Rhode Island Wildlife Action Plan

Chapter 5

Monitoring and Adaptive Management

The Nature Conservancy
Protecting nature. Preserving life.

State of Rhode Island
Department of Environmental Management

THE UNIVERSITY OF RHODE ISLAND

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Introduction

Monitoring Rhode Island's SGCN, their habitats, and the effectiveness of the conservation actions identified in the previous chapters is important and necessary information for RI DEM DFW and its partners (Element 5). It will allow them to determine the effectiveness of conservation actions and to reduce and eliminate threats facing the state's fish and wildlife resources. Monitoring is also necessary to track the success of conservation actions, ensuring the most efficient use of limited staffing and funds. As conditions change (e.g., land use patterns, climate change, global or national population trends, new data and information), adaptive management and implementation of the conservation actions identified in Chapter 4 will allow RI DEM DFW to respond appropriately. Adaptive management has received ample attention in the conservation community as an effective method for long-term conservation (e.g., Johnson and Case 2000, TNC 2000, Brown et al. 2001, Groves et al. 2002, Pew Oceans Commission 2003, USFWS 2004, and Salafsky et al. 2001, 2002, and 2003).

The RI WAP is strategic in nature and presents a monitoring and adaptive management framework that will be used to assess the status of SGCN and habitats as well as monitor the effectiveness of RI WAP conservation actions. Rhode Island's approach identifies existing monitoring efforts and tools currently used by RI DEM DFW or its partners to assess SGCN, key habitats and related issues, as listed in the plans and programs in Appendix 5. If monitoring is not identified for an SGCN or species group/taxa, Chapter 4 of this WAP describes monitoring actions for other species which occupy the same habitats; these recommendations are prioritized to benefit the overall habitat, community, or assemblage, including many other SGCN. In cases where not enough information exists to monitor a species or group, or for which monitoring protocols have not yet been developed, this need is documented and followed by a conservation action intended to address that information need. This is true for some taxa groups such as small mammals and invertebrate groups for which standardized protocols need to be developed, and where baseline data do not exist to form the basis of a monitoring protocol. In these cases, these overarching taxa needs are described in Chapter 1 under the appropriate taxa. As the information gaps are filled, any relevant monitoring can be adapted to be more quantitative and specific (Holling 1978). Where new monitoring protocols are needed, Oakley et al. (2003) provides guidelines on how to develop them.

This chapter describes how the state of Rhode Island will use tools for information management and conservation planning to track the implementation and effectiveness of conservation actions. Examples of these tools include the Northeast Regional Monitoring and Performance Reporting Framework collaboratively funded by the National Fish and Wildlife Foundation (NFWF, see NEAFWA 2008) and its successors, the State Wildlife Grants Effectiveness Measures Project (AFWA 2012) funded by the Doris Duke Foundation, the Northeast Lexicon Project (Crisfield and NEFWDTC 2013), and the national Wildlife Tracking and Reporting Actions for the Conservation of Species (TRACS) database funded by USFWS. The framework starts with a specific conservation action, then a basic results chain is created linking the action to relevant threats, habitats and species. Next, indicators and measures are selected for each step in the chain, and monitoring data are used to track and populate those indicators. Information about the results chain, indicators, and measures will be captured in the Rhode Island WAP database. Taken together, the measurements of these indicators will provide the essential information needed for evaluating the effectiveness of conservation action. Conservation actions will be monitored and measured throughout the 10-year implementation of the RI WAP.

Regional Coordination and Regional Context

The northeastern region (Virginia north to Maine, including Rhode Island) has a long history of collaborative wildlife conservation spanning the past 50 years. Planning efforts by NEFWDTC have led to several key monitoring projects funded by the RCN Grant Program.

The NEFWDTC identified the development of a regional monitoring and performance measurement project as a high priority. Although northeastern states had developed their own monitoring programs to track the status and condition of wildlife species and habitats, the NEFWDTC recognized the importance of coordinating monitoring and evaluation activities across the entire Northeast region. Several key factors cited by NEFWDTC in supporting the development of regional monitoring activities include the large number of shared priority species and habitats, the relatively limited funding available in any one state for monitoring and evaluation activities, and the presence of many regional experts who have knowledge of particular taxa or ecosystems throughout the Northeast.

The examples in this section are intended to show the breadth and diversity of regionally coordinated monitoring activities in the Northeast, especially those activities funded through the collaborative RCN Grant Program. In addition to species and habitat monitoring, many of these approaches have used results chains or similar tools such as logic models to articulate theories of change and identify status measures and effectiveness indicators. The list of examples is by no means comprehensive or exhaustive. Additional monitoring activities and programs are described in more detail in the SWAPs developed by the individual northeastern states.

The Monitoring and Performance Reporting Framework

The NEAFWA Monitoring and Performance Reporting Framework (NEAFWA 2008) is intended to help each state in the Northeast to meet the expectations set by Congress and the USFWS for the SWAPs and the SWG programs. The goal of this framework is to assess the status and trends of SGCN and their habitats and to evaluate the effectiveness of activities intended to conserve species and habitats across the Northeast. For more information and to review project reports, please visit: *http://rcngrants.org/content/regional-monitoring-and-performance-framework*.

