CHAPTER 2

VEGETATION TREATMENT PROGRAMS, POLICIES, AND METHODS

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The BLM programs and policies provide broad guidance for determining and prioritizing appropriate site-specific vegetation treatment methods. This chapter discusses these programs, policies, and initiatives, and concludes with a discussion of vegetation treatment methods and standard operating procedures (SOPs) used to reduce impacts to the environment from treatment activities.

Programs, Policies, and Initiatives Influencing Vegetation Treatment Activities

Program Goals

In order to be effective, vegetation management by the BLM must involve all programs that rely on healthy plant species and communities to meet their objectives. The BLM's overarching goal for vegetation management is as follows:

> *Through an interdisciplinary collaborative process, plan and implement a set of actions that improve biological diversity and ecosystem function and which promote and maintain native plant communities that are resilient to disturbance and invasive species. Healthy functioning plant communities will enhance the ability to attain economic benefits on public land* (USDI BLM 2006b).

If this goal is met, eventually the number of acres needing treatment should be reduced as a result of overall improvement in conditions. To achieve this goal, the BLM must 1) understand and plan for the condition and use of public lands, 2) focus on restoring sites that will most benefit from treatments, 3) select the appropriate treatments and SOPs to improve the likelihood of restoration success, 4) monitor treatments to better understand what treatments are successful or unsuccessful, and 5) convey information about treatment activities to BLM staff and the public.

Concurrently, public lands must be administered under the principles of multiple use and sustained yield in accordance with the intent of Congress as stated in the FLPMA. Thus, vegetation must be managed to protect and enhance the health of the land while providing a source of food, timber, and fiber for domestic needs (USDI BLM 2000c). Land-disturbing activities must be conducted in a manner that minimizes ecosystem fragmentation and degradation, and lands should be rehabilitated when necessary to safeguard the long-term diversity and integrity of the land.

Planning and Management at the National Level

Wildland Fire Management Program

As discussed in Chapter 1, the BLM is increasing the amount of land treated annually from nearly 2 million acres to about 6 million acres primarily in response to Presidential and Congressional mandates to reduce the risk of wildfire by reducing the occurrence of hazardous fuels, especially in the WUI, restoring fire-adapted ecosystems, and repairing lands damaged by fire. Public lands that are subject to these mandates total about 5 million acres annually. The remaining 1 million acres would be treated based on the needs of other programs within the BLM.

Efforts to reduce the risk of wildfire are primarily the responsibility of the Wildland Fire Management program. During fiscal year (FY) 2005, the Wildland Fire Management program conducted hazardous fuel treatments on about 542,000 acres in the WUI and nearly 727,000 acres in non-WUI areas. The program conducted emergency stabilization and burned area rehabilitation activities on nearly 880,000 acres. Together, the USDI and Forest Service conducted over 3 million acres of hazardous fuels treatments and treated nearly 2.4 million acres in the WUI during FY 2005 (USDI BLM 2006c, d). Between 2001 and 2006, federal

land management agencies invested more than 60% of fuels treatment dollars in the WUI, enabling collaborative treatment of some 8.5 million acres near communities (USDI BLM 2006c).

Prior to 1998, the BLM managed hazardous fuels on approximately 57,000 acres annually. Historically, approximately 70% of acres were managed to restore fire-adapted ecosystems, while the remaining 30% were managed to reduce wildfire risks to communities.

Under current direction, the acreage treated annually by the BLM to reduce wildland fire risk would increase significantly, to about 3.5 million acres in the western U.S., including Alaska, and most treatments would occur in the WUI. Although all treatment methods would be used, prescribed fire and mechanical treatments would account for most fuels reduction in the continental U.S., and wildland fires for resource use would account for most fuels reduction in Alaska.

The Wildland Fire Management program is guided by the policies expressed in the following national policy documents: 1) *National Fire Plan* (USDI and USDA 2001a); 2) *Healthy Forests Initiative of 2002 and Healthy Forests Restoration Act of 2003* (Public Law 108-148); 3) Chapter 3 *(Interagency Burned Area Emergency Stabilization and Rehabilitation)* in BLM Manual 620 (*Wildland Fire Management*; USDI BLM 2004b); 4) *A Collaborative Approach for Reducing Wildland Fire Risks to Communities and the Environment 10-Year Comprehensive Strategy Implementation Plan* (USDI and USDA 2006a); 5) *Protecting People and Sustaining Resources in Fire Adapted Ecosystems: A Cohesive Strategy* (USDI and USDA 2006b); 6) *Draft Interagency Burned Area Emergency Response Guidebook* (USDI and USDA 2006c); 7) *Interagency Burned Area Rehabilitation Guidebook* (USDI and USDA 2006d); and 8) *Draft Burned Area Emergency Stabilization and Rehabilitation Handbook* (H-1742-1; USDI BLM 2006a).

Wildland Urban Interface (WUI)

The WUI has generally been defined by the National Wildfire Coordinating Group (NWCG) as "the line, area or zone, where structures and other human development meet or intermingle with undeveloped wildland or vegetative fuel." A more specific definition is provided in the *Healthy Forests Restoration Act of 2003*:

1. An area within or adjacent to an at-risk community that is identified in recommendations to the Secretary of the Interior or Agriculture in a community wildfire protection plan (CWPP); or

2. In the case of an area for which a CWPP is not in effect:

(a) an area extending ½ mile from the boundary of an at-risk community;

(b) an area within 1½ miles from the boundary of an at-risk community, including any land that has a sustained steep slope that creates the potential for wildfire behavior endangering the at-risk community; has a geographic feature that aids in creating an effective fire break such as a road or ridge top; or is in Fire Regime Condition Class 3, as documented by the Secretary of the Interior in the project-specific environmental analysis; and

(c) an area that is adjacent to an evacuation route for an at-risk community that the Secretary determines, in cooperation with the at-risk community, requires hazardous fuel reduction to provide safer evacuation from the at-risk community.

The variation in the WUI definition allows local issues to drive the definition, but does not allow for national mapping of WUI.

National Fire Plan

The *National Fire Plan* was developed in August 2000, following a landmark wildland fire season, with the intent of actively responding to severe wildland fires and their impacts to communities while ensuring sufficient firefighting capacity for the future. The *National Fire Plan* addresses five key points: firefighting, rehabilitation, hazardous fuels reduction, community assistance, and accountability (National Fire Plan 2005).

The *National Fire Plan* continues to provide invaluable technical, financial, and resource guidance and support for wildland fire management across the U.S. Together, the Forest Service and the USDI are working to successfully implement the key points outlined in the *National Fire Plan* by taking the following steps:

- Assuring that necessary firefighting resources and personnel are available to respond to wildland fires that threaten lives and property.

- Conducting emergency stabilization and rehabilitation activities on landscapes and communities affected by wildland fire.
- Reducing hazardous fuels (dry brush and trees that have accumulated and increase the amount of fuel available to burn, potentially resulting in unusually large fires) in the country's forests and rangelands.
- Providing assistance to communities that have been or may be threatened by wildland fire.
- Committing to the Wildland Fire Leadership Council (WFLC), an interagency team created to set and maintain high standards for wildland fire management on public lands.

Since development of the *National Fire Plan* in 2000, several additional strategies and initiatives have been developed that guide fire management on BLM and other federally-administered lands. These are discussed below.

10-Year Comprehensive Strategy Implementation Plan

A Collaborative Approach for Reducing Wildland Fire Risks to Communities and the Environment 10-Year Comprehensive Strategy Implementation Plan (10-Year Comprehensive Strategy), updated in December 2006, emphasizes 1) information sharing and monitoring of accomplishments and forest conditions, 2) a long-term commitment to maintaining the essential resources for implementation, 3) a landscape-level vision for restoration of fire adapted ecosystems, 4) the importance of using fire as a management tool, and 5) continual improvement in collaboration consistent with the orginal 10-Year Comprehensive Strategy.

The primary objective of the plan is to promote a greater degree of collaboration among federal, state, and local authorities through the implementation of a collaborative framework. The framework is based on three tiers of collaboration (local, state/regional/tribal, and federal). At each level, activities will focus on planning; prioritizing action and implementation responsibilities; timely decision making, particularly for implementing projects and activities; tracking performance, monitoring, and assuring that activities are consistent with relevant science and new information; and communicating to the public the goals, tasks and outcomes of the 10-Year Comprehensive Strategy.

The plan includes four main goals: 1) improve fire prevention and suppression, 2) reduce hazardous fuels, 3) restore fire adapted ecosystems, and 4) provide community assistance**.** It also addresses methods to evaluate whether federal government is effectively using the money devoted to the plan to attain the desired results.

Cohesive Strategy

Protecting People and Sustaining Resources in Fire Adapted Ecosystems: A Cohesive Strategy (Cohesive Strategy; USDI and USDA 2006b) focuses on goals 2, 3, and 4 of the 10- Year Comprehensive Strategy (listed above).

The Cohesive Strategy aims to lessen the risks from catastrophic wildfires by reducing hazardous fuels build-up in forests and woodlands, and by reducing threats from flammable invasive species in rangelands, with an emphasis on protecting communities.

The Cohesive Strategy provides a strategic and realistic approach for reducing fuels on Federal lands by focusing on specific goals that address the multiple factors that influence fuels treatments.

The Cohesive Strategy points the way to picking which acres to treat and treatment methods to use, and does so in ways that address multiple concerns voiced by various segments of society.

Four principles guide the Cohesive Strategy*:*

1. Prioritization – Priority should be give to the WUI and to sites outside the WUI where vegetation is most likely to support catastrophic fire (see Fire Regime Condition Class section).
2. Coordination – Coordination should occur between all BLM vegetation management programs to maximize their combined benefits towards overall fuels management objectives.
3. Collaboration – Each year's program of work should increasingly reflect input from, and priorities of, local, tribal, and state interests.
4. Accountability – In 2003, the WFLC signed an agreement on fuels treatment priorities. The WFLC brings together federal, state, tribal and local government leaders to provide coordination for fire and fuels treatment programs. The WFLC using agreed upon effectiveness and efficiency measures, tracks progress in reducing hazardous fuels nationally.

Healthy Forests Restoration Initiative of 2002

This Presidential initiative was developed to better protect people and natural resources by lowering procedural and process hurdles that impede the reduction of hazardous fuels on public lands. Administrative actions included:

- Creation of categorical exclusions for certain fuel reduction projects usable by all federal land managing agencies;
- Streamlining the appeals process within the existing administrative appeals framework;
- Streamlining the EA documentation process, resulting in concise public documents;
- Better coordinating Endangered Species Act consultations including development of joint counterpart Section 7 consultation regulations.

Healthy Forests Restoration Act of 2003

President Bush signed *the Healthy Forests Restoration Act of 2003* (P.L. 108-148) in December 2003. The Act is a detailed piece of legislation that serves to aid in the implementation of the goals of the *National Fire Plan*, the 10-year Comprehensive Strategy Implementation Plan and the *Healthy Forests Initiative of 2002*. The Act helps states, tribes, rural communities and landowners restore healthy forest and rangeland conditions on state, tribal, and private lands (USDI and USDA 2006a).

On lands meeting specific criteria, it provides streamlined approaches to satisfy NEPA requirements for collaboratively selected fuels treatment projects. The provisions of *Healthy Forests Restoration Act of 2003* can be applied to as many as 20 million acres of land administered by the Forest Service and the BLM.

Regarding removal of hazardous fuels, Title I of the Act:

- Provides authority for expedited vegetation treatments on certain types of Forest Service- and BLM-administered lands that: 1) are at risk of wildland fire, 2) have experienced windthrow, blowdown, or ice-storm damage, 3) are currently experiencing disease or insect epidemics, or 4) are at imminent risk of such epidemics because of conditions on adjacent land.
- Provides expedited environmental analysis of Healthy Forests Restoration Act projects, namely by requiring that fewer alternatives be analyzed for authorized projects.
- Provides administrative review before decisions are issued on proposed Healthy Forests Restoration Act projects on Forest Service-administered lands.
- Contains requirements governing the maintenance and restoration of old-growth forest stands when the Forest Service and BLM carry out Healthy Forests Restoration Act projects in such stands.
- Requires Healthy Forests Restoration Act projects on Forest Service- and BLM-administered lands to maximize retention of larger trees in areas outside of old-growth stands, consistent with the objective of restoring fire-resilient stands and protecting at-risk communities and federal lands.
- Requires using at least 50% of the dollars allocated to Healthy Forests Restoration Act projects to protect areas adjacent to communities at risk for wildland fire.
- Requires performance to be monitored when agencies conduct hazardous fuel reduction projects, and encourages multiparty monitoring that includes communities and other diverse stakeholders (including interested citizens and tribes).
- Encourages courts to expedite judicial review of legal challenges to Healthy Forests Restoration Act projects.
- Directs that when courts consider a request for an injunction on a Healthy Forests Restoration Act-authorized project, they balance the short- and long-term environmental effects of undertaking the project against the effects of taking no action.
- Requires collaboration between federal agencies and local communities, particularly when community wildfire protection plans are prepared. A community wildfire protection plan (CWPP) is developed in the context of the collaborative agreements and guidance established by the Wildland Fire Leadership Council. This plan is agreed to by the local government, local fire department, and state agency responsible for forest management, in consultation with interested parties and the federal land management agencies that manage

in the vicinity of an at-risk community. The CWPP plans identify and set priorities for areas needing hazardous fuel reduction treatments, and recommend the types and methods of treatments on federal and non-federal lands that will protect one or more at-risk communities and their essential infrastructure.

Other titles in the Act also:

- Encourage biomass removal from public and private lands.
- Provide technical, educational, and financial assistance to improve water quality and address watershed issues on non-federal lands.
- Authorize large-scale silvicultural research.
- Authorize the acquisition of Healthy Forest Reserves on private land to promote recovery of threatened and endangered species, and improve biodiversity and carbon sequestration.
- Direct the establishment of monitoring and early warning systems for insect or disease outbreaks.

Emergency Stabilization and Burned Area Rehabilitation

The goals of Emergency Stabilization and Burned Area Rehabilitation are to mitigate the adverse effects of fire on the soil and vegetation in a cost-effective and expeditious manner and to minimize the possibility of wildland fire recurrence or invasion of weeds. The acreage of public lands stabilized and rehabilitated under this program annually has ranged from less than 100,000 acres to nearly 4 million acres since 1996.

Appropriate use of Emergency Stabilization and Burned Area Rehabilitation funds includes implementing practices to:

- Protect life, property, and soil, water (including water dependent resources), and/or vegetation resources.
- Prevent unacceptable on-site or off-site damage.
- Facilitate meeting land use plan objectives per FLPMA and other federal laws.
- Reduce the invasion and establishment of undesirable or invasive plant species.

The terms rehabilitation and restoration are often used synonymously. Rehabilitation is the repair of a wildland fire area utilizing native and/or non-native plant species to obtain a stable plant community that will protect the burned area from erosion and invasion of weeds. Restoration is defined as the process of returning ecosystems or habitats to their original structure and species composition.

Other BLM Programs Associated with Vegetation Treatment Activities

Wildland fire management provides the basis for proposed vegetation treatment activities on approximately 5 million acres annually. The remaining 1 million acres would be treated based on the specific needs of several programs within the BLM that are responsible for vegetation treatments or influence how and where vegetation treatments are carried out on public lands. Types of treatments conducted by these programs include weed removal, prevention of non-native invasive or noxious weeds, fish and wildlife habitat improvement, habitat improvement for threatened and endangered species, restoration of riparian habitats, reforestation for forest health restoration and habitat improvement, modification of vegetation composition and structure to improve land health, and protection and enhancement of vegetation in areas with cultural resources and administrative facilities.

Each program, as described below, has its own objectives for vegetation management. The BLM is currently developing guidance on an integrated approach to vegetation management. The basic premise is that renewable resource programs within the BLM should be working toward common goals and objectives that will maximize the effectiveness of BLM management actions, as well as improve overall program efficiency. An integrated, interdisciplinary approach in planning, implementing and monitoring management actions, based on common goals and objectives will be established at all levels of the BLM.

Soil, Water, and Air Management

The Soil, Water and Air Management program is responsible for water and air quality on public lands, and for restoring threatened watersheds. Activities include assessing the physical condition of watersheds, identifying priority watersheds, and restoring watersheds through partnerships with states. The program also oversees the Abandoned Mine Land Cleanup program, the Federal Salinity Control program,

and various other ecological and environmental inventories, assessments, and restoration projects (USDI BLM 2006c).

During FY 2005, the program completed over 5 million acres of watershed-based land health assessments to support Land Health Standards assessments, environmental reviews of expiring livestock permits, watershed restoration activities, wildland fire rehabilitation, and mine land reclamation (USDI BLM 2006c). The program also collected soil inventory data on nearly 645,000 acres, monitored approximately 6,460 surface water stations, and cleaned up 175 abandoned mines (USDI BLM 2006c).

