontail in Southern Maine

Background: The Scarborough Marsh Wildlife Management Area (SMWMA) is an approximately 3,000 acre area owned and managed by MDIFW. Most of the area is comprised of salt marsh or other wetlands, and the remainder includes wet meadows, old fields, shrublands, and mature forest (Figure 5/6-4). The SMWMA falls within the known historical range of New England Cottontail, a State Endangered species and SGCN Priority 1. SMWMA is within the Cape Elizabeth-Scarborough New England Cottontail focal area, and verified records of the species were documented on the property in 2009. It is the only MDIFW property with recent New England Cottontail records (MDIFW, proposed habitat management plan for SMWMA).

Results: Students identified New England Cottontail as the key conservation target for the SMWMA. Students identified increased New England Cottontail habitat acreage and enhanced habitat quality within SMWMA and adjacent properties as key indicators of success for this scenario. Students developed a conceptual model and multiple results chains (Figure 5/6-5) focusing on landowner engagement and public support for management activities to address New England Cottontail conservation and early successional habitat management. Like the BLWMA example, these results chains contain SMART objectives that provide detailed approaches for strategic implementation of several high and critical priority conservation actions.

Figure 5/6-2. Habitat types (macrogroups) within the Bud Leavitt Wildlife Management Area based on the Northeast Habitat Terrestrial Classification System.

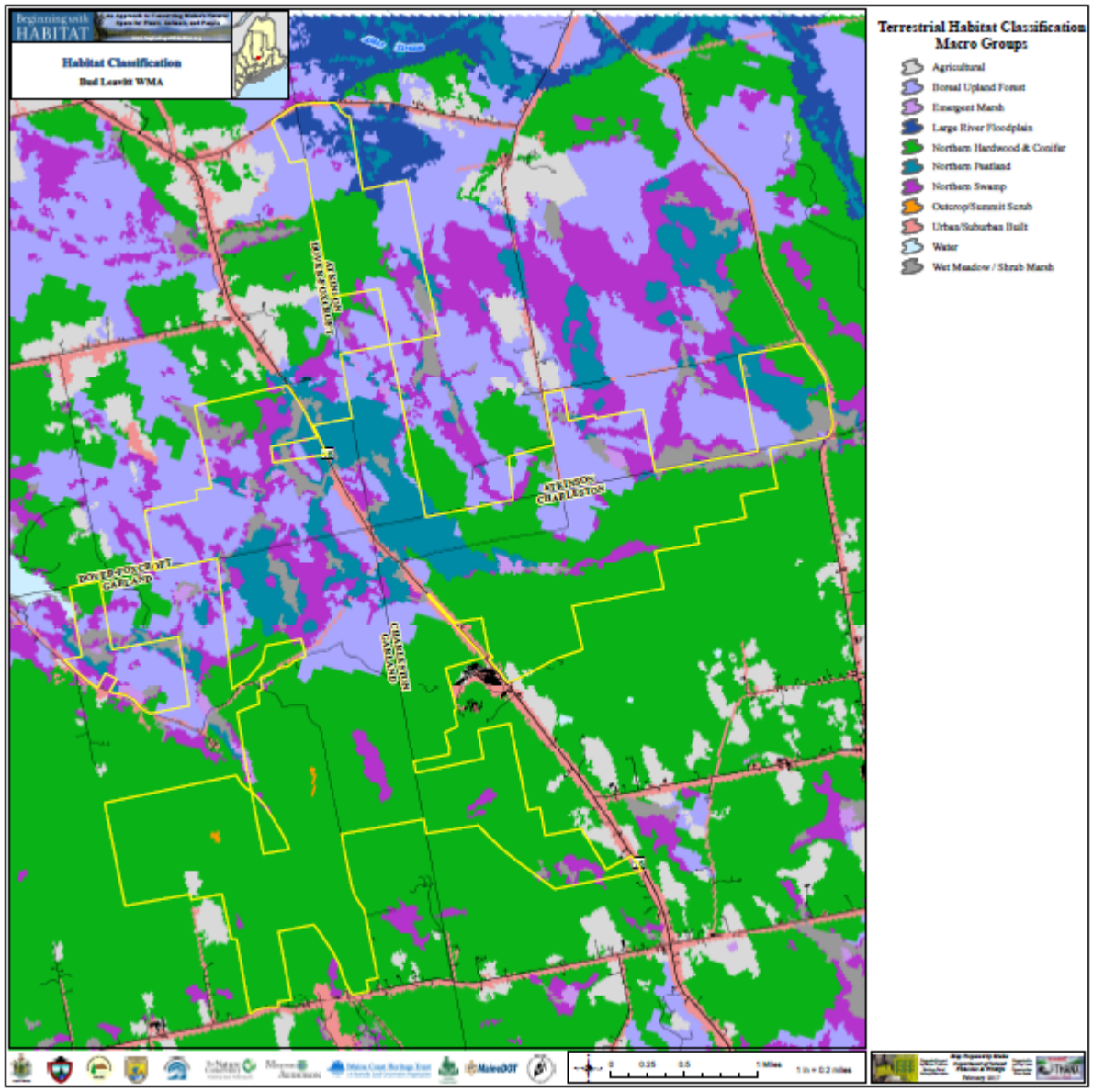


Figure 5/6-3. Example conceptual model and results chains to address unauthorized recreational vehicle impacts to SGCN habitats in the Bud Leavitt Wildlife Management Area.

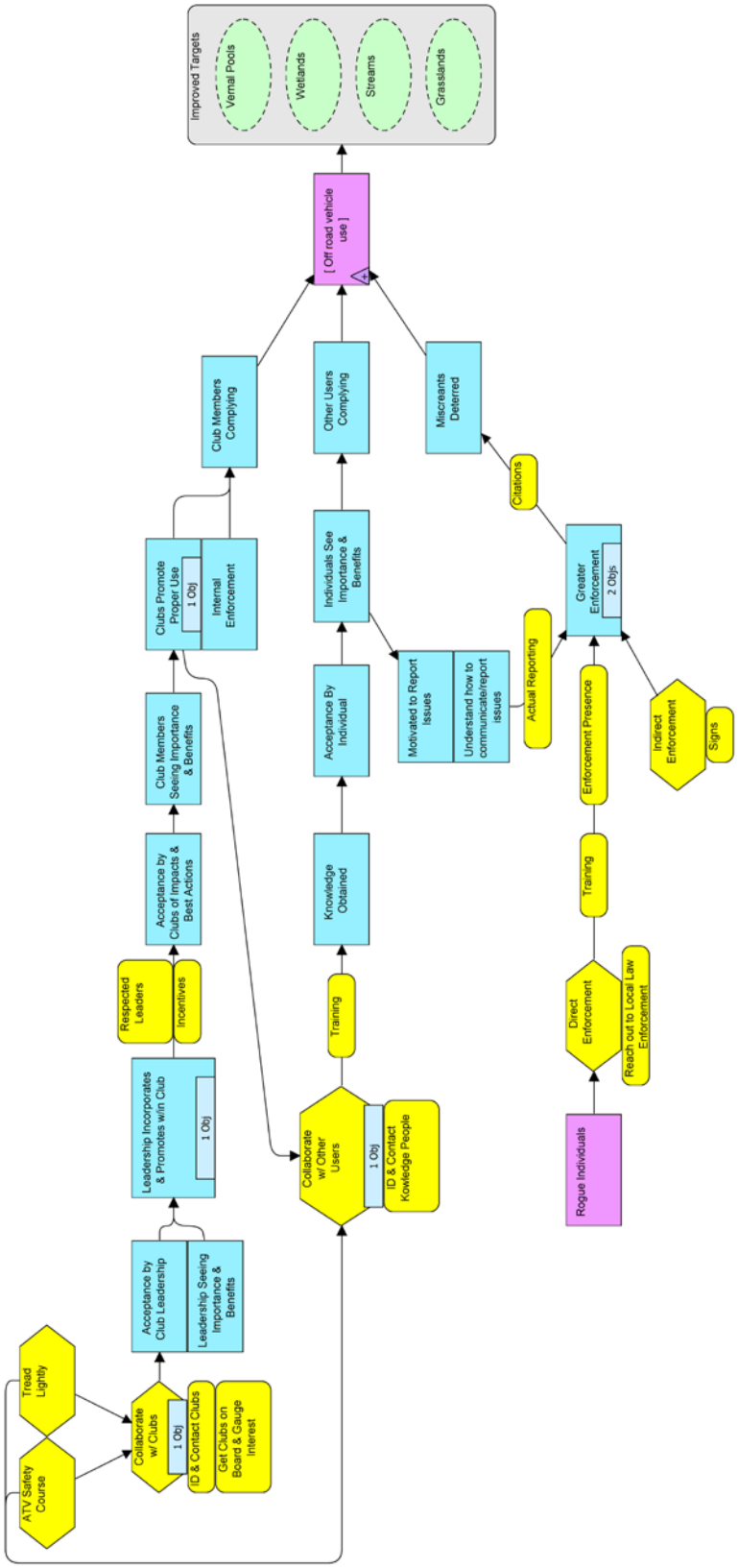


Figure 5/6-4. Habitat types (macrogroups) within the Scarborough Marsh Wildlife Management Area based on the Northeast Habitat Terrestrial Classification System.

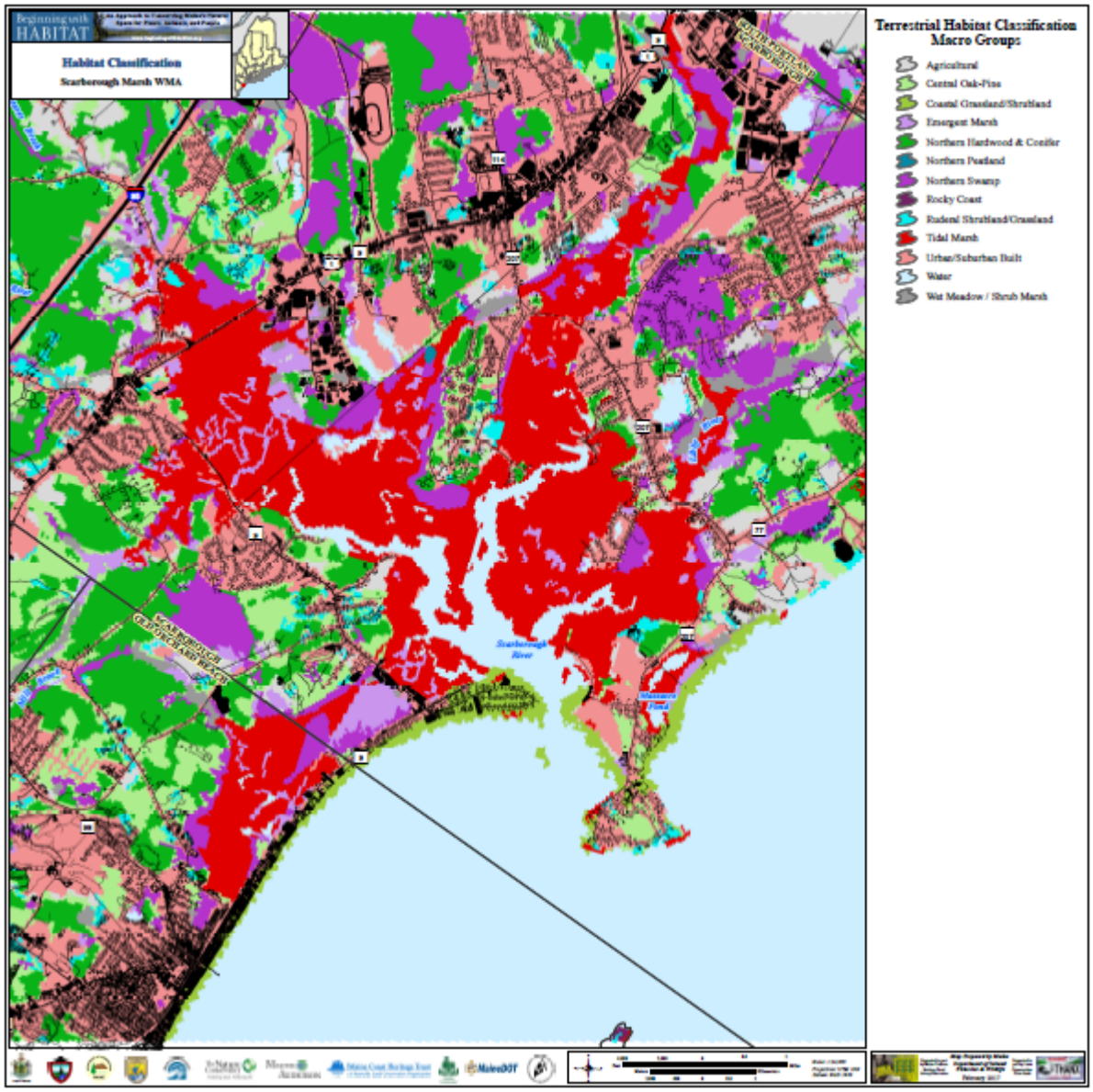
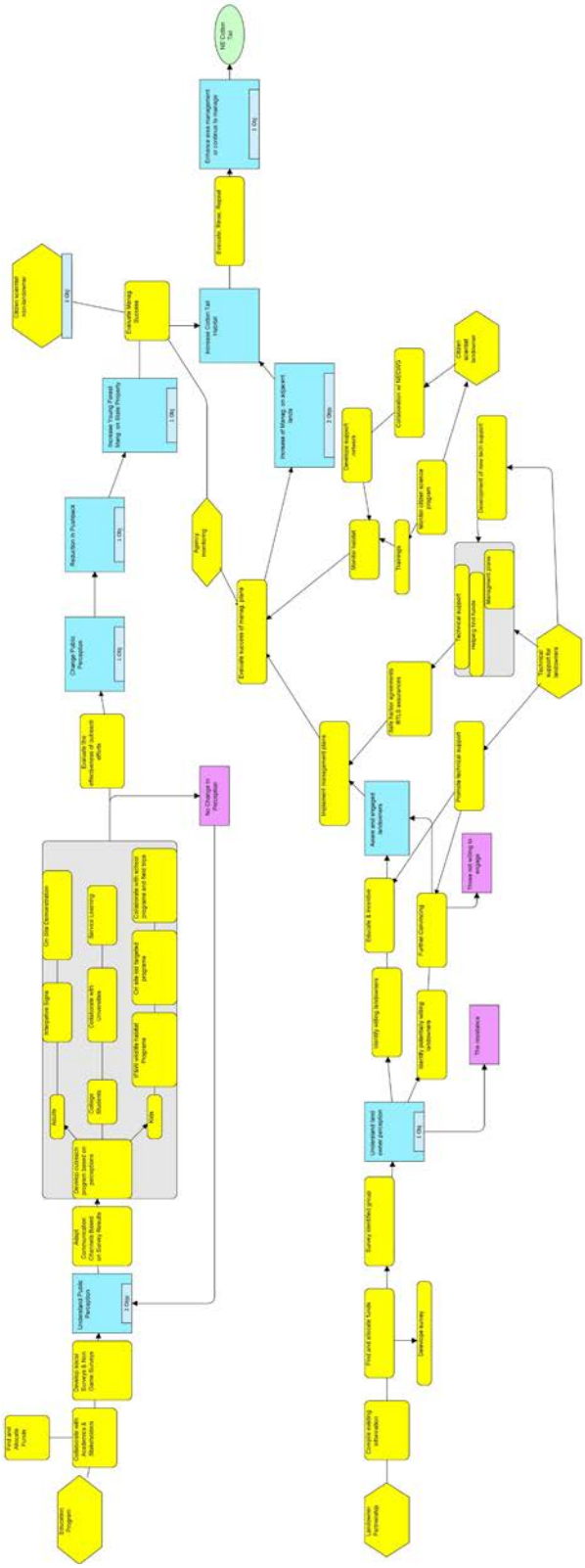

