



## 6 Conservation Actions

In Chapter 4, the threats and conservation actions pertinent to each of the 24 SWAP Habitats and associated SGCN were discussed in detail. In this chapter, we provide an overview of the highest priority conservation actions on a state-wide basis, which are aimed at conserving the biodiversity of the Commonwealth as a whole and at meeting our obligations to species of high regional conservation need. These strategies are organized into:

- Conservation planning;
- Proactive habitat protection and securement;
- Habitat restoration and management;
- Environmental regulation;
- Surveys, monitoring, and databases; and
- Public outreach.

These activities provide the overarching framework for the conservation, management, and restoration of the

species in greatest need of conservation identified in this Plan. **However, the foremost priorities among these strategies are the targeted and focused protection and management of the habitats of the species in greatest need of conservation.**

By necessity, this chapter largely describes actions to be taken by the Massachusetts Division of Fisheries and Wildlife, but we would encourage our conservation partners to use this chapter and Chapter 4 to help guide their own conservation actions.

Although grouped somewhat differently, the actions described in this chapter are intended to fit into the Northeast Conservation Framework (Workshop Planning Team 2011; see Figure 6-1).

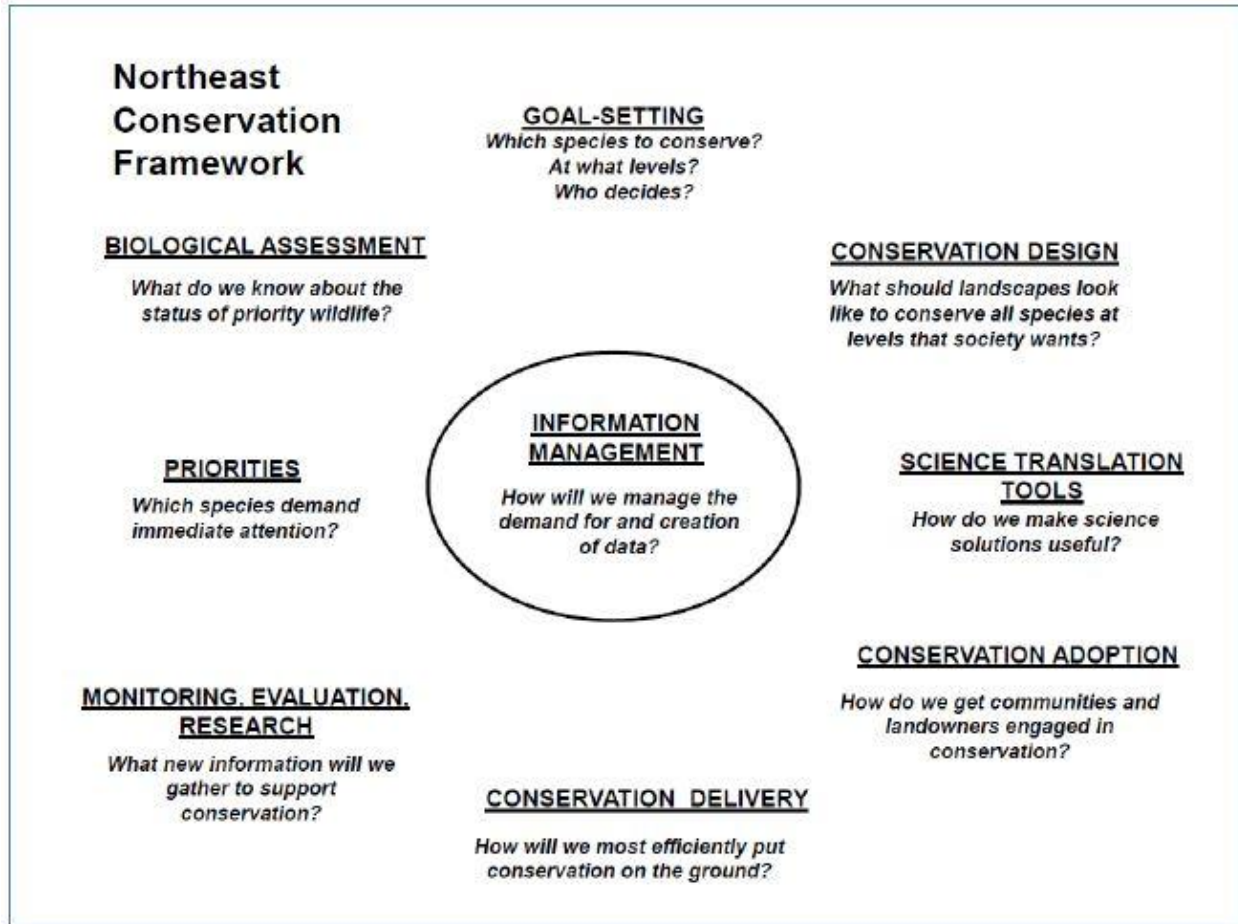


Figure 6-1. The Northeast Conservation Framework.

From Figure 1 in Workshop Planning Team 2011.

## A. Conservation Planning

The Division has created tools like *BioMap2* to answer where the best areas for biodiversity are. Now, we want to begin to answer the question **how much is enough?** Massachusetts has made considerable strides towards conserving its biodiversity; how much more land do we need to protect, and where? What habitat restoration and management is necessary? How do we build climate change considerations into the planning process? What other actions are needed in particular situations? To some extent, these questions are rhetorical and the answers can never be exact or absolute; yet without making the attempt to find answers, we cannot prioritize our acquisition, management, and planning efforts.

In order to accomplish effective biodiversity conservation, we must set realistic and pragmatic conservation goals by developing species and habitat-based conservation plans, and then monitor our progress towards those goals.

Developing conservation plans for SWAP species, habitats, and other resources involves the following steps:

- Assessing the state of information for each SWAP species in Massachusetts, as well as for SWAP Habitats and other coarse-filter elements of biodiversity, and targeting research to fill major information gaps, if needed.

- Incorporating appropriate elements of existing regional, national, and international conservation plans.
- Prioritizing, for each species and other biodiversity element, among the needs for land protection, habitat management, regulation, research, and public outreach.
- Setting quantitative, clear, written goals for each high-priority conservation action needed, for each species and other biodiversity element.
- Monitoring annual progress.
- Using adaptive management to reassess and reset conservation goals on a periodic basis.

In particular, we must set conservation goals for land protection and habitat management, as these are time- and resource-intensive efforts. Without appropriate goals, it is too easy to waste considerable resources on protecting land or managing habitat without accomplishing something worthwhile. Indeed, it is likely, in addition, that we will need to prioritize among SWAP species, as the efforts of the entire conservation community may not be enough to conserve every SWAP species.

To inform these conservation plans, DFW will complete and refine the **protectedness analysis** begun as part of this SWAP update (see Chapter 2, Section A), as land protection is an easily measured conservation action that is likely to be of high priority for most of the SGCN. This analysis seeks to determine how much of the land inhabited by a SWAP species or coarse-filter *BioMap2* element in Massachusetts is permanently protected against development.

We will also update the **Key Sites** data periodically, to ensure that state land protection and habitat management efforts are targeting the most appropriate and efficient sites.

