Chapter 7

Monitoring, Implementation & Review

2015

Monitoring & Adaptive Management

"However beautiful the strategy, you should occasionally look at the results."
—Winston Churchill

Elements five and six of the Eight Required Elements for Wildlife Action Plans outline Congressional expectations for monitoring and plan review:

5. Proposed plans for monitoring species [of Greatest Conservation Need] and their habitats, the effectiveness of the conservation actions proposed in the 4th element [strategies], and for adapting these conservation actions to respond appropriately to new information or changing conditions.

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

Just as a doctor checks a patient's blood pressure at every visit, wildlife monitoring allows biologists to identify changes in the health of wildlife (e.g., population changes, the spread of disease, changes to the landscape). Biologists can also monitor the impact of strategies to determine effectiveness just as doctors assess the efficacy of treatments and compare competing medical practices. The goal is not simply to cure one patient but improve the standard of care for all patients.

Taken together elements five and six speak to the need for a program to track changes in wildlife populations and their habitats, and to hone the effectiveness of actions. Adaptive management is a formalized method for learning from experience where design, management, and monitoring are integrated to test assumptions in order to adapt, learn and improve (Salafsky et. al. 2001). Instead of relying on a fixed conservation goal and an inflexible plan for achieving the goal, adaptive management provides a framework of planning, acting and monitoring for midcourse corrections (Figure 5.1).

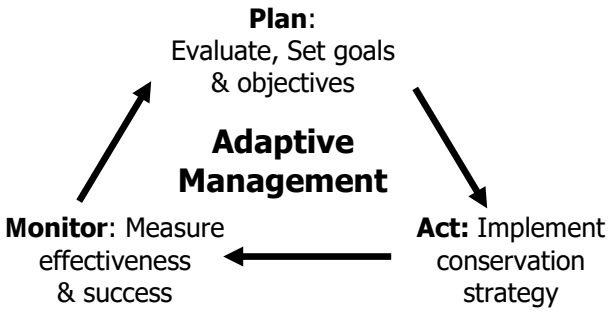

Fig 7.1 Basic steps in an adaptive management process (adapted from Noss & Cooperider 1994)

In the initial **planning** phase for this Wildlife Action Plan teams identified threats and problems limiting SGCN and their habitats and then developed of conservation strategies and research recommendations that the could be implemented during an **action** phase. Measuring the effectiveness and success of the action would occur in the **monitoring** phase. The cycle begins anew with the fine-tuning of goals and objectives before action is renewed.

Current Survey and Monitoring of Vermont's Wildlife and Habitats

The list of current survey and monitoring programs providing relevant data for the conservation and management of SGCN is remarkably long. The Fish & Wildlife Department, sister departments at the Agency of Natural Resources the Department of Environmental Conservation (DEC), the Department of Forests, Parks & Recreation (FPR), and other conservation partners monitor the status of several threatened and endangered species, as well as some rare species, some habitats and some uncommon natural communities. The following is a cursory review of survey and monitoring efforts in that may benefit SGCN conservation and management. It is not meant to be comprehensive.

Species Surveys and Monitoring

Amphibians & Reptiles: The Vermont Reptile and Amphibian Atlas (VtHerpAtlas.org) is an ongoing citizen science research and monitoring project begun in 1995 that tracks the distribution of reptiles and amphibians in Vermont. VFWD monitors threatened and endangered reptiles and amphibians including the Rattlesnake and Spiny Softshell Turtle, and a SWG-funded survey of vernal pools catalogued some 2500 vernal pool amphibian breeding sites statewide.

Birds: Birds are the most studied and best monitored group of wildlife in Vermont—and nationally. A monumental advancement in bird monitoring during the past decade was the completion and publication of Vermont's Second Vermont Breeding Bird Atlas (2013). A collaborative effort, the Atlas was developed with more than 350 citizen scientists contributing more than 50,000 hours over five years to document every bird species breeding across the state. The project was led by the Vermont Center for Ecostudies (VCE), the Fish & Wildlife Department and others, with significant SWG funding. Other important Vermont bird monitoring efforts include: the annual Breeding Bird Surveys, Mountain Birdwatch, Forest Bird Monitoring Project and LoonWatch (VCE); Common Tern and Peregrine Falcon monitoring programs (Audubon and VFWD); Bald Eagle, Wild Turkey, American Woodcock, waterfowl, and Double Crested Cormorants (VFWD). Regional and national monitoring efforts include the Breeding Bird Survey and Atlantic Coast Joint Venture.