The monitoring framework identified eight conservation targets defined as species, landscape features, or vegetation communities important to fish and wildlife: forests, freshwater streams and river systems, freshwater wetlands, highly migratory species, lakes and ponds, managed grasslands and shrublands, regionally significant SGCN, and unique habitats in the Northeast. Each of these targets is discussed under the appropriate chapter for species and habitats. For each target, key threats were identified, along with conservation actions that could help alleviate or eliminate the effects of that particular stressor. Indicators were proposed for tracking status and trends of each of the targets, and data sources were identified for each of the indicators (NEAFWA 2008). Table 5-1 excerpted from NEAFWA (2008) lists the indicators and threats that were selected by workshop participants for each of the eight conservation targets

Table 5-1. List of Conservation Targets and Proposed Indicators

Targets	Proposed Indicators
1. Forests	1a. Forest area - by forest type 1b. Forest area - by reserve status 2. Forest composition and structure - by seral stage 3. Forest fragmentation index 4. Forest bird population trends 5. Acid deposition index
2. Freshwater streams and river systems	1. Percent (%) impervious surface 2. Distribution and population status of native Eastern Brook Trout 3. Stream connectivity (length of open river) and number of blockages 4. Index of biotic integrity 5. Distribution and population status of non-indigenous aquatic species
3. Freshwater wetlands	1. Size/area of freshwater wetlands 2. % impervious surface flow 3. Buffer area and condition (buffer index) 4a. Hydrology - upstream surface water retention 4b. Hydrology - high and low stream 5. Wetland bird population trends 6. Road density
4. Highly migratory species	1. Migratory raptor population index 2. Shorebird abundance 3. Bat population trends 4. Abundance of diadromous fish (indicator still under development) 5. Presence of Monarch Butterfly
5. Lakes and ponds	1. % impervious surface/landscape integrity 2. % shoreline developed (shoreline integrity) 3. Overall Productivity of Common Loons
6. Managed grasslands and shrublands	To be developed
7. Regionally Significant Species of Greatest Conservation Need	1. Population trends and reproductive productivity of federally listed species 2. State-listing status and heritage rank of highly imperiled wildlife 3. Population trends of endemic species
8. Unique habitats in the Northeast	1. Proximity to human activity/roads 2. Wildlife presence/absence 3. Wildlife population trends 4. Land use/land cover changes

Source: NEAFWA 2008

Conservation Status of Northeast Fish, Wildlife, and Natural Habitats

Using the indicators developed at the regional level, NEAFWA supported The Nature Conservancy to assess the current condition of species and habitats in the Northeast through the Conservation Status Project. This project used a GIS analysis to examine the relationship between species and habitat condition and land ownership and conservation management status. The original assessment project merged with another RCN-funded project, titled *Regional Indicators and Measures: Beyond Conservation Land* (Anderson and Olivero Sheldon 2011), which measured approximately 30 indicators of habitat condition and species and ecosystem health in the northeastern states. Together these projects, completed in September 2011, implemented approximately 75% of the Northeast Regional Monitoring and Performance Measures Framework (NEAFWA 2008), previously funded by the NFWF and the RCN Grant Program. Please see: *http://www.rcngrants.org/sites/default/files/final_reports/Conservation-Status-of-Fish-Wildlife-and-Natural-Habitats.pdf*.

State Wildlife Grants Effectiveness Measures Project

Building on the success of the Northeastern Regional Monitoring and Performance Measures Framework (NEAFWA 2008), the AFWA led an effort to develop an approach for measuring the effectiveness of wildlife conservation activities funded under the USFWS's SWG program. In September 2009, AFWA's Teaming with Wildlife Committee formed the Effectiveness Measures Working Group. This working group included representatives from state fish and wildlife agencies as well as private, academic, and non-governmental conservation partners with expertise in wildlife conservation and performance management.

In April 2011, the working group released a final report that outlines a comprehensive approach to measure the effectiveness of the activities funded under the SWG program. The report builds on the monitoring framework that was originally developed in the northeastern states and recommends a set of common indicators for measuring status, trends, and/or effectiveness of thirteen general types of conservation actions that are commonly supported by SWG. These actions include direct management of natural resources, species restoration, creation of new habitat, acquisition/easement/lease, conservation area designation, environmental review, management planning, land use planning, training and technical assistance, data collection and analysis, education, conservation incentives, and stakeholder involvement. The report includes sample templates and forms that could be used for reporting the results of conservation activities, as well as a discussion of the specific methods by which these reporting methods could be incorporated into in the USFWS's grants management database. For more information and to review the project final report, please visit: *http://www.fishwildlife.org/files/Effectiveness-Measures-Report_2011.pdf*.

Wildlife TRACS Database

The State Wildlife Grants Effectiveness Measures Project has informed the development of *Wildlife TRACS*, a database designed by the USFWS to record information about conservation activities funded through the Wildlife and Sport Fish Restoration Program, including SWG. When fully functional, *Wildlife TRACS* is intended to track and report project outputs, effectiveness measures, and species and habitat outcomes. *Wildlife TRACS* has the potential to track long-term outcomes for species and habitats, above and beyond the types of short-term output measures commonly tracked by funding agencies (e.g., number of publications, number of workshops, number of people contacted). Because it is being designed to be responsive to the needs of the state agencies receiving SWG funding, *Wildlife TRACS* includes its

own customized classifications of conservation actions and threats. These classifications are based, at least in part, on the classifications developed jointly by the IUCN and the Conservation Measures Partnership (CMP, see Salafsky et al. 2008). For more information about the development of *Wildlife TRACS*, please visit: *http://wsfrprograms.fws.gov/Subpages/TRACS/TRACS.html*.

Northeast Lexicon for Common Planning and State Wildlife Action Plan Database

Wildlife conservation planners in the Northeast have long recognized a potential ambiguity in many of the terms that are used to describe fish and wildlife conservation activities. For example, a "target" may refer to a number, an area, a specific site, a species, a group or guild of species, a vegetation community, or an ecosystem type. There is an acute need to develop a standard lexicon that provides conservationists with a uniform terminology that accurately and adequately describes the work of state fish and wildlife agencies. Although lexicons have been developed by the IUCN and the CMP, they are designed primarily for international conservation and sustainable development projects, activities that differ in many important ways from fish and wildlife conservation activities in the northeastern states. Thus, the NEFWDTC is developing a regional conservation lexicon that can be used by state wildlife agencies and partners to describe their conservation projects (Crisfield and NEFWDTC 2013).