The most difficult part of constructing any truly useful conservation plan is setting goals: How many populations of Blanding's Turtles or Chain Dot Geometer or Purple Clematis should be conserved, and which ones? How many acres of early successional habitat should be created each year, and exactly where? Should conserving coarse-filter biodiversity elements – Forest Cores or areas highly resilient in the face of climate change – be more or less important than conserving globally rare species, or is it practical to conserve both?

DFW has already adopted, developed, or is developing conservation plans for many species and habitats, and is implementing the planned conservation actions in coordination with our many partners. Some of these plans include:

- Recovery Plans for Federally listed species, such as Piping Plover, Roseate Tern, and Sandplain Gerardia;
- Continental-scale plans for migratory waterfowl and American Woodcock;
- Regional plans for New England Cottontail, Blanding's and Wood Turtles, and the Eastern Brook Trout Initiative;
- [Massachusetts Grassland Bird Conservation Plan](#);
- Conservation plans for grassland, shrubland, and Pitch Pine-Scrub Oak habitats on DFW properties;
- Massachusetts Black Bear conservation and management plan.

At the same time, we must recognize that our landscape is changing as a result of climate change, and changing ever more rapidly. Results from the Climate Change Vulnerability Assessment conducted by the Manomet Center for Conservation Sciences with DFW helped to identify which SWAP habitat types are more vulnerable to climate change than others and, importantly, helped to identify the factors which make them vulnerable. Armed with this information and the results from the Regional Climate Change Vulnerability Assessment, we are able to set priorities for habitat conservation within the Commonwealth based on how likely various habitat types are likely to persist both within the state and throughout their current range. Thus, the second conservation planning task we will undertake is to incorporate landscape-scale planning into our conservation actions. Already, DFW uses SGCN data and coarse-filter *BioMap2* areas in its land protection and habitat management planning; shortly, we will evaluate and incorporate other landscape planning efforts, among them:

- The Nature Conservancy's [resiliency data](#);
- UMass [Critical Linkages/CAPS data](#) (some of which was incorporated in *BioMap2*);
- Harvard Forest's [Wildlands and Woodlands project](#).

Finally, we will look beyond Massachusetts' borders and coordinate our planning for SGCN species and habitats throughout their ranges, by working with the other states in our region. This process began in the

past five years with the Regional Conservation Needs (RCN) grant projects, funded by the Northeast Association of Fish and Wildlife Agencies (NEAFWA) using funds from each state's apportionment of State Wildlife Grant funds. Projects included developing a common set of habitat maps, both aquatic and terrestrial, in order to be able to view the entire region in a similar fashion. Additional projects have been completed, including those focusing on Wood and Blanding's Turtles, odonates, and New England Cottontail. A complete listing of all of the projects funded through the RCN Grant Program can be found at [Northeast Regional Conservation Needs](#). The [North Atlantic Landscape Conservation Cooperative](#) (NALCC) has provided additional funding to broaden the scope of the RCN Program. The regional scale projects they have funded can be seen on their website under the Projects heading. While our focus remains within our own borders, we will continue to participate in regional conservation planning efforts, including NEAFWA, the [Landscape Conservation Cooperatives](#) (LCCs), and the [NatureServe Network](#).

The Regional Conservation Needs (RCN) Program formalizes a cooperative approach to address SGCN needs across multiple states. The purpose of the RCN program is to develop, coordinate, and implement conservation actions that are regional/sub-regional in scope, and build upon the many regional initiatives that already exist. The Massachusetts Division of Fisheries and Wildlife will participate in developing and implementing conservation actions for issues, threats, and opportunities most effectively addressed at a

regional/multi-state scale, with the input and involvement of multiple parties involved in the creation and implementation of the State Wildlife Action Plans.

Another example of coordination beyond the borders of Massachusetts is DFW's involvement with the [Southern Wings Program](#), a partnership of state wildlife agencies, via the Northeast Association of Fish and Wildlife Agencies (AFWA), to conserve priority migratory birds on their wintering grounds in the Caribbean, Mexico, and Central and South America. Of the 95 birds on the Massachusetts list of SGCN, 74 migrate out of the state for the winter; 52 of those species primarily spend the winter outside the United States. Conservation of these species must involve actions beyond Massachusetts to be most effective. One example of such a species for Massachusetts is the Piping Plover. Currently, Massachusetts has the largest breeding population (more than 650 pairs) along the Atlantic Coast and over 15% of the global population of this federally listed species. The Atlantic Coast population of Piping Plovers migrates to the southeastern United States, the Gulf of Mexico, and the Caribbean. To date, the Northeast Association of Fish and Wildlife Agencies has contributed to two Southern Wings projects: the Conservation of Cerulean Warbler Wintering Grounds, which aims to improve habitat in Columbia for the warbler; and Protecting the Piping Plover and other Shorebirds, focused on improving over-winter survival in the Bahamas. Both projects are focused in critically important wintering areas for the target species and could have profound conservation impacts.

## B. Proactive Habitat Protection

For almost every species and habitat in greatest need of conservation in Massachusetts, this Plan recommends that appropriate areas be protected from development and managed for the long-term conservation of these species and habitats. However, slightly more than one quarter of Massachusetts – over a million acres – is already protected by a conservation entity (state, Federal, municipal, or private non-profit). Further, it is clear that the opportunities to protect suitable habitat and the funding with which to protect land are both dwindling rapidly in this state. **Thus, to protect our species in greatest need of conservation, the challenge is that of making the difficult and**

**wrenching decisions about which lands have the highest priority for acquisition in the very near future.**

The paragraph above was written for the 2005 SWAP, and it is still appropriate for the next decade. The only change – it is a significant one – has been to update the amount of protected land, from one sixth of the state to one quarter, and that is quite an achievement in only ten years (see Chapter 2, section A). For the next decade, because we may be nearing having sufficient land protected, the targets of land protection efforts by all concerned entities should be even more proactive, clearly defined, focused, and supportable.



Once appropriate species or habitat conservation goals are set through conservation planning, the following steps will be needed to assess the effectiveness of the planning effort:

- Assess the protectedness of each element of biodiversity. As part of completing and refining this protectedness analysis, it will be necessary to collect and update data on biodiversity element occurrences and on the protected/unprotected status of land parcels.
- Target for acquisition unprotected areas sufficient to meet conservation goals.
- Disseminate this analysis to the existing land protection community in Massachusetts, through reports, downloadable GIS layers, and presentations, to allow our partners to use their resources effectively to reach these landscape goals.
- Encourage land protection efforts in the goal areas, through targeted state and private grant programs.
- Track progress towards land protection goals.
- Reassess goals periodically, to see if they are still appropriate or if conservation efforts are better shifted to emphasize habitat management, say, as most of the targeted areas are protected.

On top of this element-by-element effort, there should be an effort to determine those areas of the state that are “hotspots” for SGCN species, where several rare species co-occur, as targeting those areas for land protection (and habitat management) is a highly efficient use of resources. The Massachusetts Division of Fisheries and Wildlife has recently performed this determination in its Key Sites project (see Chapter 4, Section D, for further explanation of the project) and is using the resulting data in its land protection and

habitat management initiatives, as well as sharing the data with its sister agency, the Department of Conservation and Recreation. The Key Sites data should be updated on a periodic basis.

