6. Monitoring and Effectiveness Measures

6.1 Introduction

This section covers SWAP Element 5.

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

Each year in the United States, federal and state natural resource agencies invest millions of dollars on projects intended to benefit fish and wildlife and their habitats. But, how do we know if these projects are having the desired outcomes and actually working to benefit species and habitats? Simply counting number of acres protected or restored or the number of animal X reintroduced to area Y, for example, do not clearly link the conservation action to the ultimate desired result – presumably healthy, sustainable habitats and wildlife populations. In addition, the U.S. Congress and the Office of Management and Budget want to know that the funds they provide to states through the State Wildlife Grants Program are spent efficiently and effectively and that Wildlife Action Plans meet their goal of keeping species off the Endangered Species List. In Wisconsin, natural resource managers and decision-makers need to know how to allocate limited financial and people resources to conservation actions that are most effective at achieving the desired outcomes.

The Wisconsin Wildlife Action Plan identifies 417 animal SGCN as well as the natural communities that support them. Knowing the condition of Wisconsin's natural resources is fundamental to the ability to manage those resources for the future. Information obtained from scientifically sound monitoring programs can be used to evaluate the effectiveness of management and restoration efforts, identify problems while cost-effective options are still available, and provide a basis for understanding and identifying change in complex and variable natural systems. Monitoring data may help identify the normal limits of variation and therefore can also help determine when something may be wrong in a system, providing early warning of threats. [1]

Understanding the status, condition, and trends in the state's natural resources helps resource managers and decision-makers as they plan for the management and conservation of natural resources. Monitoring data are also necessary to track the progress of conservation actions, adjusting them as necessary through the adaptive management process. As landscape patterns and conditions change (e.g. land use patterns, climate change, population trends), information from monitoring and tracking conservation action effectiveness will help the department and its conservation partners respond appropriately and expediently. Adaptive management is well known and used in the conservation community as an

[1] National Park Service's *Guidance for Designing an Integrated Monitoring Program at* http://science.nature.nps.gov/im/monitor

effective tool for long-term management and conservation of natural resources (also see Section 6.8).

Wisconsin has many monitoring programs that provide important information about wildlife species and their habitats. Numerous agencies and organizations are involved in natural resource-related monitoring programs in Wisconsin – many in partnership with the department. Many of these programs have been designed to provide information about the status and trends of species in the state, as well as the condition and extent of habitat. Since the original WWAP was completed in 2005, Wisconsin has been involved with several state and regional projects to address conservation and monitoring of SGCN species and their habitats. Regionally, Wisconsin has collaborated on many projects, including with the Upper Midwest and Great Lakes Landscape Conservation Cooperative and the Northeast Climate Science Center. Additionally, Wisconsin has worked with other states on several Competitive State Wildlife Grants (SWG). These projects have included work on white-nose syndrome, snake fungal disease, turtle conservation, and projects providing support to landowners.

Wisconsin has many monitoring programs already in place that track individual wildlife species as well as important species guilds such as shorebirds or waterfowl or calling frogs. There are also numerous monitoring programs that track various characteristics of habitats and natural communities. These existing programs will be the primary method for monitoring species and habitats in the updated WWAP. Ultimately, the goal is to connect data from these programs to the WWAP database. This will allow information to be used for adaptive management and to track the effectiveness of conservation actions. These data can also be reported in the USFWS Wildlife TRACS database.

The status of SGCN and natural community monitoring efforts is continually in flux, shifting as issues shift and tracking the availability of human and fiscal resources. Rather than list the current and historic inventory and monitoring programs that include SGCN and natural communities here, we direct readers to the Aquatic and Terrestrial Resources Inventory (ATRI) for a listing of several key statewide monitoring programs[2]. As the monitoring framework described in this chapter is developed, consideration will be given to current monitoring programs, asking whether a given effort is still relevant and providing needed information or whether it needs modifications to address climate adaptation needs, etc. For many SGCN and natural communities, there are existing well-tested and accepted monitoring protocols that would be used as applicable. The consistent use of standard monitoring methodologies and survey protocols help support regional assessments of the status and trends of SGCN and their habitats.