The *Northeast SWAP Database* is a data management tool developed by Kevin Kalasz, Karen Terwilliger, and Jonathan Mawdsley that provides a basic structure for storing and querying data collected by the individual states as part of their SWAP revisions. The database includes full support for results chains as well as indicators and the AFWA SWG Effectiveness Measures.

Region-wide Taxa-specific Surveys and Monitoring

There are numerous taxa-specific surveys, inventory, or monitoring programs that have been developed and implemented with NEAFWA's support and through other regional collaborations. With RCN funding, surveys and assessments have been conducted or are in the process of being conducted for Wood Turtle, Eastern Black Rail, odonates (dragonflies and damselflies), New England Cottontail (Fuller and Tur 2012), shrubland birds (McDowell 2011), aquatic habitats (Gawler 2008), and frogs. Detailed avian indicators have also been developed for assessing the magnitude of threats and the effectiveness of conservation measures (Northeast Coordinated Bird Monitoring Partnership 2007). An online database of museum specimen records for SGCN invertebrates in the Northeast was developed by Fetzner (2011). More in-depth reports describing the methods and results of these surveys and associated data products are available at the RCN website: *http://www.rcngrants.org*.

Regional Monitoring Protocols and Databases

Northeast states have also developed monitoring protocols and databases through regional multi-state collaborative efforts. With funding from the RCN Grant Program, monitoring protocols have been developed, reviewed, or revised for several species of regional conservation interest, including New England Cottontail (Fuller and Tur 2012), shrubland-dependent birds (McDowell 2011), freshwater aquatic habitats (Gawler 2008), and frogs. Ongoing RCN projects are also developing monitoring protocols for Wood Turtle, Eastern Black Rail, and odonates (dragonflies and damselflies). The consistent and widespread use of common monitoring methodologies and survey protocols will help support regional assessments of the status and trends of SGCN and their habitats. In addition, NEAFWA has also funded development of a database for regional invertebrate species of greatest conservation need through a partnership with the Carnegie Museum of Natural History in Pittsburgh (Fetzner 2012). A more

comprehensive database has been proposed that would include data on all species, habitats, actions, and threats from the individual SWAPs in the Northeast; for introductory information and a lexicon of terms that would be used in such a database see Crisfield and NEFWDTC 2013. Links to monitoring plans and tools developed through the RCN Grant Program are available on the web site.

Rhode Island's Species and Habitat Monitoring Programs

Rhode Island is blessed with a wealth of monitoring programs that provide important information about wildlife species and their habitats. The following tables of wildlife species and habitat monitoring programs in Rhode Island were originally developed for the first edition of the RI CWCS. They have been updated and enhanced based on information provided during the process of revising the RI WAP. The tables list individual monitoring programs, the associated organization(s) with each program, and the type and level of monitoring, whether single-species, guild-focused, or habitat-focused. Data from these programs and process-related information from individual implementation projects (e.g. number of meetings held, number of reports produced, number of people contacted through outreach efforts, number of plans developed, etc.) will be reported to the USFWS and tracked using the *Wildlife TRACS* database.

Species Monitoring

Rhode Island has numerous monitoring programs already in place that monitor individual wildlife species as well as important species guilds such as shorebirds or waterfowl (Table 5-2.). These existing programs will be the primary method for monitoring and tracking species identified as SGCN in the current revision of the Rhode Island WAP. Data from these programs are collected and reported to the relevant wildlife managers at the state and federal level, in order to provide information that can be used for adaptively managing these important wildlife populations.

Table 5-2. Species and Guild-Level Monitoring Programs in Rhode Island

Monitoring Program or Action	Implementation Lead	Target(s)	Level of Monitoring		
			Species	Guild	Habitat
RI Audubon Birdathon	Audubon Society of Rhode Island	Birds	X	X	
Diamondback Terrapin Population Study	Barrington Land Conservation Trust	Diamondback Terrapin	X		
Summer on the Water Program (water and faunal sampling Great Salt Pond)	Committee for the Great Salt Pond	Faunal sampling		X	X
Coastal 2000/EMAP	EPA	Coastal ecosystem health		X	X
Narragansett Bay Program	RI DEM	Species monitoring	X	X	X
Bird Source (national monitoring program)	National Audubon Society and Cornell Lab of Ornithology	Birds		X	
Lobster Tagging Program	NMFS, RI Sea Grant, CMER	Lobster	X		
National Status and Trends Program on Narragansett Bay	NOAA, RI DEM	Fish health, benthic surveys		X	X
NOAA Restoration Center Programs	NOAA, RI DEM	Oil spill and contaminant release response and restoration	X	X	X
Norman Bird Sanctuary	Norman Bird Sanctuary	Amphibians,		X	X