Rangeland Management

Approximately 165 million acres of public lands are upland rangeland, of which approximately 160 million acres are open to livestock grazing (USDI BLM 2006c). The Rangeland Management program in Alaska is responsible for reindeer grazing on approximately 5 million acres in western Alaska. The Rangeland Management program is responsible for upland health management, assessment, and restoration; rangeland improvement planning and implementation; allotment planning and administration; and resource monitoring. Management of rangeland ecosystems is conducted on a landscape basis through land use plans.

Vegetation treatment activities conducted by this program are designed to promote compliance with the state and regional rangeland health standards, but specific benefits of these projects often include livestock forage improvement, wildlife habitat improvement, suppression of plants that are toxic to wildlife and livestock, removal of plants that compete with more desirable vegetation, improvement of watershed conditions on rangelands, and restoration of native plant communities.

Vegetation treatments on public lands also include activities to control invasive species such as noxious and invasive weeds. The BLM uses an integrated pest management approach, more specifically integrated vegetation management. The goal of integrated vegetation management is to control invasive and unwanted vegetation, to prevent the spread of noxious weeds, to eradicate early-detected noxious weed species in areas where certain weeds have not been introduced or established, and to control weeds where they have become established. Vegetation control methods include physical and biological controls, and use of herbicides. The policy, direction, and requirements for planning and implementing integrated weed management are given in BLM Manual 9015, *Integrated Weed Management* (USDI BLM 1992b).

A total of 205,256 acres were treated to prevent the spread of noxious weeds and invasive plants in FY 2005, and an estimated 317,959 acres were treated in FY 2004 by the Invasive and Noxious Weed program (USDI BLM 2006d). In addition, nearly 4.2 million acres were inventoried for weeds during FY 2005.

Currently, the funding and labor resources available to combat weeds dictate a containment strategy. Actions will continue to be targeted at preventing the spread of weeds into the most vulnerable areas (USDI BLM 2000b).

Public Domain Forest Management

Approximately 26 percent (69 million acres) of the lands managed by BLM consist of forestlands and woodlands (USDI BLM 2006e). Of these lands, 58 million acres are classified as woodlands and 11 million acres are classified as forestlands. Two and one-half million acres are managed under the Oregon and California (O&C) Grant Lands program, while the remaining 66.6 million acres are managed under the Public Domain Forest Management program.

Woodlands are defined as land with 10% or more cover of low-stature tree species not typically used in commercial wood products, including land that formerly had such tree cover and will be naturally or artificially regenerated. Forestland is defined as land that has 10% or more cover of tall-stature tree species typically used in commercial wood products, including land that formerly had such tree cover and will be naturally or artificially regenerated.

Approximately 36.5 million acres of forestlands and woodlands are managed by the BLM in Alaska. These consist primarily of black spruce (14.7 million acres) and white spruce (17.2 million acres) woodlands. The remaining 4.6 million acres consist of many different forest types, including paper birch, aspen, balsam poplar, mountain hemlock and Sitka spruce.

Approximately 16 million of the 32 million acres of BLM forestlands and woodlands found in the remaining 16 western states consist of pinyon/juniper woodlands, where a mix of pinyon and juniper tree species predominates. Approximately 2.7 million acres are comprised of the Douglas-fir forest type, 1.9 million acres are the western juniper forest type, 1.1 million

acres are the ponderosa pine forest type, and 0.3 million acres each are the lodgepole pine and aspen forest types. The remaining 10 million acres consist of a wide variety of forest and woodland types.

The Public Domain Forest Management and O&C Grand Lands programs are responsible for timber and non-timber special forest product sales, reforestation efforts, fish and wildlife habitat improvement, and forest vegetation composition and structure improvements intended to increase diversity and productivity of forest landscapes, as well as their resiliency in response to disease, insects, and wildfire.

The FLPMA and BLM Manual 5000-1, Forest Management Public Domain (USDI BLM 1991c), direct the policy of the Public Domain Forest Management program, including requirements for planning and implementing forestry and woodland management projects.

Management of the O&C Grant Lands program is authorized under *The Oregon and California Grant Lands Act of 1937* (43 U.S.C. 1181). The FLPMA applies to all public lands, including the O&C grant lands by definition (§103(e)). However, §701(b) of FLPMA (43 USC 170) provides that if any provision of FLPMA is in conflict with or inconsistent with the *Oregon and California Grant Lands Act* and *Coos Bay Wagon Road Act*, insofar as they relate to management of timber resources and disposition of revenue from lands and resources, the latter Acts will prevail.

Treatments that are addressed in this PER include: 1) reducing plant competition to enhance the growth of desired tree species and structures, 2) managing forest stands to provide habitat for wildlife and prevent epidemic insect or disease outbreaks, and 3) managing vegetation that could serve as fuel for wildfires. In 2006, the program implemented forest restoration treatments on 31,948 acres and forest management treatments on 28,644 acres (USDI BLM 2006d). Sales of timber, wood products, and non-timber special forest products totaled nearly $36.1 million during FY 2005 (USDI BLM 2006d).

Riparian Management

The BLM manages over 23 million acres of riparian and wetland areas, comprising about 9% of public lands, and providing habitat for roughly 80% of the fish and wildlife species on public lands. This Riparian Management program's responsibilities include watershed, riparian, and wetland inventories, assessments, maintenance, restoration, and reconstruction. During 2005, the program assessed the condition of over 4,300 miles of streams, implemented enhancement projects on approximately 310 acres of wetlands and 542 miles of streams, and monitored over 8,200 acres of lakes and wetlands and 2,380 miles of streams (USDI BLM 2006c).

Wildlife and Fisheries Management

The Wildlife Management and Fisheries Management programs are responsible for managing and protecting habitats on public lands for wildlife, fish, and plant species that are federally-listed threatened or endangered species, or other sensitive species (collectively referred to as "special status" species), as well as the more common fish and wildlife. Activities conducted by the programs include wildlife, fish, and plant inventories; habitat management plan development; habitat restoration projects, such as vegetation along streambanks; and weed control.

The Wildlife Management and Fisheries Management programs support the Great Basin Restoration and the Conservation of Prairie Grasslands initiatives. In 2000, the BLM implemented the Great Basin Restoration Initiative, a regional restoration strategy to restore and enhance nearly 70 million acres of sagebrush habitat in Nevada, Utah, Oregon, and Idaho, and California. The focus of this effort is to prevent much of the land burned in wildfires from being overwhelmed by annual grasses and noxious weeds. The same year, the BLM also initiated the Conservation of Prairie Grasslands initiative to protect and maintain important grasslands on approximately 15 million acres of short- and mixed-grass prairie in a 7-state area that extends from Canada to Mexico. Both efforts focus on managing healthy landscapes and protecting and restoring habitats to benefit wildlife. The Wildlife Management and Fisheries Management programs are also responsible for managing subsistence uses on public lands in Alaska.

During FY 2005, the programs inventoried nearly 4.7 million acres of wildlife habitat and applied treatments on nearly 166,000 acres of shrubland/grassland vegetation. The BLM also restored or enhanced 1,015 miles of streams and 9,160 acres of upland habitat (USDI BLM 2006c). In addition, the programs monitored over 10.4 million acres of habitat.

Threatened and Endangered Species Management

The Threatened and Endangered Species program is responsible for the conservation and protection of plants and animals that are listed, proposed for listing, or candidates for listing under the ESA, as well as species designated as special status by the BLM. The program inventories and monitors populations of special status species, develops recovery plans and conservation strategies, restores habitat, and reintroduces special status species into areas where they were once found. Examples of recent activities conducted by the program include vegetation treatments to benefit ESA-listed plant and animal species at the West Eugene Wetlands in Oregon, a semi-captive breeding program for the Sonoran pronghorn, and desert tortoise habitat monitoring in California.

Wild Horse and Burro Management

The Wild Horse and Burro Management program is responsible for implementing the Wild Free Roaming Horse and Burro Act and currently manages about 31,000 wild horses and burros on public lands. The goals of the program are to manage wild horses and burros as an integral part of the natural system of public lands under the principle of multiple uses; to protect wild horses and burros from unauthorized capture, branding, harassment or death; and to ensure humane care and treatment of wild horses and burros. The BLM manages wild horse and burro populations by monitoring the animals, establishing appropriate management levels, and removing excess animals when the management level is exceeded. During FY 2005, over 5,700 animals were adopted by the public (USDI BLM 2006d).

Cultural Resources Management, Paleontology, and Tribal Consultation

There are an estimated 4 million archeological and historical properties, millions of archaeological and historical artifacts, and thousands of paleontological (fossil) localities on public lands. The Cultural and Fossil Resources and Tribal Consultation program is responsible for the study, evaluation, protection, management, stabilization and inventory of these paleontological, historical, and archeological resources. The program also ensures the close consultation with tribal and Alaskan native governments, as required by law, for the maintenance, preservation, and promotion of native cultural heritage and resources, including plant and animal subsistence resources. During FY 2005, the BLM restored and protected 627 at-risk cultural and paleontological properties, and conducted 62,510 acres of cultural and paleontological resource inventory (USDI BLM 2006b).

The BLM currently manages numerous Areas of Critical Environmental Concern (ACECs), many of which have a cultural resources basis for this designation. These include the Biscuitroot Cultural ACEC in eastern Oregon, for traditional plant gathering, and the Sears Point ACEC in southwestern Arizona, for rock art and historic trails. Oregon's Yaquina Head Outstanding Natural Area, the BLM's only Outstanding Natural Area, contains the Yaquina Head Lighthouse, a significant cultural property.

Recreation Management

The Recreation Management program, which is comprised of the Wilderness Management and Recreation Resource Management subprograms, is responsible for resource-related recreational activities on public lands. The program manages developed and undeveloped recreational facilities, which involve various types of maintenance and vegetation control. These facilities include nearly 14 million acres of National Conservation Areas, 4.8 million acres of National Monuments, 7.2 million acres of Wilderness Areas, and 14.2 million acres of Wilderness Study Areas, which are part of the BLM's National Landscape Conservation System. This program is also involved in evaluating resources associated with 2,061 miles of rivers protected under the Wild and Scenic Rivers Act, and maintaining vegetation along 5,470 miles of scenic trails (USDI BLM 2006c, d).

Energy and Minerals Management

The Energy and Minerals Management program is responsible for managing oil, gas, geothermal, and mineral development on public lands. The BLM leases lands for development, issues permits for post-lease actions such as drilling, and monitors management activities on leases. Public lands produce over 40% of the Nation's coal, 11% of its natural gas, and 5% of its oil. The BLM issued nearly 3,520 oil and gas leases and nearly 7,740 permits to drill during FY 2005, and in 2004, energy and mineral development is projected to generate $1.4 billion through royalties, rents, bonuses, sales, and fees (USDI BLM 2006c).

Energy and mineral development and operation often involve site disturbance, which can result in invasion of the site by undesired vegetation. Management activities

center on the prevention and detection/eradication of undesirable vegetation, and treatment or control when these are not sufficient. The Energy and Minerals Management program also conducts extensive rehabilitation of disturbed lands.

Realty and Ownership Management

Under FLPMA and Mineral Leasing Act provisions, the Realty and Ownership Management program issues ROW grants to authorize the construction, operation, and maintenance of petroleum pipelines, power lines, energy development and distribution facilities, roads, and communication sites. Over the past 2 years, the BLM processed approximately 4,500 ROW actions annually. In FY 2005, there were nearly 88,000 existing ROW, totaling over 6.6 million acres on public lands, with nearly half of these in New Mexico and Wyoming (USDI BLM 2006c).

Vegetation treatments on ROW are necessary to suppress vegetation that restricts vision or presents a safety or fire hazard. Trees can provide direct or indirect contact with power lines, creating electrical shock and powerline outages, and often causing wildfires. Removal of vegetation is also necessary to maintain drainage ditches associated with these facilities, and to prevent vegetation from encroaching on sites. A primary goal of vegetation control on ROW involves the control of noxious weeds and other invasive or nonnative species.

The BLM maintains and operates approximately 4,000 buildings and nearly 700 administrative sites (USDI BLM 2006c). Buildings on public lands range from complex office buildings and large visitor centers to small restrooms and well houses. Administrative facilities include, but are not limited to, office complexes, fire stations, interagency dispatch centers, internal communication sites, wareyards, equipment maintenance shops, and field camps.

The BLM is responsible for maintaining 394 recreation fee sites, 2,989 non-fee recreation sites, 497 campgrounds with 17,000 campsites, 368 boat ramps, and 87 interpretive centers or contact stations. The BLM administers over 76,000 miles of roads. In addition, the BLM is responsible for a portion of the maintenance on numerous facilities jointly held with other federal, state, county, or private entities (USDI BLM 2006c). At these sites, vegetation management focuses on controlling vegetation that can pose a safety or fire hazard, or is not aesthetically pleasing. The BLM uses premergence and postemergence herbicides to control emerging vegetation.

Vegetation Treatment Planning and Management

The BLM's *Strategic Plan* (USDI BLM 2000a); *A Collaborative Approach for Reducing Wildland Fire Risks to Communities and the Environment 10-Year Comprehensive Strategy Implementation Plan* (USDI and USDA 2002); *Partners Against Weeds: An Action Plan for the Bureau of Land Management* (USDI BLM 1996), and *Pulling Together: National Strategy for Invasive Plant Management* (USDI BLM 1998a) identify broad objectives for management of vegetation on public land, while treatment activities at the local level are guided by the goals, standards, and objectives of land use plans developed for each BLM field office.

Although vegetation management actually occurs at the local level, policies established at the national level help direct local efforts. Examples of national policy direction designed to improve vegetation management efforts include development of rangeland health standards and development of assessments and evaluations for land, water, air, and vegetative health (USDI BLM 2002b). These assessments provide information that is used to ascertain achievement of land health standards and to identify causes for not meeting standards. These assessments are used to help identify restoration activities and establish restoration priorities.

Land Use Planning

Land use planning decisions are the basis for every on-the-ground action the BLM undertakes. Land use plans, usually in the form of RMPs, ensure that public lands are managed in accordance with the intent of Congress, as stated in FLPMA (43 USC 1701 et seq), under the principles of multiple use and sustained yield. As required by FLPMA and BLM policy, "public lands must be managed in a manner that protects the quality of scientific, scenic, historical, ecological, environmental, air and atmospheric, water resource, and archaeological values; that, where appropriate, will preserve and protect certain public lands in their natural condition; that will provide food and habitat for fish, and wildlife and domestic animals; that will provide for outdoor recreation and human occupancy and use; and that recognizes the Nation's need for domestic sources of minerals, food, timber, and fiber from the public

lands by encouraging collaboration and public participation throughout the planning process."

Land use plans guide land use and vegetation management decisions within the geographic area they cover, and provide specific goals, standards, objectives, and expected outcomes that apply to vegetation treatment projects and activities. These plans identify important local resources to be protected, identify historic, current, and future desired conditions for vegetation, and describe land use activities and levels that are appropriate to maintain healthy vegetation. Wise planning also considers the importance of other natural resources, such as water and soil, when developing vegetation restoration strategies. In addition, BLM land use plans identify transportation facilities, utility corridors, and other infrastructure development on the public lands that is likely to receive some form of vegetative treatment.

To assist with vegetation management planning, key resource elements such as plant community types, aquatic habitats, sensitive areas, and invasive species concentration areas, are inventoried and mapped regionally and district-wide. Inventories and maps allow field managers to identify areas of high ecological integrity; to ensure that there is suitable habitat for wide-ranging species; to identify areas where land uses may be incompatible with long-term ecosystem health; and to identify areas that could benefit from improved management. Inventories and mapping are also done at the local level to help managers better understand how proposed projects fit in with vegetative conditions on a larger scale, such as within ecoregions or watersheds. The BLM also cooperates with other agencies, organizations, and landowners in regional planning efforts, including establishment of Cooperative Weed Management Areas (CWMAs).

Site Selection and Treatment Priorities

Upon approval of a land use plan, subsequent implementation decisions are often put into effect by developing implementation plans. Implementation plans, also referred to as "activity plans," tend to focus on multiple resources, and include vegetation treatment activities within a BLM field office jurisdiction. Implementation plans are made with the appropriate level of NEPA analysis; implementation decisions are usually made by BLM field managers. Implementation decisions identify site-specific vegetation management practices to achieve desired outcomes laid out in the land use plans. Some examples of practices include fuels treatments and integrated vegetation management techniques for weed infestations.

General Site Selection and Treatment Priorities

Several factors influence where treatments will occur and treatment priorities:

- Statutory mandates, including the FLPMA, ESA, HFRA, and Taylor Grazing Act.
- Program guidance including such initiatives as the Healthy Forests Initiative and the Great Basin Restoration Initiative.
- Goals of the Strategic and Annual Performance Plans.
- Existing risks to resources.
- Likelihood of success in restoring natural biotic communities.
- Cost-effectiveness of actions.