Fish: VFWD, the University of Vermont and Vermont Cooperative Fish and Wildlife Research Unit, and other partners have surveyed a broader range of fishes including Lake and Round whitefishes, Lake Trout, Stonecat, Eastern Sand and Channel darters, and Muskellunge. And, a robust, long-term monitoring program for Lake Sturgeon is now underway. *Fishes of Vermont* (Langdon et. al. 2006) is supported by VDEC's 9,000 record fish distribution database. Non-native invasive species, such as alewife, are also the subject regular surveys. Notwithstanding these and other accomplishments executed under the 2005 WAP and looking forward, long-term monitoring of SGCN, more specifically brook lampreys, cyprinids, redhorses and others, require directed attention to obtain baseline population and habitat metrics, as well as development of a long-range plan for species monitoring.

Invertebrates: Significant advances were made in the past decade in assessing the status of Vermont's invertebrates—most projects were SWG funded. The Vermont Butterfly Survey (2002-2007), a statewide survey and analysis of historic records and collections documented the distribution of 103 butterfly species, including 12 species new to Vermont. The first

statewide dragonfly and damselfly survey focused on peatlands and large river habitat was completed in 2009 providing species distribution and occurrence information which has broadened our understanding of these rare habitat-specialists (Vermont Damselfly and Dragonfly Atlas). The Cobblestone Tiger Beetle and the Hairy-necked Tiger Beetle were the focus of dedicated surveys from 2005-2010. The Vermont Bumble Bee Atlas (2012-2013) led by VCE had biologists and trained citizen scientists searching more than 1,500 locations across the state and recording more than 10,000 individual bumble bee encounters. And, surveys were conducted to determine the status of Vermont's freshwater mussels, their habitat needs, fish hosts and to establish appropriate species population goals. Virtually all other invertebrate taxa remain largely uninvestigated and unknown in Vermont and basic background surveys to document the presence and distribution of major orders of insects in Vermont are needed.

Mammals: Deer, Moose, Black Bear and furbearing species are closely monitored by VFWD which also monitors the endangered American Marten, Canada Lynx and several bat species in both winter hibernacula and summer maternity colonies. The Small Mammals Atlas (2007-2009) compiled historic documents and museum collections and conducted field surveys documenting 2,844 small mammal captures from 47 sites and created distribution maps for all 23 small mammal species in Vermont. Additionally, Keeping Track, Inc. has citizen monitoring teams in many sections of the state and region collecting long-term data on Black Bear, Bobcat, Moose, Fisher, River Otter, and Mink. Numerous individual localized surveys also occur but most are not ongoing, repeatable monitoring efforts. Since 2013 VFWD and VTrans with help from TNC and NWF have implemented three wildlife camera and road tracking projects to survey wildlife's use of transportation infrastructure.

Habitat and Vegetation Surveys and Monitoring

VFWD conducts ongoing natural community inventory identifies and maps natural community types statewide. A survey and report on the distribution, ecology, classification of hardwood swamps was completed in 2004. VFWD also updates and maintains data on known and mapped significant natural communities, maps natural communities on state land and works with non-governmental organization partners to map or identify significant natural communities on NGO lands. Since 2005 we have completed natural community inventories of Limestone Bluff Cedar-Pine Forest, softwood swamps, Montane Spruce-Fir Forest, are nearly complete with an inventory of Dwarf Shrub Bog and Poor Fen, and are in the last year of oak-pine forest inventory. Cedar bluffs used CARA funds, bogs and fens and softwood swamps used EPA funds, and Montane Spruce-Fir Forest and oak-pine forests used SWG funds. These inventories are a critical part of FWD conservation work at the SGCN level and at the community level.

The Ambient Biomonitoring Program in DEC's Watershed Management Division has been monitoring the biological integrity of Vermont's lakes, wetlands, rivers, and streams for more than 30 years. It tracks long-term trends in water quality through changes over time to fish and macroinvertebrate populations. In 2014 alone the program collected and identified over 100,000 invertebrates from approximately 150 stream collections and usually samples 60-70 stream sites per year for fish.

The Lake Champlain Long-term Water Quality and Biological Monitoring Project began in 1992. A joint effort shared by DEC and the New York State Department of Environmental

Conservation, the primary purpose of the project is to detect long-term environmental change in the lake.

The Forest Inventory and Analysis (FIA) is a recurring inventory conducted by the US Forest Service's FIA Unit of the Northeastern Research Station in conjunction with the Vermont Department of Forests, Parks & Recreation. The inventory provides data for measuring changes and trends in the extent and condition of forest land, associated timber volumes, and rates of timber growth, mortality, and removal (Wharton et. al 2003). Though this information is developed primarily for timber management and does not track old-growth forests it does provide important information to wildlife managers.

