



Monitoring For Success

This Conservation Strategy identifies ways to make monitoring efforts more comprehensive, integrated, efficient, and frugal by focusing monitoring on the status of species and habitats, and the effectiveness of conservation actions.

This section:

1. Provides an overview of monitoring (“Monitoring in Oregon: some frequently asked questions”)
2. Lists recommendations for monitoring in support of the Conservation Strategy (“Specific Recommendations and First Steps for Monitoring in support the Conservation Strategy”)
3. Presents current ongoing efforts to monitor species and habitats in Oregon (“Current ongoing efforts to monitor species and habitats in Oregon: How the Conservation Strategy builds on existing efforts”)

Monitoring in Oregon: Some “Frequently Asked Questions”

Why is monitoring so important?

Investments in conservation should be strategic, effective, and account-

able. Success of these investments can be measured by: 1) assessing existing conditions (2) identifying desired conditions and 3) measuring change over time.

A well-designed monitoring program takes an adaptive management approach (see sidebar) using verifiable and reliable science. Monitoring objectives should be simple, easily communicated, and relevant to people’s concerns. Data and information derived from monitoring should be easily understood, well-documented, and accessible in a variety of formats for relevant audiences (e.g., scientists, public and private land managers, and policy makers). Results should be displayed graphically and spatially and made relevant to Oregonians. Monitoring in support of the Conservation Strategy will involve work with partners to reach conventional and new audiences, and engage interested lay Oregonians. Bird population and water quality monitoring programs are excellent models.

At what scale should monitoring occur?

Monitoring may occur at different scales--site, stream, watershed, ecoregion, and statewide. While different questions may be addressed at each scale and different variables measured, all should be unified and

How should monitoring begin?

Monitoring can be initiated to achieve a variety of goals. Goals will determine what should be monitored, how it should be monitored, and for how long. Monitoring may be directed toward individual species or species groups, habitat conditions, ecologic function, or ecological integrity.

This table lists example questions and possible measures for a monitoring project focusing on grassland songbirds. This example demonstrates effectiveness monitoring.

Type of monitoring	Question	Measure
Project-level	Was the project implemented as planned?	Number of acres planted with grasses and wildflowers
Project-level	Was the project successful as planned?	Survival and establishment of planted grasses and wildflowers.
Resource (songbird “health”)	Did the project benefit grassland songbirds in the short-term?	Number of grassland songbird pairs before and after project implementation, reproductive success of pairs
Resource (songbird population trends)	Did the project benefit grassland songbirds in the long-term?	Population trends of grassland songbirds

focus data collection on a defined purpose. Useful monitoring should be directed at the same scale that the conservation action or limiting factor is occurring. Monitoring conducted in Oregon can be incorporated into regional, national, and international efforts to examine larger-scale population or ecologic trends.

Criteria or benchmarks of desired habitat conditions should be identified to evaluate habitat changes. Habitats in good ecological condition provide references for identifying degraded habitats needing restoration. However, reference conditions can be difficult to define and use. Reference conditions should be described at a regional scale, and with an understanding of natural ecological variability. This provides for comparison within similar ecological conditions. Using a combination of expert opinion, historical data, modeling and regional surveys should be used to define reference conditions. Consider disturbance history such as logging, land clearance, channeling, sediment loading, or groundwater contamination. Finally, methods need to be developed to quantify levels of “background” disturbance and its variability. Monitoring should be responsive to the changes that occur over time (e.g., seral stages).

To ensure that monitoring occurs at appropriate scales, the Conservation Strategy’s approach to monitoring is intended to:

- Determine areas to be monitored and specify the level of detail. Monitor habitat at the statewide scale, including distribution of conservation actions and habitats. Track at finer scales for rare

or rapidly changing habitats of concern.

- Review progress toward monitoring objectives annually or biannually to determine if conservation actions are achieving goals and if state conservation goals should be refined.

How does applied research relate to monitoring?

The Conservation Strategy takes a broad approach to monitoring and includes applied research. Applied research seeks knowledge necessary to improve management of species and habitat. In addition, it includes evaluation of monitoring programs and approaches, such as the utility of indicator species.