National priorities have been established for various BLM vegetation management programs. These priorities were developed for use in conjunction with state and local office priorities for meeting restoration goals, and address site-specific conditions and/or issues as laid out in the land use plan. For example, the following treatment priorities have been established to promote integrated efforts across BLM resource programs that manage vegetation:

- WUI community protection treatments that are designed to reduce the risk of wildfire to the community and/or its infrastructure developed collaboratively with the community.
- Treatments to restore or maintain healthy, diverse, resilient, and productive native plant communities.
- Special status species habitat improvement projects designed to improve or protect special status fish, wildlife, and plant habitat.
- Treatments that will be planned, implemented and/or monitored using funding from multiple sources, both internal and external.
- Landscape treatments (>1,000 acres for mechanical and >4,500 acres for prescribed fires) coordinated across field office boundaries to improve treatment effectiveness.

- Contracted treatments that support economic opportunities for rural communities and/or high potential to use stewardship contracting authorities.
- Treatments that have a high potential for woody biomass utilization.

Weed Treatment Site Selection and Treatment Priorities

For noxious weeds and invasive plants, vegetation treatment priorities identified in the *EIS Vegetation Treatment on BLM Lands in Thirteen Western States* (USDI BLM 1991a) are still applicable. They are:

- Take actions to prevent or minimize the need for vegetation controls, where feasible.
- Use effective nonchemical methods of vegetation control, where feasible.
- Use herbicides only after considering the effectiveness of all potential methods.

Development of a weed management strategy is set up at the local level and aligned with the land use planning objectives.

Actions to prevent or minimize the need for vegetation control can include protecting intact systems; maintaining conditions that have led to healthy lands (e.g. allowing natural fires to burn); reducing the impact of ongoing activities (e.g., improving grazing management practices); and applying mitigation measures to new projects to minimize soil and vegetation disturbance and avoid introductions of invasive species.

If treatment is required, efforts are focused on activities that restore natural ecosystem processes, and on ventures that are likely to succeed and provide the greatest benefits with the least expenditure of capital. Also beneficial to treatment success is site-specific analysis that includes 1) a determination of site potential under current circumstances, 2) an evaluation of land health based on land assessment studies, 3) an assessment of causes of land degradation, 4) an assessment of the likely effectiveness of treatment methods, and 5) an evaluation of the success of restoration efforts on similar types of land.

Several management objectives are considered when determining appropriate treatment of an infestation.

- Containment to prevent weed spread from moving beyond the current infestation perimeter;
- Control to reduce the extent and density of a target weed;
- Eradication to completely eliminate the weed species including reproductive propagules (this is usually only possible with small infestations); and
- Restoration of native plant communities and habitats using native species that are adapted to the project site to compete with invasives.

Several variables are considered when determining what, when, and how weed populations should be treated. These include, but are not limited to:

- The species – is it an aggressive non-native species that could be on a state noxious weed list or an adjacent state's noxious weed list, or that could be a species known for altering plant communities or ecological processes on a regional basis? If a species is native to a project area, how does current management influence the increase of the species beyond acceptable levels?
- Location – is the infestation found in a special management area, in a formerly uninfested area, or upslope/upstream from current treatments (i.e., could the species reinfest treated areas)? Does the infestation pressure or negatively impact special status plants or their habitats?
- Extent – is the infestation at a size where eradication is possible, in an area where other infestations are numerous, or of a size that may not be able to be eradicated, but can be contained or controlled to some extent? Is the extent of the infestation so large that one treatment would cover all of the known locations of an endemic species or its required resources?

The following suggests a decision process for prioritizing weed treatments in order to focus efforts towards success. It provides broad guidance to be adapted to the local level based on species, size, and extent of infestations. Priorities are then matched with the management objectives listed above.

1. Highest Priority: New aggressive infestations in an uninfested area or small infestations in areas of special concern (e.g., wilderness, research natural areas). Management objective: Eradicate.

2. Higher Priority: Areas of high traffic or sources of infestation and larger infestations in areas of special concern. Management objective: Control.

3. High Priority: Existing large infestations or roadside infestations where spread can be checked or slowed. Management objective: Contain.

The overriding goal is to prioritize treatment methods based on their effectiveness and likelihood to have minimal impacts on the environment, and to restore desirable vegetation on lands where necessary (i.e., where desired vegetation cannot reestablish naturally).

Vegetation Treatment Methods

The BLM treats vegetation using fire, mechanical and manual methods, biological treatments, and herbicides. In an integrated vegetation management program, each management option is considered, recognizing that no one management option is a stand-alone option and that each has strengths and weaknesses. Utilizing the strengths of each allows for a more effective and environmentally sound program. When the BLM plans vegetation management projects, all control methods should be available for use, allowing the BLM to select the one method, or the combination of methods, that optimizes vegetation control with respect to environmental concerns, effectiveness, and cost of control.

No individual method will control undesirable vegetation in a single treatment; diligence and persistence will be required over a number of years to subdue vegetation such as weeds. The success of different treatment methods depends on the type of vegetation being controlled. It is important to think of these treatment methods as they relate to specific characteristics of weeds and other vegetation.

Vegetation Treatment Method Selection

Vegetation treatment methods are selected based on several parameters, which may include the following:

- Management program/objective for the site.
- Historic and current conditions.
- Opportunities to prevent future problems.
- Opportunities to conserve native and desirable vegetation.
- Effectiveness and cost of the treatment methods.
- Success of past restoration treatments or treatments conducted under similar conditions or recommendations by local experts.
- Characteristics of the target plant species, including size, distribution, density, life cycle, and life stage in which the plant is most susceptible to treatment.
- Non-target plant species that could be impacted by the treatment.
- Land use of the target area.
- Proximity to communities.
- Slope, accessibility, and soil characteristics of the treatment area.
- Weather conditions at the time of treatment, particularly wind speed and direction, precipitation prior to or likely to occur during or after application, and season.
- Proximity of the treatment area to sensitive areas, such as wetlands, streams, or habitat for plant or animal species of concern.
- Potential impacts to humans and fish and wildlife, including non-game species.
- Need for subsequent revegetation and/or restoration.

These parameters are considered before a treatment method is selected (USDI BLM 1991a). For most vegetation treatment projects, pretreatment surveys are conducted before selecting one or more treatment methods. These surveys involve the consideration of all feasible treatments, including their potential effectiveness based on previous experience, and best available science, impacts, and costs. Before vegetation treatment or ground disturbance occurs, the BLM consults specialists or databases for information on sensitive areas within the project area. The site may have to be surveyed for listed or proposed federal threatened or endangered species and for evidence of

cultural or historic sites. In some cases, areas may receive one or more treatments in combination, such as prescribed burning followed by an herbicide application, and some areas may be treated using one or more treatment methods over several years.

Fire Use

Fire use includes prescribed fire and wildland fire use for resource benefits. Prescribed fire is the intentional application of fire to wildland fuels under specified conditions of fuels, weather, and other variables. The intent is for the fire to stay within a predetermined area to achieve site-specific resource management objectives. Prescribed and wildland fire use for resource benefit are important tools to maintain landscapes in healthy condition. These methods may be used to control vegetation; enhance the growth, reproduction, or vigor of certain species; manage fuel loads; and maintain vegetation community types that meet multiple-use management objectives (USDI BLM 1991a). Burning may be used prior to other treatments to remove vegetation that reduces the effectiveness of various treatments, including herbicide applications (Rees et al. 1996). Often, mechanical treatments are conducted before a burn to reduce the amount of biomass so that the subsequent fire will not burn so intensely so as to kill desirable vegetation.

Prescribed fire was used on nearly 212,000 acres of public lands in 2003. Most acres were burned in Idaho (54,620), Oregon (40,459), New Mexico (26,869), and Arizona (26,127; USDI BLM 2004c).

In areas where there is no threat to human life or property, wildland fires are utilized for resource benefit to maintain ecosystems that are functioning within their normal fire regime. These fires must meet specific environmental prescriptions, and be thoroughly evaluated for potential risk, before being managed to benefit the resource. They are utilized only in pre-planned areas and when there are adequate fire management personnel and equipment available to achieve defined resource objectives.

The BLM develops land use plans to establish and define resource management objectives for a particular area (USDI BLM 1998b). All use of fuels treatments and prescribed fire will support land and resource management plans. Agency-specific land management plans are the documents that initiate, analyze, and provide the basis for conducting fuels treatment activities and using prescribed fire to meet resource objectives.

Treatments are implemented in accordance with the BLM's Prescribed Fire Management Policy. The Fire Management Plan (FMP) serves as the program strategy document for fuels treatments and prescribed fire activities. The FMP captures and quantifies the overall fuels management program needs of the field office. The FMP identifies how fuels treatments, fire use, and other fire management strategies will be used to meet the overall land management goals identified in land use plans. The FMP also identifies areas where the use of wildland fire for resource benefits is acceptable.

The Prescribed Fire Plan is the contract between a Line Officer and Burn Boss to conduct a burn safely to achieve predetermined objectives. Prescribed fire projects must be implemented in compliance with the written plan.

A Wildland Fire Implementation Plan (WFIP) is prepared for all wildland fires that are managed for resource benefit. The WFIP is an operational plan for assessing, analyzing, and selecting strategies for wildland fire use. It is progressively developed, and documents appropriate management responses for any wildland fire managed for resource benefits.

Several factors are considered when designing a burn plan and implementing a prescribed burn. These factors include weather conditions, vegetation types and density, slope, fuel moisture content, time of year, risks to dwellings and property, alternative treatment methods, and potential impacts on air quality, land use, cultural resources, and threatened and endangered species.

Hand-held tools, such as drip torches, propane torches, diesel flame-throwers, and flares, may be used to start a prescribed fire. Mass ignition techniques, which include terra-torches and heli-torches, release an ignited gelled fuel mixture onto the area to be treated. Helicopters may also be used to drop hollow polystyrene spheres containing potassium permanganate that are injected with ethylene glycol immediately before ignition. The sphere ignition method is best used for spot-firing programs.

Prescribed fire can be used in some situations where some other treatment methods are not feasible due to soil rockiness, slope steepness, or terrain irregularity, although prescribed fire is limited to situations where adequate fuel is available to carry the fire. It is also

relatively inexpensive to treat vegetation using fire ($20 to $500 per acre, with higher costs associated with treating forestlands in California and Oregon).

The use of prescribed fire comes with a risk of the fire getting out of control and damaging property and endangering human life, although <1% of BLM ignited prescribed fires exceed control and are declared wildfires. Thus, chemical, biological, mechanical and manual methods, instead of fire, are often used to control vegetation near communities. In some situations, prescribed fire can encourage the germination and establishment of weeds if the treatment site is not treated with herbicides or revegetated after fire use.

Mechanical Treatment

Mechanical treatment involves the use of vehicles such as wheeled tractors, crawler-type tractors, or specially designed vehicles with attached implements designed to cut, uproot, or chop existing vegetation. The selection of a particular mechanical method is based on the characteristics of the vegetation, seedbed preparation and revegetation needs, topography and terrain, soil characteristics, climatic conditions, and an analysis of the improvement cost compared to the expected productivity (USDI BLM 1991a). Mechanical methods that may be used by the BLM include chaining, root plowing, tilling and drill seeding, mowing, roller chopping and cutting, blading, grubbing, and feller-bunching. As new technologies or techniques are developed, they could be used if their impacts are similar to or less than those associated with the methods listed below.

Chaining consists of pulling heavy (40 to 90 pounds per link) chains in a "U" or "J" shaped pattern behind two crawler-type tractors. The chain is usually 250 to 300 feet long and may weigh as much as 32,000 pounds. The width of each swath varies from 75 feet to 120 feet. Chain link size, modifications to links, and operation of the crawler tractors determine the number and size of trees and shrubs that are removed and the effects on understory species. Chaining can be conducted during the appropriate season to benefit soil stability and plant seeding, and reduce the invasion of weeds (Monsen et al. 2004).

Chaining works best for crushing brittle brush and uprooting woody plants. Chaining can be done on irregular, moderately rocky terrain, with slopes of up to 20%. Chaining may cause soil disturbance, but the plant debris can be left in place to minimize runoff and erosion, shade the soil surface, and maintain soil moisture and nutrient recycling. Alternatively, the debris can be burned to facilitate seeding, improve scenic values, and eliminate potential rodent habitat. Chaining is a cost-effective means of incorporating seed into soil, especially in burned areas. Chaining provides a variety of seeding depths and microsites, as well as improves ground cover and forage production. Recent studies have shown improved seedling establishment on chained sites and less downy brome establishment 3 years after fire in chained sagebrush and pinyon-juniper habitats (Ott et al. 2003).

Tilling involves the use of angled disks (disk tilling) or pointed metal-toothed implements (chisel plowing) to uproot, chop, and mulch vegetation. This technique is best used in situations where complete removal of vegetation or thinning is desired, and in conjunction with seeding operations. Tilling leaves mulched vegetation near the soil surface, which encourages the growth of newly planted seeds. Tilling is usually done with a brushland plow, a single axle with an arrangement of angle disks that covers about 10-foot swaths. An offset disk plow, which consists of multiple rows of disks set at different angles to each other, is pulled by a crawler-type tractor or a large rubber tire tractor. This method is often used for removal of sagebrush and similar shrubs and works best on areas with smooth terrain, and deep, rock-free soils. Chisel plowing can be used to break up soils such as hardpan.

Often, drill seeding is conducted along with tilling. The seed drills, which consist of a series of furrow openers, seed metering devices, seed hoppers, and seed covering devices, are either towed by or mounted on a tractor. The seed drill opens a furrow in the seedbed, deposits a measured amount of seed into the furrow, and closes the furrow to cover the seed.

Mowing tools, such as rotary mowers or straight-edged cutter bar mowers, can be used to cut herbaceous and woody vegetation above the ground surface. Mowing is often done along highway ROW to reduce fire hazards, improve visibility, prevent snow buildup, or improve the appearance of the area. Mowing is also used in sagebrush habitats to create a mosaic of uneven aged stands and enhance wildlife habitat. Mowing is most effective on annual and biennial plants (Rees et al. 1996). Weeds are rarely killed by mowing, and an area may have to be mowed repeatedly for the treatment to be effective (Colorado Natural Areas Program 2000). However, the use of a "wet blade," in which an herbicide flows along the mower blade and is applied

directly to the cut surface of the treated plant, has greatly improved the control of some species. In addition, chipping equipment can be used to cut and chip vegetation.

Roller chopping tools are heavy bladed drums that cut and crush vegetation up to 5 inches in diameter with a rolling action. The drums are pulled by crawler-type tractors, farm tractors, or a special type of self-propelled vehicle designed for forested areas or range improvement projects.

During blading, a crawler type tractor blade shears small brush at ground level. The topsoil can be scraped with the brush and piled into windrows during this operation. Blading use is limited to areas where degradation to the soil is acceptable, such as along ROW or in borrow ditches (USDI BLM 1991a).

Grubbing is done with a crawler-type tractor and a brush or root rake attachment. The rake attachment consists of a standard dozer blade adapted with a row of curved teeth projecting forward at the blade base. Brush is uprooted and roots are combed from the soil by placing the base of the blade below the soil surface. Grubbing greatly disturbs perennial grasses, so grubbed areas are usually reseeded to prevent extensive runoff and erosion (USDI BLM 1991a).

Feller-bunchers are machines that grab trees, cut them at the base, pick them up, and move them into a pile or onto the bed of a truck (Bonneville Power Administration [BPA] 2000). Feller-bunchers are used in forest thinning to remove potential hazardous fuels. Large chippers, or "tub-grinders," are often used to chip the limbs, bark, and wood of trees to generate mulch or biomass, which can be used in power generation facilities.

Mechanical methods are effective for removing thick stands of vegetation. Some mechanical equipment can also mulch or lop and scatter vegetation debris, so debris disposal is taken care of while the vegetation is removed. Mechanical methods are appropriate where a high level of control over vegetation removal is needed, such as in sensitive wildlife habitats or near homesites, and are often used instead of prescribed fire or herbicide treatments for vegetation control in the WUI.

Unless used with follow-up herbicide treatments, mechanical treatments have limited use for noxious weed control, as the machinery tends to spread seeds and not kill roots. Mechanical vegetation control costs from $100 to $600 per acre for equipment and labor (BPA 2000). Additionally, repeated mechanical treatments are often necessary due to residual weed seed in the seed bank.

Manual Treatment

Manual treatment involves the use of hand tools and hand-operated power tools to cut, clear, or prune herbaceous and woody species. Treatments include cutting undesired plants above the ground level; pulling, grubbing, or digging out root systems of undesired plants to prevent sprouting and regrowth; cutting at the ground level or removing competing plants around desired species; or placing mulch around desired vegetation to limit competitive growth (USDI BLM 1991a).