Five years ago, DFW updated the original BioMap and Living Waters to produce *BioMap2*, a detailed map of areas that need to be secured and managed in order to conserve the breadth of biodiversity in this state. Where the areas identified for protection in the first BioMap were based primarily on areas supporting state-listed and federally listed species, the new *BioMap2* uses in addition a broader set of criteria, including habitats which support SGCN and areas vulnerable to sea level rise caused by climate change. Altogether, *BioMap2* Core Habitat and Critical Natural Landscape cover 2.1 million acres, about 40% of the state. About 41% of these 2.1 million acres are already protected. Clearly, the remaining *BioMap2* areas should be the targets for land protection in the near future, but we should recognize that it may not be possible nor even preferable to protect all of the approximately 1.2 million acres as yet unprotected. Indeed, *BioMap2* explicitly noted that many areas of Critical Natural Landscape can be working landscapes, where active forestry or agriculture can occur. In the past five years, some *BioMap2* areas have already been developed. In a few areas, the targeted biological resource may have been locally extirpated. Almost certainly, even the entire Massachusetts conservation community will not have the funding needed to protect all of those 1.2 million acres. Therefore, we must prioritize within unprotected *BioMap2* Core and Critical Natural Landscape areas to determine what are the highest priorities for land protection. However, this *within-BioMap2* prioritization must be flexible, not a hard and unchanging line on a map.

## C. Habitat Restoration and Management

### ***Forest, Shrubland, and Grassland Management***

The DFW established landscape composition goals for wildlife habitats in 1996 (see Figure 2-1). The SWAP identifies these habitat types as important habitats for many SGCN. In many cases, achieving habitat goals involves actively manipulating existing features because the desired future condition is different than the present condition. Typical examples include mowing abandoned agricultural lands to maintain open habitats, wood products harvesting to establish young

forest habitat, selective application of herbicides to control invasive plants, and prescribed fires to counter decades of fire suppression. However, management does not always involve active manipulation. For example, to achieve MDFW’s goal for late-seral forest habitat, areas of existing mid-seral forest are identified where no future harvesting will occur. Similarly, management of wetland resources often involves maintaining current conditions, which can be accomplished by limiting activities within the wetland

resource (e.g., no draining, road building, etc), by establishing buffer zones immediately outside the resource area where management is mitigated (e.g., limiting timber harvest to 50% of basal area within 50 or 100 feet of a wetland), and by restricting development (e.g., no construction within 100 or 200 feet of a wetland). At times, however, changes are desired within wetland habitats if they are becoming degraded by invasive plant species, and/or if tree growth is degrading food and cover resources provided by native shrubs.

Active management of upland resources typically involves reclamation and maintenance of grassland, shrubland, and young forest habitats (see Figure 2-1). The DFW's Habitat Program and Ecological Restoration Program works cooperatively through the Division's Biodiversity Initiative (BDI) to identify the highest priority sites for grassland, shrubland, and young forest management to address long-term population declines in native wildlife species associated with these early-successional habitats. The BDI works to determine desired future conditions for these priority sites, to create planning documents that detail how desired future conditions can be achieved, and to implement specific management practices by DFW staff and private contractors to achieve desired conditions.

Management of grassland and shrubland habitats typically occurs on post-agricultural or abandoned field habitats, but can also involve conversion of second-growth forest adjacent to existing grasslands and shrublands to enhance habitat quality for declining, area-dependent wildlife species that need extensive patches (e.g., 50-500 acres) of shrubland and grassland habitats. Many SGCN depend on these habitat types. Examples of declining area-dependent shrubland species include the New England Cottontail and Eastern Towhee. Examples of declining, area-dependent grassland species include the Grasshopper Sparrow and Upland Sandpiper.

Management of young forest habitats typically occurs within full-canopy, second-growth forest that has become reestablished following agricultural abandonment in the early 1900s. Second-growth forest occurring on relatively flat terrain with stable soils is the primary choice for establishing young forest habitat.

Grassland management involves removing invading woody vegetation and controlling invasive exotic

plants. These activities are carried out using a combination of selective herbicide application, mechanical mowing, and prescribed burning. Relatively few sites on DFW lands are appropriate for grassland management, and the highest priority grassland sites were recently identified in the 2013 Action Plan for Conservation of Obligate Grassland Birds in Massachusetts (<http://www.mass.gov/eea/docs/dfg/nhosp/species-and-conservation/grassland-bird-plan-final.pdf>).

Shrubland management involves removing invading trees, and controlling invasive plants. The priority of an individual site for shrubland management is determined by its landscape setting. High-priority sites are relatively large (2-20 hectares), and/or occur adjacent to or near (within 400 meters of) other open habitats. The DFW seeks to cluster large areas of shrubland habitat to minimize the potential deleterious impacts associated with fragmentation of forested habitats, including increased nest predation rates, increased risk of population extinctions, and increased potential for invasion by exotic species.

Land-clearing machinery is often used to cut and mulch invading trees and large invasive shrubs within shrubland sites. Land-clearing machinery includes moderate-sized Fecon-style mulching mowers for woody stems up to about 3" in diameter, and larger industrial mowers such as a hydro-axe or an excavator-mounted rotary drum mower/mulcher for woody stems 4-6 inches in diameter. For trees greater than 6 inches in diameter, tree shears, skidders, and chippers are typically used. Valuable food-producing trees and shrubs such as wild apple, dogwood, viburnum, blueberry, and serviceberry are retained.

Control of invasive exotic plants is a vital component of shrubland management because invasive exotic species often occur on abandoned agricultural lands and thrive on disturbance, including the disturbance caused by vegetation clearing. If left untreated, invasive exotic plants can quickly dominate sites and degrade natural communities. Invasive plant control is accomplished through mechanical and/or chemical methods, depending on the abundance of invasive plants. Small infestations of invasive plants are usually treated mechanically by pulling individual plants and their entire root systems from the ground; larger infestations are typically herbicide-treated to kill the root system and prevent resprouting.

The very people and equipment used to control the spread of exotic invasive plants can themselves become the vectors for the spread of these plants. The DFW has developed Best Management Practices (BMPs) for the control of invasive species to limit the spread of these plants. These BMPs are followed by both DFW personnel and contractors.

Invasive exotics are colonizers which quickly establish themselves in disturbed communities. Invasive exotic vegetation commonly found on shrubland sites includes Japanese and common barberry, multiflora rose, glossy and common buckthorn, Asiatic bittersweet, autumn olive, and others. When herbicide control is required, a selective foliar spray or cut-stem application is used. Reclamation sites are not broadcast-treated; only individual invasive exotic plants are treated. Herbicides are applied only by experienced applicators that are licensed by the Massachusetts Department of Agricultural Resources (DAR). Herbicides used are limited to those recommended for use in sensitive areas on rights-of-way by DAR [333 CMR 11.04 (1) (d)]. Sensitive areas include areas within the primary recharge area of a public drinking water supply well, within 400 feet of any surface water used as a public water supply, and within 100 feet of private water supplies, surface waters, wetlands, and agricultural and inhabited areas.