Beginning with HABITAT
Habitat Classification
Scarborough Marsh WMA
Terrestrial Habitat Classification Macro Groups
Agricultural
Central Oak-Pine
Coastal Grassland/Shrubland
Emergent Marsh
Northern Hardwood & Conifer
Northern Peatland
Northern Swamp
Rocky Coast
Ruderal Shrubland/Grassland
Tidal Marsh
Urban/Suburban Built
Water
Wet Meadow / Shrub Marsh
Scarborough River
Dunstan River
Spurwink River
Cutler River
Nonesuch River
Scarborough Beach State Park
Pine Point
Prout's Neck
Black Point
Scarborough Beach
Pine Point Beach
Scarborough Marsh
Oak Hill
Dunstan
Pine Point
Scarborough
Cummings Corner
Dunstan Landing
Pine Point Road
Black Point Road
Scarborough Beach Road
Pine Point Road
Black Point Road
Scarborough Beach Road
Pine Point Road
Black Point Road
Scarborough Beach Road

Figure 5/6-5. Example conceptual model and results chains for improving and expanding New England Cottontail habitat in the Scarborough Marsh Wildlife Management Area



Monitoring Effectiveness of Conservation Actions

The monitoring programs detailed in the first part of this chapter provide periodic SGCN and habitat condition information that will help us determine the effectiveness of conservation actions. Where our monitoring programs indicate a condition is not improving or is worsening, results chains allow us to identify where exactly our theory of change was incorrect or insufficient, and we can adapt our approach accordingly. While we are still developing a formal tracking system that accommodates partner input (see Program Action 8), we intend to meet at least annually with partners to review the status of partner-led actions and monitoring programs. Within MDIFW, we will continue to assess project status at least annually with MDIFW staff and our Steering Committee and communicate progress through our regular reporting procedures to USFWS.

5/6.6 PLANS FOR REVISION

States are required to review and revise, as appropriate, State Wildlife Action Plans (SWAP) 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 Action Plan. MDIFW will use the programmatic actions described above to monitor conservation action progress at least annually, and will summarize this information in annual reports to USFWS as required by the State Wildlife Grant Program. As described in Elements 7/8, MDIFW will also establish an Implementation Committee in the Fall of 2015 comprised of agency staff and conservation partners. This committee will meet at least annually to review Action Plan accomplishments and to address any emerging issues or adaptive management needs. We will undertake a comprehensive plan review beginning in year eight of the 2015 Action Plan that will include reviewing the criteria and literature used for designating SGCN. We will revisit the stressor levels assigned to SGCN and habitats and determine if our actions sufficiently prevented additional declines or actually improved stressor rankings. MDIFW and its conservation partners will develop a revised Action Plan by October 1, 2025 for submission to USFWS.

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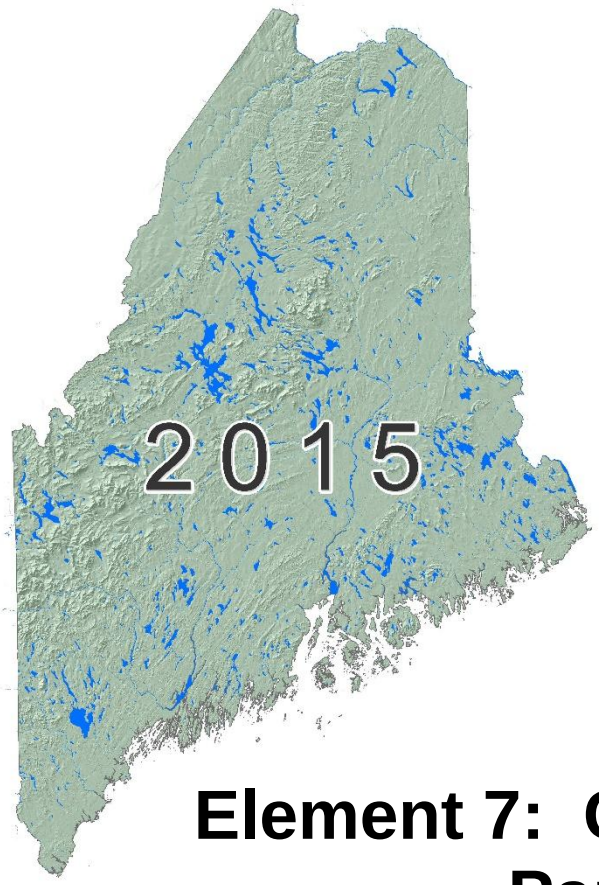

MAINE'S WILDLIFE ACTION PLAN

Element 7: Coordination with Partners &
Element 8: Public Participation

Prepared by

Maine Department of Inland Fisheries and Wildlife

In collaboration with

Maine's Conservation Partners

September 2015

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Element 8: Public Participation

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KEY TO ACRONYMS

BMP	Best Management Practices
CMP	Conservation Measures Partnership
GIS	Geographic Information System
IUCN	International Union for the Conservation of Nature
MDIFW	Maine Dept. of Inland Fisheries and Wildlife
MDMR	Maine Dept. of Marine Resources
MFS	Maine Forest Service
MNAP	Maine Natural Areas Program
RFP	Request for Proposals
SGCN	Species of Greatest Conservation Need
SWAP	State Wildlife Action Plan
SWG	State Wildlife Grants
SWOAM	Small Woodland Owners Association of Maine
USFWS	U.S. Fish and Wildlife Service

7/8.0 ABSTRACT

Maine has a long history of successful collaboration among conservation partners, conducting comprehensive wildlife planning and public involvement for 50 years. The Maine Department of Inland Fisheries and Wildlife (MDIFW) began assembling an Action Plan Coordination Team in January 2014. This planning team developed the strategies necessary to achieve the eight required elements of the 2015 State Wildlife Action Plan (SWAP). In September 2014, the Coordination Team established an Action Plan Steering Committee to guide the overall development of the SWAP. The Steering Committee represented the broader conservation partner group by providing regular review and advice concerning the activities and proposed strategies of the Coordination Team. The Coordination Team and the Steering Committee began preparing an Operational Charter early in the update to guide the development of the Action Plan; the Steering Committee officially adopted the charter in November 2014. The Coordination Team invited 158 conservation partners to participate in the preparation of Maine's 2015 Action Plan, representing 102 unique organizations and key members of the conservation public. From July 2014 – June 2015 the partners attended five, day-long 'conservation partner' meetings at which they collaboratively developed Elements 1-5 of the 2015 Action Plan.

MDIFW both informed the public of its intent to revise the Action Plan and encouraged public participation. It established a Public Outreach Subcommittee to guide its public participation efforts. The Subcommittee identified methods to engage the public and to solicit its comment. The Coordination Team and Steering Committee implemented these methods in a manner that made effective use of agency resources and ensured an appropriate level of public participation.

The success of Maine's 2015 Wildlife Action Plan depends on continued partner and public engagement during plan implementation. To guide implementation of the Action Plan and to encourage continued public involvement, MDIFW and the Steering Committee identified 11 Programmatic Conservation Actions.

7/8.1 INTRODUCTION

Element 7 (Coordination with Partners) requires MDIFW to coordinate, to the extent feasible, with federal, state, and local agencies and Indian tribes that manage significant areas of land or water within the state, or administer programs that significantly affect the conservation of Species of Greatest Conservation Need (SGCN) during development, implementation, review, and revision of Maine's Action Plan. Element 8 (Public Participation) requires MDIFW to provide an opportunity for public participation in the development of the Plan (AFWA 2012).

September 2015 Conservation Partner meeting. © Mark Stadler

Developing the partnerships identified in Elements 7 and 8 early in the Plan revision fostered partner ownership and support, maintained positive and collaborative relationships, and ensured that the Action Plan is a plan for all of Maine, not merely MDIFW.

MDIFW prepared the Plan in close cooperation with other natural resource agencies and organizations and built public and political support for the Action Plan. Maine's Action Plan reflects the input and values of Maine's diverse suite of conservation partners (federal, state, and local agencies, Indian tribes, academia, private conservation organizations, and the public). MDIFW achieved support for the Plan by ensuring that its update was transparent and open to public input. Successfully implementing many of the Plan's recommended conservation actions will require that the Action Plan is accomplished through coordinated actions undertaken in partnership. Complementary roles and actions with partners elevate conservation actions to broader levels, leverage scarce dollars, and avoid duplication of effort. To guide the implementation of the Plan and to encourage continued public involvement, MDIFW and the Steering Committee identified 11 Programmatic Actions (Section 7/8.5).

7/8.1.1 SIGNIFICANT DIFFERENCES FROM MAINE'S 2005 PLAN

MDIFW has conducted comprehensive wildlife planning and public involvement for 50 years, and has a long history of successful collaboration among conservation partners and the public. Most notable is MDIFW's species planning process (Chapters 6, 7, MDIFW 2005). MDIFW invoked this same historical practice in developing Maine's 2005 Action Plan (MDIFW 2005), and amplified upon this collaborative spirit as it prepared Maine's 2015 Plan. MDIFW invited 158 conservation partners to participate, more than double the 64 partners involved in 2005 (Table 7/8-1). In 2015, conservation partners represented 102 unique agencies and organizations, again doubling the 51 entities that prepared the 2005 Plan (Tables 7/8-1 and 7/8-2). During 2005, conservation partners participated in three day-long meetings to address the eight required elements of the Action Plan. In 2015, conservation partners attended fully five day-long meetings (Table 7/8-1).

> *"MDIFW has conducted comprehensive wildlife planning and public involvement for 50 years, and has a long history of successful collaboration among conservation partners and the public."*

MDIFW established an Action Plan Steering Committee to guide the overall development of the 2015 Plan (Section 7/8.2.2). The Steering Committee represented the broader conservation partner group and provided regular and timely review and advice concerning MDIFW's proposed strategies for accomplishing the 2015 revision; it also monitored Maine's progress in successfully accomplishing the larger, overall aspects of the Plan (AFWA 2012).

The Best Practices for State Wildlife Actions Plans (AFWA 2012) recommends that each state prepare a charter to formalize how conservation partners and fish and wildlife agencies will collaboratively develop their Action Plan. MDIFW and the Steering Committee prepared and adopted Maine's Action Plan Operational Charter (Section 7/8.2.3 and Appendix 7/8-1) in November 2014.

In addition to comparable public outreach activities undertaken in 2005, MDIFW provided a 30-day period during which the public had an opportunity to review the Plan and to provide comments and suggestions (Section 7/8.4). MDIFW broadly announced this opportunity and received several hundred comments, which it consolidated into approximately 50 distinct categories (Table 7/8-8). In addition, MDIFW met twice with forest and agricultural interests: once at the start of the Plan update and again during the public-comment period. Their comments and suggestions are reflected throughout Maine's conservation actions.

As Maine prepared its 2015 Action Plan, it adopted a team approach to authoring the several chapters of the Plan. We addressed Elements 1-4 as individual, stand-alone chapters; we combined Elements 5/6 into a single chapter to better address their close relationship. Similarly, and for the same reason, we combined Elements 7/8. These five sequential chapters constitute the Road Map to the Eight Required Elements.

Table 7/8-1. Comparison of Conservation Partner Engagement 2005 and 2015.

Partnership Metric	2005	2015
Number of Steering Committee members	0	12 (not including MDIFW staff)
Approximate number of conservation partners (individuals)	64	158
Approximate number of unique organizations	51	102
Number of partner meetings	3	5 (and steering committee and subcommittee meetings, workshops, and others described below)

7/8.2 ACTION PLAN COORDINATION TEAM / ACTION PLAN STEERING COMMITTEE

7/8.2.1 ACTION PLAN COORDINATION TEAM

MDIFW began assembling an Action Plan Coordination Team in January 2014. This planning team met bi-weekly and developed the strategies necessary to achieve the eight required elements of the 2015 Plan. As the planning responsibilities of the team broadened, it reached out to include additional individuals. Maine's Coordination Team included the following individuals:

Judy Camuso, Wildlife Division Director, MDIFW
Andrew Cutko, Ecologist, Maine Natural Areas Program
Phillip deMaynadier, Reptile, Amphibian, and Invertebrate Group Leader, MDIFW
Claire Enterline, Diadromous Fisheries Scientist, Maine Department of Marine Resources
Amanda Shearin, Wildlife Planner and Biologist, MDIFW
Mark Stadler, Wildlife Action Plan Coordinator, MDIFW (retired)
Charlie Todd, Endangered and Threatened Species Coordinator, MDIFW
Nathan Webb, Special Projects Biologist, MDIFW

One of the team's initial actions was to identify conservation partners who would participate in developing the Plan (Table 7/8-2).

7/8.2.2 ACTION PLAN STEERING COMMITTEE

In September 2014, the Coordination Team established an Action Plan Steering Committee to guide the Plan's overall development. The Steering Committee represented the broader conservation partner group by providing regular review and advice concerning the activities and proposed strategies of the Coordination Team. The Committee assisted the Coordination Team with planning conservation partner meetings (five, day-long meetings occurring from July 2014 – June 2015), reviewed strategies for developing the Action Plan prior to implementation with partners, and provided suggestions on partner meeting agendas, meeting format, and the presentation of information to partners. Because the Coordination Team was concerned largely with the week-to-week aspects of Plan preparation, the team asked the Steering Committee to monitor MDIFW's success in accomplishing the larger, overall aspects of the Action Plan (AFWA 2012). The Committee served as ambassadors for the larger group of conservation partners and provided quality-control as development of the Plan progressed. The Steering Committee met monthly, generally for four to five hours. MDIFW recorded the minutes of each meeting and made these available to the public on the Action Plan website (http://www.maine.gov/ifw/wildlife/reports/MWAP2015.html).

Conservation Partner break-out session.
© Mark Stadler

The Nature Conservancy, a member of the Committee, provided Open Standards (CMP 2013) training for MDIFW, members of the Steering Committee, and several conservation partners prior to developing SGCN habitat conservation actions. Following the training, MDIFW, MDMR, MNAP, and several conservation partners met for two, day-long sessions to develop preliminary SGCN habitat conservation actions for (1) Terrestrial / Wetland and (2) Coastal / Marine / Freshwater habitats.