In 2004, the WDNR conducted a review of most bird, herptile, mammal, invertebrate, and plant inventory and monitoring programs to assess the adequacy of current efforts in meeting our collective information and data needs (Wisconsin DNR 2004). The review covered key topics including population trend, distribution and range, habitat requirements, habitat condition and availability, population status, and wildlife health.

[2] http://wiatri.net/inventory/ (Search Terms: Wisconsin DNR Aquatic Terrestrial Resources Inventory)

Monitoring each and every species and natural community is simply not feasible as the resources needed to accomplish this are not currently available. Despite these limitations, there is a need for a cost-efficient and effective monitoring approach that will inform decision-makers and land managers and provide a pulse for how Wisconsin's species and natural communities are doing. In addition to understanding the status of conservation targets (plant and animal species and natural communities) within the state, it is also vital to understand whether or not the implemented conservation actions result in the desired impact. In the following pages, we outline the approach that Wisconsin will take to measure the effectiveness of conservation actions implemented as part of the Wildlife Action Plan.

Wisconsin's Wildlife Action Plan is a comprehensive, strategic document that outlines a framework for taking actions. This section identifies tools that are available and that continue to be developed to help measure the success of conservation actions. The goal for monitoring SGCN and natural communities in the context of the Wildlife Action Plan is to use monitoring within an adaptive management context; to test the effectiveness of conservation actions; and to develop a long-term monitoring program for ecosystems, natural communities, and populations of Species of Greatest Conservation Need.

6.2 Proposed Approach for Monitoring the Targets of These Actions and for Measuring Their Effectiveness

Information on the condition of Wisconsin's natural resources is fundamental to the management of those resources. Many existing monitoring programs provide valuable information on our state's natural resources, and in many cases, this information is applied to land-use planning and management activities.

Despite many ongoing monitoring initiatives or projects, Wisconsin does not currently have a comprehensive, statewide biological monitoring framework. Developing such a framework is a top implementation priority for WWAP2. In order to be manageable, this framework should focus on the most important monitoring needs across Wisconsin. This means that the framework cannot provide an all-inclusive view of every possible monitoring effort in the state. Rather, it must rely on key indicators that are illustrative of overall progress and that will serve as a dashboard of information to guide decision makers – elected officials and conservation managers alike. Monitoring and effectiveness measurement must be done at multiple levels within the department (field, program, statewide,) at multiple geographic scales, and together with individuals and organizations that provide input to the WWAP and to our knowledge of SGCN and SGCN habitat in Wisconsin.

In developing a statewide biological monitoring framework, we will follow the general steps as described by multiple sources.[3]

- Identify conservation targets (species, ecosystems, geographic areas, or vegetative communities);

[3] Source: AFWA 2005; The Heinz Center 2009

- Develop a conceptual model that relates conservation targets to stressors or threats, as well as conservation activities;
- Use the model to select potential indicators of target status and conservation effectiveness;
- Develop a monitoring program to measure and track indicators;
- Implement conservation activities, measuring indicators to track progress; and
- Use information from the indicator measurements to modify activities and adjust the conceptual models.