Monitoring Program or Action	Implementation Lead	Target(s)	Level of Monitoring		
			Species	Guild	Habitat
Monitoring		grassland birds, marshland			
Oceanology Program on Little Narragansett and Pawcatuck Estuaries	Pine Point School	Benthic surveys		X	X
Raytheon Employees Wildlife Habitat Committee	Raytheon, INC	Flora and fauna inventories		X	
BioBlitz Surveys	RI Natural History Survey	Faunal inventories	X		
Lobster Larval Settlement Index	RI Sea Grant, RI DEM	Lobster	X		
Narragansett Bay Rapid Assessment Survey for Marine Bioinvasive Species	RI Sea Grant, RI CRMC, RI DEM	Marine invasive Species	X	X	
Adult American Shad and River Herring Monitoring (5 locations)	RI DEM	American Shad and River Herring	X		
Aquatic Furbearer Survey	RI DEM	Mammals	X	X	
Artificial Substrate Monitoring	RI DEM	Benthic surveys		X	X
Biotoxin Shellfish Poisoning Sampling	RI DEM	Shellfish Poisoning		X	
Bird Species Breeding Monitoring	RI DEM	Colonial waterbirds	X	X	
Coastal Fishery Resource Assessment Trawl Survey (18-28 stations in Narragansett Bay, RI and Block Island Sounds)	RI DEM, USFWS	Coastal fish species	X	X	X
Fin Fish Monitoring on Coastal Ponds	RI DEM	Fin fish	X	X	
Finfish Trawl Survey, Narragansett Bay	RI DEM DFW	Fin fish	X	X	X
Gill Net Monitoring Program	RI DEM	Pelagic gamefish	X	X	
Juvenile American Shad and River Herring Monitoring (5 locations)	RI DEM	American Shad and River Herring	X		
Juvenile Fin Fish Survey (18 locations on Narragansett Bay)	RI DEM	Fin fish	X	X	
Largemouth Bass Monitoring (5 locations)	RI DEM	Largemouth Bass	X		
Lobster Fishery Monitoring	RI DEM	Lobster	X		
Rapid Bioassessment Protocol Monitoring (45 stream locations)	RI DEM	Macroinvertebrates		X	X
Shellfish Growing Area Monitoring (water quality for 305 locations)	RI DEM	Shellfish		X	X
Shellfish Monitoring Program Shoreline Surveys (bacteria sources for 410 miles)	RI DEM	Shellfish		X	X
Summer Inland Breeding Survey of Canadian Geese	RI DEM	Canadian Geese	X		

Monitoring Program or Action	Implementation Lead	Target(s)	Level of Monitoring		
			Species	Guild	Habitat
Spring and fall banding	Lapham Family	Migratory songbirds	X	X	
Banding at Doug Krause	URI	Migratory songbirds	X	X	
Christmas Bird Counts	National Audubon Society	Bird inventory	X	X	
BI Veterans Day bird count	RI DEM	Bird inventory	X	X	
President's Day bird count	RI DEM	Bird inventory	X	X	
Fin Fish Monitoring Great Salt Pond	The Nature Conservancy	Juvenile Fin Fish Species	X	X	X

The species monitoring programs listed in this table have been designed for different purposes and may track different attributes of individual species or groups of species, depending on the management needs of the species or group in question, and the levels and kinds of data needed by wildlife managers. Thus, the existing species monitoring programs in Rhode Island may not all be reporting similar types of data for all species that are being tracked in the state.

Habitat Monitoring

Rhode Island also has numerous monitoring programs already in place that monitor various attributes of wildlife habitats, from the site-specific local level all the way up to statewide and regional levels (Table 5-3.). These existing programs will be the primary means for monitoring the condition, extent, and status of wildlife habitats identified in this WAP. Data from these programs are collected and reported to the relevant wildlife managers at the state and federal level, in order to provide information that can be used for adaptively managing these important wildlife habitats.

Brian Wulker

Barn owls nest in trees, barns, and abandoned buildings but hunt in grassland and other habitats

Table 5-3. Habitat-Level Monitoring Programs in Rhode Island

Monitoring Program or Action	Implementation Lead	Target(s) of Monitoring	Level of Monitoring		
			Species	Guild	Habitat
Barrington and Palmer River Monitoring (physical parameters)	Brown University, Dept. of Geosciences	Water quality monitoring			X
Summer on the Water Program (water and faunal sampling Great Salt Pond)	Committee for the Great Salt Pond	Water quality monitoring		X	X
Hazardous waste site clean-up and remediation (Superfund sites)	Dept. of Defense, US Navy	Pollution remediation			X
Aircraft remote sensing for Chlorophyll-a for Narragansett Bay and coastal waters	EPA-AED	Algal blooms in estuarine and coastal waters			X
Coastal 2000/EMAP (coastal ecosystem health)	EPA	Coastal ecosystem health		X	X
Blackstone and Woonasquantucket Rivers Watershed Education Project (water quality)	Massachusetts Audubon Society, Smithfield and Tolman High Schools	Water quality monitoring			X

Monitoring Program or Action	Implementation Lead	Target(s) of Monitoring	Level of Monitoring		
			Species	Guild	Habitat
Moshassuck River Monitors (water quality)	Moses Brown and Wheeler Schools	Water quality monitoring			X
Narragansett Bay Program, RI DEM	Narragansett Bay	Water quality monitoring	X	X	X
Providence River Sampling (water quality)	Narragansett Bay Commission (NBC)	Water quality monitoring			X
Regional River Fecal Monitoring (5 rivers)	NBC	Water quality monitoring			X
Seekonk River Monitoring (water quality)	NBC	Water quality monitoring			X
Ten Mile River Sampling (water quality)	NBC	Water quality monitoring			X
National Status and Trends Program on Narragansett Bay (water quality, fish health, benthic surveys)	NOAA, RI DEM	Water quality monitoring		X	X
NOAA Restoration Center Programs (oil spill and contaminant release response and restoration)	NOAA, RI DEM	Oil spills and contaminant releases, response and restoration	X	X	X
Narragansett Bay Window (water quality and benthic surveys)	NOAA/NMFS, EPA, RI DEM, URI	Water quality monitoring			X
National Estuarine Reserve Systems: Narragansett Bay, RI (water quality, bio-indicators)	NOAA, RI DEM	Water quality monitoring			X
Norman Bird Sanctuary Monitoring (amphibians, grassland birds, marshland)	Norman Bird Sanctuary	Amphibians, grassland birds, marshland condition		X	X
Pawtuxet River Authority (water quality)	Pawtuxet River Authority	Water quality monitoring			X
Oceanology Program on Little Narragansett and Pawcatuck Estuaries (water quality, benthic surveys)	Pine Point School	Water quality monitoring		X	X
Runnins River Monitoring (water quality)	Pokanoket Watershed Alliance	Water quality monitoring			X
Prudence Island Conservancy Citizens Monitoring Program (water quality, meteorological parameters)	Prudence Island Conservancy, Narragansett Bay NERR	Water quality monitoring			X
Rhode Island Bristol County Observer Network (RIBCON) (meteorological parameters)	RIBCON	Climate and weather parameters			X
Blue Water Task Force Beachscape (coastal water quality)	RI Surfrider Foundation	Coastal water quality			X
Air Quality Monitoring (15 locations)	RI DEM	Air quality			X
Artificial Substrate Monitoring (benthic surveys)	RI DEM	Benthic surveys		X	X
Chemical Baseline Monitoring (water quality at 25 locations)	RI DEM	Water quality monitoring			X