The Steering Committee consisted of representatives from:

Brunswick-Topsham Land Trust - Angela Twitchell
Maine Audubon Society - Sally Stockwell
Maine Coastal Program - Emily Norton
Maine Dept. of Marine Resources - Claire Enterline
U.S. Fish and Wildlife Service - Jed Wright and Mitchka Hartley
Maine Coast Heritage Trust - Tim Glidden
Maine Forest Products Council - Barry Burgason
Maine Natural Areas Program - Molly Docherty
Natural Resources Conservation Service, U.S. Dept. of Agriculture - Jeff Norment
Small Woodland Owners Association of Maine - Tom Doak
The Nature Conservancy - Barbara Vickery
Maine Dept. of Inland Fisheries and Wildlife - Judy Camuso, Amanda Shearin, Nate Webb, Charlie Todd, Phillip deMaynadier, Mark Stadler

7/8.2.3 SWAP REVIEW AND UPDATE CHARTER

The Best Practices for State Wildlife Actions Plans (AFWA 2012) recommends that each state prepare a charter to formalize how conservation partners and fish and wildlife agencies will collaboratively develop their Action Plan. The Coordination Team and the Steering Committee began preparing Maine's Operational Charter early in the update; the Steering Committee adopted the charter in November 2014 (Appendix 7/8-2). The Operational Charter outlines the organizational structure that MDIFW and partners established to accomplish the Action Plan update, the process they would use, and the schedule for completing specific tasks. The charter explicitly defines and delineates key roles, responsibilities, and contributions for MDIFW and partners. Maine's Operational Charter addresses the following:

1. Introduction
2. Statement of Purpose: Maine's Wildlife Action Plan
3. Guiding Principles
4. Operational Guidance for Conservation Partners, Including the Steering Committee and Subcommittees

5.0 Process Structure
- 5.1. Conservation partners
- 5.2. Steering Committee
- 5.3. Subcommittees

6.0 Evaluation

7/8.3 COORDINATION WITH CONSERVATION PARTNERS

The Coordination Team invited 158 conservation partners to participate in the preparation of Maine's 2015 SWAP, representing 102 unique organizations and key members of the conservation public (Table 7/8-2).

Federal partners	14
State partners	14
Tribal partners	5
Public and Local partners	68 (includes non-governmental conservation organizations)

From July 2014 – June 2015 the partners attended five, day-long conservation partner meetings at which they collaboratively developed Elements 1-5 of the 2015 Action Plan (Tables 7/8-3 - 7/8-6, Appendix 7/8-2).

Table 7/8-2. Conservation Partners invited to participate in the preparation of Maine's 2015 SWAP.

Federal
Acadia National Park Maine Army National Guard National Marine Fisheries Service [Maine Field Station] Natural Resource Conservation Service National Oceanic and Atmospheric Administration U.S. Fish and Wildlife Service, Ecological Services USFWS Gulf of Maine Coastal Program USFWS Maine Fishery Resource Office USFWS North Atlantic Landscape Conservation Cooperative USFWS Maine Wildlife Action Plan Contact USFWS Aroostook, National Wildlife Refuge System USFWS Maine Coastal Islands NWR USFWS Moosehorn NWR USFWS Rachel Carson NWR
State
Baxter State Park DACF(1) Bureau of Agriculture, Resource Development Division DACF Bureau of Agriculture, Food and Rural Resources DACF Land Use Planning Commission DACF Lands for Maine's Future Program DACF Maine Coastal Program DACF Maine Forest Service DACF Maine Natural Areas Program DACF Municipal Planning Assistance Program DAFC Bureau of Parks and Lands Dept. of Environmental Protection Dept. of Marine Resources Dept. of Inland Fisheries and Wildlife Dept. of Transportation, Environmental Office (1)Dept. of Agriculture, Conservation, and Forestry
Tribes
Aroostook Band of MicMac Indians Houlton Band of Maliseet Indians Passamaquoddy Tribe Indian Township Reservation Passamaquoddy Tribe Pleasant Point Reservation Penobscot Nation

Table 7/8-2. *continued: page 2 of 3.*

Public and Local
Appalachian Conservation Biology
Atlantic Salmon Federation
Biodiversity Research Institute
Brunswick Topsham Land Trust
Casco Bay Estuary Partnership
Coastal Mountains Land Trust
Conservation Law Foundation - Maine Advocacy Center
Cornell University
Defenders of Wildlife
Downeast Lakes Land Trust
Downeast Salmon Federation
Ducks Unlimited
Endangered Species Coalition
Forest Society of Maine
GrowSmart Maine
Gulf of Maine Research Institute
Island Institute
Lakes Environmental Association
Maine Aquaculture Association
Maine Association of Wetland Scientists
Maine Association of Conservation Commissions
Maine Association of Planners
Maine Audubon Society
Maine Birding Trail
Maine Bowhunters Association
Maine Chamber of Commerce
Maine Chapter of the Sierra Club
Maine Chapter of the Wildlife Society
Maine Coast Heritage Trust
Maine Cooperative Fish & Wildlife Research Unit
Maine Discovery Museum
Maine Farm Bureau
Maine Farmland Trust
Maine Forest Products Council
Maine Lakes Society
Maine Maritime Academy
Maine Professional Guides Association
Maine Rivers
Maine SeaGrant
Maine Tourism Association
Maine Trappers Association
Maine's Teaming With Wildlife / SWG Coalition
Manomet Center for Conservation Science
MDIFW Advisory Council
Mt. Agamenticus to the Sea Conservation Initiative

Table 7/8-2. *continued: page 3 of 3.*

Public and Local (continued)
National Wild Turkey Federation
Natural Resources Council of Maine
North Maine Woods
Northern Maine Partner
Orono Land Trust
Project Share
Restore: The North Woods
Royal River Conservation Trust
Ruffed Grouse Society
Senator George Mitchell Center / Sustainability Solutions Initiative
Small Woodland Owners Association of Maine
Sportsmen's Alliance of Maine
Suffolk University
The Nature Conservancy
Trout Unlimited
University of Maine at Machias, School of Marine Sciences
University of Maine, Orono, Department of Wildlife Ecology
University of Maine, Orono, School of Forest Resources
University of Maine, Orono, School of Biological Sciences
University of New England
University of Southern Maine
Wells Reserve
Wildlife Alliance of Maine

7/8.3.1 COORDINATION WITH FEDERAL PARTNERS

The Coordination Team invited 14 federal conservation partners to participate in the preparation of the 2015 Action Plan (Table 7/8-2). Federal partners served on the Steering Committee, attended the five conservation partner meetings, and participated in several workshops and training sessions (Table 7/8-3). Federal partners from Region 5, USFWS, provided an essential link with the tribal partners.

7/8.3.2 COORDINATION WITH STATE PARTNERS

Fourteen state agency partners participated in the preparation of the 2015 Action Plan (Table 7/8-2). State partners served on the Steering Committee, attended the five conservation partner meetings, and participated in several workshops and training sessions (Table 7/8-4).

7/8.3.3 COORDINATION WITH TRIBAL PARTNERS

The Coordination Team and Steering Committee invited representatives from five Maine tribes to participate (Table 7/8-2). Tribal partners attended one of the five conservation partner meetings (Table 7/8-5). In March 2015, Maine tribes met with staff from the USFWS and members of the Steering Committee. The day-long meeting addressed opportunities for collaboration between federal, state, and tribal partners in the development and funding of conservation programs for SGCN. The tribes requested that species of tribal cultural significance be included on Maine's list of SGCN species. Maine revised its SGCN list to include those species (Element 1).

7/8.3.4 COORDINATION WITH PUBLIC AND LOCAL PARTNERS, INCLUDING NON-GOVERNMENTAL ORGANIZATIONS

Sixty-six public conservation partners, including non-governmental conservation organizations and academia, assisted with the preparation of 2015 Plan, participating in all aspects of Plan development (Tables 7/8-2 and 7/8-6).

Table 7/8-3. Extent of coordination with Federal Partners.

Month / Year	Event	Federal Agencies	Acadia National Park	Maine Army National Guard	National Marine Fisheries Service (Maine Field Station)	Natural Resource Conservation Service	National Oceanic and Atmospheric Administration	U.S. Fish and Wildlife Service, Ecological Services	USFWS Gulf of Maine Coastal Program	USFWS Maine Fishery Resource Office	USFWS North Atlantic Landscape Conservation Cooperative	USFWS, Region 5	USFWS Aroostook National Wildlife Refuge	USFWS Maine Coastal Islands NWR	USFWS Moosehorn NWR	USFWS Rachel Carson NWR	U.S. Geological Survey, Maine Cooperative Fish and Wildlife Research Unit
May 2014	Invited to participate in 2015 action plan update		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
July 2014	Conservation Partners Meeting #1		X					X	X			X		X		X	X
	Maine Department of Marine Resources Information Session																
August 2014	Public Outreach Subcommittee Meeting																
September 2014	Landowners Meeting																
	Keeping Maine's Forests Implementation Committee																
	Steering Committee Meeting					X				X		X					
	MDIFW Advisory Council Meeting																
	Conservation Partners Meeting #2		X			X		X	X				X	X	X	X	
October 2014	Stanton Bird Club Annual Meeting																
	Society of American Foresters Fall Meeting																
	Steering Committee Meeting					X				X							
November 2014	Tribal Engagement Conference Call with USFWS																
	SFI-Fisheries Improvement Network																
	Conservation Partners Meeting #3							X	X				X				
	Steering Committee Meeting					X				X							
	Human Dimensions Meeting																

Table 7/8-3. *continued: page 2 of 3.*

Month / Year	Event	**Federal Agencies**	Acadia National Park	Maine Army National Guard	National Marine Fisheries Service (Maine Field Station)	Natural Resource Conservation Service	National Oceanic and Atmospheric Administration	U.S. Fish and Wildlife Service, Ecological Services	USFWS Gulf of Maine Coastal Program	USFWS Maine Fishery Resource Office	USFWS North Atlantic Landscape Conservation Cooperative	USFWS, Region 5	USFWS Aroostook National Wildlife Refuge	USFWS Maine Coastal Islands NWR	USFWS Moosehorn NWR	USFWS Rachel Carson NWR	U.S. Geological Survey, Maine Cooperative Fish and Wildlife Research Unit
December 2014	Unity College Herpetology Class																
	Tribal Engagement Conference Call with USFWS																
	Steering Committee Meeting					X				X							
	Tribal Engagement Conference Call																
January 2015	Conservation Partner Meeting #4		X					X							X		
	Steering Committee Meeting					X											
February 2015	Steering Committee Meeting									X							
	Open Standards Training					X				X							
	Marine/Coastal/Aquatic Conservation Proposal Brainstorming		X							X							
	Terrestrial/Wetland Conservation Proposal Brainstorming					X											
March 2015	NE Cottontail Working Group Annual Meeting																
	Eastern Maine Sportsman Show																
	Steering Committee Meeting									X							
	Presque Isle Sportsman Show																
	Maine Association of Wetland Scientists Annual Meeting																
	Maine Tribal Engagement Meeting																
	State of Maine Sportsman Show																
	Maine Dept. of Transportation Meeting on Invasive Species Actions																
	Brunswick Conservation Commission Presentation																

Table 7/8-3. *continued: page 3 of 3.*

Month / Year	Event	**Federal Agencies**	Acadia National Park	Maine Army National Guard	National Marine Fisheries Service (Maine Field Station)	Natural Resource Conservation Service	National Oceanic and Atmospheric Administration	U.S. Fish and Wildlife Service, Ecological Services	USFWS Gulf of Maine Coastal Program	USFWS Maine Fishery Resource Office	USFWS North Atlantic Landscape Conservation Cooperative	USFWS, Region 5	USFWS Aroostook National Wildlife Refuge	USFWS Maine Coastal Islands NWR	USFWS Moosehorn NWR	USFWS Rachel Carson NWR	U.S. Geological Survey, Maine Cooperative Fish and Wildlife Research Unit
April 2015	Steering Committee Meeting					X											
	Marine/Coastal Conservation Action Theme Development Meeting		X														
	Terrestrial/Wetland Conservation Action Theme Development Meeting																
	Steering Committee Review of Habitat Conservation Actions																
	Maine Land Trust Network Conference Workshop																
May 2015	York County Community College Environmental Science Class																
	Maine Association of Conservation Commissions Annual Meeting																
	Steering Committee Meeting					X				X							
June 2015	Steering Committee Meeting					X			X					X		X	
	Maine Forest Products Council Presentation																
	Landowner Meeting																
	Conservation Partners Meeting #5													X			
July 2015	30-day Public Comment Period on Draft Action Plan											X		X			

Table 7/8-4. Extent of coordination with State Partners.

Month / Year	Event	State Agencies	Baxter State Park Authority	DACF(1) Bureau of Agriculture, Resource Development Division	DACF Bureau of Agriculture, Food, and Rural Resources	DACF Land Use Planning Commission	DACF Lands for Maine's Future Program	DACF Maine Coastal Program	DACF Maine Forest Service	DACF Maine Natural Areas Program	DACF Municipal Planning Assistance Program	DACF Bureau of Parks and Lands	Dept. of Environmental Protection	Dept. of Marine Resources	Maine Dept. of Inland Fisheries and Wildlife, Advisory Council	Dept. of Transportation, Environmental Office	Maine Army National Guard
May 2014	Invited to participate in 2015 action plan update		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
July 2014	Conservation Partners Meeting #1					X		X	X	X	X			X	X	X	X
	Maine Department of Marine Resources Information Session																
August 2014	Public Outreach Subcommittee Meeting											X					
September 2014	Landowners Meeting																
	Keeping Maine's Forests Implementation Committee																
	Steering Committee Meeting									X							
	MDIFW Advisory Council Meeting														X		
	Conservation Partners Meeting #2					X		X	X	X	X	X		X		X	X
October 2014	Stanton Bird Club Annual Meeting																
	Society of American Foresters Fall Meeting																
	Steering Committee Meeting									X							
November 2014	Tribal Engagement Conference Call with USFWS																
	SFI-Fisheries Improvement Network																
	Conservation Partners Meeting #3				X			X		X				X			
	Steering Committee Meeting									X							
	Human Dimensions Meeting																

Table 7/8-4. *continued: page 2 of 3.*

Month / Year	Event	State Agencies	Baxter State Park Authority	DACF(1) Bureau of Agriculture, Resource Development Division	DACF Bureau of Agriculture, Food, and Rural Resources	DACF Land Use Planning Commission	DACF Lands for Maine's Future Program	DACF Maine Coastal Program	DACF Maine Forest Service	DACF Maine Natural Areas Program	DACF Municipal Planning Assistance Program	DACF Bureau of Parks and Lands	Dept. of Environmental Protection	Dept. of Marine Resources	Maine Dept. of Inland Fisheries and Wildlife, Advisory Council	Dept. of Transportation, Environmental Office	Maine Army National Guard
December 2014	Unity College Herpetology Class																
	Tribal Engagement Conference Call with USFWS																
	Steering Committee Meeting									X							
	Tribal Engagement Conference Call																
January 2015	Conservation Partner Meeting #4				X			X	X	X				X			
	Steering Committee Meeting									X							
February 2015	Steering Committee Meeting							X		X							
	Open Standards Training							X		X							
	Marine/Coastal/Aquatic Conservation Proposal Brainstorming							X		X				X			
	Terrestrial/Wetland Conservation Proposal Brainstorming									X							
March 2015	NE Cottontail Working Group Annual Meeting																
	Eastern Maine Sportsman Show																
	Steering Committee Meeting													X			
	Presque Isle Sportsman Show																
	Maine Association of Wetland Scientists Annual Meeting																
	Maine Tribal Engagement Meeting																
	State of Maine Sportsman Show																
	Maine Dept. of Transportation Meeting on Invasive Species Actions															X	
	Brunswick Conservation Commission Presentation																
April 2015	Steering Committee Meeting							X		X				X			
	Marine/Coastal Conservation Action Theme Development Meeting							X						X			

Table 7/8-4. *continued: page 3 of 3.*

Month / Year	Event	State Agencies	Baxter State Park Authority	DACF(1) Bureau of Agriculture, Resource Development Division	DACF Bureau of Agriculture, Food, and Rural Resources	DACF Land Use Planning Commission	DACF Lands for Maine's Future Program	DACF Maine Coastal Program	DACF Maine Forest Service	DACF Maine Natural Areas Program	DACF Municipal Planning Assistance Program	DACF Bureau of Parks and Lands	Dept. of Environmental Protection	Dept. of Marine Resources	Maine Dept. of Inland Fisheries and Wildlife, Advisory Council	Dept. of Transportation, Environmental Office	Maine Army National Guard
April 2015 (continued)	Terrestrial/Wetland Conservation Action Theme Development Meeting									X							
	Steering Committee Review of Habitat Conservation Actions							X		X				X			
	Maine Land Trust Network Conference Workshop																
May 2015	York County Community College Environmental Science Class																
	Maine Association of Conservation Commissions Annual Meeting																
	Steering Committee Meeting							X		X							
June 2015	Steering Committee Meeting																
	Maine Forest Products Council Presentation																
	Landowner Meeting																
	Conservation Partners Meeting #5					X	X	X		X	X					X	
July 2015	30-day Public Comment Period on Draft Action Plan								X								
(1) Dept. of Agriculture, Conservation, and Forestry																	

Table 7/8-5. Extent of coordination with Tribal Partners.