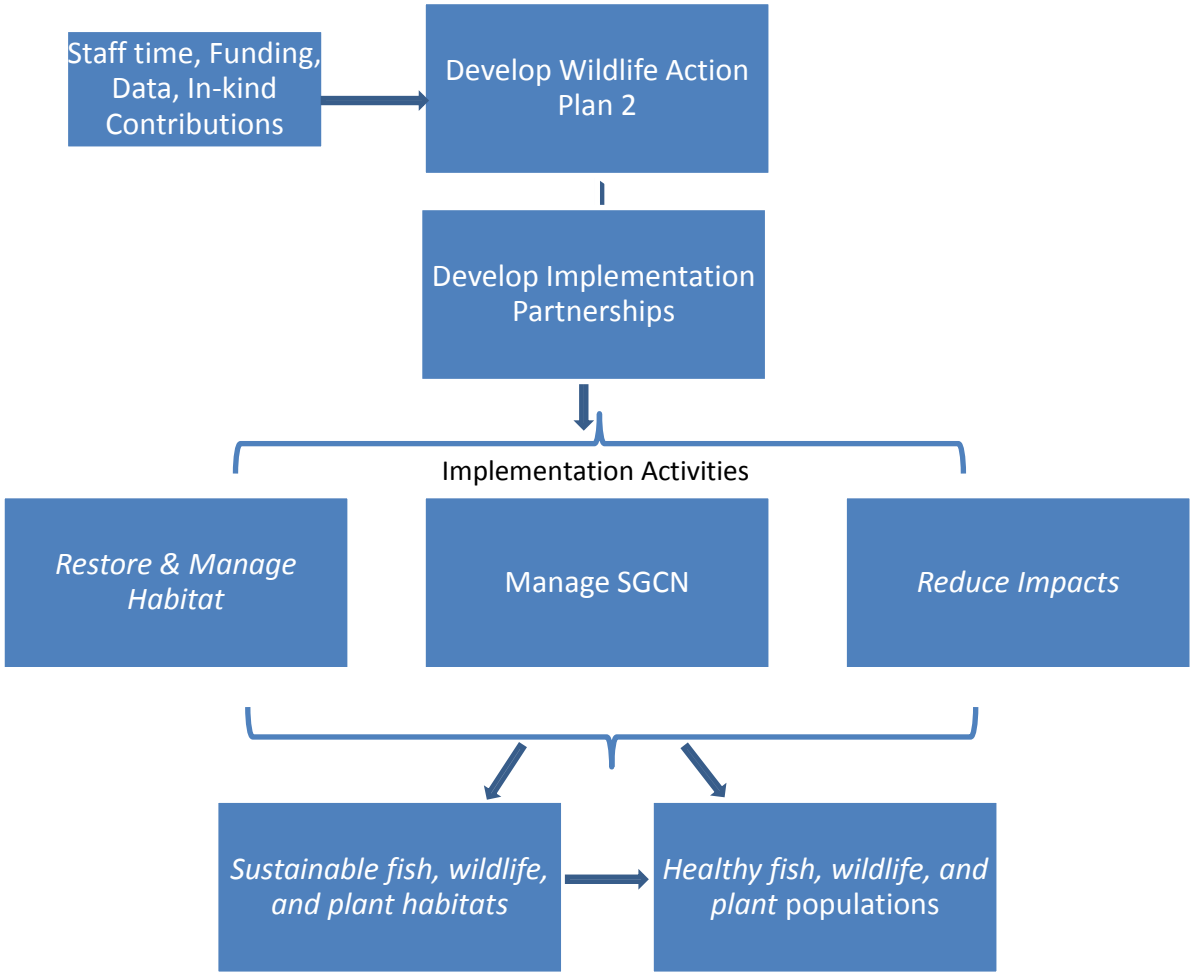
In developing a monitoring framework, we will also follow these basic and well accepted principles/guidelines:

- Evaluate existing monitoring efforts, building on them when possible;
- Integrate monitoring with local, regional, and national programs;
- Produce quantitative, comprehensive assessments of the resources;
- Relate habitat monitoring to species monitoring;
- Maintain detailed, accurate documentation of data and results;
- Strive for consistency of protocols among monitoring projects, so results are comparable;
- Include internal and external peer-review of plans and products; and
- Encourage partnerships, leveraging of resources, and cost-sharing, including support for citizen-based monitoring projects.

6.3 A Conceptual Model for Wisconsin's Wildlife Action Plan[4]

In developing a monitoring and effectiveness measures framework, it is helpful to begin with a conceptual model that illustrates the relationship between elements of the monitoring framework including inputs and resources, plan development, partnership building, conservation actions, and results. The literature is full of examples of conceptual models, but for illustrative purposes we provide the following as a conceptual model for Wisconsin's Wildlife Action Plan. This model and other components described in Sections 6.4 to 6.7 are the basis for improvements to the WWAP that will be demonstrated over the next ten years.