Monitoring Program or Action	Implementation Lead	Target(s) of Monitoring	Level of Monitoring		
			Species	Guild	Habitat
Coastal Fishery Resource Assessment Trawl Survey (18-28 stations in Narragansett Bay, RI and Block Island Sounds)	RI DEM, USFWS	Coastal fish species	X	X	X
Finfish Trawl Survey, Narragansett Bay	RI DEM DFW	Narragansett Bay fin fish species	X	X	X
Rapid Bioassessment Protocol Monitoring (45 stream locations for macroinvertebrates)	RI DEM	Water quality monitoring		X	X
RI Pollution Discharge Elimination System Monitoring (water quality for >335 locations)	RI DEM	Water quality monitoring			X

The habitat monitoring programs listed in this table have been designed for different purposes and may track different attributes of individual sites or ecological communities, depending on the management needs of the area in question, and the levels and kinds of data needed by wildlife managers. Thus, the existing habitat monitoring programs in Rhode Island may not all be reporting similar types of data for all habitats that are being tracked in the state.

Important Data Gaps in Rhode Island

With the finite resources available to support monitoring programs, it is simply not possible to monitor many aspects of the natural or human environment relevant to fish and wildlife conservation efforts. However, it is possible to identify high-priority target areas where additional data would be helpful for developing management prescriptions for fish and wildlife species and their habitats in Rhode Island. Chapter 1 and chapter 4 both include the high priority data gaps identified by taxa experts, planners, and stakeholders through the RI WAP review process. RI DEM plans to work with partners to develop monitoring programs to address these gaps including species, taxa, habitat and community-level monitoring. This will be an important step towards providing wildlife managers in Rhode Island with the information they need.

Coordination with Partners

Rhode Island has a rich history of collaborative efforts. Existing monitoring efforts and tools currently used by RI DEM DFW and its partners to assess SGCN, key habitats and related issues, are listed in the plans and programs in Appendix 5. The RI WAP identifies information gaps and new research needs, prioritized for species, taxa or habitat (chapter 4). Creating new programs to address these needs will require extensive coordination. RI DEM will play a lead role, involving key partners and stakeholders in identifying new or expanding current monitoring programs that can be implemented by federal, state and local governments, non-governmental organizations, universities and other partners.

Rhode Island has a unique opportunity though the Rhode Island Environmental Monitoring Collaborative (RIEMC) to coordinate with partners on monitoring programs in the state. The RIEMC provides significant direction and guidance for overall environmental monitoring. Regular annual coordination of all the key partners assures that the opportunity to implement the WAP will continue through the RIEMC, as established by the state for this purpose.

A WAP performance measure will be evaluating the extent to which the WAP and its implementation are coordinated with partners. An effective measure of coordination success will be the degree to which partners integrate SGCN, key habitats and conservation actions into their plans and programs. To that end, each partner will receive the final WAP with the request that they incorporate its species and habitats into their programs and coordinate with RI DEM to implement appropriate conservation actions.

Effectiveness of Conservation Actions

The purpose of tracking effectiveness measures is to obtain the information needed to adaptively manage fish and wildlife species and habitats in the state. Rhode Island is committed to an adaptive management approach to fish and wildlife conservation. The next sections of this chapter describe a conceptual model for the WAP with corresponding results chains and illustrate how the SWG effectiveness measures function within an adaptive management context. The effectiveness of conservation actions described in this WAP will be measured using a set of standardized effectiveness measures that have been developed by AFWA and described in their 2011 *Measuring the Effectiveness of State Wildlife Grants Final Report* (AFWA 2011). Actual values for these measures will be entered into the USFWS *Wildlife TRACS* database, and comparisons of the values of these measures over time will be used to establish the degree of effectiveness of individual projects as well as broader conservation programs. Terms and standard definitions are derived from Margoluis and Salafsky (1998) and Salafsky et al. (2008).

Conceptual Model for the Rhode Island State Wildlife Action Plan

Conceptual models are at the heart of adaptive management approaches for species and habitat conservation. Models illustrate what is called the "theory of change" for a project: the causal pathways by which managers believe that a project will achieve its desired results. Although there are many different kinds of conceptual models, Margoluis and Salafsky (1998) introduced a simple form of box-and-arrow diagram that shows causal linkages between the basic conservation elements for an individual project, including targets, threats, and conservation actions. While originally developed as a tool for developing individual conservation projects, conceptual models can also be developed for a larger conservation program. The following conceptual model for the RI WAP illustrates the linkages between the core plan elements, including species and habitats, threats and actions. This conceptual model is intended to be a generalized representation of the interactions between the plan elements. Not all of the threats and actions shown in the diagram will apply to every species or habitat. What the diagram shows is the set of possible threats and actions that could affect a particular species or habitat.

Conservation actions are shown in yellow hexagons; threats or information needs are shown in lavender boxes, and targets are shown in blue ovals. Arrows indicate the logical causal linkages between the elements. Arrows between actions and threats show that the action is intended to remediate or ameliorate the threat. Arrows between threats and targets show that the threat affects that target.