Young forest habitat management is needed because forest cover across Massachusetts is generally 75-100 years old. Potential sites for establishing young forest habitats have been identified on DFW lands through a GIS analysis of forest cover type data, slope, and soil types.

The analysis for potential young forest sites identified existing stands that were deemed to be either high risk or low quality. High-risk stands primarily included White Pine forest growing on hardwood sites (i.e., on soils that typically support hardwood forest). These stands are thought to be at risk because mature pine trees are likely to be highly susceptible to wind-throw and to insect infestations. Low-quality stands primarily included mid-seral forest with relatively open canopies (e.g., 40-60% canopy cover), which typically indicates that high-grade timber cutting occurred prior to state acquisition. High-grade cutting typically removes only the largest, highest quality trees that can be sold for timber, and leaves suppressed trees of poor vigor and limited species diversity.

On high-risk sites, silvicultural prescriptions generally call for shelterwood cutting which typically involves two harvest operations within a 5-10 year period. In the first operation, 40-50% of the overstory trees are removed in order to provide adequate sunlight on the forest floor to regenerate desired tree species that are well suited to the site. Mature, high-quality trees are retained in the overstory to provide seed for the next generation of trees. In the second operation, 30-40% of the original overstory is removed to release young trees that have become established on the site. This process retains 10-30% of the original overstory canopy in clusters of trees to provide structural diversity in the stand, to provide den and cavity trees for wildlife, and to provide a future source of coarse woody debris. This is generally referred to as "shelterwood with reserves" and typically results in a two-aged stand.

On low-quality sites, silvicultural prescriptions generally call for either the shelterwood with reserves approach described above, or for aggregate retention cutting which typically involves a single harvest operation that removes 70-90% of the overstory. As with the shelterwood with reserves approach, aggregate retention cutting retains 10-30% of the original overstory canopy in clusters of trees to provide structural diversity in the stand, to provide den and cavity trees for wildlife, and to provide a future source of coarse woody debris. Aggregate retention cuts also typically result in a two-aged stand.

Shelterwood cutting typically favors regeneration of tree species that benefit from a moderate amount of shade during the early seedling stage of development (e.g., White Pine and Red Oak). Aggregate retention cutting typically favors regeneration of tree species that benefit from a good deal of sunlight during the early seedling stage of development (e.g., Black Cherry and White Ash). On sites that are neither high risk nor low quality, a process called "group selection" cutting may be used. This process typically removes 20-30% of the overstory trees during each cutting operation, and cutting usually occurs within a stand once every 25-30 years. This approach favors regeneration of tree species that benefit from a good deal of shade during the early seedling stage of development (e.g., Sugar Maple and Eastern Hemlock) and typically results in forest stands with multiple ( $\geq 3$ ) age classes of trees.

All silvicultural operations on DFW lands are carried out by private contractors chosen through competitive, public bids. These operations typically involve

mechanical harvesting machinery (tracked vehicles with hydraulic systems for cutting and processing individual trees), skidders (wheeled vehicles with either winch or grapple capabilities to move cut trees in steeper portions of harvest sites), and forwarders (wheeled or tracked vehicles equipped with a hydraulic loader that transport cut trees from within the harvest site to a roadside area from which wood products can be trucked to processing mills).

Potential sites for establishing late-seral forest habitats on DFW lands were identified through a cooperative effort with other state agencies and private, non-profit conservation groups to establish a system of forest reserves on state lands. Potential forest reserve sites were identified through a GIS analysis of 22 extensive, relatively unfragmented forest landscapes that still exist in Massachusetts. A series of ecological attributes were identified to evaluate and compare these relatively unfragmented forest landscapes. Attributes included existing old-growth forest, rare species habitats, amount of protected open space, and amount of interior forest habitat that is buffered from fragmenting features such as roads and development.

To date, nearly 20,000 acres of forest reserves have been established on DFW lands. These include both large (matrix) reserves of more than 5,000 acres, and small (patch) reserves of less than 500 acres. Together, large and small reserves on DFW lands meet the existing landscape composition goal for late-seral forest habitat (Figure 2-1). It is important to note that large reserves were established on DFW land only if adequate buffers of private forestlands could be secured outside a reserve to limit future impacts of fragmentation within a reserve.

Management of grassland, shrubland, and young forest habitats is not restricted to DFW property. DFW provides technical assistance on active management of early-successional habitats at high priority sites on

other public lands (e.g., town lands administered by local Conservation Commissions, state forestlands and state watershed lands within the Department of Conservation of Recreation, and federal lands within the U.S. Army Corp of Engineers), and on private lands (e.g., land trusts and private Conservation Restrictions) throughout the state.

Private forestlands provide more wildlife habitat (nearly 2 million acres) than any other type of ownership (public or private) in Massachusetts. Wildlife populations simply cannot be conserved at the landscape level in Massachusetts without the direct and indirect contributions made by private forestlands. The good news is that wildlife is often the most important attribute private owners associate with their land (Kittredge 2015). The bad news is that most private forestland owners do not have a forest management plan, and have not engaged in long-term conservation planning for their property (Catanzaro et al. 2014). How can these two contradictory items be addressed to benefit wildlife?

Perhaps the best thing that DFW can do is to establish within the agency full-time technical assistance capacity for private lands. Research indicates that women and multiple generations of a family need to be involved in decision-making for individual private forestlands (Catanzaro et al. 2014), and those individuals need a place they can turn to for recommendations on the wildlife values they associate so highly with their property. Based on U.S. Forest Service data, we already know that private forestlands in Massachusetts provide relatively little of the grassland, shrubland, and young forest habitats that are needed, so technical assistance from DFW could go a long way toward enhancing wildlife habitat across the Commonwealth. A technical assistance liaison within DFW could assist private landowners, and also assist managers of town conservation lands and land trust lands, who are interested in enhancing wildlife habitat.

## D. Environmental Regulation

The Commonwealth of Massachusetts has strong and effective environmental laws and regulations (see Chapter 2, Section C). While occasional modifications are needed (for example, the change of legal status of species on the MESA list as new information emerges), no major changes to environmental laws are needed.

However, what is needed are sufficient funding, staffing, and other resources to ensure appropriate monitoring and enforcement of the current laws and regulations. The Division of Fisheries and Wildlife, which regulates under MESA, has not had staffing cuts, but is facing a funding crisis in the next decade, as traditional sources of funding (hunters' license fees and excise taxes on hunting and fishing equipment) shrink.



A major function of the Natural Heritage and Endangered Species Program (NHESP) is to review the likely impact of proposed development projects or wetland alterations on the state-listed SWAP species and their habitats. The Program reviews about 2,000 such projects a year and plays a critical role in implementing the Massachusetts Endangered Species Act (MESA) and the Massachusetts Wetlands Protection Act (WPA).

Over the next few years, NHESP plans to develop clear performance standards that will cover the majority of such reviews, providing developers and other proponents of proposed alterations with transparent, scientifically defensible guidance for avoiding or minimizing impacts to MESA-listed species habitat. As part of this, NHESP will participate in the development of species-specific conservation plans that determine where regulation under MESA makes a positive contribution to the long-term viability of a species. The development of these plans will begin with those species that are mostly commonly reviewed under MESA, such as Wood and Eastern Box Turtles, Blue-spotted and Jefferson Salamanders, and certain moths of Pitch Pine-Scrub Oak habitats.