Month / Year	Event	**Tribal Partners**	Aroostook Band or MicMac Indians	Houlton Band of Maliseet Indians	Passamaquoddy Tribe, Indian Township Reservation	Passamaquoddy Tribe, Pleasant Point Reservation	Penobscot Nation
May 2014	Invited to participate in 2015 action plan update		X	X	X	X	X
July 2014	Conservation Partners Meeting #1						X
	Maine Department of Marine Resources Information Session						
August 2014	Public Outreach Subcommittee Meeting						
September 2014	Landowners Meeting						
	Keeping Maine's Forests Implementation Committee						
	Steering Committee Meeting						
	MDIFW Advisory Council Meeting						
	Conservation Partners Meeting #2						
October 2014	Stanton Bird Club Annual Meeting						
	Society of American Foresters Fall Meeting						
	Steering Committee Meeting						
November 2014	Tribal Engagement Conference Call with USFWS						
	SFI-Fisheries Improvement Network						
	Conservation Partners Meeting #3						
	Steering Committee Meeting						
	Human Dimensions Meeting						
December 2014	Unity College Herpetology Class						
	Tribal Engagement Conference Call with USFWS						
	Steering Committee Meeting						
	Tribal Engagement Conference Call						
January 2015	Conservation Partner Meeting #4						
	Steering Committee Meeting						
February 2015	Steering Committee Meeting						
	Open Standards Training						
	Marine/Coastal/Aquatic Conservation Proposal Brainstorming						
	Terrestrial/Wetland Conservation Proposal Brainstorming						

Table 7/8-5. *continued: page 2 of 2.*

Month / Year	Event	**Tribal Partners**	Aroostook Band or MicMac Indians	Houlton Band of Maliseet Indians	Passamaquoddy Tribe, Indian Township Reservation	Passamaquoddy Tribe, Pleasant Point Reservation	Penobscot Nation
March2015	NE Cottontail Working Group Annual Meeting						
	Eastern Maine Sportsman Show						
	Steering Committee Meeting						
	Presque Isle Sportsman Show						
	Maine Association of Wetland Scientists Annual Meeting						
	Maine Tribal Engagement Meeting		X	X	X	X	X
	State of Maine Sportsman Show						
	Maine Dept. of Transportation Meeting on Invasive Species Actions						
	Brunswick Conservation Commission Presentation						
April 2015	Steering Committee Meeting						
	Marine/Coastal Conservation Action Theme Development Meeting						
	Terrestrial/Wetland Conservation Action Theme Development Meeting						
	Steering Committee Review of Habitat Conservation Actions						
	Maine Land Trust Network Conference Workshop						
May 2015	York County Community College Environmental Science Class						
	Maine Association of Conservation Commissions Annual Meeting						
	Steering Committee Meeting						
June 2015	Steering Committee Meeting						
	Maine Forest Products Council Presentation						
	Landowner Meeting						
	Conservation Partners Meeting #5						
July 2015	30-day Public Comment Period on Draft Action Plan			X			

Table 7/8-6. Extent of coordination with Public and Local Partners.

Month / Year	Event	Members of the General Public	Public and Local Partners	Appalachian Conservation Biology	Atlantic Salmon Federation	Biodiversity Research Institute	Brunswick-Topsham Land Trust	Casco Bay Estuary Project	Coastal Mountains Land Trust	Conservation Law Foundation, Maine Advocacy Center	Cornell University	Defenders of Wildlife	Downeast Lakes Land Trust	Downeast Salmon Federation	Ducks Unlimited	Endangered Species Coalition	Forest Society of Maine	GrowSmart Maine	Gulf or Maine Research Institute	Island Institute	Lakes Environmental Association	Maine Aquaculture Association	Maine Association of Wetland Scientists	Maine Audubon Society	Maine Birding Trail	Maine Bowhunters Association
May 2014	Invited to participate in 2015 action plan update			X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
July 2014	Conservation Partners Meeting #1					X	X										X						X	X		X
	Maine Department of Marine Resources Information Session																									
August 2014	Public Outreach Subcommittee Meeting																							X		
September 2014	Landowners Meeting						X										X									
	Keeping Maine's Forests Implementation Committee	X																								
	Steering Committee Meeting						X																	X		
	MDIFW Advisory Council Meeting																									
	Conservation Partners Meeting #2			X			X	X					X			X	X						X	X		X
October 2014	Stanton Bird Club Annual Meeting	X																								
	Society of American Foresters Fall Meeting	X																								
	Steering Committee Meeting						X																	X		
November 2014	Tribal Engagement Conference Call with USFWS																									
	SFI-Fisheries Improvement Network	X																								
	Conservation Partners Meeting #3							X					X										X	X		X
	Steering Committee Meeting						X																	X		
	Human Dimensions Meeting																									
December 2014	Unity College Herpetology Class	X																								
	Tribal Engagement Conference Call with USFWS																									
	Steering Committee Meeting						X																	X		
	Tribal Engagement Conference Call																									
January 2015	Conservation Partner Meeting #4						X	X															X			
	Steering Committee Meeting																							X		

Table 7/8-6. *continued: page 2 of 9.*

Month / Year	Event	**Members of the General Public**	**Public and Local Partners**	Appalachian Conservation Biology	Atlantic Salmon Federation	Biodiversity Research Institute	Brunswick-Topsham Land Trust	Casco Bay Estuary Project	Coastal Mountains Land Trust	Conservation Law Foundation, Maine Advocacy Center	Cornell University	Defenders of Wildlife	Downeast Lakes Land Trust	Downeast Salmon Federation	Ducks Unlimited	Endangered Species Coalition	Forest Society of Maine	GrowSmart Maine	Gulf or Maine Research Institute	Island Institute	Lakes Environmental Association	Maine Aquaculture Association	Maine Association of Wetland Scientists	Maine Audubon Society	Maine Birding Trail	Maine Bowhunters Association
February 2015	Steering Committee Meeting						X																	X		
	Open Standards Training						X																	X		
	Marine/Coastal/Aquatic Conservation Proposal Brainstorming							X						X									X			
	Terrestrial/Wetland Conservation Proposal Brainstorming																X							X		
March 2015	NE Cottontail Working Group Annual Meeting	X																								
	Eastern Maine Sportsman Show	X																								
	Steering Committee Meeting						X																	X		
	Presque Isle Sportsman Show	X																								
	Maine Association of Wetland Scientists Annual Meeting																						X			
	Maine Tribal Engagement Meeting																									
	State of Maine Sportsman Show	X																								
	Maine Dept. of Transportation Meeting on Invasive Species Actions																									
	Brunswick Conservation Commission Presentation	X																								
April 2015	Steering Committee Meeting																								X	
	Marine/Coastal Conservation Action Theme Development Meeting													X												
	Terrestrial/Wetland Conservation Action Theme Development Meeting																									
	Steering Committee Review of Habitat Conservation Actions																									
	Maine Land Trust Network Conference Workshop	X																								

Table 7/8-6. *continued: page 3 of 9.*

Month / Year	Event	Members of the General Public	Public and Local Partners	Appalachian Conservation Biology	Atlantic Salmon Federation	Biodiversity Research Institute	Brunswick-Topsham Land Trust	Casco Bay Estuary Project	Coastal Mountains Land Trust	Conservation Law Foundation, Maine Advocacy Center	Cornell University	Defenders of Wildlife	Downeast Lakes Land Trust	Downeast Salmon Federation	Ducks Unlimited	Endangered Species Coalition	Forest Society of Maine	GrowSmart Maine	Gulf or Maine Research Institute	Island Institute	Lakes Environmental Association	Maine Aquaculture Association	Maine Association of Wetland Scientists	Maine Audubon Society	Maine Birding Trail	Maine Bowhunters Association
May 2015	York County Community College Environmental Science Class	X																								
	Maine Association of Conservation Commissions Annual Meeting	X																								
	Steering Committee Meeting																							X		
June 2015	Steering Committee Meeting																									
	Maine Forest Products Council Presentation																									
	Landowner Meeting																									
	Conservation Partners Meeting #5	X														X						X	X	X		
July 2015	30-day Public Comment Period on Draft Action Plan	X																				X				

Table 7/8-6. *continued: page 4 of 9.*

Month / Year	Event	Public and Local Partners	Maine Chamber of Commerce	Maine Chapter of the Sierra Club	Maine Chapter or the Wildlife Society	Maine Coast Heritage Trust	Maine Discovery Museum	Maine Farm Bureau	Maine Farmland Trust	Maine Forest Products Council	Maine Lakes Society	Maine Maritime Academy	Maine Professional Guides Association	Maine Rivers	Maine SeaGrant	Maine Tourism Association	Maine Trappers Association	Maine Teaming with Wildlife – State Wildlife Grant Coalition	Manomet Center for Conservation Science	Mt. Agamenticus to the Sea	National Wild Turkey Federation	Natural Resources Council of Maine	North Maine Woods	Northern Maine Partner	Orono Land Trust	Project Share	Restore: The North Woods
May 2014	Invited to participate in 2015 action plan update		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
July 2014	Conservation Partners Meeting #1				X	X		X						X	X	X	X	X	X	X					X		
	Maine Department of Marine Resources Information Session																										
August 2014	Public Outreach Subcommittee Meeting									X																	
September 2014	Landowners Meeting							X		X																	
	Keeping Maine's Forests Implementation Committee																										
	Steering Committee Meeting																										
	MDIFW Advisory Council Meeting																										
	Conservation Partners Meeting #2				X	X		X		X			X			X	X	X	X						X		X
October 2014	Stanton Bird Club Annual Meeting																										
	Society of American Foresters Fall Meeting																										
	Steering Committee Meeting									X																	
November 2014	Tribal Engagement Conference Call with USFWS																										
	SFI-Fisheries Improvement Network																										
	Conservation Partners Meeting #3				X			X		X					X		X	X							X	X	
	Steering Committee Meeting					X				X																	
	Human Dimensions Meeting																										
December 2014	Unity College Herpetology Class																										
	Tribal Engagement Conference Call with USFWS																										
	Steering Committee Meeting					X				X																	
	Tribal Engagement Conference Call																										
January 2015	Conservation Partner Meeting #4												X		X		X	X	X						X		X
	Steering Committee Meeting																										

Table 7/8-6. *continued: page 5 of 9.*

Month / Year	Event	Public and Local Partners	Maine Chamber of Commerce	Maine Chapter of the Sierra Club	Maine Chapter or the Wildlife Society	Maine Coast Heritage Trust	Maine Discovery Museum	Maine Farm Bureau	Maine Farmland Trust	Maine Forest Products Council	Maine Lakes Society	Maine Maritime Academy	Maine Professional Guides Association	Maine Rivers	Maine SeaGrant	Maine Tourism Association	Maine Trappers Association	Maine Teaming with Wildlife – State Wildlife Grant Coalition	Manomet Center for Conservation Science	Mt. Agamenticus to the Sea	National Wild Turkey Federation	Natural Resources Council of Maine	North Maine Woods	Northern Maine Partner	Orono Land Trust	Project Share	Restore: The North Woods
February 2015	Steering Committee Meeting					X				X																	
	Open Standards Training					X																					
	Marine/Coastal/Aquatic Conservation Proposal Brainstorming					X								X													
	Terrestrial/Wetland Conservation Proposal Brainstorming									X								X	X						X		
March2015	NE Cottontail Working Group Annual Meeting																										
	Eastern Maine Sportsman Show																										
	Steering Committee Meeting					X				X																	
	Presque Isle Sportsman Show																										
	Maine Ass'n of Wetland Scientists Annual Meeting																										
	Maine Tribal Engagement Meeting																										
	State of Maine Sportsman Show																										
	Maine Dept. of Transportation Meeting on Invasive Species Actions																										
	Brunswick Conservation Commission Presentation																										
April 2015	Steering Committee Meeting									X																	
	Marine/Coastal Conservation Action Theme Development Meeting																										
	Terrestrial/Wetland Conservation Action Theme Development Meeting																										
	Steering Committee Review of Habitat Conservation Actions																										
	Maine Land Trust Network Conference Workshop																										

Table 7/8-6. *continued: page 6 of 9.*

Month / Year	Event	Public and Local Partners	Maine Chamber of Commerce	Maine Chapter of the Sierra Club	Maine Chapter or the Wildlife Society	Maine Coast Heritage Trust	Maine Discovery Museum	Maine Farm Bureau	Maine Farmland Trust	Maine Forest Products Council	Maine Lakes Society	Maine Maritime Academy	Maine Professional Guides Association	Maine Rivers	Maine SeaGrant	Maine Tourism Association	Maine Trappers Association	Maine Teaming with Wildlife – State Wildlife Grant Coalition	Manomet Center for Conservation Science	Mt. Agamenticus to the Sea	National Wild Turkey Federation	Natural Resources Council of Maine	North Maine Woods	Northern Maine Partner	Orono Land Trust	Project Share	Restore: The North Woods
May 2015	York County Community College Environmental Science Class																										
	Maine Ass'n of Conservation Commissions Annual Meeting																										
	Steering Committee Meeting									X																	
June 2015	Steering Committee Meeting																										
	Maine Forest Products Council Presentation																										
	Landowner Meeting																										
	Conservation Partners Meeting #5				X	X							X		X		X										X
July 2015	30-day Public Comment Period on Draft Action Plan							X							X				X			X					