Hand tools used in manual treatments include the handsaw, axe, shovel, rake, machete, grubbing hoe, mattock (combination of cutting edge and grubbing hoe), pulaski (combination of axe and grubbing hoe), brush hook, and hand clippers. Power tools such as chain saws and power brush saws are also used, particularly for thick-stemmed plants.

Manual treatments, such as handpulling and hoeing, are most effective where the weed infestation is limited and soil types allow for complete removal of the plant material (Rees et al. 1996). Additionally, pulling works well for annual and biennial plants, shallow-rooted plant species that do not resprout from residual roots, and plants growing in sandy or gravelly soils. Repeated treatments are often necessary due to soil disturbance and residual weed seeds in the seed bank.

Manual techniques can be used in many areas and usually with minimal environmental impacts. Although they have limited value for weed control over a large area, manual techniques can be highly selective. Manual treatment can be used in sensitive habitats such as riparian areas, areas where burning or herbicide application would not be appropriate, and areas that are inaccessible to ground vehicles (USDI BLM 1991a).

Manual treatments are expensive and labor intensive, compared to other vegetation management methods such as prescribed burning and herbicide application. Typical manual vegetation control costs range from $70 to $700 per acre. Manual methods may also be more dangerous for the workers involved in implementation because of the sharp tools and the difficulties associated with working conditions (e.g., steep terrain with slippery ground cover). Some weeds may contain potentially toxic or hazardous compounds. While

manual techniques may not be very efficient or cost-effective over large areas, they may be very useful for highlighting specific invasive species problems, and for educating public land users.

Biological Control

Biological control involves the intentional use of domestic animals, insects, nematodes, mites, or pathogens (agents such as bacteria or fungus that can cause diseases in plants) that weaken or destroy vegetation (USDI BLM 1991a, BPA 2000). Biological control is used to reduce the targeted weed population to an acceptable level by stressing target plants and reducing competition with the desired plant species.

Domestic animals, such as cattle, sheep, or goats, control the top-growth of certain non-native invasive and noxious weeds which can help to weaken the plants and reduce the reproduction potential. The animals benefit by using the weeds as a food source and, after a brief adjustment period, can consume 50% or more of their daily diet of the weed, depending on the animal species (Tu et al. 2001).

Cattle primarily eat grass, but also eat some shrubs and forbs. Sheep consume many forbs, as well as grasses and shrubs, but tend not to graze an area uniformly. Goats typically eat large quantities of woody vegetation as well as forbs, and tend to eat a greater variety of plants than sheep (USDI BLM 1991a; Tu et al. 2001). Goats and sheep are effective control agents for leafy spurge, Russian knapweed, toadflax, other weed species, and some types of shrubs (Colorado Natural Areas Program 2000).

The use of livestock grazing to help control undesirable vegetation involves more than just authorizing grazing for the area to be treated. A general grazing authorization would only rarely provide significant control of undesirable vegetation. The use of livestock to control undesirable vegetation requires "prescribed grazing." In prescribed grazing, the kind of animals and amount and duration of grazing are specifically designed to help control a particular species of plant while minimizing the impacts on perennial native vegetation that is needed to help reduce the likelihood of reinvasion by undesirable plant species.

In order for prescribed grazing to be effective, the right combination of animals, stocking rates, timing, and rest must be used. Grazing by domestic animals should occur when the target species is palatable and when feeding on the plants can damage them or reduce viable seeds. Additionally, grazing should be restricted during critical growth stages of desirable competing species. When desirable species are present, there must be adequate rest following the treatment to allow the desirable species to recover.

Whenever the use of livestock to control undesirable vegetation is being considered, the needs of the domestic animals as well as the other multiple use objectives for the area must be considered. A herder, fencing, or a mineral block may be required to keep the animals within the desired area. Many weed species are less palatable than desired vegetation, so the animals may overgraze desired vegetation rather than the weeds. Additionally, some weeds may be toxic to certain livestock and not to others, which will influence the management option selected (Tu et al. 2001). Proper management of the domestic animals is extremely important if this method of treatment is to be successful (Olson 1999).

Caution should be used whenever grazing or any other vegetation control is prescribed near riparian areas, in steep topography, or in areas with highly erodible soils. Weed seeds may still be viable after passing through the digestive tract of animals, so the animals should not be moved to weed-free areas until ample time has passed for all seeds to pass through their systems. Seeds can also travel on the animals' fur (Tu et al. 2001).

Plant-eating insects, nematodes, mites, or pathogens affect plants directly, by destroying vital plant tissues and functions, and indirectly, by increasing stress on the plant, which may reduce its ability to compete with other plants (BPA 2000). Often, several biological control agents are used together to reduce undesired vegetation density to an acceptable level.

Biological control agents currently used by the BLM have been tested by the USDA Agricultural Research Service to ensure that they are host specific and will feed only on the target plant and not on crops, native flora, or endangered or threatened plant species.

Testing of biological control agents is time consuming and expensive. Test results are reported in an environmental assessment, or a risk assessment, which is a measurement of risk of using the organism. The Plant Pest Quarantine Branch of the USDA Animal and Plant Health Inspection Service (APHIS) is responsible for finding and testing suitable biological controls, and authorizing permits to transport and release biological controls into the U.S. Organizations, such as the USDA Agricultural Research Service, CABI Bioscience-

Europe and Canada, and Canadian agencies and universities are working to collect, identify, screen, and approve biological control agents to support the BLM's integrated weed management program.

The approval process for a biological control agent can be very complicated. Researchers wanting to use a candidate biological control agent should submit a proposed test plant list to the Technical Advisory Group for Biological Control Agents of Weeds (USDA APHIS 2002). This step includes consulting with the USFWS to determine whether threatened, endangered, or candidate species should be considered in the test plant list. The researcher must apply for a permit to import the agent into the U.S. In addition, if the researcher proposes to use a pathogen for weed biological control, he must obtain approval from the USEPA, which regulates microbial pathogens as biological pesticides under the Federal Insecticide, Fungicide, and Rodenticide Act of 1972. Once a biological control organism has been approved for release, its release can only occur in states that have been covered under a NEPA assessment and have consulted with the USFWS. More information on the testing process is available at: http://www.aphis.usda.gov. A list of biological control agents approved for use is available at: http://www.aphis.usda.gov/ppq/permits/tag/petition.html.

Once a biological control agent becomes established, it can reproduce and increase its numbers and continue to affect the target organism. Agents are also often fairly mobile and can seek out new host plants (Rees et al. 1995, 1996). However, it may take as many as 15 to 20 years for the agents to establish themselves and bring about the desired level of control. Treatments involving biological control agents are most suitable for large sites where the target plant is well established and very competitive with native species. It is unlikely that biological control agents will eradicate a pest plant, because as populations of the host plant decrease, populations of the agent will also decline.

Treatment of noxious weeds using domestic animals is relatively inexpensive, costing about $12 to $15 per acre. Biological control costs using insects, nematodes, mites, or other pathogens range from $80 to $150 per release for ground applications and $150 to $300 for aerial releases (BPA 2000). The cost of this method reflects the limited availability of appropriate control agents and expertise required in dealing with the agents and treating areas. Biological treatments are most effective when followed with other treatments.

Herbicides

As discussed in Chapter 1, this PER focuses primarily on the use of non-chemical means to treat vegetation. A *Vegetation Treatments on Bureau of Land Management Lands in 17 Western States Programmatic EIS* has been prepared concurrently with the PER to analyze the effects of herbicide use on humans, plants, and animals (including special status species), and other environmental and social resources associated with public lands. This analysis will provide the basis for a programmatic ESA Section 7 consultation with the USFWS and NMFS for herbicide use as a vegetation control practice, and the potential impacts of these practices on plant and animal species of concern.

Herbicides are chemicals that kill or injure plants. Herbicides can be classified by their mode of action; they include growth regulators, amino acid inhibitors, grass meristem destroyers, cell membrane destroyers, root and shoot inhibitors, and amino acid derivatives, all of which interfere with plant metabolism in a variety of ways (Bussan and Dyer 1999).

Herbicides can be categorized as selective or non-selective. Selective herbicides kill only a specific type of plant. For example, some herbicides used for noxious weed control are selective for broad-leaved plants, so that they can be used to control weeds while maintaining grass species. Glyphosate is non-selective, so it must be used carefully around desirable and non-target plants (Rees et al. 1996).

Herbicide treatments comply with the USEPA label directions and follow BLM procedures outlined in BLM Handbook H-9011-1 (*Chemical Pest Control*), and manuals 1112 (*Safety*), 9011 (*Chemical Pest Control*), and 9015 (*Integrated Weed Management)*, and meet or exceed states' label standards (USDI BLM 1991a). Several herbicide application methods are available. The application method chosen depends upon the treatment objective (removal or reduction); the accessibility, topography, and size of the treatment area; the characteristics of the target species and the desired vegetation; the location of sensitive areas and potential environmental impacts in the immediate vicinity; the anticipated costs and equipment limitations; and the meteorological and vegetative conditions of the treatment area at the time of treatment.

An operational plan is developed and updated for each herbicide project. The plan includes information on project specifications, key personnel responsibilities,

communication procedures, and safety, spill response, and emergency procedures. The plan should also specify minimum widths for buffers between treatment areas and water bodies for non-aquatic use herbicides that comply with BLM policy and label restrictions (BLM Handbook H-9011-1).

Herbicide application schedules are designed to minimize potential impacts to non-target plants and animals, while remaining consistent with the objective of the vegetation treatment program. The application rates depend upon the target species, the presence and condition of non-target vegetation, weather and site conditions, soil type, depth to the water table, presence of other water sources, the label requirements, approved BLM rates, and sensitivity of non-target species.

Herbicides are applied aerially with helicopters or fixed-wing aircraft, and on the ground with vehicles or manual application devices. Operation of helicopters is more expensive than operation of fixed-wing aircraft, but helicopters are more maneuverable and more effective in areas with irregular terrain. Helicopters also are more effective for treating target vegetation in areas with multiple vegetation types.

Manual applications of herbicides are used only in small areas, in areas inaccessible by vehicle, and/or to minimize potential impacts to non-target plants. Herbicides may be applied to green leaves with a backpack applicator or spray bottle, wick (wiped on), or wand (sprayed on). Herbicides can be applied to trees around the circumference of the trunk on the intact bark (basal bark), to cuts in the trunk or stem (frill, or "hack and squirt"), to cut stems and stumps (cut stump), or injected into the inner bark (Tu et al. 2001).

Herbicides can be used selectively to control specific types of vegetation, or nonselectively to clear all vegetation in a particular area. Herbicides can be applied over large areas and in remote locations using aircraft, or applied using spot applications in environmentally sensitive areas. The cost of herbicide application generally ranges from $20 to $250 per acre (BPA 2000).

There are several drawbacks and limitations to herbicide use. Herbicides can damage or kill non-target plants. Herbicides can be toxic or cause health problems in humans, other animals, and other plants. Herbicides must be applied by someone with the appropriate certification identified in state laws and BLM policy (Colorado Natural Areas Program 2000).

Herbicides are applied according to the current label directions. The BLM must comply with changes in label directions, and with state registration requirements.

Herbicide Terminology

Active ingredient (a.i.) is the chemical or biological component that kills or controls the target pest.

Adjuvant(s) are chemicals that are added to the pesticide formulation to enhance the toxicity of the active ingredient or to make the active ingredient easier to handle.

Formulation is the commercial mixture of both active and inactive (inert) ingredients.

Herbicide is a chemical pesticide used to treat vegetation.

Herbicide resistance occurs when naturally occurring heritable characteristics allow individual weeds to survive and reproduce, producing a population, over time, in which the majority of the plants of the weed species have the resistant characteristics.

Inert ingredient(s) are those ingredients that are added to the commercial product (formulation) and are not herbicidally active.

Weed populations may develop a resistance to a particular herbicide over time. Herbicide resistance is the inherited ability of a plant to survive an herbicide application to which the wild-type was susceptible. Resistant plants occur naturally within a population and differ slightly in genetic makeup, but remain reproductively compatible with the wild-type. Herbicide resistant plants are present in a population in extremely small numbers. The repeated use of one herbicide allows these few plants to survive and reproduce. The number of resistant plants then increases in the population until the herbicide no longer effectively controls the weed. Herbicide resistance is not the natural tolerance that some species have to an herbicide. The appearance of herbicide-resistant weeds is strongly linked to repeated use of the same herbicide or herbicides with the same site of action in a monoculture cropping system or in non-crop areas.

There are several things that can be done, and are being done by the BLM, to minimize the potential development of resistant weed species, including, but not limited to the following:

- Rotate herbicides – by understanding the different modes of action of each herbicide

proposed for use on public lands, select the appropriate one to minimize resistance;

- Understand the potential effects of long-term residual herbicides on the selection for resistant weeds, and correctly apply these herbicides with the understanding that they can lead to weed resistance if used yearly for several consecutive years;
- Use mechanical and biological management options to eliminate weed escapes that may represent the resistant population; and
- Keep accurate records of herbicide application.

Herbicides Evaluated in the PEIS

In previous EISs, a total of 25 herbicide active ingredients were reviewed, 22 were evaluated, and 20 are presently approved for use in one or more states (Tables 2-1, 2-2, and 2-3). The decision to approve these herbicides for use on public lands was based on a detailed analysis of the risks to human health and non-target species from the use of these chemicals.

Since the majority of these assessments were completed in the late 1980s, a comprehensive literature review was conducted as part of the PEIS to determine whether there was any significant new information relevant to environmental concerns regarding the continued use of these herbicides (McMullin and Thomas 2000). Local BLM field offices were also consulted for information from field applications suggesting that any of these chemicals should be re-analyzed. If so, a new risk assessment for that active ingredient was completed as part of the PEIS in order to assess whether the BLM should continue its use.

Based on the literature review and information from the field, sulfometuron methyl (Oust®) was found to potentially have significant impacts on non-target vegetation when carried on soil to untreated areas, effects that were not evaluated earlier. Thus, the toxicity and environmental fate of sulfometuron methyl were analyzed in the PEIS. It was determined that the remaining 19 herbicides did not require further analysis for human health risks. However, the BLM determined that the level of analysis contained in the non-target species assessments for fish and wildlife for the previous EISs was inadequate to characterize the risks to species of concern, including anadromous fish.

Since the mid-1990s, the Forest Service conducted ecological risk assessments (ERAs) for nine herbicide active ingredients also used by the BLM: 2,4-D, clopyralid, dicamba, glyphosate, hexazinone, imazapyr, metsulfuron methyl, picloram, and triclopyr. In addition, the Forest Service prepared interactive spreadsheets that allowed the BLM to determine exposure concentrations for plants and animals under different application rates and exposure scenarios for these herbicides. The ERAs and spreadsheets are available on the Internet at the Forest Service Pesticide Management and Coordination website at http://www.fs.fed.us/foresthealth/pesticide/index.shtml.

Information contained in the ERAs was used by the BLM to characterize risks to non-target species from the specific chemicals and is incorporated by reference into the PEIS.

The Forest Service did not conduct ERAs for bromacil, chlorsulfuron, diuron, and tebuthiuron. Thus, the BLM conducted new ERAs for these herbicides as part of the PEIS.

The remaining six active ingredients currently approved for use by the BLM—2,4-DP, asulam, atrazine, fosamine, mefluidide, and simazine—have not been used, or their use has been limited to a very small number of acres, by the BLM for several years, primarily due to the availability of other, more effective approved active ingredients.

In the PEIS, the BLM proposes to use four new herbicide active ingredients that are registered and available for use—diflufenzopyr (as a formulation with dicamba), diquat, fluridone, and imazapic. All four of the herbicides have been deemed effective in controlling vegetation, have minimal effects on the environment and human health if used properly, and are registered (except diflufenzopyr as a stand-alone active ingredient) with the USEPA. Diflufenzopyr is approved as a formulation with dicamba and is labeled as Distinct, but cannot be used as a stand-alone active ingredient by the BLM until it is registered with the USEPA.

The new active ingredients were selected based on: 1) input from BLM field offices on types of vegetation needing control; 2) studies indicating that these active ingredients would be more effective in controlling noxious weeds and other unwanted vegetation targeted for control than active ingredients currently used by the BLM; 3) USEPA approval for use on rangelands, forestlands, and/or aquatic environments (see http://cfpub.epa.gov/oppref/rereg/status.cfm?show=rereg for information on herbicide registration and fact sheets on all registered products); 4) responses from

herbicide manufacturers to a request from the BLM in October 2001 for a list of herbicides not currently approved for use on public lands that may be appropriate to control vegetation; 5) the ability of the herbicide formulations to be applied on a variety of plant species needing control; 6) the level of risk of the herbicidal formulations to human health and the environment; and 7) the funds available to the BLM to conduct human health and ecological risk assessments of the proposed herbicides.