The National Resources Inventory program of the National Resource Conservation Service (NRCS) collects and distributes data on a state, regional and national level about the status, condition, and trends of soil, water, and related resources. The focus is primarily on agricultural lands with data includes available land-use types and land-use changes, erosion, and wetlands.

The Forest Ecosystem Monitoring Cooperative (FEMC), previously known as the Vermont Monitoring Cooperative, coordinates numerous monitoring and survey operations in Vermont focusing primarily on forest health issues. The Cooperative's databases house more than two decades of data gathered for five main components of the forested ecosystem: air, water, forest, wildlife and soil resources.

VFWD's ongoing natural community inventories identify and map natural community types statewide and map and monitor state significant natural communities. Since 2005, the following natural community types/Wildlife Action Plan habitat types have been surveyed or inventoried: Significant Limestone Bluff Cedar-Pine Forests of Vermont (2006), Softwood Swamp Inventory (2010), Montane Spruce-Fir Forest Inventory (2010), Bogs and Poor Fens (2013), Oak-Pine Forest Mapping and Inventory (in progress).

Other Monitoring

Technical Assistance Impact: More than 80% of Vermont's land base is privately owned and, land use decision-making is a municipal responsibility (there are 273 municipalities each with separate land use plans and planning authorities). With so much land in private hands guided by local decision making, helping landowners and municipalities make good decisions is critical to protecting and conserving the state's SGCN and their habitats, this is why both the 2005 Wildlife Action Plan and the 2015 revision invest heavily the provision of technical assistance.

Tracking the impact of this technical assistance, and it effectiveness, is both important and difficult. Every 10-years, beginning in 2000, VFWD has reviewed every town plan and bylaw in the state pertaining to fish and wildlife species and habitat protections in order to provide insight into the progress made through municipal planning. The data indicates that protection trends are increasing. VFWD is currently working with UVM researchers and municipal planning partners to develop a conceptual model of community based decision-making processes which can then be used to develop better indicators, measures and success metrics. Technical assistance provided to private landowners is also tracked. For example, from 2003-2013 VFWD and the Natural Resources Conservation Service (NRCS)

collaborated on 1,206 new wildlife habitat enhancement projects with as many private landowners. Project funding was through NRCS's Wildlife Habitat Improvement Program (986) and Environmental Quality Incentives Program (220). Follow-up effectiveness monitoring occurs on all projects.

Public Support: VFWD regularly surveys the public, landowners and recreationalists to determine trends in wildlife, conservation, recreation and management policies. This information is critical to effective and responsive long-term management. The most recent survey occurred in July 2015. It found that 83 percent responded, when asked to compare the importance of wildlife with economic development that the use and development of land should be restricted to protect fish and wildlife; and 81 percent responded that wildlife habitat must be protected even if it reduces the land use options of some landowners and developers (Duda et al 2015). The USFWS conducts its National Survey of Fishing, Hunting, and Wildlife Associated Recreation every five years (most recently 2011) and documented that 62 percent of Vermonters went fishing, hunting, or wildlife watching. Vermont ranked second, only two points behind Alaska in participation (U.S. Dept of Interior 2011).

Meeting the Congressional Requirements for Monitoring and Adaptive Management

Monitoring is clearly a linchpin in the adaptive management process. Monitoring is also a complex, demanding and expensive task that never ends. Monitoring was also the weakest link of virtually every Wildlife Action Plan in 2005. The reason is that with the funding and staffing resources available to states, monitoring the status of all SGCN and their habitat and threats was simply not possible. For the 2015-2025 Vermont's Action Plan Monitoring and Adaptive Management Program will focus on the following elements:

1. Landscape Change Monitoring
2. Monitoring of Threatened & Endangered Species and other select SGCN
3. Taxa-wide surveys
4. Development of baseline distribution and abundance estimates:
5. Survey/Monitoring Protocol Development
6. Regional Monitoring of SGCN and Habitats
7. Threat Monitoring
8. Effectiveness Monitoring

Landscape Change Monitoring

The landscape conservation elements of this Wildlife Action Plan (chapter 6) with the accompanying Vermont Conservation Design (appendix F) focuses on the lands and waters of highest priority for maintaining ecological integrity. This connected landscape of large and intact forested habitat, healthy aquatic and riparian systems, and a full range of physical features on which plant and animal natural communities depend, when conserved or managed appropriately to retain or enhance ecological function, is expected to sustain Vermont's natural legacy into the future.