Already, NHESP has developed Best Management Practices for the utility, renewable energy, and forestry industries in Massachusetts, where those industries work in the habitat of MESA-listed species. These BMPs, produced in consultation with the industries, provide easily obtainable guidance for the industries' most common activities. NHESP has also provided the Massachusetts Department of Conservation and Recreation (DCR), the largest single owner of important biodiversity lands in the state, with prior guidance on routine trail maintenance in habitats of state-listed SWAP species, including recommendations for over 35,000 individual trail segments. This guidance is structured such that DCR does not need to submit every instance of proposed trail maintenance for legal review by NHESP under MESA; instead, only those activities thought to be most likely to cause possible harm to MESA-listed species need to be submitted to NHESP. NHESP is evaluating whether this trail maintenance protocol can be extended to trails on other properties, including trails on DFW lands, and perhaps even to other kinds of land maintenance, such as mowing fields.

## E. Surveys, Monitoring, and Databases

Currently, DFW maintains extensive databases tracking the occurrences of many species in Massachusetts, including specific monitoring projects for wildlife species that are not state-listed but are in greatest need of conservation and for which there may be regulated hunting and/or trapping seasons (for example, Black Bear, Bobcat, and American Woodcock). DFW also maintains geospatial databases, as does MassGIS, of land cover features and SWAP habitat types. NHESP monitors all federally and state-listed rare animals and plants.

In addition to state-listed species, the Natural Heritage and Endangered Program of DFW tracks other plants and animals for which the conservation status in the state is unclear. However, some of the globally rare SGCN listed in this Plan have not been tracked by any section or program of DFW, and the current distribution and abundance of a number of state-listed species have not been surveyed systematically in recent years. The Natural Heritage Program will continue to track rare species, as it does now, but given

sufficient funding and staffing, there are additional species to be monitored and types of surveys to be conducted, as detailed below.

First, the Natural Heritage Program should add to its rare species database and determine the state rank (S1 through S5) of those globally rare animals (G1 through G3, rounded, or T1 through T3, rounded) listed in this Strategy which are not already tracked by the Program. This includes these species:

- *Alosa aestivalis*, Blueback Herring, G3G4
  - *Bombus affinis*, Rusty-patched Bumble Bee, G1
  - *Bombus pennsylvanicus*, American Bumblee Bee, G3G4
  - *Bombus terricola*, Yellow-banded Bumble Bee, G2G4
  - *Epeoloides pilosula*, Macropis Cuckoo Bee, G1
  - *Potamogeton gemmiparus*, Budding Pondweed, G5T3
  - *Sylvilagus transitionalis*, New England Cottontail, G3
- Abbreviations: See notes at the end of Table 3-1.

Second, the Natural Heritage Program should review the state status (S1 through S5) of species in greatest need of conservation, which are globally common, not already state-listed as rare, and currently ranked S1

though S3, SH, SU, SNA, or SNR. This review should include an assessment of the species' status in Massachusetts and, possibly, proposal for state listing, should a species prove threatened across the state. These species are listed in Table 6-1.

**Table 6-1: Species Needing Status Assessments**

<b>Taxon</b>	<b>Scientific Name</b>	<b>Common Name</b>	<b>State Rarity Ranking</b>
<b>Fish</b>	<i>Alosa aestivalis</i>	Blueback Herring	S3S4
	<i>Alosa pseudoharengus</i>	Alewife	S3S4
	<i>Alosa sapidissima</i>	American Shad	S3S4
	<i>Anguilla rostrata</i>	American Eel	S3S4
	<i>Fundulus luciae</i>	Spotfin Killifish	S3
<b>Amphibians</b>	<i>Lithobates pipiens</i>	Northern Leopard Frog	S3S4
<b>Birds</b>	<i>Accipiter gentilis</i>	Northern Goshawk	S3
	<i>Ammodramus caudacutus</i>	Saltmarsh Sharp-tailed Sparrow	S3B
	<i>Ammodramus maritimus</i>	Seaside Sparrow	S2B
	<i>Anas discors</i>	Blue-winged Teal	S2B, S5M
	<i>Ardea alba</i>	Great Egret	S2B, S4N
	<i>Calonectris diomedea</i>	Cory's Shearwater	S3N
	<i>Chordeiles minor</i>	Common Nighthawk	S2B, S5M
	<i>Cistothorus palustris</i>	Marsh Wren	S2S3B
	<i>Colinus virginianus</i>	Northern Bobwhite	S2
	<i>Contopus cooperi</i>	Olive-sided Flycatcher	SHB, S2N
	<i>Dolichonyx oryzivorus</i>	Bobolink	S3S4B
	<i>Egretta thula</i>	Snowy Egret	S2B, S4N
	<i>Eremophila alpestris</i>	Horned Lark	S3B, S4N
	<i>Euphagus carolinus</i>	Rusty Blackbird	S1?B, S3N
	<i>Falco sparverius</i>	American Kestrel	S3
	<i>Fratercula arctica</i>	Atlantic Puffin	S2N
	<i>Gallinago delicata</i>	Wilson's Snipe	S1S2B, S4N
	<i>Haematopus palliatus</i>	American Oystercatcher	S2B
	<i>Histrionicus histrionicus</i>	Harlequin Duck	S2N
	<i>Larus argentatus</i>	Herring Gull	S3S4B, S5N
	<i>Larus atricilla</i>	Laughing Gull	S2B
	<i>Larus marinus</i>	Great Black-backed Gull	S3S4B, S5N
	<i>Numenius phaeopus</i>	Whimbrel	S3N
	<i>Nycticorax nycticorax</i>	Black-crowned Night-Heron	S2B
	<i>Petrochelidon pyrrhonota</i>	Cliff Swallow	S2B
	<i>Phalacrocorax auritus</i>	Double-crested Cormorant	S3B, S5N
	<i>Porzana carolina</i>	Sora	S2S3B, S4N
	<i>Progne subis</i>	Purple Martin	S1B
	<i>Puffinus puffinus</i>	Manx Shearwater	SXB, S3S4N
	<i>Setophaga cerulea</i>	Cerulean Warbler	S1B, S2M
	<i>Setophaga discolor</i>	Prairie Warbler	S3S4B
	<i>Somateria mollissima</i>	Common Eider	S2B, S5N
	<i>Spizella pusilla</i>	Field Sparrow	S3S4
	<i>Sturnella magna</i>	Eastern Meadowlark	S3S4B
<i>Tringa semipalmata</i>	Willet	S3B, S3N	
<i>Vermivora cyanoptera</i>	Blue-winged Warbler	S3S4B	
<b>Mammals</b>	<i>Glaucomys sabrinus</i>	Northern Flying Squirrel	S2?
	<i>Lasionycteris noctivagans</i>	Silver-haired Bat	S3M
	<i>Lasiurus borealis</i>	Red Bat	S3M