In order to ensure that the use of these active ingredients is appropriate for public lands, the BLM conducted human health risk assessments (HHRAs) and ERAs to assess the potential for risks to humans and non-target plants and animals, including special status species, from using these active ingredients. The following analyses are presented in Chapter 4, Environmental Consequences, and in appendixes B, C, and D of the Final PEIS: 1) the toxicity and environmental fate of each active ingredient, and of a formulation of diflufenzopyr and dicamba (Overdrive®); 2) risks associated with surfactants found in herbicide formulations and herbicide active ingredient degradates; and 3) the potential for herbicides considered in the PEIS to be endocrine disrupting chemicals.

For new and currently available herbicides that may be proposed for use in the future, the BLM would follow the following steps for conducting risk assessments: 1) assess a product's or a technology's effectiveness for use on target vegetation on public lands; 2) identify the level of data and analysis needed to conduct a human health and ecological risk assessment for that chemical; 3) determine the level of NEPA documentation required to support a decision to use a new product or technology; and 4) consult with the ESA regulatory agencies. These steps are discussed in more detail in Appendix E of the Final PEIS.

Vegetation Treatment Standard Operating Procedures and Guidelines

This section identifies standard operating procedures (SOPs) that would be followed by the BLM to ensure that risks to human health and the environment from treatment actions would be kept to a minimum. Standard operating procedures are the management controls and performance standards required for vegetation management treatments. These practices are intended to protect and enhance natural resources that could be affected by future vegetation treatments.

Prevention of Weeds and Early Detection and Rapid Response

Once weed populations become established, infestations can increase and expand in size. Weeds colonize highly disturbed ground and invade plant communities that have been degraded, but are also capable of invading intact communities. Therefore, prevention, early detection, and rapid response are the most cost-effective methods of weed control. Prevention, early detection, and rapid response strategies that reduce the need for vegetative treatments for noxious weeds should lead to a reduction in the number of acres treated using herbicides in the future by reducing or preventing weed establishment.

As stated in the BLM's *Partners Against Weeds - An Action Plan for the BLM* (USDI BLM 1996), prevention and public education are the highest priority weed management activities. Priorities are as follows:

- Priority 1: Take actions to prevent or minimize the need for vegetation control when and where feasible, considering the management objectives of the site.
- Priority 2: Use effective nonchemical methods of vegetation control when and where feasible.
- Priority 3: Use herbicides after considering the effectiveness of all potential methods or in combination with other methods or controls.

Prevention is best accomplished by ensuring the seeds and vegetatively reproductive plant parts of new weed species are not introduced into new areas.

The BLM is required to develop a noxious weed risk assessment when it is determined that an action may introduce or spread noxious weeds or when known habitat exists (USDI BLM 1992b). If the risk is moderate or high, the BLM may modify the project to reduce the likelihood of weeds infesting the site, and to identify control measures to be implemented if weeds do infest the site.

To prevent the spread of weeds, the BLM takes actions to minimize the amount of existing non-target vegetation that is disturbed or destroyed during project or vegetation treatment actions (Table 2-4). During project planning, the following steps are taken:

TABLE 2-1
Herbicide Active Ingredients Proposed, Evaluated, and included in Current Environmental Impact Statements of the Bureau of Land Management

Active Ingredient	EIS in which Herbicide is Evaluated				Summary of Evaluations for all EISs		
	Northwest Area Noxious Weed Control Program (1985)	California Vegetation Management (1988)	Vegetation Treatment on BLM Lands in 13 Western States (1991)	Western Oregon Program – Management of Competing Vegetation (1992)	Active Ingredients Considered	Active Ingredients Evaluated	Active Ingredients Available for Use
2,4-D	Yes (Esteron-99; DMA-4)	Yes	Yes	Yes	Yes	Yes	Yes
2,4-DP		Yes			Yes	Yes	Yes
Ammonium sulfamate				Proposed, not evaluated	Yes	No	No
Amitrole		Yes	Evaluated, but not included		Yes	Yes	No
Asulam		Yes		Yes	Yes	Yes	Yes
Atrazine		Yes	Yes	Yes	Yes	Yes	Yes
Bromacil		Yes	Yes		Yes	Yes	Yes
Chlorsulfuron			Yes		Yes	Yes	Yes
Clopyralid			Yes		Yes	Yes	Yes
Dalapon		Yes	Evaluated, but not included	Proposed, but not evaluated	Yes	Yes	No
Dicamba	Yes (Banvel)	Yes	Yes	Yes	Yes	Yes	Yes
Diquat				Proposed, but not evaluated	Yes	No	No
Diuron		Yes	Yes	Proposed, but not evaluated	Yes	Yes	Yes
Fosamine		Yes		Proposed, but not evaluated	Yes	Yes	Yes
Glyphosate	Yes (Rodeo)	Yes	Yes	Yes	Yes	Yes	Yes
Hexazinone		Yes	Yes	Yes	Yes	Yes	Yes
Imazapyr			Yes		Yes	Yes	Yes
Mefluidide			Yes		Yes	Yes	Yes
Metsulfuron methyl			Yes		Yes	Yes	Yes
Monosodium methanearsonate				Proposed, but not evaluated	Yes	No	No
Picloram	Yes (Tordon 2K, Tordon 22K)	Yes	Yes	Yes	Yes	Yes	Yes
Simazine		Yes	Yes		Yes	Yes	Yes
Sulfometuron methyl			Yes		Yes	Yes	Yes
Tebuthiuron		Yes	Yes		Yes	Yes	Yes
Triclopyr		Yes	Yes	Yes	Yes	Yes	Yes
Active ingredients evaluated or available for use	4	16	17	8	25	22	20

TABLE 2-2
Herbicides Approved and Proposed for Use on Public Lands

Herbicide	Herbicide Characteristics and Target Vegetation	Areas Where Registered Use is Appropriate					
		Rangeland	Forestland	Riparian and Aquatic	Oil, Gas, and Minerals	ROW	Recreation and Cultural Resources
Herbicides Approved for Use on Public Lands							
2, 4-D	Selective; foliar absorbed; postemergent; annual/perennial broadleaf weeds. Key species treated include burningbush, mustard species, and Russian thistle.	●	●	●	●	●	●
2, 4-DP	Selective; foliar absorbed; postemergent; broadleaf weeds and woody species. Key species treated include burningbush, mustards, Russian thistle, and brush species.	●	●		●	●	●
Asulam	Inhibits mitosis; controls growing grasses and certain broadleaf weeds. Key species treated include brackenfern, dock, and Johnsongrass.				●	●	
Atrazine	Selective; mostly root absorbed; inhibits photosynthesis. Key species treated include annual grasses, mustards, pigweed, and Russian thistle.		●			●	
Bromacil	Non-selective; inhibits photosynthesis; controls wide range of weeds and brush. Key species treated include annual grasses and broadleaf weeds, burningbush, and Russian thistle.				●	●	●
Chlorsulfuron	Selective; inhibits enzyme activity; broadleaf weeds and grasses. Key species treated include biennial thistles and annual and perennial mustards.	●			●	●	●
Clopyralid	Selective; mimics plant hormones; annual and perennial broadleaf weeds. Key species treated include knapweeds, mesquite, and starthistle and other thistles.	●	●		●	●	●
Dicamba	Growth regulator; annual and perennial broadleaf weeds, brush, and trees. Key species treated include knapweeds, burningbush, and Russian thistle and other thistles.	●			●	●	●
Diuron	Preemergent control; annual and perennial broadleaf weeds and grasses. Key species treated include annual grasses and broadleaf weeds, burningbush, and Russian thistle.				●	●	●
Fosamine ammonium	Inhibits bud and leaf formation; broadleaf weeds, brush, and trees. Key species treated include field bindweed, leafy spurge, and locust.				●	●	●
Glyphosate	Non-selective; annual and perennial grasses and broadleaf weeds, sedges, shrubs, and trees. Key species treated include annual, biennial, and perennial grasses and broadleaf weeds and woody shrubs.	●	●	●	●	●	●
Hexazinone	Foliar or soil applied; inhibits photosynthesis; annual and perennial grasses and broadleaf weeds, brush, and trees. Key species treated include mesquite and scrub oak.	●	●		●	●	●
Imazapyr	Non-selective; preemergent and postemergent uses; absorbed through foliage and roots; annual and perennial broadleaf weeds, brush, and trees. Key species treated include saltcedar.	●	●	●	●	●	●
Mefluidide	Growth inhibitor; suppresses seed production of grasses, brush, and trees. Key species treated include roadside grasses.				●	●	●
Metsulfuron methyl	Selective; postemergent; inhibits cell division in roots and shoots; annual and perennial broadleaf weeds, brush, and trees. Key species treated include annual and perennial mustards and biennial thistles.	●	●		●	●	●
Picloram	Selective; foliar and root absorption; mimics plant hormones; certain annual and perennial broadleaf weeds, vines, and shrubs. Key species treated include knapweeds, leafy spurge, and starthistle.	●	●		●	●	●
Simazine	Used selectively or as complete vegetation killer; requires substantial moisture for activation; inhibits photosynthesis. Key species treated include annual grasses, mustards, pigweed, and Russian thistle.				●	●	●

TABLE 2-2 (Cont.)
Herbicides Approved and Proposed for Use on Public Lands

Herbicide	Herbicide Characteristics	Areas Where Registered Use is Appropriate					
		Rangeland	Forestland	Riparian and Aquatic	Oil, Gas, and Minerals	ROW	Recreation and Cultural Resources
Herbicides Approved for Use on Public Lands (Cont.)							
Sulfometuron methyl	Broad-spectrum pre and postemergent control; inhibits cell division; grasses and broadleaf weeds. Key species treated include downy brome, annual and perennial mustards, and medusahead.		●		●	●	●
Tebuthiuron	Relatively non-selective soil activated herbicide; pre and postemergent control of annual and perennial grasses, broadleaf weeds, and shrubs. Key species treated include creosote bush, oak, Russian olive, and sagebrush (thinning).	●			●	●	●
Triclopyr	Growth regulator; broadleaf weeds and woody plants. Key species treated include mesquite and saltcedar.	●	●	●	●	●	●
Herbicides Proposed for Use on Public Lands							
Diflufenzopyr + Dicamba	Postemergent; inhibits auxin transport; broadleaf weeds. Key species treated include knapweeds, burningbush, and Russian thistle and other thistles.	●			●	●	●
Diquat	Non-selective and foliar applied. Key species treated include giant salvinia, water-thyme, and watermilfoils.			●	◘	◘	◘
Fluridone	Aquatic herbicide to control submersed aquatic plants. Key species treated include water-thyme and watermilfoils.			●			
Imazapic	Selective postemergent herbicide; inhibits broadleaf weeds and some grasses. Key species treated include downy brome, leafy spurge, medusahead, and mustards.	●	●		●	●	●

● = Areas where USEPA approved registration exists and the BLM has approval or proposes to use on public lands; ◘ = Areas where USEPA approved registration exists, but where the BLM does not propose to use on public lands.

TABLE 2-3
States in which Herbicides are Approved for Use on Public Lands Based Upon Current Environmental Impact Statements, Court Injunctions, and Changes in Registration Status [1]

Chemical	AZ	CA	CO	ID	MT	NV	NM	ND	OK	OR E	OR W	SD	UT	WA	WY
2,4-D	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
2,4-DP		●													
Asulam		◉									○				
Atrazine	●	●	●	●	●	●	●	●	●	○	○	●	●	●	●
Bromacil	●	●	●	●	●	●	●	●	●	○		●	●	●	●
Chlorsulfuron	●		●	●	●	●	●	●	●	○		●	●	●	●
Clopyralid	●		●	●	●	●	●	●	●	○		●	●	●	●
Dicamba	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Diuron	●	●	●	●	●	●	●	●	●	○		●	●	●	●
Fosamine		●													
Glyphosate	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Hexazinone	●	●	●	●	●	●	●	●	●	○	○	●	●	●	●
Imazapyr	●		●	●	●	●	●	●	●	○		●	●	●	●
Mefluidide	●		●	●	●	●	●	●	●	○		●	●	●	●
Metsulfuron methyl	●		●	●	●	●	●	●	●	○		●	●	●	●
Picloram	●	◉	●	●	●	●	●	●	●	●	●	●	●	●	●
Simazine	●	●	●	●	●	●	●	●	●	○		●	●	●	●
Sulfometuron methyl	●		●	●	●	●	●	●	●	○		●	●	●	●
Tebuthiuron	●	●	●	●	●	●	●	●	●	○		●	●	●	●
Triclopyr	●	●	●	●	●	●	●	●	●	○	○	●	●	●	●

[1] These chemicals have not been approved for use in Alaska, Nebraska, and Texas.
● Based upon the current EISs, these herbicides have been analyzed and approved for application on BLM lands.
○ Based upon the current EISs, these herbicides have been analyzed and approved for application on BLM lands, but are not currently approved for use in Oregon per court injunction (Southern Oregon Citizens Against Toxic Sprays (SOCATS) v. Watt, No. 79-1098 (District Court of Oregon. October 20, 1982), 13 Environmental Law Report 20, 176.
◉ Based upon the current EISs, these herbicides have been analyzed and approved for application on BLM lands, but application is not allowed due to change in registration status in the state.

- Incorporate measures to prevent introduction or spread of weeds into project layout, design, alternative evaluation, and project decisions.
- During environmental analysis for projects and maintenance programs, assess weed risks, analyze potential treatment of high-risk sites for weed establishment and spread, and identify prevention practices.
- Determine prevention and maintenance needs, to include the use of herbicides if needed, at the onset of project planning.
- Avoid or remove sources of weed seed and propagules to prevent new weed infestations and the spread of existing weeds.

During project development, weed infestations are prioritized for treatment in project operating areas and along access routes. Weeds present on or near the site are identified, a risk assessment is completed, and weeds are controlled as necessary. Project staging areas are weed free, and travel through weed infested areas is avoided or minimized. Examples of prevention actions to be followed during project activities include cleaning all equipment and clothing before entering the project site; avoiding soil disturbance and the creation of other soil conditions that promote weed germination and establishment; and using weed-free seed, hay, mulch,

gravel, soil, and mineral materials on public lands where there is a state or county program in place.

Conditions that enhance invasive species abundance should be addressed when developing mitigation and prevention plans for activities on public lands. These conditions include excessive disturbance associated with road maintenance, poor grazing management, and high levels of recreational use. If livestock grazing is managed to maintain the vigor of native perennial plants, particularly grasses, the chance of weeds invading rangeland is much less. By carefully managing recreational use and educating the public on the potential impacts of recreational activities on vegetation, the amount of damage to native vegetation and soil can be minimized at high use areas, such as campgrounds and OHV trails. Early detection in recreation areas is focused on roads and trails, where much of the weed spread occurs.

The BLM participates in the National Early Warning and Rapid Response System for Invasive Plants (Figure 2-1). The goal of this system is to minimize the establishment and spread of new invasive species through a coordinated framework of public and private processes:

- Early detection and reporting of suspected new plant species to appropriate officials;
- Identification and vouchering of submitted specimens by designated specialists;
- Verification of suspected new state, regional, and national plant specimens submitted by specialists;
- Archival of new records in designated regional and plant databases;
- Rapid assessment of confirmed new records; and
- Rapid response to verified new infestations that are determined to be invasive.

Revegetation

Disturbed areas may be reseeded or planted with desirable vegetation when the native plant community cannot recover and occupy the site sufficiently.

Determining the need for revegetation is an integral part of developing a vegetation treatment. The most important component of this process is determining whether active (seeding/planting) or passive (natural recovery) revegetation is appropriate.

USDI policy states, "Natural recovery by native plant species is preferable to planting or seeding, either of natives or non-natives. However, planting or seeding should be used only if necessary to prevent unacceptable erosion or resist competition from non-native invasive species" (620 Departmental Memorandum 3 2004). This policy is reiterated in the USDI *Burned Area Emergency Stabilization and Rehabilitation* Manual, the BLM *Draft Burned Area Emergency Stabilization and Rehabilitation Manual* (BLM H-1742-1; USDI BLM 2006a), and the *Interagency Burned Area Rehabilitation Guidebook* (USDI and USDA 2006d).

In addition to these handbooks and policy, use of native and non-native seed in revegetation and restoration is guided by BLM Manual 1745 (*Introduction, Transplant, Augmentation and Reestablishment of Fish, Wildlife and Plants)*. This manual states that native species shall be used, unless it is determined through the NEPA process that: 1) suitable native species are not available; 2) the natural biological diversity of the proposed management area will not be diminished; 3) exotic and naturalized species can be confined within the proposed management area; 4) analysis of ecological site inventory information indicates that a site will not support reestablishment of a species that historically was part of the natural environment; or 5) resource management objectives cannot be met with native species.