[4] Source: Heinz 2009

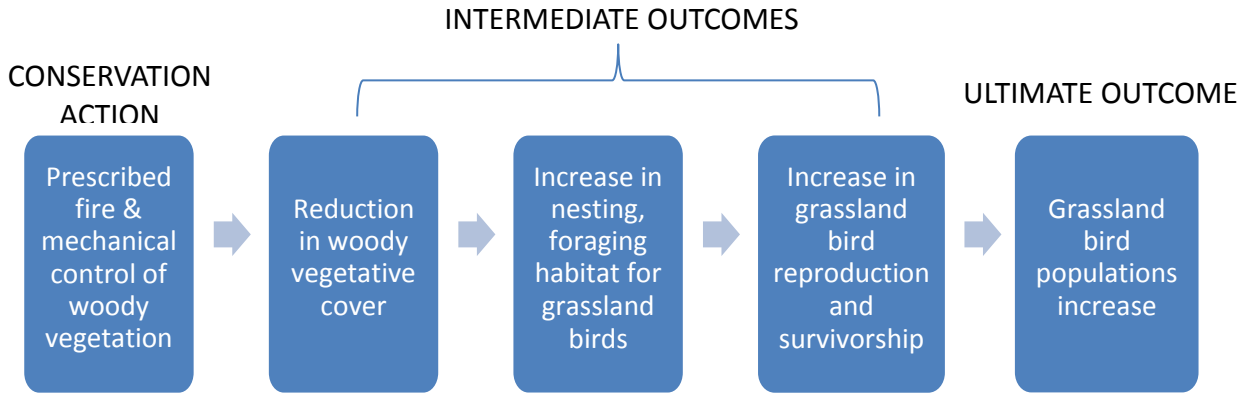


The model above is a simple illustration of how the WWAP works. And, while it does not show threats or stressors, many of the conservation actions identified in the WWAP (Implementation Activities above) are focused on reducing or eliminating threats (e.g. habitat loss, invasive species, disease). More detailed models can be developed that show linkages between threats and targets as well as that show specifically how particular conservation actions will lead to a measurable changes in fish, wildlife, plants, and their habitats. These are described in the following sections.

6.4 Results Chains and Effectiveness Measures

Results chains (also known as logic models, logic chains, or causal chains) are a tool that can help show the connections between actions and results, showing intermediate and final outcomes. They are used in many sectors to measure performance and evaluate progress toward goals. Logic models are simple box and arrow diagrams and

offer the benefit of combining quantitative and qualitative results (outputs and outcomes).



Breaking down a project into multiple steps between the conservation action and the ultimate outcome, or result, makes the steps in a project clear and shows both short-term and long-term outcomes. For each outcome an indicator, or "measure," can be established allowing for both short and long term progress to be measured. The time lag between undertaking a conservation action and achieving the ultimate outcome may take years or even decades. Yet organizations that provide funding for such activities often want to see documentation of results at a much shorter timescale. Establishing results chains for projects with clear indicators across a realistic timeframe allow natural resource managers to both meet reporting requirements and achieve their ultimate outcomes.

Generalized results chains like the one above can help identify 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. For Wisconsin's WAP, conservation actions were developed using a common classification of actions (see Section 2, Appendix 2.1), which will allow for the tracking and reporting on "groups of similar projects" (e.g. invasive control on State Natural Areas) as well as for individual projects. Additionally, using a common conservation action classification makes it possible to "roll up" effectiveness measures across states (see more on TRACS Database below). Wisconsin's approach to developing indicators and effectiveness measures for conservation actions for SGCN and habitats will follow those developed by the Association of Fish and Wildlife Agencies (AFWA). These are described in general below and in detail in the 2011 AFWA report, "*Measuring the Effectiveness of State Wildlife Grants*".[5]

Actual values for these measures will be entered into the USFWS Wildlife TRACS database (see below), 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

[5] http://www.fishwildlife.org/files/Effectiveness-Measures-Report_2011.pdf

broader conservation programs. Terms and standard definitions are derived from Margoluis and Salafsky (1998) and Salafsky et al. (2008).

