

---

**APPENDIX D**  
**MONITORING**



## APPENDIX D

# MONITORING

Monitoring ensures that vegetation management is an adaptive process that continually builds upon past successes and learns from past mistakes. The regulations of 43 Code of Federal Regulations (CFR) 1610.4-9 require that land use plans establish intervals and standards for monitoring and evaluating of land management actions. During preparation of implementation plans, treatment objectives, standards, and guidelines are stated in measurable terms, where feasible, so that treatment outcomes can be measured, evaluated, and used to guide future treatment actions. This approach ensures that vegetation treatment processes are effective, adaptive, and based on prior experience.

The diversity of plant communities on U.S. Department of the Interior Bureau of Land Management (USDI BLM) lands calls for a diversity of monitoring approaches. Monitoring strategies may vary in time and space depending on the species. Sampling designs and techniques vary depending on the type of vegetation. Guidance on monitoring methodologies can be found in such BLM documents as *Measuring and Monitoring Plant Populations* (BLM Technical Reference 1730-1), which was developed in cooperation with The Nature Conservancy. Other guidance documents include *Sampling Vegetation Attributes* (Interagency Technical Reference 4400-4), developed in cooperation with the U.S. Department of Agriculture (USDA) Forest Service, the Natural Resource Conservation Service, and the Cooperative Extension Service; and the *Ecological Site Inventory* (BLM Inventory and Monitoring Technical Reference 1734-7). These documents, as well as numerous other guidance documents for specific plant communities, can be found on the National Science and Technology Center website (<http://www.blm.gov/nstc>). These documents, plus any regionally specific documents developed to meet management objectives, allow for the flexibility needed to monitor the variety of vegetation on public lands.

Two types of monitoring of vegetation treatments may be pursued by the BLM. One type is implementation monitoring, which answers the question, “Did we do what we said we would do?” The second type is effectiveness monitoring, which answers the question, “Were treatment and restoration projects effective?”

Implementation monitoring is usually done at the land use planning level or through annual work plan accomplishment reporting. Effectiveness monitoring is usually done at the local project implementation level.

Invasive plant implementation monitoring for non-herbicide treatments is accomplished through site revisits performed during the growing season of the target species to determine if treatments were implemented correctly and the best time for follow-up treatments.

For herbicide use, implementation monitoring is accomplished through the use of Pesticide Use Proposals (PUPs) and Pesticide Application Records. Both documents are required by the BLM in order to track pesticide use annually. The PUP requires reporting of the pesticide proposed for use and the maximum application rate. It also requires reporting of the number and timing of applications. Targeted species and non-targeted species at the treatment site are described, as well as the other site characteristics. A description of sensitive resources and mitigation measures to protect these resources is also required. Most importantly, the integrated weed management approach to be taken (i.e., the combination of treatments to be used) is required. The National Environmental Policy Act (NEPA) document that analyzes the effects of the treatment must also be referenced. PUPs must be signed by a certified weed applicator, the field office manager, state coordinator, and deputy state director before the treatment can go forward. The Pesticide Application Record, which must be completed within 24 hours after completion of the application, documents the actual rate of application and that all the above factors have been taken into account. Pesticide Application Records are used to develop annual state summaries of herbicide use for BLM.

Pesticide Use Plans and Pesticide Application Records can also be used for more site-specific implementation monitoring. For example, the Application Record can be used to track whether the application was made at the correct time, if mitigation for sensitive wildlife concerns is included in the PUP.

Monitoring of invasive plant treatment effectiveness can range from site visits to compare the targeted population size against pre-treatment inventory data, to comparing pre-treatment and post-treatment photo points, to more elaborate transect work, depending on the species and site-specific variables. The goals of monitoring should be to answer questions such as the following:

- What changes in the distribution, amount, and proportion of invasive plant infestations have resulted due to treatments?
- Has infestation size been reduced at the project level or larger scale (such as a watershed)?
- Which treatment methods, separate or in combination, are most successful for a particular species?