Table 7/8-6. *continued: page 7 of 9.*

Month / Year	Event	Public and Local Partners	Royal River Conservation Trust	Ruffed Grouse Society	Senator George Mitchell Center / Sustainability Solutions Initiative	Small Woodland Owners Association of Maine	Sportsmen's Alliance of Maine	Suffolk University	The Nature Conservancy	Trout Unlimited	University of Maine, Machias School of Marine Sciences	University of Maine, Orono School of Forest Resources and Dept. of Wildlife Ecology	University of Maine, Orono School of Biological Sciences	University of New England	University of Southern Maine	Wells Estuarine Reserve	Wildlife Alliance of Maine	Maine Association of Conservation Commissions	Maine Association of Planners
May 2014	Invited to participate in 2015 action plan update		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
July 2014	Conservation Partners Meeting #1					X			X			X		X		X	X		X
	Maine Department of Marine Resources Information Session																		
August 2014	Public Outreach Subcommittee Meeting											X							
September 2014	Landowners Meeting					X			X										
	Keeping Maine's Forests Implementation Committee																		
	Steering Committee Meeting					X			X										
	MDIFW Advisory Council Meeting																		
	Conservation Partners Meeting #2						X		X	X		X				X			
October 2014	Stanton Bird Club Annual Meeting																		
	Society of American Foresters Fall Meeting																		
	Steering Committee Meeting					X			X										
November 2014	Tribal Engagement Conference Call with USFWS																		
	SFI-Fisheries Improvement Network																		
	Conservation Partners Meeting #3						X		X	X		X							
	Steering Committee Meeting								X										
	Human Dimensions Meeting											X							
December 2014	Unity College Herpetology Class																		
	Tribal Engagement Conference Call with USFWS																		
	Steering Committee Meeting					X			X										
	Tribal Engagement Conference Call																		
January 2015	Conservation Partner Meeting #4						X		X										
	Steering Committee Meeting					X			X										

Table 7/8-6. *continued: page 8 of 9.*

Month / Year	Event	**Public and Local Partners**	Royal River Conservation Trust	Ruffed Grouse Society	Senator George Mitchell Center / Sustainability Solutions Initiative	Small Woodland Owners Association of Maine	Sportsmen's Alliance of Maine	Suffolk University	The Nature Conservancy	Trout Unlimited	University of Maine, Machias School of Marine Sciences	University of Maine, Orono School of Forest Resources and Dept. of Wildlife Ecology	University of Maine, Orono School of Biological Sciences	University of New England	University of Southern Maine	Wells Estuarine Reserve	Wildlife Alliance of Maine	Maine Association of Conservation Commissions	Maine Association of Planners
February 2015	Steering Committee Meeting								X										
	Open Standards Training								X										
	Marine/Coastal/Aquatic Conservation Proposal Brainstorming								X	X			X		X				
	Terrestrial/Wetland Conservation Proposal Brainstorming					X			X										
March 2015	NE Cottontail Working Group Annual Meeting																		
	Eastern Maine Sportsman Show																		
	Steering Committee Meeting								X										
	Presque Isle Sportsman Show																		
	Maine Association of Wetland Scientists Annual Meeting																	X	
	Maine Tribal Engagement Meeting																		
	State of Maine Sportsman Show																		
	Maine Dept. of Transportation Meeting on Invasive Species Actions																		
	Brunswick Conservation Commission Presentation																		
April 2015	Steering Committee Meeting					X			X										
	Marine/Coastal Conservation Action Theme Development Meeting											X							
	Terrestrial/Wetland Conservation Action Theme Development Meeting								X										
	Steering Committee Review of Habitat Conservation Actions					X			X										
	Maine Land Trust Network Conference Workshop																		

Table 7/8-6. *continued: page 9 of 9.*

Month / Year	Event	**Public and Local Partners**	Royal River Conservation Trust	Ruffed Grouse Society	Senator George Mitchell Center / Sustainability Solutions Initiative	Small Woodland Owners Association of Maine	Sportsmen's Alliance of Maine	Suffolk University	The Nature Conservancy	Trout Unlimited	University of Maine, Machias School of Marine Sciences	University of Maine, Orono School of Forest Resources and Dept. of Wildlife Ecology	University of Maine, Orono School of Biological Sciences	University of New England	University of Southern Maine	Wells Estuarine Reserve	Wildlife Alliance of Maine	Maine Association of Conservation Commissions	Maine Association of Planners
May 2015	York County Community College Environmental Science Class																		
	Maine Association of Conservation Commissions Annual Meeting																		
	Steering Committee Meeting								X										
June 2015	Steering Committee Meeting																		
	Maine Forest Products Council Presentation																		
	Landowner Meeting																		
	Conservation Partners Meeting #5					X		X	X										
July 2015	30-day Public Comment Period on Draft Action Plan					X			X										

7/8.4 PUBLIC ENGAGEMENT

MDIFW established a Public Outreach Subcommittee comprised of conservation partners to guide its public participation efforts. The Subcommittee identified several methods to engage the public, encourage participation, and solicit comment. The Coordination Team and Steering Committee implemented these methods, making effective use of agency resources to ensure an appropriate level of public participation. Table 7/8-7 presents a summary of these efforts.

Table 7/8-7. Press Releases, Articles, and Social Media.

MDIFW Press Release	November 19, 2014
MDIFW Facebook post (181 likes, 26 shares)	November 19, 2014
MDIFW Twitter	November 24, 2014
SeaCoast Online Article	November 30, 2014
Maine Association of Wetland Scientists Newsletter	February 2015
MDIFW prepared a stock newsletter article available to all partners	February 2015
Action Plan update brochure	March 2015
Press release when the Action Plan was posted for public review	July 2015
Social media posts when the Action Plan was posted for public review	July 2015

7/8.4.1 PUBLIC PRESENTATIONS

During each Action Plan presentation or workshop, MDIFW asked the audience its thoughts on the best ways to present Plan information to partners and what would partners find most useful for incorporating the Plan into their own work. MDIFW also asked what types of 'services' (e.g., web portals, technical assistance) partners would find most helpful. MDIFW recorded all suggestions for consideration during Plan implementation.

7/8.4.2 BROCHURE

MDIFW developed an Action Plan brochure (March 2015) and made it available to agency staff for distribution at non-Action Plan related meetings or presentations. MDIFW also provided the brochure to partners for distribution within their respective organizations.

7/8.4.3 PEER REVIEW

MDIFW and conservation partners invited 47 external biologists and taxa specialists to peer review the criteria used to identify SGCN and the draft SGCN list (June 2014). MDIFW received

several hundred species-specific comments from peer reviewers. In addition, specialists reviewed SGCN habitats and SGCN habitat stressors (January 2015) and provided comments.

7/8.4.4 MAINE ACTION PLAN WEBPAGE

MDIFW established an Action Plan webpage, within the agency website, dedicated to the 2015 Plan revision (June 2014): http://www.maine.gov/ifw/wildlife/reports/MWAP2015.html
The page allows the public and partners to view Action Plan documents, meeting schedules, Steering Committee and subcommittee meeting minutes, and contact information, as well as the 2005 Wildlife Action Plan. MDIFW updates the page regularly.

7/8.4.5 EMAIL CORRESPONDENCE

MDIFW created a dedicated Google email account (July 2014) to receive public inquiries and comments and posted the address on the Action Plan webpage, in press releases, and correspondence with partners. In addition, MDIFW has engaged in numerous email exchanges with partners and the public via staff's individual maine.gov email accounts.

7/8.4.6 30-DAY COMMENT PERIOD

MDIFW provided a 30-day comment period, extending from July 13 – August 12, 2015, to allow the public an opportunity to review the Action Plan and to provide written comments and suggestions. Conservation partners also had an opportunity to provide additional comments during the period. We received approximately 50 unique comments. MDIFW discussed all comments with the Steering Committee (Table 7/8-8). Substantive comments are considered below.

Conservation Partner break-out session.
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Public Comments
MDIFW received 196 form emails requesting that the Gray Wolf be added to Maine's list of SGCN. The wolf was an SGCN in Maine's 2005 Plan, but MDIFW did not designate the wolf as an SGCN in 2015. The Steering Committee suggested that MDIFW reconsider the wolf as a potential SGCN. MDIFW concluded that there is no current evidence of a population of wolves in Maine and that the establishment of a viable wolf population is unlikely. As such, the species does not meet Maine's SGCN listing criteria which specifies that only Maine extant species be considered for designation as SGCN.

Table 7/8-8. Summary of all comments and inquiries received.

Affiliation	Comment	Relevant Element
Northeast Wolf Coalition	Add Gray Wolf to SGCN list	1
Maine Wolf Coalition	Add Gray Wolf to SGCN list	1
Public	Add Gray Wolf to SGCN list; more public involvement needed; wolves were on 2005 SGCN list	1
	MDIFW received 196 form emails requesting the addition of the wolf as an SGCN	
Public	Concern over moose declines	1
Public	Clarify the criteria "cultural significance" used to designate SGCN	1
Public	Concern about loon conservation. Why aren't loons on the SGCN list?	1
Freeport Wild Bird Supply	Noted inconsistencies and lacking information in species reports for birds (e.g., no stressors listed for loon; no actions listed for P3 SGCN that are lacking information); concern for use of citizen science and other monitoring methods; provided a species-specific list of comments	1
Public	Concern with noise and chemical effects of fireworks on loons	1
Public	Commented on the lack of several raptors on SGCN list; suggested use of the survey methodology employed by the Maine River Bird Survey	
Public	Recommended use of Natural Resource Conservation Service habitat evaluation procedure	2
Public	Commented that the Plan needs further review and noted that the Northeast Terrestrial Habitat Classification System no longer mandates 75% canopy cover to be assessed as wildlife habitat	2, 4
Natural Resources Council of Maine	Plan lacks consideration of the condition of the Maine forest	2, 4
Suffolk University	Commented that "stressor" is the appropriate term; rockweed is not the only marine resource that is a habitat and in a permanent location	2, 3
Public	Structural modifiers needed; lack of successional stages and forest structure in habitat classification; forests not appropriately classified based on canopy cover; lack of northern White Cedar in plan by name; forestry is a greater stressor than identified; not enough specificity on forest condition; 2005 plan did a better job of identifying canopy closure types	2, 4
Public	More details needed on why climate change impacts are so prevalent in Plan given uncertainty	3

Table 7/8-8. *continued: page 2 of 4.*

Affiliation	Comment	Relevant Element
The Nature Conservancy	Plan needs adjustments to characterization of several coastal habitat stressors and actions (e.g., tidal restrictions need to be added to tidal marshes; culvert replacement timeframes; add living ecosystem alternatives to hardened shorelines, etc.)	3, 4
Maine Aquaculture Association	Plan implementation needs to engage marine resource users; lack of citations; disease actions should be drafted and implemented with USDA APHIS	3, 4
Maine Forest Service	Concern regarding the characterization of forestry as a stressor when other stressors are more prominent; questioned the inclusion of MDIFW in outcome-based forestry and certification programs and in on-going efforts e.g., chop-and-drop, etc.; is MDIFW looking to modify outcome based-forestry, certification? Actions require further prioritization	3, 4
Public	Plan needs additional citations for stressors and actions; need support for landowner incentives such as term easements and technical assistance biologists; need to review actions for specificity and any regulatory language; produce audience specific guides to the Plan; concern about grouping forestry and agricultural stressors together; need more action prioritization and how to define success; expand SGCN management actions on MDIFW lands to all public lands; establish an ongoing landowners committee similar to the steering committee; include more information in the Plan on where nongame funding comes from	3, 4
Public	Plan needs additional citations for stressors and actions; actions require additional specificity; need to review actions for any regulatory language; need stronger language throughout that this is not MDMR's work plan and that MDMR is a partner; make sure all references and disclaimers are included in reports	3, 4
Aquaculture Industry	Recommended line item clarifications to stressors, tables, species, and actions	1, 3, 4
Public	Local funding is necessary for implementation of actions; prioritize and promote habitat connectivity	4
Sea Grant	Reduce marine guilds to only relevant SGCN; amend actions so as not to conflict with aquaculture activities; general rewording of actions	4
Appalachian Mountain Club	Plan needs to address conservation of sub-alpine forest	4
Suffolk University	Why are there conservation actions for harvested (and therefore, regulated) marine species; concern for conflicts between guild-level actions and aquaculture	

Table 7/8-8. *continued: page 3 of 4.*

Affiliation	Comment	Relevant Element
Maliseets	Recommended that the Plan include actions related to installing instream habitat structures in streams, rivers, lakes, and ponds	4
Maine Farm Bureau	Promote landowner incentives; concern that the Plan may become regulatory	4
Manomet	Suggest interagency coordination on Action Plan outreach (e.g., Maine DOT on culverts, MFS on forests); MNAP should be listed as a co-lead on several actions	4
The Nature Conservancy	Provided line item comments on habitat actions, program action themes, and habitat action themes	4
Public	Construct wildlife crossings; stop slaughter of coyotes and cormorants; stop bear baiting; restrict pesticides; protect turtle crossings; need for general public outreach on wildlife issues	4, 8
Public	Remove competing fish species from Atlantic Salmon streams	4
Public	Biodiversity is more important than just game management; manage for old growth not just deer yards	4
Manomet	Provided line item comments on habitat actions and themes; concern that climate change plays too prominent a role relative to other stressors; need to partner with other relevant groups such as developers, builders, and agriculture	3, 4, 7, 8
The Nature Conservancy	Provided comprehensive comments on elements 1, 2, 3, 4, 5, 6	1, 2, 3, 4, 5, 6

Table 7/8-8. *continued: page 4 of 4.*

	General Comments & Inquiries	
U.S. Fish & Wildlife Service	Unable to sort conservation actions in the Excel file	
Small Woodland Owners Association of Maine	Inquiry from SWOAM member concerned that the Plan may become regulatory	
Public	Somewhat difficult to navigate through the Plan; need a summary version	
Public	Need for moose surveys in southern Maine	
Public	Concern about the length of the Plan	
Public	Suggested native partridge restoration in southern Maine	
Public	Increase any-deer permits to take more does	
Public	Increase doe permits	
Public	Plan must remember that people need to live here too	
Public	Reduce hunting and promote tourism	
Public	Where is the list of endangered species?	
Public	Landowner concern about public access to private property	
Public	Is this also a fisheries Action Plan?	
Public	Make the State Wildlife Action Plan happen; thanks for the hard work	

The importance of habitat connectivity was commented upon. MDIFW recognizes the importance of this concept, and several of the habitat conservation actions specifically address connectivity (TW Theme 5, Table 4-20, Element 4).

Some comments concerned the length of the Plan, expressing concern that there is too much content for readers to absorb (Programmatic Action 2, Section 7/8.5). MDIFW shares this concern; notably, the 2015 Action Plan is approximately 20-25% of the page length of the 2005 Action Plan submission.

Conservation Partner Comments

Manomet Center for Conservation Science commented that climate change is an important issue that needs to be addressed in the long-term, but there are a host of other threats that may be more problematic in the short-term, reducing the importance of climate change as a priority. The Steering Committee noted that climate change, in many cases, is listed as an 'other factor' within the threat assessment and this tended to over-emphasize climate change. MDIFW revised Table 1-3 to address this (Element 1).

Manomet suggested partnering with other relevant groups, especially agriculture, developers and builders, urban forestry interests, and the Maine Municipal Association (See Programmatic Action 2, Section 7/8.5). In regards to agricultural interests, Manomet commented that there are increasing pressures to supply food from sources that address biodiversity and anticipates increasing Action Plan opportunities with potato growers, blueberry growers, dairy, and nursery.

Manomet also provided comments addressing specific conservation actions. The Action Plan Implementation Committee will consider these as the Plan is implemented (Programmatic Action 1, Section 7/8.5).