With this premise in mind, monitoring the status of landscape protection, connectivity and quality will be key to the successful implementation and adaptive management of the

Wildlife Action Plan. Vermont therefore expects to do the following during the coming Action Plan implementation period:

- **Develop and implement systems to track habitat loss and conversion and habitat quality and protection status**: Such tracking could include: Running the statewide habitat block analyses (first completed in 2008) every five years to determine trends; Developing metrics for connectivity blocks, interior forest blocks, diversity blocks and riparian areas (e.g., change in the percentage conserved by GAP status; change in E-911 datasets); Analyzing the Forest Inventory Analysis (FIA) forest conditions datasets and national land-cover datasets every five years to compare acres of restoration in riparian areas to the percentage in row crop, hay and developed;. Working with NOAA, NALCC and other regional partners to develop finer scale satellite data (e.g., increasing the granularity from the current 30m pixel images to 5m pixels would significantly improve our ability to detect change)

- **Municipal Conservation Monitoring:** Continue reviewing town plans and bylaws every 10-years to determine municipal level conservation status (and to assess the effectiveness of technical assistance programs). Research the development of a spatial component to this assessment.

- **Complete the Vermont Conservation Design**: The Design currently identifies only landscape-scale (coarse filter) conservation elements (Interior Forest Blocks, Connectivity Blocks, Surface Waters and Riparian Areas, Riparian Connectivity, Physical Landscape Diversity Blocks, and Wildlife Road Crossings). While we have confidence that conserving these coarse filter elements will also conserve *most* of the species they contain, Vermont intends to augment the design with finer scale elements in order to meet the needs of all of Vermont's wildlife and wild plants. The next phase, habitats/natural community elements will be in 2016-2017. This will be followed by species-level elements for those SGCN not conserved by the coarser filters.

Monitoring of Threatened & Endangered Species and other select SGCN
Monitoring programs are in effect for many of the state and/or federally listed species in Vermont, including, for example, the Spiny Softshell Turtle, Timber Rattlesnake and Eastern Ratsnake, Bald Eagle and Common Tern, Lake Sturgeon, Canada Lynx, Little Brown Bat, and Jesup's Milk-vetch and Northeastern Bulrush. Monitoring programs remain in effect for Peregrine Falcon and Common Loon which were both removed from Vermont's endangered species list in 2005. The statewide status for all SGCN can be tracked through changes to their State Rank (SRank) which is performed by VFWD's Wildlife Diversity program. This was done for most taxonomic groups in the two years leading up to this Wildlife Action Plan revision.

Many of the surveys described above in the section titled "Current Survey and Monitoring of Vermont's Wildlife and Habitats" will continue, and additional surveys for other SGCN will be initiated as staffing and budgets allow. Regional species assessments will also be supported through a collaboration of the fish and wildlife agencies of the 13 northeastern states (Northeast Association of Fish & Wildlife Agencies) which together fund projects through the Regional Conservation Needs program such as the Wood Turtle Status Assessment and Dragonfly and Damselfly Status Assessment.

Taxa-wide surveys
The Vermont Breeding Bird Atlas is the state's most comprehensive bird survey. The first Atlas (published in 1981) documented the distribution of every bird species breeding in the state. The second Atlas (published 2013) repeated this effort and in doing so documented changes in species distributions. The best data we have for many species. To complete this exhaustive, statewide survey took monumental effort with hundreds of volunteers donating thousands of hours from 2003-2007. The long-standing Vermont Reptile & Amphibian Atlas has been tracking the distribution of Vermont's reptiles and amphibians for years. Newer efforts initiated by the Vermont Center for Ecostudies, with VFWD funding, include: Vermont Butterfly Survey (2007) and the Vermont Bumble Bee Survey (2013) providing our first statewide snapshots of these groups where the data was collected in a rigorous, repeatable manner. The Vermont Damselfly & Dragonfly Atlas covers the distribution of all 142 species known from Vermont. While it may be another 20 years before they are repeated, they can provide vital information regarding species status and trends. Additional statewide surveys may be initiated for other taxonomic groups in the coming years including the Vermont Tiger Beetle Atlas.

Development of baseline distribution and abundance estimates
While great strides were made since 2005 with surveys and inventories for many species and taxonomic groups, little data exists for many other SGCN (lack of data was one criterion for selection as a Species of Greatest Conservation Need). Determining SGCN distribution and abundance is needed in order to establish meaningful baseline data which then can be used to determine measurable goals and objectives that are the foundation of monitoring priorities.