Monitoring data can have far-reaching applications in fire management because it provides the scientific basis for planning and implementing future burn treatments. Measuring post-fire ecosystem response allows the BLM to understand the consequences of fire on important ecosystem components and to share this knowledge in a scientifically based language. Monitoring is the critical feedback loop that allows fire management to constantly improve prescriptions and fire plans based on the new knowledge gained from field measurements. FIREMON is an interagency monitoring program that is used for monitoring fuels treatment effectiveness. When a fuels treatment project involves an invasive species (such as tamarisk or Russian olive), monitoring can be done using a program such as FIREMON.

Another monitoring protocol frequently used to inventory and monitor forest vegetation is called the Forest Vegetation Information System (FORVIS). FORVIS is a system for storage, retrieval, and analysis of data about forestlands. These data describe existing vegetation, classify sites relative to current condition, can be used in forest growth and structure and wildlife habitat models, describe landscapes, aid in developing forest restoration treatments, and provide a record of treatment and disturbance events.

Bureau of Land Management monitoring activities also include the BLM Legacy program, which is an outgrowth of the need to provide current BLM field managers and specialists with an opportunity to learn about past land management practices and land treatments, and to evaluate the results of those practices 25 or more years later. The Legacy program is intended to bring together current land managers and specialists

with retired and active employees who performed the land treatments in the past. The underlying philosophy of the program is that if BLM land managers do not learn from the past, they cannot know which treatments are effective and which are not.

The *Healthy Forests Restoration Act of 2003* instructs the BLM to establish a collaborative multiparty monitoring, evaluation, and accountability process when significant interest is expressed in such an approach. The process is used to assess the positive and negative ecological and social effects of projects carried out under Healthy Forests Restoration Act authority. Multiparty monitoring can be an effective way to build trust and collaboration with local communities and diverse stakeholders, including interested citizens and tribes.

The results of monitoring should be made available to interested parties. A website with links to geospatial and other data sets will ensure that inventory data, and treatment methods and results, are shared easily. The BLM has a website, <http://www.blm.gov>, with links to BLM programs, such as the weed program, and other data sources, including geospatial data. Most state offices are tied into state data clearinghouses that contain useful information gathered by federal, state, and local agencies.

### **Monitoring Guidance used by the BLM in Vegetation Management**

The BLM has prepared numerous guidance and strategy documents to aid field personnel in developing and implementing monitoring plans and strategies. These include the following:

- ***BLM National Monitoring Strategy (2006)***. The BLM is currently developing a national strategy to manage the collection, storage, and use of data describing the interrelationship of resource conditions, resource uses, and the BLM's own activities. The goals of the strategy are to: 1) enhance the efficiency and effectiveness of the BLM's assessment, inventory, and monitoring efforts; 2) establish and use a limited number of resource indicators that are common to most or all BLM field offices, and that are comparable or identical to measures used by other government agencies and non-governmental organizations; and 3) standardize data collection, evaluation, and reporting in a way that improves the quality of

the BLM's land use planning and other management decisions, and enhances the BLM's ability to manage for multiple uses.

- ***BLM Land Use Planning Handbook H-1601-1 (2005)***. Establishes requirements for periodic implementation and effectiveness monitoring for land use planning decisions.
- ***Monitoring Manual for Grasslands, Shrubland, and Savanna Ecosystems Vols. I and II. USDA Agricultural Research Service (2005)***. Provides quantitative methods to address indicators of rangeland health.
- ***BLM Technical Reference 1730-2 Biological Soil Crusts (2001)***. Provides technical guidance on how to develop and implement effective monitoring plans for biological soil crusts.
- ***BLM Handbook H-4180-1 Rangeland Health Standards (2001)***. Provides technical guidance on evaluating rangeland health, developing plans to improve rangeland health, and monitoring the progress of rangeland health plans.
- ***BLM Technical Reference 1730-1 Measuring and Monitoring Plant Populations (1998)***. Provides technical guidance on how to develop and implement effective monitoring plans for vegetation and use monitoring in adaptive management.
- ***BLM Technical Reference 1734-4 Sampling Vegetative Attributes (1996)***. Provides the basis for consistent, uniform, and standard vegetation attribute sampling that is economical, repeatable, statistically reliable, and technically adequate.
- ***Manual Section 9011 Chemical Pest Control (1992)***. Establishes requirements for monitoring pesticide applications.
- ***Manual Section 9014 Use of Biological Control Agents of Pests on Public Lands (1990)***. Establishes requirements to monitor success or failure in survival, control, and spread of biological agents.
- ***Guidelines for Coordinated Management of Noxious Weeds (1990)***. Provides guidance on

establishing monitoring plans for noxious weeds and their control.