When natural recovery is not feasible, revegetation can be used to stabilize and restore vegetation on disturbed site and to eliminate or reduce the conditions that favor invasive species. Reseeding or replanting may be required when there is insufficient vegetation or seed stores to naturally revegetate the site.

To ensure revegetation success, there must be adequate soil for root development and moisture storage, which provides moisture to support the new plants. Chances for revegetation success are improved by selecting seed with high purity and percentage germination; selecting native species or cultivars adapted to the area; planting at proper depth, seeding rate, and time of the year for the region; choosing the appropriate planting method; and, where feasible, removing competing vegetation. Planting mixtures are adapted for the treatment area and site uses. A combination of forbs, perennial grasses, and shrubs is typically used on rangeland sites, while shrubs and trees might be favored for riparian and forestland sites. A mixture of several native plant species and types or functional groups enhances the value of the site for fish and wildlife and improves the health and aesthetic

character of the site. Mixtures can better take advantage of variable soil, terrain, and climatic conditions, and thus are more likely to withstand insect infestations and survive adverse climatic conditions.

The USDI BLM Native Seed program, which is in its sixth year, was developed in response to Congressional direction to supply native plant material for emergency stabilization and longer-term rehabilitation and restoration efforts. The focus of the program is to increase the number of native plant species for which seed is available and the total amount of native seed available for these efforts. To date, the program has focused on native plant material needs of emergency stabilization and burned area rehabilitation in the Great Basin, but is expanding to focus on areas such as western Oregon, the Colorado Plateau, and most recently the Mojave Desert. The Wildland Fire Management Program funds and manages the effort (USDI BLM 2006c).

The National Seed Warehouse is a storage facility for the native seed supply. Through a Memorandum of Understanding with the BLM Idaho State Director, each state (Idaho, Oregon, Nevada, Utah, and Colorado) can reserve an annual seed supply for purchase based on a reasonable projection of annual acreage to be stabilized or rehabilitated over a 5-year period.

The Great Basin Restoration Initiative (GBRI) grew out of concern for the health of the Great Basin after the wildfires of 1999. The goal of GBRI is to implement treatments and strategies to maintain functioning ecosystems and to proactively restore degraded ones at strategic locations. Native plants are emphasized in restoration projects where their use is practical and the potential for success is satisfactory. Monitoring is recommended to measure treatment success. To increase the availability of native plants, especially native forbs, the GBRI has established a collaborative native plant project, the Great Basin Native Plant Selection and Increase Project, to increase native plant availability and the technology to successfully establish these plants. This project is supported by funding from the BLM's Native Plant Initiative.

The BLM will follow the following SOPs when revegetating sites:

- Cultivate previously disturbed sites to reduce the amount of weed seeds in the soil seedbank.
- Revegetate sites once work is completed or soon after a disturbance.
- When available, use native seed of known origin as labeled by state seed certification programs.
- Use seed of non-native cultivars and species only when locally adapted native seed is not available or when it is unlikely to establish quickly enough to prevent soil erosion or weed establishment.
- Use seed that is free of noxious and invasive weeds, as determined and documented by a seed inspection test by a certified seed laboratory.
- Limit nitrogen fertilizer applications that favor annual grass growth over forb growth in newly seeded areas, especially where downy brome and other invasive annuals are establishing.
- Use clean equipment, free of plants and plant parts, on revegetation projects to prevent the inadvertent introduction of weeds into the site.
- Where important pollinator resources exist, include native nectar and pollen producing plants in the seed mixes used in restoration and reclamation projects. Include non-forage plant species in seed mixes for their pollinator/host relationships as foraging, nesting, or shelter species. Choose native plant species over manipulated cultivars, especially of forbs and shrubs, since natives tend to have more valuable pollen and nectar resources than cultivars. Ensure that bloom times for the flowers of the species chosen match the activity times for the pollinators. Maintain sufficient litter on the soil surfaces of native plant communities for ground-nesting bees.

Where feasible, avoid grazing by domestic and wild animals on treatment sites until vegetation is well established. Where total rest from grazing is not feasible, efforts should be made to modify the amount and/or season of grazing to promote vegetation recovery within the treatment area. Reductions in numbers, permanent or temporary fencing, changes in grazing rotation, and identification of alternative forage sources are examples of methods that could be used to remove, reduce or modify grazing impacts during vegetation recovery.

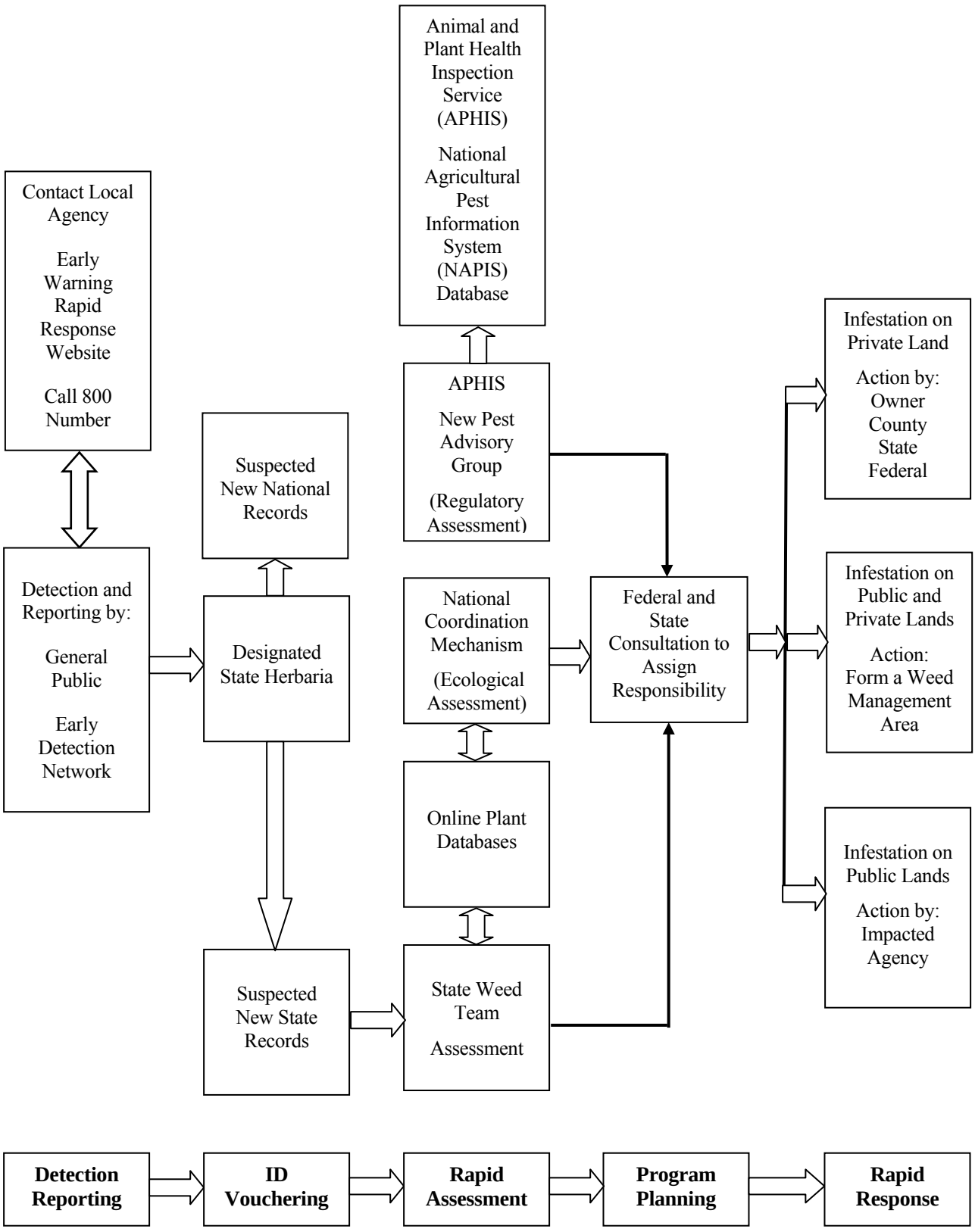

Figure 2-1. National Early Warning and Rapid Response System for Invasive Plants.

TABLE 2-4
Weed Prevention Measures

BLM Activity	PREVENTION MEASURE
Project Planning	• Incorporate prevention measures into project layout and design, alternative evaluation, and project decisions to prevent the introduction or spread of weeds. • Determine prevention and maintenance needs, including the use of herbicides, at the onset of project planning. • Before ground-disturbing activities begin, inventory weed infestations and prioritize areas for treatment in project operating areas and along access routes. • Remove sources of weed seed and propagules to prevent the spread of existing weeds and new weed infestations. • Pre-treat high-risk sites for weed establishment and spread before implementing projects. • Post weed awareness messages and prevention practices at strategic locations such as trailheads, roads, boat launches, and public land kiosks. • Coordinate project activities with nearby herbicide applications to maximize the cost-effectiveness of weed treatments.
Project Development	• Minimize soil disturbance to the extent practical, consistent with project objectives. • Avoid creating soil conditions that promote weed germination and establishment. • To prevent weed germination and establishment, retain native vegetation in and around project activity areas and keep soil disturbance to a minimum, consistent with project objectives. • Locate and use weed-free project staging areas. Avoid or minimize all types of travel through weed-infested areas, or restrict travel to periods when the spread of seeds or propagules is least likely. • Prevent the introduction and spread of weeds caused by moving weed-infested sand, gravel, borrow, and fill material. • Inspect material sources on site, and ensure that they are weed-free before use and transport. Treat weed-infested sources to eradicate weed seed and plant parts, and strip and stockpile contaminated material before any use of pit material. • Survey the area where material from treated weed-infested sources is used for at least 3 years after project completion to ensure that any weeds transported to the site are promptly detected and controlled. • Prevent weed establishment by not driving through weed-infested areas. • Inspect and document weed establishment at access roads, cleaning sites, and all disturbed areas; control infestations to prevent spread within the project area. • Avoid acquiring water for dust abatement where access to the water is through weed-infested sites. • Identify sites where equipment can be cleaned. Clean equipment before entering public lands. • Clean all equipment before leaving the project site if operating in areas infested with weeds. • Inspect and treat weeds that establish at equipment cleaning sites. • Ensure that rental equipment is free of weed seed. • Inspect, remove, and properly dispose of weed seed and plant parts found on workers' clothing and equipment. Proper disposal entails bagging the seeds and plant parts and incinerating them.
Revegetation	• Include weed prevention measures, including project inspection and documentation, in operation and reclamation plans. • Retain bonds until reclamation requirements, including weed treatments, are completed, based on inspection and documentation. • To prevent conditions favoring weed establishment, re-establish vegetation on bare ground caused by project disturbance as soon as possible using either natural recovery or artificial techniques. • Maintain stockpiled, uninfested material in a weed-free condition.

TABLE 2-4 (Cont.)
Prevention Measures

BLM Activity	Prevention Measure
Revegetation (Cont.)	• Revegetate disturbed soil (except travel ways on surfaced projects) in a manner that optimizes plant establishment for each specific project site. For each project, define what constitutes disturbed soil and objectives for plant cover revegetation. Revegetation may include topsoil replacement, planting, seeding, fertilization, liming, and weed-free mulching, as necessary. • Where practical, stockpile weed-seed-free topsoil and replace it on disturbed areas (e.g., road embankments or landings). • Inspect seed and straw mulch to be used for site rehabilitation (for wattles, straw bales, dams, etc.) and certify that they are free of weed seed and propagules. • Inspect and document all limited term ground-disturbing operations in noxious weed infested areas for at least 3 growing seasons following completion of the project. • Use native material where appropriate and feasible. Use certified weed-free or weed-seed-free hay or straw where certified materials are required and/or are reasonably available. • Provide briefings that identify operational practices to reduce weed spread (for example, avoiding known weed infestation areas when locating fire lines). • Evaluate options, including closure, to regulate the flow of traffic on sites where desired vegetation needs to be established. Sites could include road and trail ROW, and other areas of disturbed soils.

Treatment-specific Standard Operating Procedures and Guidelines

Table 2-5 lists SOPs that have been identified to reduce adverse effects to environmental and human resources from vegetation treatment activities based on guidance in BLM manuals and handbooks, regulations, and standard agency and industry practices. The list is not all encompassing, but is designed to give an overview of practices that should be considered when designing and implementing a vegetation treatment project on public lands.

Special Precautions

Special Status Species

Federal policies and procedures for protecting federally-listed threatened and endangered plant and animal species, and species proposed for listing, were established by the Endangered Species Act of 1973 and regulations issued pursuant to the Act. The purposes of the Act are to provide mechanisms for the conservation of threatened and endangered species and their habitats. Under the Act, the Secretary of the Interior is required to determine which species are threatened or endangered and to issue recovery plans for those species.

Section 7 of the Act specifically requires all federal agencies to use their authorities in furtherance of the Act to carry out programs for the conservation of listed species, and to ensure that no agency action is likely to jeopardize the continued existence of a listed species or adversely modify critical habitat. Policy and guidance (BLM Manual 6840; *Special Status Species*) also stipulates that species proposed for listing must be managed at the same level of protection as listed species.

The BLM state directors may designate sensitive species in cooperation with their respective state. These sensitive species (special status) must receive, at a minimum, the same level of protection as federal candidate species. The BLM will also carry out management for the conservation of state-listed species, and state laws protecting these species will apply to all BLM programs and actions to the extent that they are consistent with FLPMA and other federal laws.

The BLM consulted with the USFWS and NMFS during development of the PEIS as required under Section 7 of the Endangered Species Act. As part of this process, the BLM prepared a formal consultation package that included a description of the program; species listed as threatened or endangered, species proposed for listing, and critical habitats that could be affected by the program; and a BA that evaluated the likely impacts to listed species, species proposed for listing, and critical habitats from the proposed

vegetation treatment program. Over 300 species were evaluated in the BA. The BA also provides broad guidance on a programmatic level for actions that would be taken by the BLM to avoid adversely impacting species or result in the destruction of critical habitat (USDI BLM 2007b).

Before any vegetation treatment or ground disturbance occurs, BLM policy requires a survey of the project site for species listed or proposed for listing, or special status species. This is done by a qualified biologist and/or botanist who consults the state and local databases and visits the site at the appropriate season. If a proposed project may affect a proposed or listed species or its critical habitat, the BLM consults with the USFWS and/or NMFS. A project with a "may affect, likely to adversely affect" determination requires formal consultation and receives a Biological Opinion from the USFWS and/or NMFS. A project with a "may affect, not likely to adversely affect" determination requires informal consultation and receives a concurrence letter from USFWS and/or NMFS, unless that action is implemented under the authorities of the alternative consultation agreement pursuant to counterpart regulations established for *National Fire Plan* projects.

Wilderness Areas

Wilderness areas, which are designated by Congress, are defined by the Wilderness Act of 1964 as places "where the earth and its community of life are untrammeled by man, where man himself is a visitor who does not remain." The BLM manages 175 Wilderness Areas encompassing over 7.2 million acres (USDI BLM 2006d).

Activities allowed in wilderness areas are identified in wilderness management plans prepared by the BLM. The BLM does not ordinarily treat vegetation in wilderness areas, but will control invasive and noxious weeds when they threaten lands outside wilderness area or are spreading within the wilderness and can be controlled without serious adverse impacts to wilderness values.

Management of vegetation in a wilderness area is directed toward retaining the natural character of the environment. Tree and shrub removal is usually not allowed, except for fire, insect, or disease control. Reforestation is generally prohibited except to repair damage caused by humans in areas where natural reforestation is unlikely. Only native species and primitive methods, such as hand planting, are allowed for reforestation.

Tools and equipment may be used for vegetation management when they are the minimum amount necessary for the protection of the wilderness resource. Motorized tools may only be used in special or emergency cases involving the health and safety of wilderness visitors, or the protection of wilderness values.

Habitat manipulation using mechanical or chemical means may be allowed to protect threatened and endangered species and to correct unnatural conditions, such as weed infestations, resulting from human influence.

The BLM also manages a total of 610 Wilderness Study Areas (WSAs) encompassing nearly 14.3 million acres. These are areas that have been determined to have wilderness characteristics worthy of consideration for wilderness designation. The BLM's primary goals in WSAs are to manage them so as to not impair their wilderness values and to maintain their suitability for preservation as wilderness until Congress makes a determination on their future.

In WSAs, the BLM must foster a natural distribution of native species of plants and animals by ensuring that ecosystems and processes continue to function naturally.

Cultural Resources

The effects of BLM actions on cultural resources are addressed through compliance with the National Historic Preservation Act, as implemented through a national Programmatic Agreement (*Programmatic Agreement among the Bureau of Land Management, the Advisory Council on Historic Preservation, and the National Conference of State Historic Preservation Officers Regarding the Manner in Which BLM Will Meet Its Responsibilities Under the National Historic Preservation Act*) and state-specific protocol agreements with SHPOs. The BLM's responsibilities under these authorities are addressed as early in the vegetation management project planning process as possible.