Survey/Monitoring Protocol Development
Rigorous protocols for surveying, monitoring and data analysis for many species do not exist, or are not applied consistently throughout a species' range to provide robust data. VFWD will continue to collaborate with partners on the development of survey protocols through programs such as the Forest Ecosystem Monitoring Cooperative and NEAFWA's Regional Conservation Needs program (e.g., A Framework for Coordinated Bird Monitoring in the Northeast and Development of Regional Analysis for Frog Call Survey Data from the North American Amphibian Monitoring Program). To be successful, any Action Plan monitoring program will need to address these four challenges. It is hoped that the Action Plan and SWG funds will help direct future research and development efforts, facilitate the integration of existing monitoring projects across organizations and improve collaboration.

Regional Monitoring of SGCN and Habitats
The Northeast states collaborated to develop the Northeast Regional Monitoring and Performance Measures Framework (NEAFWA 2008) which identified representative habitats and species groups and proposed indicators of status and trends. States then tasked The Nature Conservancy to test the Framework with a GIS-based evaluation of target habitats conditions, population trends, and land protection status. The final report, Conservation Status of Fish, Wildlife, and Natural Habitats in the Northeast Landscape (Anderson and Olivero 2011), provides baseline measures at the regional level from which to gauge changes and progress on conservation efforts. Vermont will work with the northeast states to support repeating this evaluation every 5-10 years to provide regional-scale measures of SGCN and habitat status.

Threat Monitoring
Vermont will continue to monitor for diseases such as White-nose Syndrome (bats), Snake Fungal Disease (rattlesnakes), Chronic Wasting Disease (deer), Viral Hemorrhagic Septicemia (fishes), *Batrachochytrium salamandrivorans* (salamanders) and Avian Influenza (birds) and many other diseases affecting SGCN that have been found or could be introduced to the state. Vermont has also programs in effect to monitor for the eventual arrival of forest pests, including the Asian long-horned beetle and emerald ash borer, in order to prevent the establishment and/or limit their spread within the state. Vermont lacks rigorous method for tracking the loss of habitat across the state.

Project and Program Monitoring
In addition to monitoring the status of species, habitat and threats impacting their populations, we also need implementation, effectiveness and validation monitoring (Derr et. al 2005) to ensure that goals and objectives are achieved and funds are spent wisely.

- **Implementation Monitoring:** Assessing the degree to which a conservation strategy was implemented (e.g., were trees planted in a riparian area?).
- **Effectiveness Monitoring:** Measuring the impact or effect of a conservation strategy (e.g., did planting trees in the riparian area stabilize the streambank?—the strategy's objective).
- **Validation Monitoring:** Checking the assumptions upon which the conservation strategy was based (e.g., did stabilizing the streambank actually reduce sedimentation of spawning beds downstream, producing more brook trout fry? —the project's goal). Validation monitoring can help answer questions such as: Is the conservation strategy worth repeating or might another strategy produce results faster, more economically, or meet with better social acceptance?

Together they provide the basis for measuring effectiveness of conservation actions and the adaptive management of fish and wildlife (required element 5). Guidance for effectiveness available in the Northeast Regional Monitoring and Performance Measures Framework (NEAFWA 2008) and Measuring the Effectiveness of State Wildlife Grants Final Report, (AFWA 2011). The foundation these guidelines is the development of conceptual models which explain the causal pathways by which managers believe that a project will achieve its desired results. Both reports recommend using results chains, a graphical diagram that links an action to the desired impact through a series of short, medium, and long-term results in an "if-then" fashion to identify appropriate measures or indicators. AFWA (2011) offers model results chains for many generic actions found in Vermont's Action Plan, including: direct management of natural resources; species restoration; creation of new habitat; land acquisition, easement, lease; conservation area designation; environmental review; management planning; land use planning; training and technical assistance; data collection and analysis; outreach to key resource users; conservation incentives; and stakeholder involvement. AFWA also discusses the potential for applying effectiveness measures to overall of Wildlife Action Plan effectiveness (2011). As VFWD develops indicators and measures for Action Plan implementation projects we will consult this guidance.

Tracking and reporting project effectiveness will occur primarily using Wildlife TRACS (Tracking and Reporting Actions for the Conservation of Species), a database developed by

the US Fish & Wildlife Service for tracking and reporting conservation activities funded through its Wildlife and Sport Fish Restoration Program. It will include an effectiveness tracking component intended to track and report project outputs, effectiveness measures, and species and habitat outcomes (based on Measuring the Effectiveness of State Wildlife Grants Final Report, AFWA 2011). It should be noted that though TRACS will provide a consistent system for tracking projects effectiveness, it may take years to determine if a project is indeed effective (e.g., waiting for trees to grow to sufficient height to shade a stream) and validation of a strategy's success may be difficult to tease out from other problems impacting a species or a site (e.g., the strategy did produce more brook trout fry but the results were masked two unseasonably hot summers and an accidental chemical spill).