6.5 State Wildlife Grants Effectiveness Measures Project

In 2009, the Association of Fish and Wildlife Agencies' (AFWA) Teaming with Wildlife Committee formed the Effectiveness Measures Working Group. The role of the group was to develop an approach for measuring the effectiveness of wildlife conservation activities funded under the U.S. Fish and Wildlife Service's State Wildlife Grants (SWG) program. The working group was comprised of 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 common activities that are funded through the SWG program. The report identifies a set of common indicators for conservation actions that are frequently used to implement Wildlife Action Plans. Examples of these conservation 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. Sample forms and templates for reporting on conservation actions are included in the report.[6]

6.6 Wildlife TRACS Database

Wildlife Tracking and Reporting Actions for the Conservation of Species (TRACS) is the tracking and reporting system used by the U.S. Fish & Wildlife Service's (USFWS) Wildlife and Sport Fish Restoration (WSFR) Program to capture information about conservation and related actions funded by its grant programs. TRACS provides real-time public access to project information, including project descriptions and accomplishments. TRACS provides a means for communicating priorities, status, funding and effectiveness of WSFR's contribution towards the nation's conservation efforts. Funding agencies often track short-term outputs or simply "count" widgets (e.g. number of workshops, number of acres, number of people surveyed). TRACS is unique in that it has the potential to track longer-term outcomes for species and habitats. This kind of measurement is needed so that funders and agencies can understand which conservation actions are having the desired impact and ultimately meeting their intended goals. Because it is designed to meet the needs of state agencies, TRACS uses a customized classification system for conservation actions and threats. The system is based, in part, on a classification system developed by the Conservation Measures Partnerships (CMP)[7]. This is also the system that Wisconsin has implemented with the 2015 revision of its WAP. The department is using TRACS to report all activities that are

[6] For more information and to review the final report, please visit: http://www.fishwildlife.org/files/Effectiveness-Measures-Report_2011.pdf
[7] Source: Salafsky et al. 2008

funded via the U.S. Fish and Wildlife Service's WSFR Program, including State Wildlife Grants. [8]

The development and implementation of a biological monitoring and effectiveness measures framework for Wisconsin will begin following the completion of the WWAP update. The following example provided in 6.7 describes how such a framework might work for a specific conservation action. The scenario is meant to be illustrative in nature. Some elements have or are being implemented, but may not be exactly as identified below.

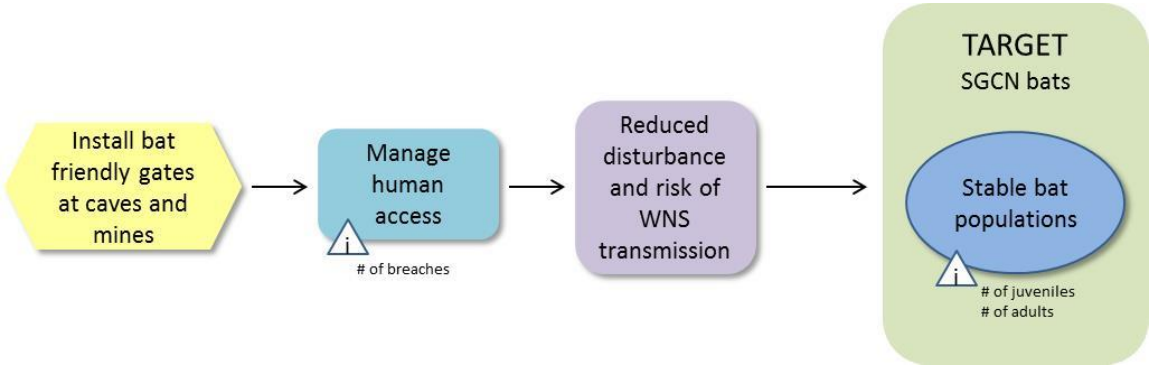
6.7 Scenario - A Comprehensive Approach to Bat Management in Wisconsin