Taxon	Scientific Name	Common Name	State Rarity Ranking
	<i>Lasiurus cinereus</i>	Hoary Bat	S2B
	<i>Sylvilagus transitionalis</i>	New England Cottontail	S2
Freshwater Mussels	<i>Alasmidonta undulata</i>	Triangle Floater	S3
	<i>Anodonta implicata</i>	Alewife Floater	SU
	<i>Margaritifera margaritifera</i>	Eastern Pearlshell	SU
Crustaceans	<i>Cambarus bartonii</i>	Appalachian Brook Crayfish	S2
Dragonflies & Damselflies	<i>Anax longipes</i>	Comet Darner	S2S3
	<i>Rhionaeschna mutata</i>	Spatdock Darner	S3
Bees	<i>Anthophora walshii</i>	Walsh's Anthophora	SNR
	<i>Bombus fervidus</i>	Yellow Bumble Bee	SNR
	<i>Epeoloides pilosula</i>	Macropis Cuckoo Bee	SNR
	<i>Macropis ciliata</i>	Ciliary Oil-collecting Bee	SNR
	<i>Macropis nuda</i>	Naked Oil-collecting Bee	SNR
	<i>Macropis patellata</i>	Patellar Oil-collecting Bee	SNR
Plants	<i>Amaranthus pumilus</i>	Seabeach Amaranth	SH
	<i>Botrychium simplex</i>	Least Moonwort	S1S2
	<i>Botrychium tenebrosum</i>	Swamp Moonwort	S1S2
	<i>Carex exilis</i>	Bog Sedge	S2S3
	<i>Coeloglossum viride</i>	Long-bracted Green Orchid	S3
	<i>Corema conradii</i>	Broom Crowberry	S3
	<i>Coreopsis rosea</i>	Rose Coreopsis	S3
	<i>Crocianthemum dumosum</i>	Bushy Rockrose	S3
	<i>Cystopteris laurentiana</i>	Laurentian Bladderfern	S2S3
	<i>Galearis spectabilis</i>	Showy Orchid	S2S3
	<i>Gentiana linearis</i>	Narrow-leaved Gentian	S2?
	<i>Lathyrus palustris</i>	Marsh-pea	SNR
	<i>Linum intercursum</i>	Sandplain Flax	S3
	<i>Liparis loeselii</i>	Loesel's Twayblade	SNR
	<i>Lupinus perennis</i>	Wild Lupine	S3S4
	<i>Orthilia secunda</i>	One-sided Wintergreen	SNR
	<i>Platanthera aquilonis</i>	North Wind Orchid	SNR
	<i>Platanthera hookeri</i>	Hooker's Orchid	S2?
	<i>Platanthera huronensis</i>	Northern Green Orchid	S2?
	<i>Platanthera macrophylla</i>	Large Round-leaved Orchid	S2?
	<i>Platanthera orbiculata</i>	Round-leaved Orchid	S1S2
	<i>Potamogeton gemmiparus</i>	Budding Pondweed	S2?
	<i>Silene caroliniana</i> ssp. <i>pensylvanica</i>	Wild Pink	S2S3
	<i>Suaeda maritima</i> ssp. <i>richii</i>	Rich's Sea-blite	S2S3
	<i>Symphotrichum praealtum</i>	Willow Aster	S1

Abbreviations: See notes at the end of Table 3-1.

Finally, specific taxa need systematic surveys and research efforts statewide, as noted in the following table. Although many of the species in this SWAP are covered here, not every taxon needs survey and

research effort. For example, the distribution of Blanding's and Wood Turtles in Massachusetts has been extensively surveyed in the past decade.

**Table 6-2: Species Needing Systematic Surveys and Research Efforts**

<b>Taxonomic Group</b>	<b>Scientific Name</b>	<b>Common Name</b>	<b>Notes</b>
<b>Fishes</b>	<i>Notropis bifrenatus</i>	Bridle Shiner	Population status in MA is unclear.
<b>Amphibians</b>	<i>Lithobates pipiens</i>	Northern Leopard Frog	Of regional conservation concern; status in MA is unclear.
<b>Reptiles</b>	<i>Caretta caretta</i> <i>Chelonia mydas</i> <i>Eretmochelys imbricata</i> <i>Lepidochelys kempii</i> <i>Dermochelys coriacea</i>	Seaturtles	Current tracking efforts are inadequate; in coordination with others, NHESP should track rescued seaturtles, salvaged specimens (including cause of death), distribution, abundance, age structure, and movements in MA waters.
	<i>Clemmys guttata</i> <i>Glyptemys insculpta</i> <i>Terrapene carolina</i>	Spotted Turtle Wood Turtle Eastern Box Turtle	NHESP has more than 200 documented occurrences of each of these turtles; the need is to determine if the longterm viability of these long-lived species is threatened in MA. Research needs include long-term trend monitoring, size and age structure of existing populations, percentage of populations that are currently protected, efficacy of remediation attempts related to environmental review projects.
<b>Reptiles</b>	<i>Emydoidea blandingii</i>	Blanding's Turtle	This species is highly threatened by sprawling development; research needs include full extent of distribution, acreage necessary for viable populations, efficacy of remediation attempts (tunnels, drift fences, created nest sites, etc.), age structure of existing populations, long-term (5-10 years) monitoring of populations, and coordination with New Hampshire researchers, at least.
	<i>Malaclemys terrapin</i>	Northern Diamond-backed Terrapin	Possible breeding habitat should be surveyed systematically for presence/absence of terrapins.
	<i>Pseudemys rubriventris</i>	Northern Red-Bellied Cooter	Ponds where head-started hatchlings were released should continue to be surveyed every five years, to determine success of head-starting. Also needed are short-term intensive surveys to determine nest success, etc.
	<i>Agkistrodon contortrix</i> <i>Crotalus horridus</i> <i>Pantherophis alleghaniensis</i>	Northern Copperhead Timber Rattlesnake Eastern Ratsnake	Not all den sites of these snakes are documented; long-term monitoring of den sites is needed. Movement distances and habitat use in MA should be investigated.
	<i>Coluber constrictor</i> <i>Heterodon platirhinos</i>	North American Racer Eastern Hog-nosed Snake	Of regional conservation concern; status in MA is unclear.
	<i>Opheodrys vernalis</i> <i>Thamnophis sauritus</i>	Smooth Greensnake Eastern Ribbonsnake	