VFWD annually reports on progress in the implementation of its strategic plan. Where possible, Action Plan indicators will be incorporated in this annual report (e.g., land acquisition, habitat management, status of select species).

Considerations for monitoring program development

Before any new monitoring programs are initiated a review of existing efforts and careful planning are required. Such planning should take into account the following considerations:

Collaboration: Planning to develop and implement a Species of Greatest Conservation Need monitoring program should begin with collaboration. As with the design of actions in this report, successful monitoring of SGCN will require the help and cooperation of many partners. Many current survey and monitoring efforts are conducted by interagency and inter-organizational efforts locally, regionally and nationally. These collaborations share expertise, make the best of limited resources, prevent redundancies of effort, increase the level of expertise of volunteers and improve program quality and effectiveness.

How much collaboration is needed? As many entities as possible should be brought together to develop consistent monitoring protocols and systems for data collection and data sharing, identifying indicators for species and habitats and goals and objectives for SGCN conservation.

The need for collaborative fund raising efforts cannot be overstated. Sufficient funds are imperative for monitoring to be effective. The State Wildlife Grants program currently is not sufficiently funded to finance the monitoring needs outlined here. Even if it was, state-side match is insufficient. A collaborative effort of agencies, conservation partners, local, state and federal elected officials, NGOs and private businesses and individuals is needed to develop adequate funding mechanisms at the state and federal levels.

Coordination: The coordination of monitoring programs, summarizing of results and sharing data with resources managers, researchers, local, state and national decision makers, educators, stakeholders and the general public will be essential to the success of a monitoring collaborative, to Action Plan efforts and to wildlife conservation in general. Solid coordination throughout the implementation phase will also make revisions of the Action Plan report straightforward and uncomplicated.

Indicators: Monitoring every SGCN, their habitats, problems and the effects of conservation actions is too costly and time-consuming to ever complete. Relevant indicators that are measurable, precise, consistent, and sensitive are needed as coarse filters to make

monitoring useful and manageable. Indicators should also be of appropriate scale, easily obtained and obvious in meaning so that results can be supported by a broad array of users.

Citizen Science: Successful monitoring projects such as VINS' Bird Atlas, Butterfly Atlas and LoonWatch, the Vermont Reptile and Amphibian Atlas, Keeping Track Inc.'s big mammal monitoring, Audubon's Christmas Bird Counts, and Great Backyard Bird Count and VFWD's Big Game Report Stations provide multiple benefits that should be considered in the development of new monitoring efforts. In addition to the direct benefits—improved wildlife knowledge—citizen-based monitoring also provides wildlife education through active field work on local projects, boosts awareness of and involvement in natural resource protection at the community level, and can be highly cost-effective.

FEMC as a Model for Coordination of Statewide SGCN Monitoring: The Forest Ecosystem Monitoring Cooperative (FEMC), previously known as the Vermont Monitoring Cooperative, is a collaborative partnership that collects and pools information and data on Vermont's forested ecosystems. Participating cooperators from government, academic and private sectors, conduct research projects on a variety of topics including forest health, air quality and meteorology, wildlife and aquatic systems. The Cooperative makes the data and results from these projects available to other scientists, educators, resource managers and the public through its online data library and card catalogue containing the data and metadata from more than 100 projects.

Data storage and data sharing: The volume of government (local, state, federal), NGO, and private sectors data available for plants, animals, ecosystems, climate, geology, hydrology, social and economic that could be used to conserve wildlife is simply huge. The management, storage and accessibility of monitoring data will be a significant issue for any coordinated monitoring efforts. VFWD's Natural Heritage Inventory manages much of the current data for rare wildlife in collected in Vermont but the program is already understaffed. The Natural Heritage Inventory is the Vermont affiliate to NatureServe (www.natureserve.org) an international network of biological inventories—known as natural heritage programs and conservation data centers—operating in all 50 U.S. states, Canada, Latin America and the Caribbean. NatureServe collects and manages data on rare, threatened and endangered plants, animals, and ecosystems, establishes scientific standards for biological inventory and biodiversity data management, and develops data management tools.