The BLM meets its responsibilities for consultation and government-to-government relationships with Native American tribes by consulting with appropriate tribal representatives prior to making decisions that affect tribal interests. The BLM's tribal consultation policies

TABLE 2-5
Vegetation Treatment Methods Standard Operating Procedures and Guidelines

Resource Element	Treatment Method				
	Fire Use	**Mechanical**	**Manual**	**Biological**	**Chemical**
Guidance Documents	BLM handbooks H-9211-1 (*Fire Management Activity Planning Procedures*) and H-9214-1 (*Prescribed Fire Management*), and manuals 1112 (*Safety*), 9210 (*Fire Management*), 9211 (*Fire Planning*), 9214 (*Prescribed Fire*), and 9215 (*Fire Training and Qualifications*).	BLM Handbook H-5000-1 (*Public Domain Forest Management*), and manuals 1112 (*Safety*) and 9015 (*Integrated Weed Management*).	BLM *Domain Forest Management*, and manuals 1112 (*Safety*), and 9015 (*Integrated Weed Management*).	BLM manuals 1112 (*Safety*), 4100 (*Grazing Administration*), 9014 (*Use of Biological Control Agents on Public Lands*), and 9015 (*Integrated Weed Management)* and Handbook H-4400-1 (*Rangeland Health Standards*).	BLM Handbook H-9011-1 (*Chemical Pest Control*), and manuals 1112 (*Safety*), 9011 (*Chemical Pest Control*), 9015 (*Integrated Weed Management)*, and 9220 (*Integrated Pest Management*).
General	• Prepare fire management plan. • Use trained personnel with adequate equipment. • Minimize frequent burning in arid environments. • Avoid burning herbicide-treated vegetation for at least 6 months.	• Ensure that power cutting tools have approved spark arresters. • Ensure that crews have proper fire-suppression tools during the fire season. • Wash vehicles and equipment before leaving weed infested areas to avoid infecting weed-free areas. • Keep equipment in good operating condition.	• Ensure that crews have proper fire-suppression tools during fire season. • Minimize soil disturbance, which may encourage new weeds to develop.	• Use only biological control agents that have been tested and approved to ensure they are host specific. • If using domestic animals, select sites with weeds that are palatable and non-toxic to the animals. • Manage the intensity and duration of containment by domestic animals to minimize overutilization of desirable plant species. • Utilize domestic animals to contain the target species in the treatment areas prior to weed seed set. Or if seed set has occurred, do not move the domestic animals to uninfested areas for a period of 7 days.	• Prepare a spill contingency plan in advance of treatment. • Select herbicides that are least dangerous to the environment while providing the desired results. • Minimize the size of treatment areas, where feasible. • Use the least amount of herbicide necessary to achieve the desired result. • Follow product label for use and storage. • Have a licensed applicator apply herbicides. • Keep records of each application, including the active ingredient, formulation, application rate, date, time, and location. • Dispose of unwanted herbicides promptly and correctly.

TABLE 2-5 (Cont.)
Vegetation Treatment Methods Standard Operating Procedures and Guidelines

Resource Element	Treatment Method				
	Fire Use	**Mechanical**	**Manual**	**Biological**	**Chemical**
Land Use	• Carefully plan fires in the WUI to avoid or minimize loss of structures and property. • Notify nearby residents and landowners who could be affected by smoke intrusions or other fire effects.	• Collaborate on project development with nearby landowners and agencies.	• Collaborate on project development with nearby landowners and agencies.	• Notify nearby residents and landowners who could be affected by biological control agents.	• Consider surrounding land uses before aerial spraying. • Comply with herbicide-free buffer zones to ensure that drift will not affect crops or nearby residents and landowners. • Post treated areas and specify reentry times, if appropriate.
Air Quality See Manual 7000 (*Soil, Water, and Air Management*).	• Have clear smoke management objectives. • Evaluate weather conditions, including wind speed and atmospheric stability, to predict effects of burn and impacts from smoke. • Burn when weather conditions favor rapid combustion and dispersion. • Burn under favorable moisture conditions. • Use backfires, when applicable. • Burn small vegetation blocks, when appropriate. • Manage smoke to prevent air quality violations and minimize impacts to smoke-sensitive areas. • Coordinate with air pollution and fire control officials, and obtain all applicable smoke management permits, to ensure that burn plans comply with federal, state, and local	• Maintain equipment in optimal working order. • Conduct treatment activities during the wetter seasons. • Use heavy equipment under adequate soil moisture conditions to minimize soil erosion. • Minimize vehicle speeds on unpaved roads. • Minimize dust impacts to the extent practicable.	• Maintain equipment in optimal working order. • Conduct treatment activities during the wetter seasons. • Minimize vehicle speeds on unpaved roads. • Minimize dust impacts to the extent practicable.		• Consider effects of wind, humidity, temperature inversions, and heavy rainfall on herbicide effectiveness and risks. • Apply herbicides in favorable weather conditions to minimize drift. For example, do not treat when winds exceed 10 mph (6 mph for aerial applications) or rainfall is imminent. • Apply herbicides consistent with label directions. • Use drift reduction agents, as appropriate, to reduce the drift hazard. • Select proper application equipment (e.g., equipment that produces 200- to 800-micron diameter droplets). • Select proper application methods and use appropriate buffer distances between spray sites and non-target resources.

TABLE 2-5 (Cont.)
Vegetation Treatment Methods Standard Operating Procedures and Guidelines

Resource Element	Treatment Method				
	Fire Use	Mechanical	Manual	Biological	Chemical
	regulations.				
Soil Resources See Manual 7000 (*Soil, Water, and Air Management*).	• Assess the susceptibility of the treatment site to soil damage and erosion prior to treatment. • Prescribe broadcast and other burns that are consistent with soil management activities. • Plan burns so as to minimize damage to soil resources. • Conduct burns when moisture content of large fuels, surface organic matter, and soil is high to limit the amount of heat penetration into lower soil surfaces and protect surface organic matter. • Time treatments to encourage rapid recovery of vegetation. • Further facilitate revegetation by seeding or planting following treatment. • When appropriate, reseed following burning to re-introduce species, or to convert a site to a less flammable plant association, rather than to specifically minimize erosion.	• Assess the susceptibility of the treatment site to soil damage and erosion prior to treatment. • Time treatments to avoid intense rainstorms. • Time treatments to encourage rapid recovery of vegetation. • Further facilitate revegetation by seeding or planting following treatment. • Use equipment that minimizes soil disturbance and compaction. • Minimize use of heavy equipment on slopes >20%. • Conduct treatments when the ground is sufficiently dry to support heavy equipment. • Implement erosion control measures in areas where heavy equipment use occurs. • Minimize disturbances to biological soil crusts (e.g., by timing treatments when crusts are moist). • Reinoculate biological crust organisms to aid in their recovery, if possible. • Conduct mechanical treatments along topographic contours to minimize runoff and	• Assess the susceptibility of the treatment site to soil damage and erosion prior to treatment. • Time treatments to avoid intense rainstorms. • Time treatments to encourage rapid recovery of vegetation. • Further facilitate revegetation by seeding or planting following treatment. • Minimize soil disturbance and compaction. • Minimize disturbance to biological soil crusts (e.g., by timing treatments when crusts are moist). • Reinoculate biological crust organisms to aid in their recovery, if possible. • When appropriate, leave plant debris on site to retain moisture, supply nutrients, and reduce erosion. • Prevent oil and gas spills to minimize damage to soil.	• Assess the susceptibility of the treatment site to soil damage and erosion prior to treatment. • Minimize use of domestic animals if removal of vegetation may cause significant soil erosion or impact biological soil crusts. • Closely monitor timing and intensity of biological control with domestic animals. • Avoid grazing on wet soil to minimize compaction and shearing.	• Assess the susceptibility of the treatment site to soil damage and erosion prior to treatment. • Minimize treating areas where herbicide runoff is likely, such as steep slopes when heavy rainfall is expected. • Minimize the use of herbicides that have high soil mobility, particularly in areas where soil properties increase the potential for mobility. • Time treatments to encourage rapid recovery of desirable vegetation. • Further facilitate revegetation by seeding or planting following treatment.

TABLE 2-5 (Cont.)
Vegetation Treatment Methods Standard Operating Procedures and Guidelines

Resource Element	Treatment Method				
	Fire Use	Mechanical	Manual	Biological	Chemical
Soil Resources (cont.)		erosion. • When appropriate, leave plant debris on site to retain moisture, supply nutrients, and reduce erosion. • Consider chaining when soils are frozen and plants are brittle to minimize soil disturbance.			
Water Resources See Manual 7000 (*Soil, Water, and Air Management*).	• Prescribe burns that are consistent with water management objectives. • Plan burns to minimize negative impacts to water resources. • Minimize burning on hillslopes, or revegetate hillslopes shortly after burning. • Maintain a vegetated buffer between treatment areas and water bodies.	• Minimize removal of desirable vegetation near residential and domestic water sources. • Do not wash equipment or vehicles in water bodies. • Maintain minimum 25-foot wide vegetated buffer near streams and wetlands.	• Maintain vegetated buffer near residential and domestic water sources. • Minimize removal of desirable vegetation near residential and domestic water sources. • Minimize removal of desirable vegetation near water bodies.	• Minimize use of domestic animals near residential or domestic water sources. • Minimize use of domestic animals adjacent to water bodies if trampling or other activities are likely to cause soil erosion or impact water quality.	• Consider climate, soil type, slope, and vegetation type when developing herbicide treatment programs. • Do not rinse spray tanks in or near water bodies. • Do not broadcast herbicide pellets where there is danger of contaminating water supplies. • Minimize treating areas with a high risk for groundwater contamination. • Maintain buffers between the treatment area and water bodies. Buffer widths should be developed based on herbicide- and site-specific criteria to minimize impacts to water bodies.
Wetlands and Riparian Areas	• Following treatment, reseed or replant with native vegetation if the native plant community cannot recover and occupy the site	• Manage riparian areas to provide adequate shade, sediment control, bank stability, and recruitment of wood into stream channels.	• Following treatment, reseed or replant with native vegetation if the native plant community cannot recover and occupy the site	• Manage animals to prevent overgrazing and minimize damage to wetlands. • Following treatment, reseed or replant with	• Use appropriate herbicide-free buffer zone for herbicides not labeled for aquatic use based on risk assessment guidance, with minimum widths of

TABLE 2-5 (Cont.)
Vegetation Treatment Methods Standard Operating Procedures and Guidelines

Resource Element	Treatment Method				
	Fire Use	**Mechanical**	**Manual**	**Biological**	**Chemical**
Wetlands and Riparian Areas (cont.)	sufficiently.	• Following treatment, reseed or replant with native vegetation if the native plant community cannot recover and occupy the site sufficiently.	sufficiently.	native vegetation if the native plant community cannot recover and occupy the site sufficiently.	100 feet for aerial, 25 feet for vehicle, and 10 feet for hand spray applications. • Following treatment, reseed or replant with native vegetation if the native plant community cannot recover and occupy the site sufficiently.
Vegetation See Handbook H-4410-1 (*National Range Handbook*), and manuals 5000 (*Forest Management*) and 9015 (*Integrated Weed Management*).	• Keep fires as small as possible to meet the treatment objectives. • Conduct low intensity burns to minimize adverse impacts to large vegetation. • Limit area cleared for fire breaks and clearings to reduce potential for weed infestations. • Where appropriate, use mechanical treatments to prepare forests for the reintroduction of fire. • Identify and implement any temporary domestic livestock grazing and/or supplemental feeding restrictions needed to enhance desirable vegetation recovery following treatment. • Consider adjustments in the existing grazing permit, including the application of state or regional grazing administration guidelines, needed to maintain	• Power wash vehicles and equipment to prevent the introduction and spread of weed and exotic species. • Remove damaged trees and treat woody residue to limit subsequent mortality by bark beetles. • Use plant stock or seed from the same seed zone and from sites of similar elevation when conducting revegetation activities. • Use lighter chains with 40 to 60 pound links where the objective is to minimize disturbance to the understory species. • As appropriate, use two chainings to reduce tree competition and prepare the seedbed. Carry out the second chaining at the most advantageous time for seeding (late fall or early winter, in most cases). • Do not chain in areas	• Remove damaged trees and treat woody residue to limit subsequent mortality by bark beetles. • Identify and implement any temporary domestic livestock grazing and/or supplemental feeding restrictions needed to enhance desirable vegetation recovery following treatment. • Consider adjustments in the existing grazing permit, including the application of state or regional grazing administration guidelines, needed to maintain desirable vegetation on the treatment site. • Use plant stock or seed from the same seed zone and from sites of similar elevation when conducting revegetation activities.	• Use domestic animals at the time they are most likely to damage invasive species. • Manage animals to prevent overgrazing and minimize damage to sensitive areas. • Identify and implement any temporary domestic livestock grazing and/or supplemental feeding restrictions needed to enhance desirable vegetation recovery following treatment. • Consider adjustments in the existing grazing permit, including the application of state or regional grazing administration guidelines, needed to maintain desirable vegetation on the treatment site. • Use plant stock or seed from the same seed zone and from sites of similar elevation when	• Use drift reduction agents, as appropriate, to reduce the drift hazard to non-target species. • Use the appropriate application rate to treat weeds and other noxious vegetation to minimize effects to non-target vegetation. • Conduct pre-treatment surveys for sensitive habitat and species of concern within and adjacent to proposed treatment areas. • Identify and implement any temporary domestic livestock grazing and/or supplemental feeding restrictions needed to enhance desirable vegetation recovery following treatment. • Consider adjustments in the existing grazing permit, including the application of state or regional grazing policies and administration

TABLE 2-5 (Cont.)
Vegetation Treatment Methods Standard Operating Procedures and Guidelines

Resource Element	Treatment Method				
	Fire Use	Mechanical	Manual	Biological	Chemical
Vegetation (cont.)	desirable vegetation on the treatment site. • Use plant stock or seed from the same seed zone and from sites of similar elevation when conducting revegetation activities.	where annual rainfall is less than 6-9 inches, especially if downy brome is present. • Identify and implement any temporary domestic livestock grazing and/or supplemental feeding restrictions needed to enhance desirable vegetation recovery following treatment. • Consider adjustments in the existing grazing permit, including the application of state or regional grazing administration guidelines, needed to maintain desirable vegetation on the treatment site.		conducting revegetation activities.	guidelines, needed to maintain desirable vegetation on the treatment site. • Use plant stock or seed from the same seed zone and from sites of similar elevation when conducting revegetation activities.
Fish and Other Aquatic Resources See Manual 6500 (*Wildlife and Fisheries Management*).	• Maintain vegetated buffers near fish-bearing streams to minimize soil erosion and soil runoff into streams. • Minimize treatments near fish-bearing streams during periods when fish are in sensitive life stages (e.g., embryo).	• Minimize treatments adjacent to fish-bearing waters. • Do not wash vehicles in streams or wetlands. • Refuel and service equipment at least 100 feet from water bodies to reduce the chance for pollutants to enter water. • Maintain adequate vegetated buffer between treatment area and water body to reduce the potential for sediments and other pollutants to enter the water body.	• Refuel and service equipment at least 100 feet from water bodies to reduce the chance for pollutants to enter water. • Minimize removal of desirable vegetation near fish-bearing streams and wetlands.	• Limit access of domestic animals to streams and other water bodies to minimize sediments entering water and potential for damage to fish habitat.	• Use appropriate buffer zones based on label and risk assessment guidance. • Minimize treatments near fish-bearing streams during periods when fish are in life stages most sensitive to the herbicide(s) used. • Use spot, rather than aerial treatments, near water bodies. • Use herbicides that are least toxic to fish and still effective.
Wildlife Resources	• Minimize treatments during nesting and other important periods for	• Minimize treatments during nesting and other important periods for	• Minimize treatments during nesting and other important periods for	• Minimize the use of livestock grazing as a vegetation control	• Minimize treatments during nesting and other important periods for

TABLE 2-5 (Cont.)
Vegetation Treatment Methods Standard Operating Procedures and Guidelines

Resource Element	Treatment Method				
	Fire Use	**Mechanical**	**Manual**	**Biological**	**Chemical**
Wildlife Resources (cont.) See Manual 6500 (*Wildlife and Fisheries Management)*	birds and other wildlife. • Minimize treatments of important forage areas immediately prior to important use period(s), unless the burn is designed to stimulate forage growth.	birds and other wildlife. • Retain wildlife trees and other unique habitat features where practical. • Design chaining treatments to provide a mosaic of treated and nontreated sites. No more than 50% of an area should be chained at one time. Provide natural travel lanes, resting and thermal cover areas, snags, and corridors (>30 feet wide) connecting non-chained areas. Size of clearing should not exceed 100 yards at its widest point.	birds and other wildlife. • Retain wildlife trees and other unique habitat features where practical.	measure where and/or when it could impact nesting and/or other important periods for birds and other wildlife. • Consider and minimize potential adverse impacts to wildlife habitat and minimize the use of livestock grazing as a vegetation control measure where it is likely to result in removal or physical damage to vegetation that provides a critical source of food or cover for wildlife.	wildlife. • Use herbicides of low toxicity to wildlife, where feasible. • Conduct pre-treatment surveys for sensitive habitat and wildlife species of concern. • Avoid using glyphosate formulations that include R-11 in the future, and either avoid using any formulations with POEA, or seek to use the formulation with the lowest amount of POEA available, to reduce risks to amphibians. • Minimize use of herbicides near wetlands and riparian areas with amphibians.
Threatened and Endangered Species See Manual 6840 (*Special Status Species*) and *Vegetation Treatments Using Herbicides on BLM Lands in 17 Western States Programmatic Biological Assessment.*	• Survey for special status species of concern if project may impact federally- and state-listed species. • Minimize direct impacts to species of concern, unless studies show that species will benefit from fire.	• Minimize use of ground-disturbing equipment near special status species of concern. • Survey for species of concern if project could impact these species. • Use temporary roads when long-term access is not required.	• Survey for special status species of concern if project could impact these species.	• Survey for special status species of concern if project could impact these species.	• Survey for special status species before treating an area.
Livestock See Handbook H-4120-1 (*Grazing Management*).	• Notify permittees of proposed treatments and identify any needed livestock grazing, feeding, or slaughter restrictions.	• Notify permittees of proposed treatments and identify any needed livestock grazing, feeding, or slaughter restrictions.	• Notify permittees of proposed treatments and identify any needed livestock grazing, feeding, or slaughter restrictions.	• Notify permittees of proposed treatments and identify any needed livestock grazing, feeding, or slaughter restrictions.	• Notify permittees of proposed treatments and identify any needed livestock grazing, feeding, or slaughter restrictions.