Taxonomic Group	Scientific Name	Common Name	Notes
Birds	<i>Podilymbus podiceps</i> <i>Botaurus lentiginosus</i> <i>Ixobrychus exilis</i> <i>Rallus elegans</i> <i>Gallinula galeata</i> <i>Cistothorus platensis</i> <i>Ammodramus henslowii</i>	Pied-Billed Grebe American Bittern Least Bittern King Rail Common Gallinule Sedge Wren Henslow's Sparrow	Marsh Birds – difficult to observe, these birds should be surveyed every five years, using callback techniques and standardized methods.
	<i>Histrionicus histrionicus</i> <i>Parkesia motacilla</i> <i>Cardellina canadensis</i>	Harlequin Duck  Louisiana Waterthrush Canada Warbler	Of regional conservation concern; status in MA is unclear.
	<i>Clangula hyemalis</i> <i>Somateria mollissima</i>	Long-tailed Duck Common Eider	MA waters host very large wintering concentrations of these species; survey yearly for abundance, location, and movements
Birds	<i>Calidris canutus</i>	Red Knot	Newly listed under US ESA; needs intensive monitoring to determine feeding areas, numbers, and annual fluctuations
Mammals	<i>Sorex palustris</i> <i>Sorex dispar</i> <i>Synaptomys cooperi</i>	Water Shrew Rock Shrew Southern Bog Lemming	Full extent of distribution and abundance of these small mammals in MA is not well known.
	<i>Physeter macrocephalus</i> <i>Balaenoptera physalus</i> <i>Balaenoptera borealis</i> <i>Balaenoptera musculus</i> <i>Megaptera novaeangliae</i> <i>Eubalaena glacialis</i>	Sperm Whale Fin Whale  Sei Whale Blue Whale  Humpback Whale  Northern Right Whale	Current tracking efforts are inadequate; NHESP should track rescued efforts, salvaged specimens (including cause of death), distribution, abundance, age structure, and movements in MA waters.
	<i>Lasionycteris noctivagans</i> <i>Lasiurus borealis</i> <i>Lasiurus cinereus</i>	Silver-haired Bat  Eastern Red Bat Hoary Bat	Of regional conservation concern; the status of these migratory species in MA is unclear.
	<i>Sylvilagus transitionalis</i>	New England Cottontail	NHESP should compile all available current and historical data on distribution and abundance in MA; DFW and partners should continue systematic surveys in likely habitat.
Miscellaneous Invertebrates	<i>Spongilla aspinosa</i> <i>Polycelis remota</i> <i>Macrobodella sestertia</i>	Smooth Branched Sponge Sunderland Spring Planarian New England Medicinal Leech	These species have not been inventoried in recent years; full extent of distribution is likely unknown.



Taxonomic Group	Scientific Name	Common Name	Notes
Crustaceans	<i>Eubranchipus intricatus</i> <i>Eulimnadia agassizii</i> <i>Limnadia lenticularis</i>	Intricate Fairy Shrimp Agassiz's Clam Shrimp American Clam Shrimp	Vernal Pool invertebrates - full extent of distribution is likely unknown.
	<i>Gammarus pseudolimnaeus</i> <i>Stygobromus borealis</i> <i>Stygobromus tenuis</i> <i>tenuis</i>	Northern Spring Amphipod Taconic Cave Amphipod Piedmont Groundwater Amphipod	Spring and Cave invertebrates - full extent of distribution is likely unknown.
	<i>Synurella chamberlaini</i>	Coastal Swamp Amphipod	Full extent of distribution is likely unknown.
Dragonflies and Damselflies	<i>Boyeria grafiana</i> <i>Gomphus abbreviatus</i> <i>Gomphus descriptus</i> <i>Gomphus fraternus</i> <i>Gomphus quadricolor</i> <i>Gomphus vastus</i> <i>Gomphus ventricosus</i> <i>Neurocordulia obsoleta</i> <i>Neurocordulia yamaskanensis</i> <i>Ophiogomphus aspersus</i> <i>Ophiogomphus carolus</i> <i>Stylurus amnicola</i>	Ocellated Darner Spine-Crowned Clubtail Harpoon Clubtail Midland Clubtail Rapids Clubtail Cobra Clubtail Skillet Clubtail Umber Shadowdragon Stygian Shadowdragon Brook Snaketail Riffle Snaketail Riverine Clubtail	Riverine odonates; need systematic surveys of all watersheds statewide.
	<i>Somatochlora elongata</i> <i>Somatochlora forcipata</i> <i>Somatochlora georgiana</i> <i>Somatochlora incurvata</i> <i>Somatochlora kennedyi</i> <i>Somatochlora linearis</i>	Ski-Tailed Emerald Forcipate Emerald Coppery Emerald Incurvate Emerald Kennedy's Emerald Mocha Emerald	Emeralds – breeding sites in MA are virtually unknown.
	<i>Enallagma carunculatum</i>	Tule Bluet	Population status in MA is uncertain.
Beetles	<i>Cicindela dorsalis dorsalis</i> <i>Cicindela duodecimguttata</i> <i>Cicindela limbalis</i> <i>Cicindela patruela</i> <i>Cicindela purpurea</i>	Northeastern Beach Tiger Beetle Twelve-Spotted Tiger Beetle Bank Tiger Beetle Barrens Tiger Beetle Purple Tiger Beetle	Full extent of distribution of these species is likely unknown.

Taxonomic Group	Scientific Name	Common Name	Notes
<b>Butterflies and Moths</b>	<i>Apamea inebriata</i> <i>Euphyes dion</i> <i>Neoligia semicana</i> <i>Papaipema</i> <i>  appassionata</i> <i>Papaipema sp. 2</i> <i>Papaipema stenocelis</i> <i>Photedes inops</i>	Drunk Apamea Moth Dion Skipper Northern Brocade Moth Pitcher-plant Borer  Ostrich-fern Borer Chain-fern Borer Cord-grass Borer	Butterflies and moths of marshes and other wetlands; distribution across the state is not well documented.
<b>Bees</b>	All species	All species	While 9 native bees were listed as SGCN in this Plan, all bees should be surveyed to determine presence/absence, distribution, habitat use, and other elements of life histories.
<b>Plants</b>	<i>Aplectrum hyemale</i> <i>Arethusa bulbosa</i> <i>Coeloglossum viride</i>  <i>Corallorhiza odontorhiza</i> <i>Cypripedium arietinum</i>  <i>Cypripedium parviflorum</i> <i>Cypripedium reginae</i> <i>Galearis spectabilis</i> <i>Goodyera repens</i>  <i>Isotria medeoloides</i> <i>Liparis liliifolia</i> <i>Liparis loeselii</i> <i>Malaxis bayardii</i> <i>Malaxis monophyllos</i> <i>  var. brachypoda</i> <i>Malaxis unifolia</i> <i>Neottia bifolia</i> <i>Neottia cordata</i> <i>Platanthera aquilonis</i> <i>Platanthera cristata</i> <i>Platanthera dilatata</i> <i>Platanthera flava</i> var. <i>  herbiola</i> <i>Platanthera hookeri</i> <i>Platanthera huronensis</i> <i>Platanthera macrophylla</i> <i>Platanthera orbiculata</i> <i>Spiranthes</i> <i>  romanzoffiana</i> <i>Spiranthes vernalis</i>  <i>Tipularia discolor</i> <i>Triphora trianthophoros</i>	Putty-root Arethusa Long-bracted Green Orchid Autumn Coral-root  Ram's Head Lady's-slipper Yellow Lady's-slipper  Showy Lady's-slipper Showy Orchid Dwarf Rattlesnake-plantain Small Whorled Pogonia Lily-leaf Twayblade Loesel's Twayblade Bayard's Adder's Mouth White Adder's Mouth  Green Adder's Mouth Southern Twayblade Heartleaf Twayblade North Wind Orchid Crested Fringed Orchid Leafy White Orchid Pale Green Orchid  Hooker's Orchid Northern Green Orchid  Large Round-leaved Orchid Round-leaved Orchid Hooded Ladies'-tresses  Grass-leaved Ladies'-tresses Cranefly Orchid Nodding Pogonia	Numerous native orchids have been declining rapidly in the recent past. Surveys should determine the current status of these species, and research should be conducted to determine what has caused the declines.
	<i>Botrychium simplex</i> <i>Botrychium tenebrosum</i>	Least Moonwort Swamp Moonwort	Moonworts in general are poorly understood and under-surveyed. Surveys should target all known sites, historical and current, to clarify the status of populations in MA.