Adapting Conservation Actions and the Wildlife Action Plan in Response to New Information or Changing Conditions

The Little Brown and Northern Long-eared Bats underscore the need to adapt management to changing conditions and information. In 2003, VFWD established a Bat Conservation and Management Program determine the distribution and abundance of nine bat species and to identify conservation strategies for these bats. Then in 2008 White-Nose Syndrome (WNS) appeared in the Northeast and monitoring efforts revealed population declines in excess of 90% between 2008 and 2010 for Little Brown and Northern Long-eared Bats at many hibernacula. Several of the high priority conservation strategies identified in 2003 had to set aside as biologist scrambled to identify the cause and extent of WNS and to prevent the total extirpation of these species. Action Plan monitoring and review procedures will be the primary tool to identify new information, changing conditions and the need for

adaptation. It will act at three scales—individual conservation projects, ongoing plan-wide adaptations (year-to-year), and 10-year plan review.

The iterative nature of adaptive management (plan→ implement→ monitor→ evaluate→ plan→…) builds opportunities to adapt directly into Action Plan project management activities. Project reporting, monitoring and the increased communication and coordination among conservation partners fostered by Action Plan implementation will feed into overall Action Plan management from year-to-year. The USFWS allows states to incorporate significant "Emerging Issues" into the Wildlife Action Plan without full plan-wide revisions to their Action Plans, as was done with bats and WNS in 2009. All this information will be used to formally review and revise the Action Plan on a 10-year cycle (see also Action Plan Review later in this chapter).

Action Plan: Implementation

Congressional intent for Wildlife Action Plans is for states to identify and address the needs of species that might require help in order to prevent their becoming threatened or endangered. The full import of the word "comprehensive" becomes overwhelmingly clear as numbers in this report are tallied (more than 2,000 threats and 1,000 conservation actions identified for 133 vertebrate species, 200 invertebrates, 645 plants and more than 100 habitat/community/landscape categories). The next steps, conducting the recommended research, setting species and habitat goals and objectives, implementing strategies and designing and implementing the monitoring programs outlined in this report requires the continued help and support of all conservation partners—those that participated in the Action Plan development and new partners as well.

Congress has designated state fish & wildlife agencies as Action Plan and State Wildlife Grants (SWG) custodians because these agencies are mandated by state law to manage and protect wildlife. Custodial responsibilities include not only delivering the completed Action Plan but also for regular review and updating of the Action Plan report and administrating SWG funds. To carry out these responsibilities the VFWD will assign sufficient staff and resources to this program to manage projects, coordinate efforts and monitor overall program operations.

The VFWD will take the lead in coordinating the implementation of the research and monitoring recommendations and conservation strategies described in this report. While the Department may be responsible for implementing much of the research, monitoring and conservation strategies, Conservation partners may be the more logical and appropriate leaders for other research and strategy implementation, due to their skills and expertise, staffing, history, location, available resources and constituencies.

The Action Plan will remain a work in progress for many years, an experiment in long-term multi-species conservation on a broad scale. Much of the work in this document is ground breaking. Many of the species examined here have not received focused attention before. The next few cycles of implementation, review and updating of individual strategies and the Action Plan report overall will be the particularly important for working out kinks, testing methods, and improving aspects of the Action Plan.

Implementation and Participation

As a wildlife conservation plan for the entire state, the Wildlife Action Plan includes some strategies that almost any individual or organization can implement. And, any and all interested partners are encouraged to take part. Though many of these actions will not require the notification of VFWD, tracking the implementation and outcomes of actions will help with the monitoring and adaptive management goals outlined elsewhere in this chapter. All participating partners are encouraged to consult with VFWD prior to taking action.

The Vermont Fish & Wildlife Department will work to keep Conservation Partners and the public informed of Action Plan implementation through communications with partners, partnerships and collaborations, requests for proposals, meetings and conferences as well as through general outreach, education and technical assistance programs.

Impacts on other species, habitats and ecological processes and functions should always be considered when implementing conservation actions to benefit Species of Greatest Conservation Need (SGCN). Implementation may also be subject to changing conditions and regulatory review (where required) and should be conducted in cooperation with land managers, land owners and key stakeholders. Large scale conservation efforts (e.g., broad scale monitoring) should be coordinated through VFWD, interagency workgroups and formal agreements where applicable.

Coordination and Collaboration

As noted throughout this report, coordination of efforts is vital to leveraging available resources to ensure maximum wildlife benefit. VFWD will take the lead in facilitating communications among conservation partners, including local, state and federal agencies. We expect that other partners will also take the initiative to build additional partners just as they did in response to the first Wildlife Action Plan. For example the Vermont Forest Roundtable convened by VNRC in 2006 as a venue for information exchange and policy discussions to address parcelization and forest fragmentation issues regularly hosts consulting foresters, professional planners, state agency officials (including VFWD and VFPR), landowners, sportsmen, forest products industry representatives, conservation groups, biomass energy organizations and academics; and, the Wildlife Management Institute organized many government and non-government partners in the northeast for implementation of the Woodcock Conservation Plan.