Monitoring designs should be quantitative, scientifically sound and clear in purpose asking: What information is needed and why? Design and methods must be goal driven and address the appropriate scale across space and time. The degree and extent of a monitoring design must be budgeted appropriately. The data should be useful to a variety of audiences (e.g., scientists, policy makers, Oregonians). Use the Framework for Monitoring Programs described below when developing or modifying programs.

Framework for Monitoring Programs

(Based on USGS General Concepts for a Monitoring Program; www.teaming.com)

1. Identify monitoring goals; determine questions to be answered accordingly.

What is Adaptive Management?

Because natural systems and conservation issues are inherently complex, natural resource managers must continuously learn from their experiences as they restore habitats or implement other conservation actions. They must then adapt their approaches to respond to new information or to changing conditions. This process is called “adaptive management.” In adaptive management, resource managers assess results of actions and modify their future actions, viewing each action as an experiment. However, adaptive management is not just trial-and-error. It is a thoughtful and rational process in which assumptions are tested so resource managers can determine not only what actions work, but why. An example framework:

1. **Assess.** Assess existing condition. Develop concepts about what factors are creating the current conditions.
2. **Plan.** Determine desired conditions. Determine what actions could be implemented to address factors contributing to current conditions.

3. **Implement.** Take planned action.
4. **Monitor.** Detect change over time and compare to desired conditions.
5. **Learn.** Analyze and evaluate monitoring results. Refine concepts about what factors are creating the current conditions and how conservation actions should be modified (if at all).
6. **Adapt.** Modify conservation actions accordingly.
7. **Iterate.** Repeat process over time.

Ideally, the lessons learned through adaptive management are shared extensively so conservation actions can become more effective and cost-efficient over larger areas. By sharing results researchers and resource managers can view results in a broader context of space and time.

2. Identify parameters to monitor (e.g., - species population trend, shrub density, stream temperature).
3. Determine appropriate monitoring protocol(s) and analytical tools.
4. Provide mechanisms for quality control (e.g., data standards, training observers).
5. Ensure data are maintained, proofread, archived and remain accessible.
6. Conduct appropriate data analysis.
7. Report results and recommendations in a timely manner.
8. Review monitoring goals and methods to ensure that they are still relevant and appropriate.

What should be monitored?

It is neither possible nor desirable to monitor everything: natural resource professionals must make reasoned decisions about what to monitor and a number of trade-offs. For example, a project leader needs to decide how much to put into a project versus into measuring the success of that project. Priority is often placed on species or habitats in decline. The Fish and Wildlife Monitoring Team will determine criteria for selecting species and habitats to monitor in support of the Conservation Strategy.

Why and how should Oregonians have opportunities to monitor?

Citizen-based monitoring can greatly expand scientists' ability to collect data. Oregonians can often contribute valuable local biological knowledge. For example, bird-watchers and anglers understand the distribution and behavior of their favorite species. Farmers and other landowners have deep familiarity with what occurs on their land. Citizen-based monitoring can tap into this knowledge, increase the amount of data that can be collected, and reduce the costs of data collection. Citizen-based monitoring also engages Oregonians in conservation, teaches people about their local environment, and provides feedback on conservation actions they may be taking on their land or in their neighborhood.

Citizen-based monitoring programs need to be well-designed to make the best use of people's valuable volunteer time. Challenges include inconsistent methods, variable data quality due to observer bias, high turnover of volunteers, lack of scientific training for volunteers, and data management issues. These can be addressed through simplified monitoring designs, training programs, monitoring field guides, and large sample sizes. Because citizen-based monitoring programs usually aren't statistically rigorous, they can't be used for research or manage-

ment decisions. However, they are extremely valuable for tracking trends, such as changes in water quality or bird populations.

In Oregon, some examples include water quality, Christmas Bird Count, North American Breeding Bird Survey, Fourth of July Butterfly Count, Valentine's Day Herp Count, and dragonfly migration monitoring. Volunteers also often assist biologists in collecting data, a crucial step in monitoring. Such cooperative efforts include the Oregon Bat Grid, Bonney Butte Hawk Migration Count, and deer population trend surveys. By supporting and building on these efforts, scientists and Oregonians can work together to address monitoring priorities identified in the Conservation Strategy.

What help is available to start monitoring?