Taxonomic Group	Scientific Name	Common Name	Notes
Plants	<i>Amaranthus pumilus</i> <i>Aristida tuberculosa</i> <i>Lathyrus palustris</i> <i>Leymus mollis</i> ssp. <i>mollis</i> <i>Mertensia maritima</i> <i>Polygonum glaucum</i> <i>Rumex pallidus</i> <i>Setaria parviflora</i> <i>Suaeda calceoliformis</i> <i>Suaeda maritima</i> ssp. <i>richii</i>	Seabeach Amaranth Seabeach Needlegrass Marsh-pea Sea Lyme-grass  Oysterleaf Sea-beach Knotweed Seabeach Dock Bristly Foxtail American Sea-blite Rich's Sea-blite	Plants of saltwater coastlines. These need systematic surveys along all suitable stretches of habitat.
	<i>Amphicarpum amphicarpon</i> <i>Carex striata</i> <i>Coleataenia longifolia</i> ssp. <i>longifolia</i> <i>Coreopsis rosea</i> <i>Dichantherium dichotomum</i> ssp. <i>mattamuskeetense</i> <i>Dichantherium wrightianum</i> <i>Eleocharis microcarpa</i> var. <i>filiculmis</i> <i>Eleocharis tricostata</i>  <i>Eupatorium novae-angliae</i> <i>Hypericum adpressum</i> <i>Isoetes acadensis</i> <i>Isoetes lacustris</i> <i>Juncus debilis</i> <i>Lachnanthes caroliniana</i> <i>Lipocarpa micrantha</i> <i>Ludwigia sphaerocarpa</i> <i>Panicum philadelphicum</i> ssp. <i>philadelphicum</i> <i>Persicaria puritanorum</i> <i>Persicaria setacea</i> <i>Rhexia mariana</i>  <i>Rhynchospora inundata</i> <i>Rhynchospora nitens</i>  <i>Rhynchospora scirpoides</i> <i>Rhynchospora torreyana</i> <i>Rotala ramosior</i> <i>Sabatia campanulata</i> <i>Sabatia kennedyana</i> <i>Sabatia stellaris</i> <i>Sagittaria teres</i> <i>Utricularia subulata</i>	Annual Peanutgrass  Walter's Sedge Long-leaved Panic-grass  Rose Coreopsis Mattamuskeet Panic-grass  Wright's Panic-grass  Tiny-fruited Spike-sedge  Three-angled Spike-sedge New England Boneset  Creeping St. John's-wort Acadian Quillwort Lake Quillwort Weak Rush Redroot  Dwarf Bulrush Round-fruited Seedbox  Philadelphia Panic-grass  Pondshore Smartweed Swamp Smartweed Maryland Meadow-beauty Inundated Horned-sedge  Short-beaked Bald-sedge Long-beaked Bald-sedge  Torrey's Beak-sedge  Toothcup Slender Marsh Pink Plymouth Gentian Sea Pink Terete Arrowhead Subulate Bladderwort	Plants of coastal plain ponds. Because of high water levels in these ponds over the past decade, it has not been possible to survey these shoreline plants. When conditions permit, known sites should be resurveyed and de novo sites conducted.

To complement these survey and research efforts, the Natural Heritage Program needs more extensive data on the statewide distribution of the habitats important to these species in greatest need of conservation. For some habitats or natural community types – coastal plain ponds, floodplain forests, bogs – the Program has already identified likely examples through aerial photo-interpretation and has conducted ground surveys of

many of the best examples of each habitat or natural community. A statewide effort to identify and inventory the best examples of these important areas needs to be undertaken, either through aerial photo-interpretation or on the ground. For effective and efficient gathering of biological information, as well as for any conservation efforts, identifying occurrences of these habitats is a necessity.

## F. Public Engagement and Outreach

Massachusetts is the third most densely populated state in the country, and the long-term conservation of our state's biological diversity and implementation of the SWAP is dependent on the good will, engagement, and commitment of our citizens. To ensure public input, the Division of Fisheries and Wildlife is overseen by the seven-member Fisheries and Wildlife Board appointed by the Governor. The Board holds monthly public meetings and hearings to discuss issues, solicit public comment, and set regulations and policies.

The Division has long had a multi-faceted public outreach program, including:

- Quarterly publication of [Massachusetts Wildlife](#), a 40-page, full-color magazine with a print run of 25,000 copies. Twenty thousand of these go to subscribers; the rest are given away at events and meetings. The magazine covers all aspects of the outdoors across the state, including articles on rare species, BioMap2, land protection, hunting, fishing, and natural history.
- Conservation education programs designed to train educators of all types, including [Project Wild](#), the [North American Conservation Education Strategy](#) toolkit, and the [Massachusetts Envirothon](#).
- Numerous talks, field trips, and hands-on programs, for all ages.
- Hunter and angler education, because sportsmen and women are among the strongest supports of biodiversity in the Commonwealth.
- Production of maps for Wildlife Management Areas and lakes and ponds with public access.

Recently, the Division has begun incorporating social media into its outreach efforts, including frequent posts on [its Facebook page](#), which has garnered over 6,000 “likes.”

The Division intends to provide leadership and guidance particularly in regard to habitat management activities, by continuing and extending all of these outreach actions. New initiatives may include:

- Hosting periodic conferences on habitat management practices and planning, for land trusts, municipal Conservation Commissions, and other conservation organizations.
- Developing short and long videos on topics ranging from the life history of charismatic SGCN, to the rationale behind specific habitat management activities, to the predicted effects of climate change on the state's biodiversity.
- Erecting signage at sites with active habitat management activities, to explain to the public why changes are being made to familiar landscapes.
- Streamlining and enhancing the Division's website, to make information more accessible.
- Finding ways to engage a diverse public in appreciation of and support for the Commonwealth's biodiversity.
- Incorporating the human dimensions of wildlife management into effective and acceptable management approaches, especially as population levels of some species are nearing historical levels (for example, Black Bear).
- Developing a volunteer corps of citizen naturalists, who can monitor rare species, help with some invasive plant removals, and survey the condition of SWAP habitats and landscapes.
- Supporting the establishment of state-funded grants for land trusts, conservation commissions, and other conservation landowners, to fund habitat management planning and implementation.

In addition, the Division, the University of Massachusetts-Amherst, and the Department of Interior's Northeast Climate Science Center are developing a Fish and Wildlife Climate Action Tool for local decision-makers, conservation practitioners and community leaders across the state. The tool is designed to simplify decision-making and inspire action to maintain healthy, resilient natural resources and communities as the climate changes. Users can access information on climate change impacts and vulnerability and explore and plan actions to maintain healthy wildlife and natural resources based on their location and specific management needs. Specific information included in the initial development of the tool will include data on fish and wildlife species, forests and forestry, aquatic connectivity, culverts, land protection and conservation planning, and guidance for developing adaptation strategies in each community.