The Maine Chapter of The Nature Conservancy commented that the Plan's habitat actions are numerous and could be combined to reduce their sheer volume and that some actions are not as specific as they could be (Programmatic Action 1, Section 7/8.5; Programmatic Action 9, Elements 5/6; and Section 4.5.2, Element 4). TNC provided comments addressing specific conservation actions. The Action Plan Implementation Committee will consider these as the Plan is implemented (Programmatic Action 1, Section 7/8.5).

The Appalachian Mountain Club commented that the Plan should focus more attention on the acquisition of sub-alpine habitat. The Steering Committee recognized that the Action Plan does identify acquisition as a strategy for the conservation of pine barrens and floodplain forests and could do so for sub-alpine forest as well. It concluded that the Action Plan addressed AMC's concern, the conservation of sub-alpine habitat, by focusing several conservation actions on SGCN associated with sub-alpine forest (e.g., Bicknell's Thrush, Table 4-7, Element 4).

MDIFW received comments from a conservation partner in Northern Maine expressing concern that the Plan does not adequately consider the threats of forest management to the condition and structure of key forest habitats. He offered that the Plan could address this by including measures of relative condition, such as the forest canopy cover and forest development stage, within the Plan's habitat information. The partner also commented that the Plan does not recognize the importance of Northern White Cedar stands as a valuable forest habitat.

MDIFW recognizes that forest condition and structure (e.g., canopy closure, vertical layering) are important habitat characteristics for many SGCN; however, the GIS habitat layer provided with the Northeast Terrestrial Habitat Classification System (The Nature Conservancy and

NatureServe 2011) is not an effective source for this spatial information. MDIFW and the Steering Committee concluded that many of the partner's concerns are addressed adequately in the Plan (TW Theme 4, Table 4-20, Element 4). Also, there is a specific conservation action to "Develop habitat management recommendations for all Priority 1 and Priority 2 SGCN and guilds that are sensitive to certain intensive forest management practices," (Table 4.1, Element 4), that provides an opportunity for outreach to forest managers and landowners that addresses concerns about forest condition applicable to specific, sensitive SGCN.

The Maine Farm Bureau, expressed concern about the possible regulatory implications of the Plan. MDIFW clarified that the Plan was non-regulatory in a written response.

MDMR received comments from marine industries noting a general lack of citations supporting the impacts of various threats to marine SGCN and their habitats. They suggested the addition of applicable citations to bolster the documentation of the stressors, and to make clear that some stressors are perceived and additional investigation is warranted. MDMR provided the requested additional citations.

Landowner Comments

Huber Resources Corporation, SWOAM, and Maine Forest Products Council provided comments during a landowner meeting with MDIFW on August 11, 2015. The group offered these comments:

1. The Action Plan could be improved with greater citation regarding the impacts of stressors. MDIFW responded that citations exist in the species reports, and because this information exists in a database, MDIFW can continuously update citations following plan submission. In addition, MDIFW noted the significance of professional knowledge, based on unpublished field experience, as well as the consensus of conservation partners, and using this collective knowledge in the formulation of Maine's Plan.

Open Standards break-out session. © Mark Stadler

2. Forestry and agricultural effluents should not be included together as a single stressor. The group questioned whether forestry effluents are a stressor, and stated that effluents have become less of an issue in forest management due to increased application of Best Management Practices (BMPs). MDIFW agreed that there is a loss of specificity by grouping forestry and agriculture, but explained that this grouping is the result of using the International Union for the Conservation of Nature (IUCN) threat lexicon, which all the Northeast states are using as a common scheme to categorize stressors.

3. Forest certification should not involve MDIFW in the one-on-one audits between landowners and the certification system. MDIFW indicated that this was not intended and clarified the conservation action to read -- Action 42: MDIFW offer collaboration and technical expertise to forest certifications systems for a subset of applicable SGCN and their forest habitats (Table 4-16, Element 4).

4. The comprehensive nature of the threat assessment in the draft Action Plan could be misused. MDIFW recognized this possibility and addressed it by focusing the Plan's conservation actions only on those issues that address higher priority stressors.

5. Some conservation actions have a regulatory quality. MDIFW revised these to reflect a non-regulatory, collaborative approach to the implementation of conservation actions; MDIFW deleted several actions.

6. Additional prioritization is necessary among the conservation actions (Programmatic Action 1, Section 7/8.5 and Programmatic Action 9, Elements 5/6).

7. The Action Plan should be applicable to all state lands, not just MDIFW's, e.g., the Bureau of Parks and Lands is preparing an integrated resource plan and there is an opportunity to integrate the Action Plan. MDIFW expanded the appropriate conservation actions to include all public lands.

8. MDIFW should establish a post-Plan landowners' committee and charge it with preparing a streamlined Action-Plan-implementation document for landowners similar to BMP manuals. The manual would explain how landowners can engage with the Action Plan, especially smaller landowners in southern Maine. There is also a need for a similar stream-lined Action Plan document for the general public. **(**Programmatic Actions 1 and 2, Section 7/8.5).

9. The post-Plan landowners' committee should explore the use of short-term easements to achieve habitat conservation for SGCN (Programmatic Action 1, Section 7/8.5 and TW Theme 2, Table 4-20, Element 4).

10. The Plan should contain more discussion of nongame funding and its necessity to further implement the Plan (Programmatic Action 1, Section 7/8.5 and Programmatic Actions 4 and 6, Element 4). Maine TNC said that it would be interested in pursuing additional Action Plan related positions at MDIFW (Programmatic Action 6, Element 4). The group also suggested seeking legislative support to acquire funding for landowners to implement conservation actions identified in the Action Plan, as well as funding to implement several projects identified in the Plan (Programmatic Action 5, Section 7/8.5).

11. SWOAM volunteered to assist with Action Plan outreach to landowners by facilitating training and technical outreach to landowners (Programmatic Actions 1 and 2, Section 7/8.5). Landowners suggested that MDIFW provide Action Plan outreach and technical assistance to Maine Forest Service (MFS) and consulting foresters. They felt there would be public support to fund additional state agency staff to provide this outreach; they expressed interest in pursuing additional Plan-related positions at MDIFW (Programmatic Action 6, Element 4).

12. MDIFW Regional Biologists should begin providing Action Plan advice to targeted landowners. MDIFW will implement this through Beginning with Habitat or related outreach programs (Programmatic Actions 1 and 2, Section 7/8.5).

MDIFW received comments from the Director of the Maine Forest Service (MFS). MFS recommended that the stressor category "Logging and Wood Harvesting" be replaced with "Forest Conversion." MFS offered that the key indicators of forest productivity continue to increase or have stabilized at acceptable levels and that the bigger threat to SGCN and their

habitat comes from turning forest into non-forest, particularly when the transformation is permanent. MDIFW concurs that permanent habitat loss poses greater risks to SGCN and their habitat than forest management does; however, the stressor category 'Logging and Wood Harvesting' is a term-of-art employed in the threat lexicon developed by the International Union for the Conservation of Nature (IUCN). The 13 Northeastern states, including Maine, have agreed to use the IUCN lexicon in their Wildlife Action Plans as a standardized means to present a common stressor assessment for the Northeast. Maine's Action Plan will retain the threat category 'Logging and Wood Harvesting,' while recognizing that forest conversion is a greater stressor for most SGCN.

MFS commented that it did not support draft Action 42: Promote greater MDIFW involvement with forest certification to help support conservation/management of SGCN habitats in northern forests and swamps. It predicted that landowner concerns about government agencies inserting themselves into the certification process would deter landowner participation. MDIFW did not desire to insert itself into the private, voluntary interactions between a landowner and a certification system. Rather, the action sought the collaborative integration of SGCN conservation practices into the broad process of forest certification. MDIFW clarified draft Action 42: MDIFW offer collaboration and technical expertise to forest certifications systems for a subset of applicable SGCN and their forest habitats (Table 4-16, Element 4).

MFS did not support draft Action 43: Provide opportunities for MDIFW participation in outcome-based forestry. It stated that private landowners voluntarily participate in Maine's outcome based forestry measure, the effort is guided by a technical panel appointed by the Governor, and a Certified Wildlife Biologist is a member of the panel. MFS commented that draft Action 43 would require a modification to state statute. MDIFW revised draft Action 43: MDIFW collaborate with forest landowners and managers to discuss options for voluntary integration of SGCN habitat conservation actions into outcome-based forestry practices (Table 4-16, Element 4).

MFS stated that draft Action 41: Provide opportunities for MDIFW's participation in Maine Forest Practices Act discussions and encourage outcome-based forestry for landscape scale habitat management, was unnecessary. Given the modifications to Actions 42 and 43, MDIFW deleted draft Action 41.

MFS commented that it, MDIFW, and MDMR collaboratively developed Standards for Placing Wood Into Stream Channels to Enhance Cold Water Fisheries, also known as the Chop and Drop rule and asked why the Action Plan included draft Action 130: Encourage the addition of woody material and other natural instream habitat structures to streams and lakes that replace lost natural habitat complexity. MDIFW clarified Action 130: Encourage the implementation of the Standards for Placing Wood Into Stream Channels to Enhance Cold Water Fisheries, also known as the Chop and Drop rule, to replace lost natural habitat structure in streams and lakes (Table 4-16, Element 4).

MFS noted that several draft conservation actions only addressed "Logging and Wood Harvesting" or "Roads and Railroads" as stressors to water quality and the integrity of riparian areas. MFS offered that the forestry community has made great strides in protecting water quality during all phases of forest management. Forest managers widely use the water-quality BMPs and the BMPs are highly effective. Forest managers also have made great strides in protecting the integrity of riparian areas. MFS concluded that non-forest uses pose a greater threat to water bodies and riparian forests. MDIFW reviewed draft conservation actions 81-83 and 131-147. MDIFW revised each draft conservation action, as necessary, to address all

applicable IUCN threat categories (Table 4-16, Element 4). MDIFW also revised draft Action 86: Assess the overall efficacy of the existing mechanisms (e.g., regulations, standards, BMPs) employed in riparian areas associated with headwaters and creeks at maintaining or enhancing water quality (Table 4-16, Element 4).

MFS noted that more needs to be done to reduce the set of conservation actions to a manageable number. The resources do not exist to carry out the number of actions proposed. The list of conservation actions and the entire Action Plan could be significantly narrowed in size and scope to make it a useful document and tool (Programmatic Action 1, Section 7/8.5; Programmatic Action 9, Elements 5/6; and Section 4.5.2, Element 4).

MDIFW Response to Comments Received
All individuals and organizations who submitted comments received a general acknowledgement from MDIFW that it had received their comments, thanking them for their interest and input. MDIFW is preparing detailed written responses to select partners and individuals that submitted more substantive comments.

7/8.5 PUBLIC AND PARTNER ENGAGEMENT DURING PLAN IMPLEMENTATIONS

The success of Maine's 2015 Wildlife Action Plan depends on continued partner and public engagement during plan implementation. MDIFW and the Steering Committee identified 11 Programmatic Actions to help guide implementation and tracking of the 2015 Wildlife Action Plan (Table 4-21, Element 4). Programmatic actions are categorized as follows:

Conservation Partner break-out session.
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Outreach and Engagement (Programmatic Actions 1-3): Actions to inform and engage the public and partners on Action Plan accomplishments and opportunities for involvement.

Program 1: Establish an Action Plan implementation committee comprised of conservation partners and agency staff to help guide implementation of the 2015 Action Plan (short-term).

As described in the beginning of this chapter, MDIFW coordinated closely with the SWAP Steering Committee during plan development. During the winter of 2015/2016, MDIFW will begin to transition this committee into an Action Plan Implementation Committee composed of interested Steering Committee members and other key partners. They will work with agency staff to help implement the 2015 Plan and address emerging issues. The Implementation Committee will meet at least annually with additional updates provided through email and phone conferences. Within the first year of Plan implementation, MDIFW will work with the Implementation Committee to develop a charter and to set goals and objectives for the group. MDIFW also will work with the Implementation Committee to establish several subcommittees (composed of agency staff, Implementation Committee

members, and other interested partners) to address specific implementation measures and technical needs, such as Programmatic Actions 2 and 5.

Program 2: Devise and implement outreach strategies, including periodic meetings, to inform and engage conservation partners and the general public on 2015 Action Plan information, accomplishments, and opportunities for involvement (mid-term).

MDIFW will work with the Implementation Committee and the Outreach Subcommittee (to be established) to develop and implement strategies that: 1) make the 2015 SWAP available to all users in accessible formats, and 2) foster partner and public engagement in the Plan. First, the committees will explore multiple approaches (suggested by partners during plan development) for accessing plan information including online links to SGCN ecology and conservation information, SGCN habitat management recommendations, SGCN distribution data, and information modules targeted to different user groups (e.g., private landowners, land trusts, municipalities) and regions (e.g., individual ecoregions or watersheds). MDIFW also is exploring options for making the 2015 Action Plan database accessible to the public. This relational database contains linked and searchable information for individual SGCN, including their SGCN qualification criteria, habitat and distribution information, threats, threats to associated habitats, conservation actions at both species-specific and habitat scales, and species-specific notes to aid in conservation efforts. MDIFW will work with the Implementation Committee and Outreach Subcommittee to guide development of these online and database tools as well as other formats for accessing plan information. In addition, MDIFW will continue to update the 2015 Wildlife Action Plan website and provide contact information.

To address the second task, MDIFW will work with the Implementation Committee and Outreach Subcommittee to generate materials (e.g., newsletters, blog posts, social media posts) and coordinate periodic events (e.g., annual meetings, trainings) to update partners on plan accomplishments and opportunities for involvement. MDIFW also plans to host periodic workshops with partners addressing their access to Plan information. Furthermore, MDIFW may establish a small grants program for partners implementing conservation actions (Programmatic Action 5). If implemented, this program likely will generate ongoing partner interest in the Action Plan through periodic requests for proposals (RFP) and award announcements.

Program 3: Develop a public survey of SWAP and non-game species awareness, concerns, and priorities (initial survey: short-term; second survey: long-term [tentative]).

In a recent survey, 95% of Mainers valued protection of wildlife for the enjoyment of people, but were largely unaware of how MDIFW is funded to accomplish this task (MDIFW 2010). Additional surveys also highlight the importance of Maine's wildlife resources to land-use decisions (Butler et al. 2014) and to the state's economy (Southwick Associates 2013). However, there is little information on Maine citizens' awareness of Action Plan and non-game species conservation. Public opinion surveys conducted in other states (e.g., Pennsylvania [Responsive Management 2014]) have shown increasing public concern for and awareness of non-game species. Soon, MDIFW will undertake a large-scale public survey to determine attitudes toward game and non-game conservation, management, and funding. Survey results will help guide MDIFW priorities and outreach approaches. This survey also provides a timely opportunity to highlight Maine's 2015 Action Plan and discuss options for establishing stable funding for wildlife conservation. MDIFW may also conduct a

second survey toward the end of Plan implementation to gauge the effectiveness of public outreach and education efforts developed as part of Programmatic Action 2.

Funding and Tracking (Programmatic Actions 4-8): Actions to bolster funding, capacity, and tracking of SGCN-related projects.

Program 4: This action supports efforts to establish stable state and federal funding sources for SGCN and habitat conservation. (Element 4)

Program 5: Consider establishing a competitive small grants program to make a portion of State Wildlife Grant (SWG) funds available to partners implementing priority actions identified in the 2015 Action Plan (mid-term).