The Oregon Plan's technical assistance manuals produced by the Oregon Watershed Enhancement Board and manuals developed by the Oregon Department of Environmental Quality to guide water quality monitoring are good sources for launching monitoring programs. During implementation of this Conservation Strategy, ODFW (the Fish and Wildlife Monitoring Team) will develop tools for citizen-based monitoring of selected terrestrial wildlife and environmental conditions such as water quality.

What is the role and importance of monitoring in grants and other funding?

Specific measures for monitoring and reporting results allows grant administrators and other funders to track the progress and investment value of projects they have funded.

Monitoring of conservation or management actions should be funded along with project implementation. Further, natural resource professionals should seek collaborative ways to make monitoring affordable and relevant. Finally, project managers should share results with peers, policy makers and local decision-makers to the extent possible. This allows people to learn what works and adapt actions and policies more efficiently.

What are some other considerations for monitoring Oregon's natural resources?

Ownership and jurisdictional boundaries add complexity to monitoring. Habitat boundaries often do not coincide with ownership or jurisdictional boundaries. Federal, state, local and private owners have different management goals, and conservation goals within each of these ownerships can vary widely. Land ownership changes over time. Habitat monitoring and monitoring programs vary widely in approach, proprietary information, and data compatibility.

To address this situation, adjacent landowners within states and ecoregions need to be familiar with one another and build trust through periodic interaction. Collaborative initiatives, such as multi-stakeholder monitoring groups are fundamental to developing a fish and wildlife monitoring program that has credibility within and beyond the stakeholder group (McKinney et al., 2004)

Peoples' concerns are important in developing a monitoring program. Socioeconomic data are important for successful community-based conservation programs. Partner in determining suitable socioeconomic indicators and implement monitoring programs to evaluate:

- Effects of Conservation Strategy actions (costs, benefits, and implications) on local economies and communities.
- Capacity of communities to take conservation action (is there a watershed council or ongoing efforts?), availability of technical support and incentive programs, and financial resources.

To incorporate peoples' concerns into monitoring, begin by working with stakeholders and managers to understand the effects of past land-use practices. Identify ways to incorporate social change into natural resource planning. Consider what ecological attributes are important to people. Work with other groups (i.e., Economic Development; Oregon Progress Board) on social and economic elements. Effectiveness monitoring should be designed to respond to changes in conservation and/or societal values over time.

Monitoring efforts are often not well coordinated among organizations. Through recent large-scale planning efforts such as the Northwest Forest Plan and Interior Columbia Basin Ecosystem Management Project, monitoring protocols have been developed for many species. However, a variety of agencies, organizations, and individuals still monitor using highly variable protocols and designs. There is no institutional infrastructure to coordinate data collection, management, storage and sharing. Data collected at different sites within a single program may be incompatible. Larger scale analyses, such as statewide trends are hampered by poor data sharing and data incompatibility. Confounding the problem, different groups can define habitat in different ways for different parts of the state (e.g., by vegetation type, or by structural class).

A primary goal of the Conservation Strategy is to improve on coordination of monitoring efforts in Oregon. Standardized methods and formats for collecting key monitoring data need to be adopted and used, making use of new technologies to efficiently collect and manage data (e.g., Sagebrush Bird Conservation Network Study Areas Database). The Fish and Wildlife Monitoring Team will assist with developing and/or adopting standard terminology and methods in monitoring. Local and

ecoregional efforts should be linked to support statewide and nationwide assessments, and providing for long-term data management.

Specific Recommendations and First Steps for Monitoring in Support of the Conservation Strategy

Fish and Wildlife Monitoring Team

Monitoring needs for the Conservation Strategy are larger and more complex than any one agency or organization can sustain. Many ongoing monitoring efforts by groups and agencies already address some Strategy Species and Habitats. However, they are not always coordinated with other similar efforts. In order to make best use of these existing monitoring plans and efforts, Oregon Department of Fish and Wildlife will establish a multi-partner Fish and Wildlife Monitoring Team provide guidance for needed monitoring and assessments.

The Monitoring Team approach will build on the ongoing work to increase coordination between groups and to focus any new monitoring activity on gaps in current efforts. For example, the Team will coordinate with Oregon Watershed Enhancement Board's Oregon Plan monitoring efforts, which focus on aquatic and riparian habitat. This provides an opportunity to incorporate and build on environmental indicators identified in support of the Oregon Plan (http://linr.oregonstate.edu/download/opsv_envindicators.pdf). The Fish and Wildlife Monitoring Team will also coordinate with the Oregon Board of Forestry's efforts to identify indicators that could provide information about the status of native plants and animals on forest lands.