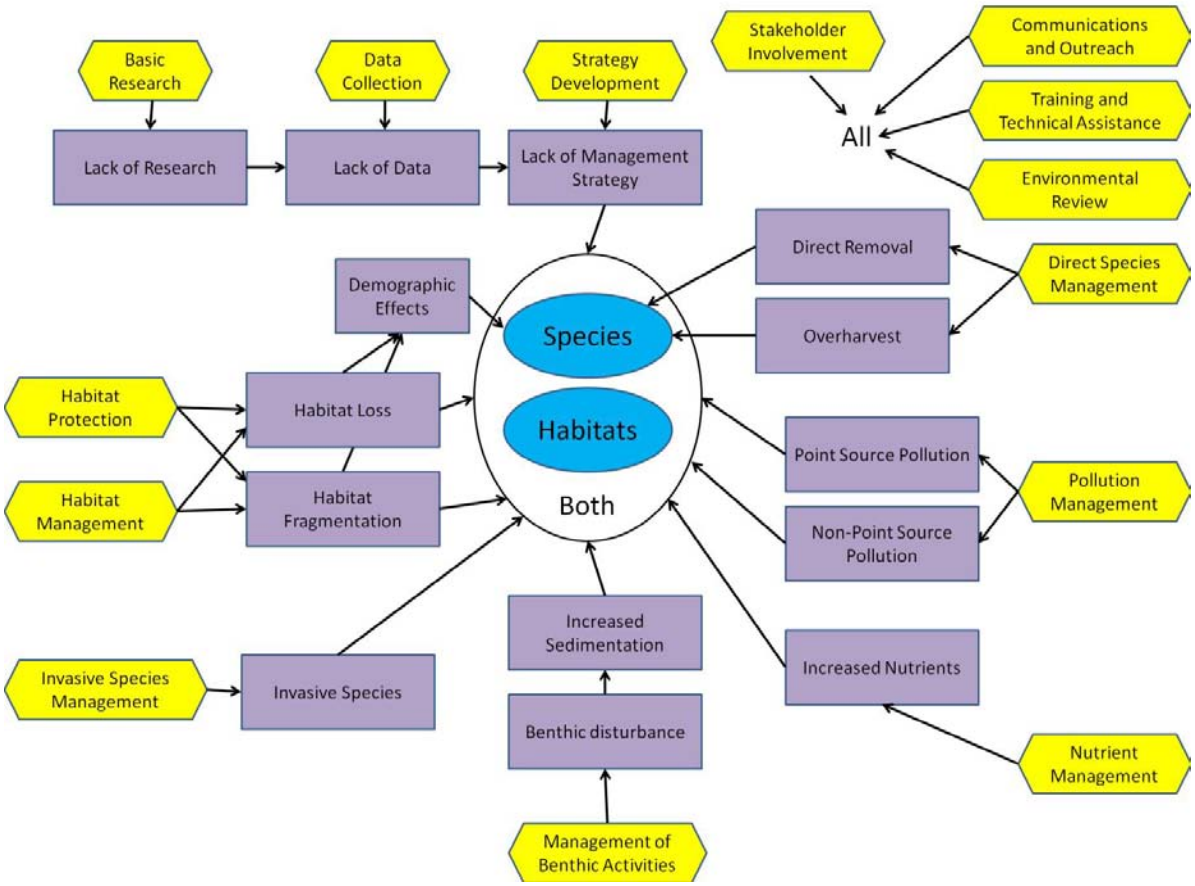


Figure 5-1. Conceptual Model Showing Linkages between SWAP Elements

From Conceptual Model to Results Chains

The conceptual model above can be used to construct a set of results chains for each of the different conservation actions in the yellow hexagons. A results chain shows the logical linkages between a conservation action and the target that is the intended beneficiary of that action. Results chains also include threats, in cases when the conservation action is intended to reduce a specific threat, and may also include intermediate outcomes between the action and its intended benefits to the target.

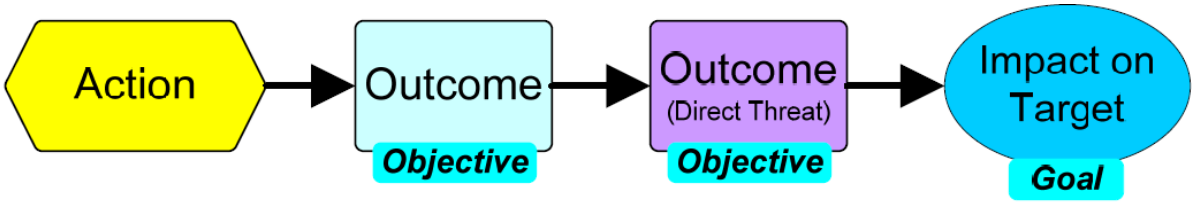


Figure 5-2. Sample Results Chain Showing the Linkages between these Basic Elements

Fully developed results chains also incorporate indicators for each of the individual elements (e.g., action, threat, outcome, and target). A specific measure is then identified for each indicator, showing how exactly that indicator will be measured over time. Data from existing monitoring programs can be used to track the values of these measures over time. Reviewing data from monitoring programs can help managers adjust their management prescriptions and adaptively manage wildlife species and their habitats.

RI DEM and its partners will develop project-specific results chains for the individual conservation actions that are selected for implementation. At the same time, the state will be using existing results chains that have been developed by NEAFWA and AFWA to identify potential indicators and effectiveness measures for the categories of conservation actions in the conceptual model presented above.

Results Chains and Effectiveness Measures for Conservation Actions

Results chains were originally developed as tools for developing an individual conservation project. It is also possible to develop generalized results chains that show the relationships between the basic classes of elements (e.g., actions, threats, outcomes, and targets) for particular types or classes of conservation projects. These generalized results chains can be very helpful in identifying indicators and measures that can be used to track progress towards conservation goals across a broader suite of similar projects. If projects are tracked using identical or compatible indicators and measures, the information about project accomplishments can then be "rolled up" across the suite of projects in order to report broader progress to funding agencies and the general public.

NEAFWA and AFWA have both developed sets of generalized results chains for common conservation actions described in the SWAPs. The AFWA report on SWG Effectiveness Measures (AFWA 2011) also included a set of recommended indicators for each of a set of generalized results chains. Because these indicators are intended to track progress on conservation projects, they are also known as "effectiveness measures" or "performance measures."