MDIFW may establish a competitive grants program to make a small portion of SWG funds available to partners. This program has two major benefits: 1) awarded funds will help leverage partners' existing or new SGCN conservation efforts; and, 2) it encourages ongoing partner involvement in the Action Plan and communication with MDIFW through periodic RFPs and reporting requirements. A small grants program also addresses conservation partner requests for greater access to SWG funds.

To establish a small grants program, MDIFW must first address several logistical and grant administration needs. Because SWG funds are limited, MDIFW will work with partners to identify the minimum award amount necessary to leverage matching funds or seed money for SGCN conservation projects. If this amount is feasible and does not compromise ongoing SWG-funded projects and personnel, MDIFW will work with the Implementation Committee to develop a transparent grant advertising, selection, and reporting process.

Program 6: This action focuses on increasing long-term agency staffing and capacity needs for Action Plan implementation. (Element 4)

Program 7: Annually compile agency and partner expenditures and seek additional match opportunities to maximize efficiency and impact of 2015 Action Plan implementation (short-term). (Elements 5-6)

Program 8: Track SWAP conservation action implementation accomplishments by agencies and partners (short-term). (Elements 5-6)

Action Development (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. (Element 4)

Regional Partnerships (Programmatic Actions 10-11): These actions address continued MDIFW and partner involvement in existing conservation efforts.

Program 10: This action supports efforts to identify new and update existing SGCN Conservation Opportunity Areas (COAs). (Element 4)

Program 11: This action supports MDIFW and partner participation in the Northeast Regional Conservation Needs (RCN) Grant Program. (Element 4)

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7/8.7 APPENDICES

Appendix 7/8-1. Operational Charter.

2015 Maine Wildlife Action Plan
Conservation Partners / Steering Committee / Subcommittees
Operational Charter
October 2015

1. Introduction

Congress instituted the State Wildlife Grant (SWG]) program in 2001, which provides wildlife conservation funds to the 50 states. States use these to develop and implement management programs that benefit wildlife and their habitat, including species that are not hunted or fished. Since inception of the SWG program, Maine has received close to $8 million in SWG funding and accomplished over 50 research, management, and conservation projects. To receive SWG funding, Maine must have a comprehensive wildlife conservation strategy, now commonly known as a state wildlife action plan (the plan). The U.S. Fish and Wildlife Service ([USFWS) approved Maine's first plan in 2005. The plan identified species and habitats in greatest conservation need, significant threats to wildlife and habitat, and the conservation actions required to prevent endangered species listing and to spur the recovery of endangered species. http://www.maine.gov/ifw/wildlife/reports/wap.html

The SWG program requires that Maine update its plan by October 2015 and forward it to the USFWS for review and approval. The plan must be developed by the Maine Department of Inland Fisheries and Wildlife (MDIFW) in collaboration with Maine citizens and wildlife conservation partners. Partners are private landowners, federal and state agencies, Native American tribes, non-governmental organizations, and academicians that have a role in the conservation of Maine's wildlife and habitat. MDIFW invited 73 partners to participate. Over the next 12 months, partners will collaboratively develop Maine's 2015 plan. MDIFW and partners will also solicit and consider advice and recommendations from the public. Following plan approval by the USFWS, MDIFW and partners together will implement the plan.

2. Statement of Purpose: Maine's Wildlife Action Plan

Maine's plan embodies the shared vision of MDIFW, its conservation partners, and the public. It is Maine's blueprint for achieving our common goal of conserving healthy wildlife populations. The plan

- articulates clear conservation goals and defines the actions required to best conserve species at risk, manage habitats, prevent the listing of rare and imperiled species, and keep common species common,
- outlines strategies to perpetuate regional and state biodiversity,
- provides opportunities for partners to lead in its implementation,
- adapts to changing environmental conditions affecting fish, wildlife, and habitat, and
- establishes efficient and effective stewardship of Maine's natural heritage that is responsive to the public trust and to private landowner rights.

3. Guiding Principles

As it develops the 2015 plan, the partners will ensure that the plan

- is built on a foundation of sound scientific principles and is feasible,
- recognizes that the public has a genuine stake in the plan -- wildlife belongs to the public and is held in the public trust,
- is developed in an open, transparent, and inclusive process that encourages and facilitates the involvement of all partners,
- respects property rights and recognizes that landowner participation is critical for the successful development and implementation of the plan,
- provides opportunities for conservation actions by multiple partners and partnerships across the state,
- develops and implements conservation actions that are voluntary, based on incentives rather than constraints,
- does not rely solely on land acquisition, but also incorporates conservation actions on private land,
- identifies opportunities for conservation and management of landscapes, watersheds, and habitats that address the needs of multiple species, wherever possible, especially in light of climate change, and
- prioritizes actions for implementation by species and habitat.

4. Operational Guidance for Conservation Partners, Including the Steering Committee (5.2) and Subcommittees (5.3)

Meetings: MDIFW recognizes that travel expenses impinge upon the budgets of state, federal, tribal, and non-governmental organizations. It will keep the number of meetings to the minimum required to develop an approvable plan.

Partners will be notified of meeting dates at least 30 days in advance.

MDIFW will post all documents distributed at partner meetings or by email or as follow-up to partner meetings on the action plan website.
http://www.maine.gov/ifw/wildlife/reports/MWAP2015.html

Timelines: Partners have the responsibility to move the process forward. MDIFW and partners will establish timelines to ensure completion of the plan on time. Each will adhere to established timelines for submittal of requested materials and information and for the completion of assigned tasks.

Mutual Respect and Trust: the strength of the partners is their diverse knowledge and experience. Partners will base their work upon collective contributions and expect others to abide by the following

- encourage participation by all partners,
- avoid hidden agendas and to be open about potential conflicts of interests,
- ensure all partners are respected and treated fairly, respect all contributions and ideas, and direct critiques at the idea not the person,
- avoid speaking while others are speaking, avoid side-bar conversations, wait until there is an appropriate time to provide your comment,

- keep to the topic,
- avoid creating distractions, and
- place cell phones on silent mode, if receiving a call, minimize disruption to the group.

Decision-making: Unanimous consensus is the goal, but not a requirement.
Partners represent the diverse interests of their agencies and organizations. It may be possible that all do not fully agree on specific aspects of the update. MDIFW and partners will strive to be open-minded and creative. As differences arise, partners will listen to other views and rationale. Partners will make decisions based on the general "modified consensus" of those present (i.e., if a partner disagrees with the rest of the group, he can nevertheless "live with" the decision and will not oppose the decision or stand in the way of moving it forward.)

MDIFW will resolve all decisions that do not receive this minimal level of support and will provide a written explanation for its decision to the partners. MDIFW will post the explanation on the action plan website; the explanation will note the degree of consensus reached by partners before the decision was handed to MDIFW for resolution.

Decisions reached by conservation partners are advisory and represent recommendations to MDIFW. If MDIFW decides not to accept a recommendation from the conservation partners, it will provide a written explanation for its decision and post the explanation on the action plan website.

Concurrence: Partners agree to participate as specified in this charter.

Travel Expenses: Partners are responsible for their travel expenses.

Partner funding: Participation will not provide an advantage in securing SWG funds.

Copyrighted or Restricted Material: All such material must be acknowledged and properly referenced.

Acknowledgement: The 2015 plan will acknowledge and recognize the contributions of participating partners and their organizations.

5. Process Structure

5.1 Conservation partners

Conservation partners will develop the 2015 action plan in collaboration with MDIFW and Maine citizens.

MDIFW invited 73 partners to participate in the development of the 2015 action plan. Partners are private landowners, federal and state agencies, Native American tribes, non-governmental organizations, and academicians that have a role in the conservation of Maine's wildlife and habitat.

5.2. Steering Committee

The steering committee (committee) will guide the development of the action plan.

MDIFW assembled a steering committee from the ranks of the conservation partners. Membership was by invitation. Committee members are broadly representative of key conservation partners. The committee may recommend additional members, but their participation must be approved by MDIFW. The committee is limited to no more than fifteen members.

MDIFW recognize that members have obligations to their agency or organization. MDIFW will strive to minimize members' time commitment; however, it is expected that those who agree to participate will endeavor to attend meetings. The committee may meet either in person or by conference call.

5.2.1. Steering Committee Function

The steering committee

- serves as the initial sounding board for MDIFW on both overall process and initial plan components and drafts,
- provides feedback to MDIFW between partner meetings on time-sensitive issues involving the plan update,
- establishes the timeline for the plan update and ensures that the timeline is met, and
- ensures that the process follows the charter's statement of purpose (2.) and guiding principles (3.).

Members present during committee meetings or conference calls are encouraged to participate fully. Not all members may be able to attend and participate in all discussions. As decisions are made or conclusions reached, those not present agree to move forward as a team and not to retrace discussions or decisions.

Members will strive to attend conservation partner meetings.

The committee may designate and establish subcommittees.

The committee may ask partners or its members to develop new materials, provide existing resources, gather information, or complete tasks necessary to the update. The committee will schedule dates when tasks are to be completed by consent of the members present. Members will share tasks and responsibilities by

- volunteering for tasks, especially those for which they have special expertise or interests,
- providing information that can fill data gaps and advance ideas, and
- keeping current with the update, even if unable to attend all discussions.

5.3. Subcommittees

The committee may designate and establish subcommittees.

Prior to the formation of the steering committee, MDIFW established a Public Communications and Outreach Committee and MDIFW / Maine Natural Areas

Program established a Focus Area Review Committee. Both are now considered subcommittees functioning under the guidance of the steering committee.

The committee will designate individuals to chair each subcommittee. Subcommittees must be chaired by a partner or MDIFW, but subcommittee members may be from outside the participating partners.

Subcommittee chairs report to the committee. Chairs will ensure that steering committee members receive information about the activities of their subcommittee, such as minutes and copies of pertinent correspondence.

Subcommittee chairs are responsible for coordinating their meetings and conference calls.
Subcommittees dissolve when they have accomplished their designated purpose.

6. Evaluation

To be successful, the steering committee and partners must complete the plan update, accomplishing the requirements and objectives specified by the USFWS, prior to October 2015. It is important that committee members and partners are committed to success. The committee must ensure that the plan update remains on schedule and meets deadlines.

Previous sections of the charter guide the deliberations of partners and the committee, and therefore, provide a basis to gauge success. The committee will evaluate periodically the progress of the action plan update and adherence to the requirements of the charter. The committee will conduct the evaluation by a method that it deems appropriate. The committee will use the following attributes to evaluate success.

Participation: MDIFW staff, partners, and committee members are engaged in the plan update; they volunteer to assist with tasks, especially those for which they have special expertise or interest; they are proactive in providing information that fills data gaps and advances ideas; and they keep current with the planning process, even if they are unable to participate in all discussions.

Schedules: MDIFW staff, partners, and committee members develop new materials, provide existing resources, gather information, or complete other necessary tasks as requested and scheduled.

Outreach: Partners and committee members engage the members of their organizations in the plan update, using their outreach mechanisms to inform their members and to solicit comment.
MDIFW provides regular updates to the steering committee and partners and provides opportunities for broad participation by other organizations and citizens.

Subcommittees: Subcommittee chairs conduct meetings and accomplish assigned tasks as scheduled, report to the committee, and ensure that the committee is fully informed of its activities.

Appendix 7/8-2. Agendas – Conservation Partner Meetings.

2015 Maine Wildlife Action Plan

Update Committee - Meeting #1

July 8, 2014

Location: Pineland Farms, New Gloucester

Meeting Purpose

- Provide background on State Wildlife Grant (SWG) program
- Provide overview of SWG accomplishments since 2005
- Review and discuss the process used to develop Maine's Species of Greatest Conservation Need (SGCN) list
- Introduce Habitat and Threat classification systems
- Discuss Public Communication plan

Meeting Agenda

9:00 Welcome and logistics

9:30 Background
- State Wildlife Grants
- State Wildlife Action Plans
- 2005 Maine Wildlife Action Plan
  - Maine's State Wildlife Grant accomplishments

10:15 Elements of Wildlife Action Plans

10:45 Break

11:00 Role of Conservation Partners in Wildlife Action Plans

11:15 Process used to develop Maine's *Species of Greatest Conservation Need* list
- Process and criteria
- Overview
  - Birds
  - Fish
  - Invertebrates
  - Mammals
  - Reptiles and amphibians

12:00 Lunch - provided

1:00 Break-out group review of SGCN list and discussion
- Birds
- Fish
- Invertebrates
- Mammals
- Reptiles and amphibians

1:45 Reconvene for break-out group reports
- Birds
- Fish
- Invertebrates
- Mammals
- Reptiles and amphibians

3:00 Break

3:15 Introduction of Element 2: Habitats

3:45 Introduction of Element 3: Threats

4:15 Public Communication Plan

4:45 Group Discussion

5:00 Adjourn

2015 Maine Wildlife Action Plan

Update Committee - Meeting #2

September 30, 2014

Location: Maple Hill Farm, Hallowell

Meeting Objectives

- Update partners on action plan activity since July 8th meeting
- Finalize Maine's list of Species of Greatest Conservation Need [SGCN] Incorporating marine fauna into the action plan
- Review the process to develop SGCN habitat associations
- Introduce proposed approach for assessing "stressors" affecting SGCN and their habitats

Meeting Agenda

8:30 Gathering / coffee available

9:00 Welcome
- Introductions
- Volunteer time
- Review of day's agenda
  - Meeting objectives

9:15 Brief re-introduction to state wildlife action plans and state wildlife grants.
- SWG and SWAP: why we are here
- Active stakeholder and working groups
  - Conservation partners
  - Steering committee
  - Public outreach committee
  - Focus Areas update committee
- Meeting with landowners

9:45 Finalizing Maine's list of species of greatest conservation need
- Peer review process – comments offered by taxa "specialists" and conservation partners
- Finalizing the criteria used to identify SGCN and the SGCN list
- Questions, discussios

10:15 Marine fauna and habitat, Dept. of Marine Resources

10:45 Break

11:00 Wildlife action plan habitats
- The role of SGCN habitat associations in the action plan update
- System / process / criteria used to classify Maine's wildlife habitats
- System / process / criteria used to identify SGCN habitats associations
- Overview: results, summary analysis
  - Habitat types
  - Habitats used by SGCN
  - Preliminary conservation land "gaps" analysis
  - Habitat distribution and location of SGCN habitats
- Questions, discussion

12:00 Lunch

1:00 Break-out group review of habitat classification and SGCN habitat associations
- Ecosystem groups
  - Wetlands
  - Coastal/marine
  - Freshwater aquatic
  - Terrestrial
- Tasks
  - Review Northeast habitat classification system by ecosystem group
  - Review SGCN habitat associations
  - Identify habitat associations not captured by classification system
  - Discuss aggregation / presentation of SGCN and habitat analysis: geopolitical, biophysical ecoregions, HUC watersheds, other
  - Discuss approaches to identify highest priority habitats for conservation actions
  - Discuss need to develop "user friendly" habitat lexicon

3:00 Break

3:15 Reconvene for break-out group reports
- Wetlands coastal /
- Marine freshwater
- Aquatic terrestrial

3:45 Proposed approach for assessing "stressors" affecting SGCN and their habitats
- October 30, 2014 conservation partner meeting

4:00 Closing discussion

4:15 Adjourn

2015 Maine Wildlife Action Plan

Update Committee - Meeting #3

November 18, 2014

Location: Spectacular Event Center, Bangor

Meeting Objectives

- Update partners on action plan activity since September 30 meeting
- Final consideration and wrap-up of SGCN habitat associations, element 2
- Introduction to criteria used to assess SGCN and habitat stressors, element 3
- Review, discuss criteria for stressor assessment: priority 1 SGCN and habitats
- Introduce ideas for prioritizing 1) habitats and 2) habitat-stressors for conservation action.