The Monitoring Team would share their recommendations and protocols to agencies, organizations, academia and others looking for opportunities to incorporate Strategy Species and Habitat monitoring into their existing efforts.

The Team should include representatives from federal, state, and local agencies; fish and wildlife user groups; tribes; conservation organizations; and forestry, agriculture, industry, and transportation interests. Their expertise and perspectives on monitoring would provide the groundwork for establishing and maintaining a database and data management system that can be used by a variety of data collectors and managers.

Potential tasks of the Team include:

- Developing a list of potential indicators (including species) and specific criteria to link indicators to Strategy Species and Habitats and evaluate these indicators for suitability, practicality and cost-effectiveness.
- Identifying monitoring priorities, including a list of Strategy Species and indicators to monitor.

- Compiling existing monitoring protocols, developing new monitoring protocols for those species or species groups lacking existing protocols and providing these protocols to potential users.
- Developing or reviewing protocols and other guidance for citizen scientists on how to monitor.
- Synthesizing information from Conservation Strategy monitoring efforts to determine the status of Strategy Species and Habitats. Providing this information to natural resource specialists, land managers, decision makers and other interested parties (e.g., information users or clients).
- Identifying ways to streamline and enhance data management and usability, and developing standards for data collection and management.

Portals of information on the web

Develop and maintain user-friendly web portals similar to the Willamette Explorer (<http://willametteexplorer.info/>) and North Coast explorer (<http://northcoastexplorer.info/>) that provide information on current applied research findings, data on species and habitats presented in a variety of formats geared to different audiences (decision-makers, Oregonians, natural resource professionals). Design portals to allow for data sharing between conservation partners.

Citizen-based monitoring is central to Conservation Strategy monitoring

Oregon Department of Fish and Wildlife will explore options to identify those parts of its monitoring program suitable for citizen participation; collaborate with citizen and conservation groups to promote and implement citizen-based monitoring; and work with partners such as

universities, non profits and landowners to provide training and access to selected databases for citizen contributions.

Charting conservation actions

The registry of conservation actions discussed previously (under How to Get the Job Done: Voluntary Conservation Tools, page 87) will be an important tool for monitoring what kinds of projects are implemented, where they are occurring, what habitats or species are potentially benefiting, and if conservation goals are being met.

Strengthen data management capacities

A critical component of any monitoring program is effective data management. Quality data are needed to evaluate the effects of conservation actions on species and habitats and make appropriate adjustments, if necessary. Some important first steps for data management include:

- Identifying critical data collection activities and associated data management efforts and determining effective methods for providing permanent, consistent data management infrastructure. For example, survey Oregon Department of Fish and Wildlife Monitoring Team, staff, and partners to (1) identify key datasets necessary for implementing conservation actions and determining success through monitoring, (2) inventory current data collection activities relevant to the Conservation Strategy, (3) identify any gaps in current efforts.
- Adopting and using standards for database design, metadata development, and acquisition protocols (e.g., ongoing efforts in Oregon Department of Fish and Wildlife's Natural Resource Information Management Program; OSU's Institute for Natural Resources; Federal, Oregon Geographic Information Council, and NatureServe standards).

Example of a conservation strategy from another state (Missouri)

Like all states, Missouri has prepared a comprehensive wildlife conservation strategy and offers one model for monitoring. Missouri Department of Conservation's approach to effectiveness monitoring will link targets (species, natural communities, restored habitats, and abiotic factors) to proposed conservation actions. Missouri will focus conservation actions and monitoring in priority landscapes called Conservation Opportunity Areas (COA's). COA Advocacy Groups (local partners and stakeholders) will define desired future conditions and needed actions. An Expert Review Panel will evaluate wildlife lists for the primary habitat types and develop a list of "monitorable" targets. This recommendation will be forwarded to the COA Advocacy Group members, and they will decide what to monitor. Effectiveness monitoring will build on the present monitoring activities by all conservation partners active in the COA, not just the Missouri Department of Conservation.