Effectiveness measures will be tracked by Rhode Island for particular classes of conservation actions. These effectiveness measures have been developed by the AFWA SWG Effectiveness Measures Working

Group (AFWA 2011) and will be reported and tracked as part of the State of Rhode Island's regular reporting to the USFWS via the *Wildlife TRACS* database.

Scenario: Habitat Management for Rare Pine Barrens Lepidoptera

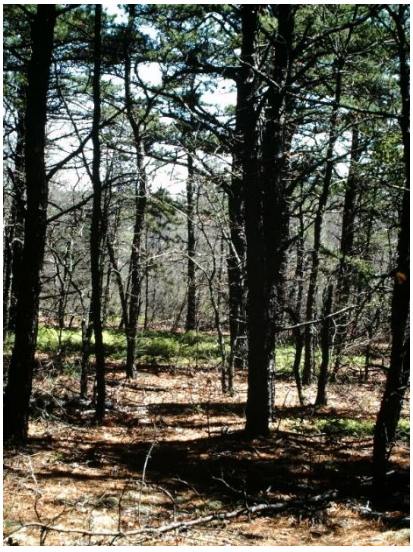
The following example describes a proposed approach for Rhode Island's framework for monitoring and effectiveness measures.

Pine Barrens, ecological systems dominated by pine species (*Pinus* spp., chiefly Pitch Pine, *Pinus rigida* in the Northeast, but also other species such as Virginia Pine, *Pinus virginiana*), are globally rare ecological communities found primarily in the northeastern U. S. states, including Rhode Island. These communities provide habitat for numerous globally rare insect species, particularly moths in the order Lepidoptera. Probably the best-known and best-studied of these rare moth species is the Eastern Buck Moth (*Hemileuca maia)* a species whose larvae feed on foliage of oak species (*Quercus* spp.) in Pine Barrens of the Northeast. The Eastern Buck Moth is identified as an SGCN in the 2015 RI WAP.

Gerald J. Leonard LSU, Bugwood.org

Male eastern buck moth

Pine Barrens communities require regular disturbances, particularly ground fire, in order to maintain their ecological integrity. In the absence of fire, undesirable native and non-native woody species will rapidly grow and crowd out the fire-tolerant pines and oaks that are characteristic of Pine Barrens communities. The oak species preferred by the Buck Moth in the Northeast, Bear Oak (*Quercus ilicifolia*), is a low and bushy species that is particularly susceptible to being crowded out by other, larger woody tree species. Thus, the continued survival of Buck Moth populations in Pine Barrens areas of the Northeast is critically dependent on regular fire events or similar ecological disturbances in order to prevent the loss of Bear Oak from the Pine Barrens ecological communities.



L. Gould

Pitch Pine woodland/barrens community

L. Gould

Mixed oak/pitch bin forest community

To prevent the loss of ecological integrity and Lepidoptera species diversity from Pine Barrens communities in Rhode Island, land managers in Rhode Island identify the following specific conservation action: use low-level prescribed ground fire to manage Pine Barrens communities, burning each acre every 5 to 10 years as needed to prevent encroachment by fire intolerant woody species.

For this action, this example basic results chain, a diagram which shows the logical connections between the four basic conservation elements is developed: action, objectives, threats, and targets (species and habitats). In this case, these elements are defined as follows:

- **Action:** Use low-level prescribed ground fire to manage Pine Barrens communities, burning each acre every ten years;
- **Objective:** Restoration of all acres of high-quality Pine Barrens, to support rare Lepidoptera populations;
- **Threat:** Invasive native and non-native vegetation crowds out native Pine Barrens vegetation at high-quality Pine Barrens sites; and
- **Targets:** Habitat- High-quality Pine Barrens Sites, Species- Rare Lepidoptera, particularly the Buck Moth.

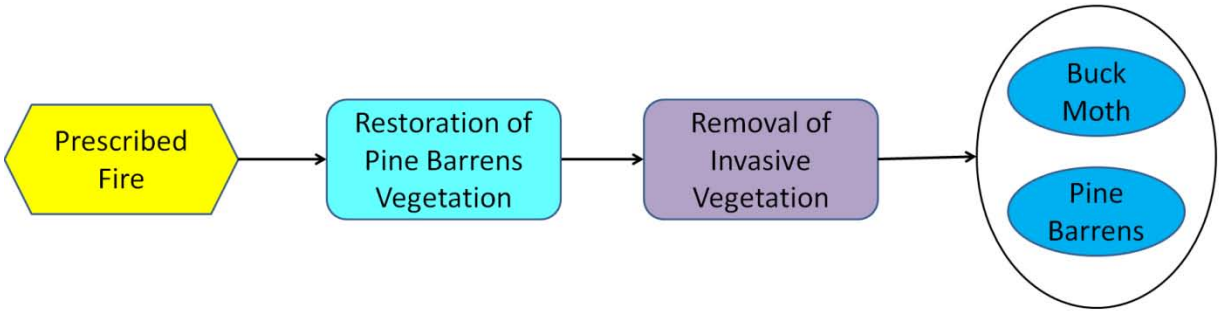


Figure 5-3. The Logical Relationships between these Elements in the Standard Results Chain Format

For each element in the results chain, an indicator and a method or measure by which that indicator will be tracked is identified.

AFWA's 2011 report on effectiveness measures for SWGs classifies "Prescribed Fire" as a "Direct Management of Natural Resources." Recommended indicators and performance measures for projects that involve Direct Management of Natural Resources include the following:

- Percent Management Actions Implemented As Planned;
- Evidence that Direct Management Action is Reducing Key Threats;
- Degree to which target SGCNs respond as expected from direct management actions;
- Degree to which target habitats/processes respond as expected from direct management actions;
- Species Measures (e.g. population size, reproductive success); and
- Habitat Measures (e.g. size, condition).