Coordination between the 13 northeast states and Washington D.C. occurs through the Northeast Association of Fish & Wildlife Agencies (NEAFWA) and the regional office of the USFWS Division of Federal Assistance. NEAFWA established the Regional Conservation Needs (RCN) Program in 2008 to formalize a cooperative approach Action Plan implementation across multiple states. The purpose of the RCN program is to develop, coordinate, and implement conservation actions to address issues, threats, and opportunities that are most effectively tackled at a regional scale. More recently, the USFWS's North Atlantic Landscape Conservation Cooperative has been bringing many regional partners together to develop planning, research and monitoring efforts for the Northeastern states.

National coordination will be spearheaded by the Association of Fish & Wildlife Agencies and the US Fish & Wildlife Service.

Prioritizing Conservation Need

During the identification and assessment of SGCN our Action Plan technical teams began the process to prioritize conservation need through the following actions: SGCN were assigned either medium or high priority status (low priority species are deemed relatively secure for now, see Action Plan development), conservation actions, research and monitoring needs and habitat problems were similarly ranked.

We did not prioritize needs and actions beyond this. The Action Plan is a conservation guide for the state—not only VFWD or the Agency of Natural Resources. It is meant to provide guidance to organizations, agencies and individuals who wish to conserve wildlife. The goals and missions of the many and varied partners involved in the project span a broad spectrum of wildlife interests, skills and reach (some are very local, others are state, regional and

federal entities). It was clear that there would be no prioritization that would satisfy all partners and that conservation need is so great that there is room for everyone to select the species and habitats they find most important and implement the strategies they are most capable of working on.

When it comes to allocating SWG funds to specific projects, further prioritization is required. Prioritization will take into account the goal of the SWG program—to keep wildlife populations from declining to the point that they require protection under the federal Endangered Species Act (ESA)—and Congressional intent— that SWG funds benefit wildlife that have not historically been the primary beneficiaries of the Federal Aid in Wildlife Restoration Act, Federal Aid in Sport Fish Restoration Program or the federal ESA. Prioritization will also be based on the impact of problems to SGCN and habitats, the project's ability to affect positive change, other conservation and social impacts and the availability of matching funds and project personnel.

Action Plan Review

Element number six of the eight required elements for an Action Plan (see Chapter 1: Congressional Guidelines) requires that states provide "descriptions of procedures to review the strategy at intervals not to exceed ten years."

Vermont will update its Action Plan on a 10-year cycle. Ten years will allow for planning, and implementation of actions and for detecting responses in at least some SGCN populations. Vermont's adaptive management approach to Action Plan implementation, however, means that species and habitat monitoring, formal project reporting and financial tracking will be ongoing and will provide a constant flow of information during the intervening years. Managers, wildlife planners and biologists will use this data to hone strategies, fine tune operations and make mid-course corrections within each ten year cycle. Review activities will include:

- Twice yearly expenditure tracking for individual projects by SWG project managers.
- Annual financial reporting of all in-kind match for individual projects by SWG project managers.
- Full project reports due within 90 days of completion of individual SWG projects by SWG project managers.
- Providing regular Federal Assistance reports to the US Fish & Wildlife Service Division of Federal Assistance.

The process to review and update the Action Plan in 2025 should begin at least two years prior to the deadline. The current thinking is that the review process should mirror the current Action Plan revision process to update each of the eight elements from the original congressional guidelines as follows:

1. Revise the list of SGCN and update information on the distribution and abundance of SGCN. Which species can be removed from the list, which should be added?
2. Update information on the location and condition of key habitats. Describe key habitats of any new SGCN.
3. Describe threats and problems impacting SGCN and their habitats. Update research needs.
4. Review the success of conservation actions implemented to date. Identify conservation actions to conserve SGCN and their habitats.
5. Review Action Plan monitoring efforts to date. Describe plans to monitor species, habitats and conservation actions for the future.
6. Update and describe the process for the next plan review.
7. Review coordination efforts to date. Update plans to coordinate with other plans and planning entities.
8. Revise and describe plans to include the public in the design and implementation of the next Action Plan report.

The Vermont Fish & Wildlife Department will work to keep Conservation Partners and the public informed of Action Plan revision through communications with partners, partnerships and collaborations, meetings and conferences as well as through general outreach, education and technical assistance programs.

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