Meeting Agenda

8:30 Gathering / coffee available

9:00 Welcome / Judy
- Activity since 09/30 partner meeting / Mark
- Steering committee / October 16 meeting
  - Additions to steering committee
  - Flora and Maine action plan
  - Operational charter
- Planning for November 18 partner meeting
- Focus area review subcommittee

9:15 Public outreach and communications, element 8 / Amanda

9:35 Marine fauna and habitat, Dept. of Marine Resources / Claire
- Marine SGCN list
- Marine habitat classification
- Marine SGCN habitat associations

10:15 Final consideration and wrap-up of SGCN habitat associations, element 2 / Andy
- Brief review of SGCN-habitat associations
  - System / process / criteria used to classify Maine's wildlife habitats
  - System / process / criteria used to identify SGCN habitats associations
- Discuss approaches to SGCN distributions
- Questions, discussion

10:45 Break

11:00 Introduction to the assessment of stressors affecting SGCN and their habitats, element 3 / Nate
- IUCN classification system
- Process and criteria used to identify priority 1 SGCN stressors
- Process and criteria used to identify habitat stressors
- Questions, discussion

12:00 Lunch

1:00 Break-out group logistics and expectations / Amanda

1:05 Break-out group discussion: SGCN priority 1 stressor assessment criteria with focus on stresses that are not related to habitat. <u>The marine group will also discuss the marine SGCN list and habitat associations.</u>
- Taxa groups
  - Birds
  - Fish
  - Invertebrates
  - Mammals and Reptiles
  - Marine
- Tasks
  - Review and discuss SGCN priority 1 stressor assessment
  - Identify errors of inclusion or exclusion
  - Discuss approaches for assigning stressors to SGCN priority 2 and 3

2:00 Move to next break-out group

2:05 Break-out group discussion: habitat stressor assessment
- Ecosystem groups
  - Wetlands
  - Coastal/marine
  - Freshwater aquatic
  - Terrestrial
- Tasks
  - Review and discuss the process and criteria used to assess habitat stressors
  - Identify errors of inclusion or exclusion

3:00 Break

3:15 Reconvene for break-out group reports / Mark
- SGCN priority 1
  - Birds
  - Fish
  - Invertebrates
  - Mammals and Reptiles
  - Marine
- Habitats
  - Wetlands
  - Coastal / marine
  - Freshwater aquatic

- Terrestrial

3:45 Next meeting: January 8, 2015

Options that the partners may use to identify and prioritize habitats and habitat-stressors for conservation action / Phillip, Andy, Nate, Charlie

4:15 Wrap-up / Mark

4:30 Adjourn

2015 Maine Wildlife Action Plan

Update Committee - Meeting #4

January 20, 2015

Location: Maple Hill Farm, Hallowell

Meeting Objectives

- Overview of public outreach and communication, element 8
- Update on the process for identifying distribution of SGCN, element 1
- Overview of the threat assessment process and results,element 3
- Prioritization of SGCN habitats, element 2
- Habitat prioritization: partner review and feedback
  - Introduction to conservation actions, element 4

Meeting Agenda

Morning sessions will provide time for floor discussion.

8:30 Check-in, coffee and tea available

9:00 Welcome

9:15 Overview of public outreach and communication, element 8
- Stakeholders, targeted surveys, focus groups, and analysis.

10:15 Update on the process for identifying distribution of SGCN, element 1

10:45 Break

11:00 Overview of the threat assessment process and results, element 3

12:00 Lunch

12:45 Prioritization of SGCN habitats, element 2 [results of habitat prioritization options]

1:15 Break-out groups
- Habitat prioritization: partner review and feedback
  - Coastal / marine
  - Wetlands
  - Freshwater / aquatics
  - Terrestrial
  - SGCN distribution [tentative]

2:30 Break

2:45 Break-out group reports

3:15 Introduction to conservation actions, element 4
- Options for organizing sub-committees to develop conservation actions
- Process that sub-committees will use to develop conservation actions

3:45 Wrap-up thoughts, suggestions Where are we in the process Closing comments from the floor
- Select date of next partner meeting – tentatively week of 02/09/2015

4:00 Adjourn

2015 Maine Wildlife Action Plan

Update Committee - Meeting #5

June 16, 2015

Location: Maple Hill Farm, Hallowell

Meeting Objectives

- Partner review of 2015 conservation actions:
  - Habitat conservation actions
  - SGCN conservation actions
  - Programmatic conservation actions
- Partner tasks:
  - Review and revise suite of proposed conservation actions
  - Identify partnerships that will bolster action implementation and success
  - Identify preferences for access to plan information and its format
  - Provide input regarding overall satisfaction with identified conservation actions
  - Partner discussion topics:
  - Programmatic conservation actions
- A process outlining considerations to be used when prioritizing conservation actions for Maine's 2015 WAP
- Continuing partner involvement

Meeting Agenda

8:30 Gathering / coffee available

9:00 Welcome / Judy

9:15 Accomplishments since January 20th partner meeting / Mark

9:30 Habitat conservation actions / Amanda

10:00 Break-out group logistics and expectations / Amanda

10:15 Break

10:30 Break-out group discussion: review habitat conservation actions
- Ecosystem groups
  - Terrestrial / wetland
  - Coastal / marine
  - Freshwater / aquatic
- Task
  - Review and revise suite of proposed conservation actions

- Identify partnerships that will bolster action implementation and success
- Identify preferences for access to plan information and its format
- Provide input regarding overall satisfaction with identified conservation actions

11:30 Reconvene for break-out group reports / Amanda
- Habitats
  - Terrestrial / wetland
  - Coastal / marine
  - Freshwater / aquatic

12:00 Lunch

12:30 SGCN conservation actions / Nate

1:00 Break-out group logistics and expectations / Nate

1:15 Break-out group discussion: review SGCN conservation actions
- Taxa groups
  - Bird
  - Inland Fish and Mammals
  - Reptiles, Amphibians, and Invertebrates
  - Marine
- Tasks
  - Review and revise suite of proposed conservation actions
  - Identify partnerships that will bolster action implementation and success
  - Identify preferences for access to plan information and its format
  - Provide input regarding overall satisfaction with identified conservation actions

2:15 Reconvene for beark-out group reports / Nate
- Taxa groups
  - Bird
  - Inland Fish and Mammals
  - Reptiles, Amphibians, and Invertebrates
  - Marine

2:45 Break: partner appreciation / Andy, Amanda, Nate

3:00 Programmatic conservation actions / Amanda, Nate

3:45 Discussion: a process outlining considerations to be used when prioritizing conservation actions for Maine's 2015 WAP / Phillip, Barbara Vickery

4:15 Next steps in the development of the 2015 action plan / Mark
- 1st draft
- Public comment period
- Respond to public comments
- Final draft
- Submit Maine's plan to USFWS for review

4:30 Continue partner involvement / Charlie
- Maine Wildlife Coalition / Teaming with Wildlife

4:45 Adjourn

Appendix 7/8-3. Frequently Asked Questions about Maine's 2015 Wildlife Action Plan.

1. What is the plan for?
2. Who wrote the plan?
3. Are you proposing new regulations?
4. Why is the plan so long?
5. How was the Species of Greatest Conservation Need (SGCN) list developed?
6. How are SGCN different from Threatened and Endangered (T/E) Species?
7. Where can I find the list of SGCN?
8. Don't some of these species already have management plans?
9. Where can I find information on what is affecting SGCN and their habitats ('stressors')?
10. Where do the stressor names come from?
11. Don't certain activities classified as 'stressors' sometimes benefit wildlife and habitats?
12. Where can I find information on the actions being proposed to prevent future species and habitat declines?
13. Who can I contact for more information on the draft plan?
14. When will the final plan be completed?
15. How can I get involved?

1. What is the plan for?

   Maine's 2015 Wildlife Action Plan is a shared vision for our state that identifies the voluntary steps needed to conserve priority wildlife species and habitats through public awareness and partnerships. The plan identifies Maine's Species of Greatest Conservation Need (SGCN), the habitats where SGCN are found, and the recommended 'conservation actions' to help prevent further declines in species and habitats over the next ten years. The 2015 plan also qualifies Maine to receive funds for wildlife conservation projects from the U.S. Fish and Wildlife Service (USFWS) under the State Wildlife Grant (SWG) program:
   http://wsfrprograms.fws.gov/Subpages/GrantPrograms/SWG/SWG.htm

2. Who wrote the plan?

   The Maine Department of Inland Fisheries and Wildlife (MDIFW), Maine Department of Marine Resources (DMR), and Maine Natural Areas Program (MNAP) wrote the plan with input from over 100 'conservation partner' groups representing many interests including private landowners, conservation organizations, sporting groups, scientists, and governmental agencies. The list of invited conservation partners begins on page 15 here:
   http://www.maine.gov/ifw/wildlife/reports/pdfs/2015MaineSWAP_Elements7and8_DRAFT.pdf

3. Are you proposing new regulations?

   No! Maine's 2015 Wildlife Action Plan is strictly non-regulatory. All conservation actions included in the plan are based on voluntary efforts.

4. Why is the plan so long?

   In order to be approved by USFWS, Wildlife Action Plans must address eight elements, described here beginning on page 4:
   http://www.maine.gov/ifw/wildlife/reports/pdfs/2015MaineSWAP_Introduction_DRAFT.pdf

   The 2015 plan provides a comprehensive proposal for how Maine will address each of these elements. We are required to post the entire plan for public review so that everyone has access to all the available plan information. Once the final plan is completed in Fall 2015, MDIFW and conservation partners will develop additional user-friendly ways to search and access plan information. Maine's 2015 plan is much shorter than the original 2005 plan, which was over 2000 pages long. For the 2015 plan, Maine eliminated many pages of text and condensed much of the SGCN, habitat, stressor, and conservation action information into tables.

5. How was the Species of Greatest Conservation Need (SGCN) list developed?

   MDIFW biologists, with review and cooperation from conservation partners and species experts, developed conservation criteria for designating Maine's eligible SGCN. For each species in Maine, MDIFW and partners reviewed the best available science to determine if the SGCN criteria were met. If so, the species was added to the list of SGCN at one of three priority levels (1=critical; 2=high; 3=moderate) depending on which and how many criteria were met. The primary themes for SGCN prioritization include risk of extirpation, population trend, endemicity, and regional conservation concerns. Secondary themes for SGCN prioritization include climate change vulnerability, survey knowledge, and indigenous cultural significance. Information on the SGCN criteria can be found here beginning on page 25:
   http://www.maine.gov/ifw/wildlife/reports/pdfs/2015MaineSWAP_Element1_DRAFT.pdf

6. How are SGCN different from Threatened and Endangered (T/E) Species?

   SGCN are different from T/E species in several ways. First, T/E species are eligible for regulation under the Maine and/or Federal Endangered Species Acts (ESA). Some activities that affect these species or habitats also are potentially regulated. In contrast, SGCN species are not regulated. Many state and federal T/E species also qualify for SGCN status; but, this designation does not add any additional regulations. There are many more SGCN than there are listed T/E species. For example, there are 51 T/E species listed under Maine's ESA, but there are 376 SGCN in Maine's 2015 Action Plan. By designating a species as SGCN now, we can take preventative steps to avoid the need for listing the species in the future under the State or Federal ESA.

7. Where can I find the list of SGCN?

   The list of SGCN begins on page 31 here:
   http://www.maine.gov/ifw/wildlife/reports/pdfs/2015MaineSWAP_Element1_DRAFT.pdf

   SGCN are organized by groups (e.g., birds, mammals, amphibians, etc.); click on each species to view a report that details how the species qualified as SGCN, associated habitats, distribution range in Maine, stressors affecting the species and its habitats, and conservation actions proposed to prevent future declines over the next ten years.

8. Don't some of these species already have management plans?

   Yes. The 2015 Wildlife Action Plan is not intended to replace existing management plans, but rather to provide additional resources for ongoing and new SGCN conservation efforts.

9. Where can I find information on what is affecting SGCN and their habitats ('stressors')? Information on SGCN and habitat stressors can be found here: http://www.maine.gov/ifw/wildlife/reports/pdfs/2015MaineSWAP_Element3_DRAFT.pdf

10. Where do the stressor names come from?

    As with most other states in the Northeast, we identified stressors using the International Union for the Conservation of Nature (IUCN) Threat Classification Scheme. This system provides standard terms that allow states to 'speak the same language' when describing common stressors. More information can be found here, beginning on page 4: http://www.maine.gov/ifw/wildlife/reports/pdfs/2015MaineSWAP_Element3_DRAFT.pdf

11. Don't certain activities classified as 'stressors' sometimes benefit wildlife and habitats?

    Yes, some 'stressors' may also have positive effects on wildlife and habitats. For example, aquaculture activities like shellfish seeding can help improve water quality and help form substrate for important habitats like eelgrass. Wood harvesting and agricultural activities can benefit certain SGCN by creating or maintaining wildlife habitat. We summarized some of these beneficial effects beginning on page 6 in Element 3: http://www.maine.gov/ifw/wildlife/reports/pdfs/2015MaineSWAP_Element3_DRAFT.pdf

12. Where can I find information on the actions being proposed to prevent future species and habitat declines?

    Information on conservation actions can be found here: http://www.maine.gov/ifw/wildlife/reports/pdfs/2015MaineSWAP_Element4_DRAFT.pdf

    This chapter also contains information on how MDIFW and conservation partners will prioritize and implement these actions over the next ten years.

13. Who can I contact for more information on the draft plan?

    For more information or to submit comments, please contact:

    Becky Orff at: becky.orff@maine.gov

    OR

    SWAP
    Wildlife Division
    Maine Dept. of Inland Fisheries and Wildlife
    284 State St. #41
    Augusta, ME 04333

Public comments will be accepted through August 12, 2015.

14. When will the final plan be completed?

    We must submit the plan to USFWS by October 1, 2015.

15. How can I get involved?

    Completing the 2015 plan is just the first step in the next ten years of wildlife conservation. The success of Maine's 2015 Action Plan relies on your participation and partnership. The plan presents actions ranging from local, SGCN-specific efforts to those with a more regional focus. We hope you will see a role for yourself or your organization in these actions.

    If you belong to one of the conservation partner organizations that participated in writing the 2015 plan (see page 15, http://www.maine.gov/ifw/wildlife/reports/pdfs/2015MaineSWAP_Elements7and8_DRAFT.pdf), you may wish to contact your local chapter or media representative for more information. You also may contact members of the MDIFW 2015 Action Plan Coordination Team at mainewildlifeactionplan@gmail.com.

    As the plan is implemented, we hope to provide ongoing workshops and informational sessions on accessing and using plan information. Please contact us (mainewildlifeactionplan@gmail.com) if your group is interested in having one of these sessions.