Bats are a vital part of many Wisconsin ecosystems, including being voracious consumers of mosquitoes and crop pests. Unfortunately, bats are at risk due to their low reproductive rate and the limited number of breeding and hibernation sites available. Added to these factors is the risk of white-nose syndrome (WNS), a devastating disease of hibernating bats that has caused the most precipitous decline of North American wildlife in recorded history. White-nose syndrome is caused by the fungus *Psuedogymnoascus destructans*. Since it was first discovered in New York in 2006, WNS has affected eleven species of cave-hibernating bats, including four endangered species and subspecies of insect-eating bats in the eastern and southern U.S., causing declines approaching 100 percent in some populations. Recent estimates suggest 5.7-6.7 million bats have died over the past seven years. In Wisconsin, white-nose syndrome was found in a single mine in Grant County in April 2014 and has since been documented in seven additional counties. The population of bats at the initial mine in Grant County has decreased by 70% since the discovery of white nose there. The disease poses a severe threat to all four of Wisconsin's cave bat species.

White-nose syndrome has significant environmental, economic and public health implications. Insectivorous bats consume large numbers of agricultural and forest pests, the control of which cost farmers and foresters billions of dollars yearly. Bats play an important role in sustaining many unique and fragile cave ecosystems. For example, bats are the primary source of nutrients in many cave systems, and many cave-obligate species depend on such input for survival. Thus, the loss or significant reduction of bat populations from caves could have cascading affects that impact the status of many other cave species.

Wisconsin's Bat Management Plan is a comprehensive and proactive effort aimed at conserving and managing the state's bat populations. It serves as a framework for coordinating projects to increase knowledge of bats through roost monitoring, acoustic monitoring, and training citizens to collect long-term bat data. This cost-effective approach to gathering information set the stage for the development and implementation of critical surveillance and monitoring of the deadly white-nose syndrome in bat hibernacula throughout the state. The following is an example of how a results chain might be used to illustrate the connections among conservation action, intermediate outcomes, and the ultimate desired result (stable bat populations).

[8] For more information about TRACS: http://tracs.fws.gov/public/



For this example, the results chain illustrates the connections between the conservation action (install bat gates), the objective (reduce human access), the threat (human disturbance), and the conservation target (SGCN bats). Walking through the logic, you would expect that if bat gates are installed at caves and mines then there will be reduced human access to those caves and mines. If there is reduced human access there will be reduced disturbance by humans. If there is reduced disturbance, the SGCN bat species will increase their populations. The specific elements in the results chain are:

Action: Install bat friendly gates at caves and mines in Wisconsin.

Objective: Reduce risk of human-spread WNS and disturbance to hibernating bats.

Threat: Human access at caves and mines could result in the white-nose syndrome casing fungus to be spread to other caves and mines, thereby facilitating the spread of the disease. Repeated arousal of hibernating bats by both humans and WNS can lead to depletion of energy reserves and starvation before winter ends.

Target: SGCN bats.

For the objectives and threats, an "indicator" is developed that will be used to measure results for that particular element. In Wisconsin's Wildlife Action Plan, the action to "install bat gates" is an example of "Direct Management of Natural Resources," one of the broad categories of conservation actions. For this broad action category, sample indicators include:

- 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 action to install bat gates, the indicator "number of bat gates installed" could be measured by counting the number of gates installed at caves and mines each year. This would be an intermediate "output" measure – one that provides a useful metric to track progress, but does not in itself reveal whether the conservation action has or will achieve the desired result (increasing bat populations).

For the threat "reduce human access" the indicator "number of breaches" could be measured. Again, this is an intermediate indicator that does not measure whether the ultimate goal of increased bat populations has been achieved.

Finally, the ultimate goal of increased SGCN bat populations can be measured by species measures of reproductive success (# of juvenile bats of each species) and population size (# adult bats of each species).

The bat example is meant to serve as a model for how monitoring and effectiveness measures will be implemented for specific conservation actions in Wisconsin's Wildlife Action Plan. As we develop the monitoring and effectiveness measures framework, we will link specific indicators and metrics with the relevant conservation actions in the WWAP database. We will also link information from existing monitoring programs that may have data relevant to a given conservation action. The database can then be used to help generate reports for specific SWG-funded projects, for individual conservation actions, and for larger classes of conservation actions (e.g. all "Direct Management" actions).

Over time the department will be able to better show how the conservation actions taken to implement the WWAP are resulting in real benefits to SGCN populations and their habitats.

6.8 References

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