For the specific management action (Prescribed Fire), the indicator "number of acres burned per year," will be measured by tracking the number of acres that are subjected to prescribed fire management each year.

For the objective (Restoration of Pine Barrens Vegetation), the indicator "number of acres of Pine Barrens in high quality condition," will be measured by tracking the number of acres of Pine Barrens communities meeting certain vegetation composition and stand characteristics typical of high quality Pine Barrens.

For the threat (Removal of Invasive Vegetation), the indicator "number of acres of Pine Barrens habitat with invasive vegetation," will be measured by tracking the number of acres of Pine Barrens communities dominated by certain invasive fire-intolerant woody plant species.

For the targets (Buck Moth and Pine Barrens), the indicators "number of sites with Buck Moth populations" and "number of acres of Pine Barrens in high quality condition" can be measured. Note that the target and objective for this particular conservation action will be tracked using the same indicator, which will be used as both a status and effectiveness measure. The indicator for the Buck Moth populations will be measured using presence-absence surveys conducted in Pine Barrens areas during the fall flight period of these diurnally active moths.

To implement and track these indicators, managers will need to record basic information about these indicators in the RI WAP database including: the description of a specific measure for the indicator, the values of that measure in 2005 and 2015, the units for the measure, and the name of any monitoring program that provides data on that measure and indicator.

Data from the RI WAP database can also be reported to the USFWS, using the *Wildlife TRACS* database to record progress towards achievement of conservation objectives as individual projects are completed.

In 2025, managers will present the basic results chain shown above and a chart or diagram showing how the values of each indicator for the chain have changed over the years since the project was implemented. The following charts (Figure 5-4.) are provided as examples of how these data might be presented in the 2025 WAP

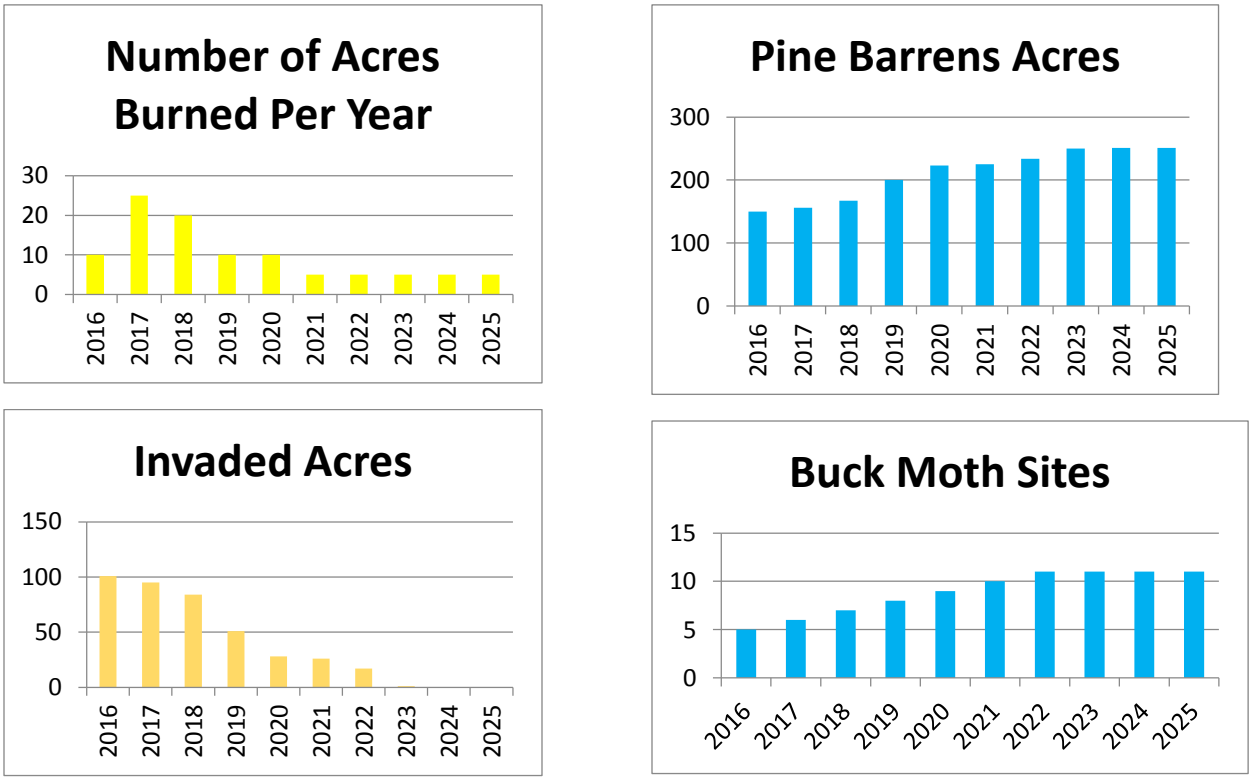


Figure 5-4. Examples of How Data Would Be Presented in the 2025 SWAP

Taken together, these four charts graphically illustrate progress towards the conservation goals for the Pine Barrens habitat and the Buck Moth populations. By burning a relatively small number of acres each year, the number of acres with fire-intolerant woody vegetation is greatly reduced over ten years, and the number of acres of high quality Pine Barrens habitat is increased. Note that there is a time lag evident between the time when a management treatment is applied and when a response in the habitat variable is observed. This is typical for many management situations, which is one important reason why multi-year monitoring may be necessary to see the effects of conservation projects. The number of sites occupied by Buck Moths also increases over time, demonstrating progress towards the overall goal of conserving this species in the state. Based on these charts, this would appear to be a successful conservation management action. These charts illustrate one way to track and report project effectiveness over time for this example project. Tracking indicators and effectiveness measures will put Rhode Island in an excellent position to show the effectiveness of WAP implementation efforts in the future.

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