- ***BLM Handbook H-4400-1 Range Monitoring and Evaluation (1989)***. Provides technical guidance on how to measure vegetation uses such as livestock grazing, wild horse and burro use, and wildlife browsing and foraging.
- ***BLM Handbook H-9011-1 Chemical Pest Control (1988)***. Provides technical guidance on post-treatment evaluations for pesticide applications to occur within 2 years of treatment.
- ***NEPA Handbook H-1790-1 Chapter VI – Monitoring (1988)***. All actions and mitigation measures, including monitoring and enforcement programs, adopted in a decision document are legally enforceable commitments. The purposes of monitoring in a NEPA context are to 1) ensure compliance with decisions, 2) measure effectiveness of decisions, and 3) evaluate validity of decisions.
- ***Manual Section 1734 Monitoring and Inventory Coordination (1983)***. Provides the BLM with technical guidance on how to develop and implement effective monitoring plans for vegetation.

Numerous other technical references for inventory, monitoring, and assessment are found at: <http://www.blm.gov/nstc/library/techref.htm>. In addition, state-specific handbooks have been developed to guide monitoring based on the national level guidance (e.g., *Nevada Monitoring Handbook*, *Oregon Monitoring Handbook*).

## Monitoring Methods and Research

Fuels treatment and noxious weed control projects must begin with an understanding of which techniques and monitoring methods are most effective, as determined through careful research and follow-up monitoring. The BLM has been supporting research at universities and Forest Service research stations through the Joint Fire Science program and projects such as the Great Basin Restoration Initiative. The Joint Fire Science program has supported research on such topics as fire effects, effects from fuels treatments, and the use of fire as a tool in controlling invasive plants (<http://jfsp.nifc.gov/>). Under the Great Basin Restoration Initiative, ongoing

projects involving weed control, restoration, and fire treatments help provide a link between science and management to ensure that ecologically-based restoration is implemented. These projects are summarized at <http://www.fire.blm.gov/gbri/technology.html>.

Dissemination of research and monitoring results and information occurs in a variety of ways, including formal conferences and workshops of fire management professionals, the National Science and Technology Center, publications such as Resource Notes, and BLM state websites. Snapshots, an online publication found at <http://www.fire.blm.gov/snapshots.htm>, highlights BLM projects that support the *National Fire Plan*. Examples of successful projects and community collaborations that have been discussed in Snapshots include creation and monitoring of fuels breaks, habitat improvement through prescribed burning, fuels reduction and associated monitoring, and the progress of a downy brome (cheatgrass) taskforce. Examples of project successes include the following:

- In Wyoming, a multi-agency prescribed burn was completed in 2005 to reduce hazardous fuels and improve the health and vigor of native plant communities. Monitoring methods include permanent vegetation transects and photo points to provide post-burn results and an elk collaring study to show which treatment areas are being used by elk. The information obtained during this study will be shared with the public, and the site will be used by school classes.

- In Wyoming, a tamarisk reduction project was started in the Bighorn Basin in 2000 to restore native cottonwood galleries. The project involves various combinations of treatments, as well as plantings of native species following the treatments.
- In Washington, the BLM has been treating reed canarygrass since 2003, using a combination of prescribed burning, herbicides, and mowing, followed by seedbed preparation and reseeding with native seed mixtures. This project is a partnership with the Natural Resource Conservation Service, Washington State Department of Fish and Wildlife, and the U.S. Fish and Wildlife Service.

Bureau of Land Management offices maintain monitoring reports to document that fuels treatments meet set objectives. Monitoring plans typically include plots and photo points, at which pre- and post-treatment data are collected. This type of monitoring has successfully provided data that has allowed the BLM to confirm that project goals have been met.