Missouri believes that the best approach to evaluating the health of landscapes and natural communities is to monitor priority environmental parameters or multi-taxa groups of animals and plants, rather than monitoring individual priority species. Good choices for monitoring targets are species that are representative of the habitats, communities that characterize the target landscape, and abiotic factors like water quality measures that provide clues to environmental health. The best choices for monitoring targets are species and communities (or related elements of the community) that respond to habitat change, are detectable and to the degree possible, demonstrate public interest and support.

Track and report results

Monitoring the effectiveness of conservation actions and adapting these actions to respond appropriately to new information or changing conditions requires that results be tracked and reported. The following steps can be taken in partnership with the Fish and Wildlife Monitoring Team, Oregon Department of Fish and Wildlife's Natural Resource Information Management Program, Oregon Natural Heritage Information Center, Oregon Watershed Enhancement Board, and other partners.

- Identify how progress will be measured (that is, specific metrics to be used such as number of acres restored, number of stream miles improved, or number of landowners given technical assistance).
- Implement consistent procedures for data entry so that progress reporting can be done through queries to a database. Where possible, develop tools to automate the reporting process.
- Design web-based data tools to ensure consistent data entry by multiple partners, maintain data integrity, and improve data sharing. The web-based portals are one way this could be achieved.

Current Ongoing Efforts to Monitor Species and Habitats in Oregon: How to Build on Existing Efforts

Overview

The Conservation Strategy recognizes that there are several major ongoing efforts to monitoring the condition of natural resources in Oregon, and intends to build on these ongoing efforts. The Fish and Wildlife Monitoring Team will develop criteria to link ongoing efforts and indicators to monitoring Strategy Species and Habitats. Some key considerations when designing programs to monitor the status of Strategy Species and Strategy Habitats include:

- Monitoring efforts for Strategy Species should emphasize, as needed, either inventory or limiting factors at appropriate spatial scales. Depending on the existing knowledge base, for some species monitoring should focus on basic knowledge of distribution; for other species it should focus on their response to a particular type of management or human activity; or, for other species it should be highly specific (i.e., the degree of contaminants in fish the Lower Columbia River).
- In long-term, ongoing monitoring efforts, emphasize Strategy Species or Habitats and/or support regional or continental programs.

Incorporate Strategy Species monitoring into other monitoring efforts. When necessary, monitor priority species one at a time to collect baseline data as needed. Use and build on existing data sets and monitoring efforts to determine status, distribution and trends.

- Use indicators or surrogates where valid.
- Where possible, monitoring should be integrated across taxa, habitats, ecoregions, and management objectives.
- Create incentives for monitoring changes in species and habitat distribution over time, in addition to the short term monitoring that guides management.

Major Plans and Initiatives that Identify Priorities for Monitoring Oregon's Natural Resources

The Conservation Strategy supports and complements monitoring priorities provided by other existing, ongoing efforts within Oregon. Oregon Department of Fish and Wildlife reviewed the following plans for priorities and ongoing efforts, There are additional ongoing efforts not reflected here, especially at the local level.

Ecologic Function and Habitats

- Oregon Benchmarks
- State of the Environment Report
- Oregon Plan for Salmon and Watersheds habitat and species monitoring
 - OWEB Monitoring Strategy for the Oregon Plan for Salmon and Watersheds
 - ODEQ Watershed Health Initiative and Volunteer Monitoring Program
 - ODFW Oregon Plan Monitoring Program
 - ODF Forest Practices Monitoring Program
- Northwest Forest Plan and related BLM and USFS local plan updates
- Pacific Northwest Aquatic Monitoring Partnership (PNAMP)
- ODEQ Total Maximum Daily Load (TMDL) planning and process
- ODA SB 1010 plans
- Subbasin plans
- City planning (i.e., City of Portland, City of Bend, etc)

Species and Species Groups

- Regional Seabird Conservation Plan (California Current System only)
- Northern Pacific Coast Regional Shorebird Management Plan
- Intermountain West Regional Shorebird Plan
- Oregon-Washington Partners in Flight Conservation Plans (5 ecoregional plans)
- Intermountain West Region Waterbird Conservation Plan
- Regional Waterbird Plan for the Northern Pacific Coast
- Pacific Flyway Management Plans
- Oregon-Washington PIF Special Species Monitoring and Assessment in Oregon and Washington