TABLE 2-5 (Cont.)
Vegetation Treatment Methods Standard Operating Procedures and Guidelines

Resource Element	Treatment Method				
	Fire Use	**Mechanical**	**Manual**	**Biological**	**Chemical**
Livestock (cont.)	• Design treatments to take advantage of normal livestock grazing rest periods, when possible, and minimize impacts to livestock grazing permits. • Provide alternative forage sites for livestock, if possible. • Notify permittees of the project to improve coordination and avoid potential conflicts and safety concerns during implementation of the treatment.	• Design treatments to take advantage of normal livestock grazing rest periods, when possible, and minimize impacts to livestock grazing permits. • Provide alternative forage sites for livestock, if possible. • Notify permittees of the project to improve coordination and avoid potential conflicts and safety concerns during implementation of the treatment.	• Design treatments to take advantage of normal livestock grazing rest periods, when possible, and minimize impacts to livestock grazing permits. • Provide alternative forage sites for livestock, if possible. • Notify permittees of the project to improve coordination and avoid potential conflicts and safety concerns during implementation of the treatment.	• Design treatments to take advantage of normal livestock grazing rest periods, when possible, and minimize impacts to livestock grazing permits. • Provide alternative forage sites for livestock, if possible. • Notify permittees of the project to improve coordination and avoid potential conflicts and safety concerns during implementation of the treatment.	• Design treatments to take advantage of normal livestock grazing rest periods, when possible, and minimize impacts to livestock grazing permits. • Provide alternative forage sites for livestock, if possible. • Use herbicides of low toxicity to livestock, where feasible. • As directed by the herbicide label, remove livestock from treatment sites prior to herbicide application, where applicable. • Take into account the different types of application equipment and methods, where possible, to reduce the probability of contamination of non-target food and water sources. • Notify permittees of the project to improve coordination and avoid potential conflicts and safety concerns during implementation of the treatment.
Wild Horses and Burros	• Minimize potential hazards to horses and burros by ensuring adequate escape opportunities. • Avoid critical periods and minimize impacts to	• Avoid critical periods and minimize impacts to habitat that could adversely affect wild horse or burro populations.	• Avoid critical periods and minimize impacts to habitat that could adversely affect wild horse or burro populations.	• Avoid critical periods and minimize impacts to habitat that could adversely affect wild horse or burro populations.	• Minimize use of herbicides in project areas actively grazed by wild horses and burros, and/or use herbicides with low toxicity to reduce potential impacts.

TABLE 2-5 (Cont.)
Vegetation Treatment Methods Standard Operating Procedures and Guidelines

Resource Element	Treatment Method				
	Fire Use	**Mechanical**	**Manual**	**Biological**	**Chemical**
Wild Horses and Burros (cont.)	critical habitat that could adversely affect wild horse or burro populations.				• Remove wild horses and burros from identified treatment areas prior to herbicide application, in accordance with label directions for livestock. • Take into account the different types of application equipment and methods, where possible, to limit the probability of contaminating non-target food and water sources. • Avoid critical periods and minimize impacts to habitat that could adversely affect wild horse or burro populations.
Paleontological and Cultural Resources See handbooks H-8120-1 (*Guidelines for Conducting Tribal Consultation*) and H-8270-1 (*General Procedural Guidance for Paleontological Resource Management*), and manuals 8100 (*The Foundations for Managing Cultural Resources*), 8120 (*Tribal Consultation Under Cultural Resource Authorities*), and 8270 (*Paleontological Resource*	• Follow standard procedures for compliance with Section 106 of the National Historic Preservation Act as implemented through the National Programmatic Agreement and state protocols or 36 CFR Part 800, including necessary consultations with the State Historic Preservation Officers and affected tribes. • Follow BLM Handbook H-8270-1 to determine known Condition 1 and Condition 2 paleontological areas, or collect information through inventory to	• Follow standard procedures for compliance with Section 106 of the National Historic Preservation Act as implemented through the National Programmatic Agreement and state protocols or 36 CFR Part 800, including necessary consultations with the State Historic Preservation Officers and interested tribes. • Follow BLM Handbook H-8270-1 to determine known Condition 1 and Condition 2 paleontological areas, or collect information through inventory to	• Follow standard procedures for compliance with Section 106 of the National Historic Preservation Act as implemented through the National Programmatic Agreement and state protocols or 36 CFR Part 800, including necessary consultations with the State Historic Preservation Officers and interested tribes. • Follow BLM Handbook H-8270-1 to determine known Condition 1 and Condition 2 paleontological areas, or collect information through inventory to	• Follow standard procedures for compliance with Section 106 of the National Historic Preservation Act as implemented through the National Programmatic Agreement and state protocols or 36 CFR Part 800, including necessary consultations with the State Historic Preservation Officers and interested tribes. • Follow BLM Handbook H-8270-1 to determine known Condition 1 and Condition 2 paleontological areas, or collect information through inventory to	• Follow standard procedures for compliance with Section 106 of the National Historic Preservation Act as implemented through the National Programmatic Agreement and state protocols or 36 CFR Part 800, including necessary consultations with the State Historic Preservation Officers and interested tribes. • Follow BLM Handbook H-8270-1 to determine known Condition 1 and Condition 2 paleontological areas, or collect information through inventory to

TABLE 2-5 (Cont.)
Vegetation Treatment Methods Standard Operating Procedures and Guidelines

Resource Element	Treatment Method				
	Fire Use	**Mechanical**	**Manual**	**Biological**	**Chemical**
Management). See also: *Programmatic Agreement among the Bureau of Land Management, the Advisory Council on Historic Preservation, and the National Conference of State Historic Preservation Officers Regarding the Manner in Which BLM Will Meet Its Responsibilities Under the National Historic Preservation Act (1997).*	establish Condition 1 and Condition 2 areas, determine resource types at risk from the proposed treatment, and develop appropriate measures to minimize or mitigate adverse impacts. • Identify cultural resource types at risk from fire use and design inventories that are sufficient to locate these resources. Provide measures to minimize impacts. • Identify opportunities to meet tribal cultural use plant objectives for projects on public lands. • Monitor significant paleontological and cultural resources for potential looting of materials where they have been exposed by fire.	establish Condition 1 and Condition 2 areas, determine resource types at risk from the proposed treatment, and develop appropriate measures to minimize or mitigate adverse impacts. • Identify cultural resource types at risk from mechanical treatments and design inventories that are sufficient to locate these resources. Provide measures to minimize impacts. • Identify opportunities to meet tribal cultural use plant objectives for projects on public lands. • Consult with tribes to locate any areas of vegetation that are of significance to the tribe and that might be affected, adversely or beneficially, by mechanical treatments.	establish Condition 1 and Condition 2 areas, determine resource types at risk from the proposed treatment, and develop appropriate measures to minimize or mitigate adverse impacts. • Identify cultural resource types at risk from manual treatments and design inventories that are sufficient to locate these resources. Provide measures to minimize impacts. • Identify opportunities to meet tribal cultural use plant objectives for projects on public lands. • Consult with tribes to locate any areas of vegetation that are of significance to the tribe and that might be affected, adversely or beneficially, by manual treatments.	establish Condition 1 and Condition 2 areas, determine resource types at risk from the proposed treatment, and develop appropriate measures to minimize or mitigate adverse impacts. • Identify opportunities to meet tribal cultural use plant objectives for projects on public lands. • Consult with tribes to locate any areas of vegetation that are of significance to the tribe and that might be affected, adversely or beneficially, by biological treatments.	establish Condition 1 and Condition 2 areas, determine resource types at risk from the proposed treatment, and develop appropriate measures to minimize or mitigate adverse impacts. • Identify opportunities to meet tribal cultural use plant objectives for projects on public lands. • Consult with tribes to locate any areas of vegetation that are of significance to the tribe and that might be affected, adversely or beneficially, by herbicide treatments.
Visual Resources See handbooks H-8410-1 (*Visual Resource Inventory*) and H-8431-1 (*Visual Resource Contrast Rating*), and Manual 8400 (*Visual Resource Management*).	• Minimize use of fire in sensitive watersheds to reduce the creation of large areas of browned vegetation. • Consider the surrounding land use before assigning fire as a treatment method. • At areas such as visual overlooks, leave sufficient vegetation in place, where possible, to	• Minimize dust drift, especially near recreational or other public use areas. • Minimize loss of desirable vegetation near high public use areas. • At areas such as visual overlooks, leave sufficient vegetation in place, where possible, to screen views of vegetation treatments.	• Minimize dust drift, especially near recreational or other public use areas. • Minimize loss of desirable vegetation near high public use areas. • At areas such as visual overlooks, leave sufficient vegetation in place, where possible, to screen views of vegetation treatments.	• At areas such as visual overlooks, leave sufficient vegetation in place, where possible, to screen views of vegetation treatments. • Lessen visual effects in Class I and Class II visual resource areas. • Design activities to repeat the form, line, color, and texture of the natural landscape character	• At areas such as visual overlooks, leave sufficient vegetation in place, where possible, to screen views of vegetation treatments. • Minimize use of broadcast foliar applications in sensitive watersheds to avoid creating large areas of browned vegetation. • Consider the surrounding

TABLE 2-5 (Cont.)
Vegetation Treatment Methods Standard Operating Procedures and Guidelines

Resource Element	Treatment Method				
	Fire Use	**Mechanical**	**Manual**	**Biological**	**Chemical**
Visual Resources (cont.)	screen views of vegetation treatments. • Avoid use of fire near agricultural or densely populated areas, where feasible. • Lessen visual effects in Class I and Class II visual resource areas. • Design activities to repeat the form, line, color, texture of the natural landscape conditions to meet established Visual Resource Management (VRM) objectives.	• Minimize earthwork and locate away from prominent topographic features. • Revegetate treated sites. • Lessen visual effects in Class I and Class II visual resource areas. • Design activities to repeat the form, line, color, and texture of the natural landscape character conditions to meet established VRM objectives.	• Lessen visual effects in Class I and Class II visual resource areas. • Design activities to repeat the form, line, color, and texture of the natural landscape character conditions to meet established VRM objectives.	conditions to meet established VRM objectives.	land use before assigning aerial spraying as an application method. • Avoid aerial spraying near agricultural or densely populated areas, where feasible. • Minimize off-site drift and mobility of herbicides (e.g., do not treat when winds exceed 10 mph; avoid treating areas where herbicide runoff is likely; establish appropriate buffer widths between treatment areas and residences). • Lessen visual effects in Class I and Class II visual resource areas. • When restoring treated areas, design activities to repeat the form, line, color, and texture of the natural landscape character conditions to meet established VRM objectives.
Wilderness and Other Special Areas See handbooks H-8550-1 (*Management of Wilderness Study Areas (WSAs)*), and H-8560-1 (*Management of Designated Wilderness Study Areas*), and Manual	• Minimize soil-disturbing activities during fire control or prescribed fire activities. • Revegetate sites with native species if there is no reasonable expectation of natural regeneration. • Maintain adequate buffers for Wild and Scenic Rivers.	• Use the least intrusive methods possible to achieve objectives, and use non-motorized equipment in wilderness and off existing routes in wilderness study areas, and where possible in other areas. • If mechanized equipment is required, use the minimum amount of equipment needed.	• Use the least intrusive methods possible to achieve objectives, and use non-motorized equipment in wilderness and off existing routes in wilderness study areas, and where possible in other areas. • Revegetate sites with native species if there is no reasonable expectation of natural regeneration.	• Use the least intrusive methods possible to achieve objectives, and use non-motorized equipment in wilderness and off existing routes in wilderness study areas, and where possible in other areas. • Maintain adequate buffers for Wild and Scenic Rivers.	• Revegetate disturbed sites with native species if there is no reasonable expectation of natural regeneration. • Use chemicals only when they are the minimum method necessary to control weeds that are spreading within the wilderness or threaten lands adjacent to the wilderness.

TABLE 2-5 (Cont.)
Vegetation Treatment Methods Standard Operating Procedures and Guidelines

Resource Element	Treatment Method				
	Fire Use	**Mechanical**	**Manual**	**Biological**	**Chemical**
8351 (*Wild and Scenic Rivers*).		• Time the work for weekdays or off-season. • Require shut down of work before evening if work is located near campsites. • If aircraft are used, plan flight paths to minimize impacts on visitors and wildlife. • Revegetate sites with native species if there is no reasonable expectation of natural regeneration. • Maintain adequate buffers for Wild and Scenic Rivers.	• Maintain adequate buffers for Wild and Scenic Rivers.		• Give preference to herbicides that have the least effect on non-target species and the wilderness environment. • Implement herbicide treatments during periods of low human use, where feasible. • Maintain adequate buffers for Wild and Scenic Rivers.
Recreation See Handbook H-1601-1 (*Land Use Planning Handbook*).	• Control public access to potential burn areas. • Schedule treatments to avoid peak recreational use times, unless treatments must be timed during peak times to maximize effectiveness. • Notify the public of treatment methods, hazards, times, and nearby alternative recreation areas.	• Control public access until potential treatment hazards no longer exist. • Schedule treatments to avoid peak recreational use times, unless treatments must be timed during peak times to maximize effectiveness. • Notify the public of treatment methods, hazards, times, and nearby alternative recreation areas.	• Control public access until potential treatment hazards no longer exist. • Schedule treatments to avoid peak recreational use times, unless treatments must be timed during peak times to maximize effectiveness. • Notify the public of treatment methods, hazards, times, and nearby alternative recreation areas.	• Control public access in areas with control agents to ensure that agents are effective. • Schedule treatments to avoid peak recreational use times, unless treatments must be timed during peak times to maximize effectiveness. • Notify the public of treatment methods, hazards, times, and nearby alternative recreation areas.	• Adhere to entry restrictions identified on the herbicide label for public and worker access. • Post signs noting exclusion areas and their duration. • Schedule treatments to avoid peak recreational use times, unless treatments must be timed during peak times to maximize effectiveness. • Notify the public of treatment methods, hazards, times, and nearby alternative recreation areas.
Social and Economic Values	• Post treatment areas. • Notify adjacent landowners, grazing permittees, the public, and emergency personnel of treatments.	• Post treatment areas. • Notify adjacent landowners, grazing permittees, the public, and emergency personnel of treatments.	• Post treatment areas. • Notify adjacent landowners, grazing permittees, the public, and emergency personnel of treatments.	• Post treatment areas. • Notify adjacent landowners, grazing permittees, the public, and emergency personnel of treatments.	• Observe restricted entry intervals given on herbicide labels. • Post treated areas and specify reentry or rest times, if appropriate.

TABLE 2-5 (Cont.)
Vegetation Treatment Methods Standard Operating Procedures and Guidelines

Resource Element	Treatment Method				
	Fire Use	**Mechanical**	**Manual**	**Biological**	**Chemical**
Social and Economic Values (cont.)	• Control public access to treatment areas. • Consult with Native American tribes and Alaska Natives whose health and economies might be affected by the project. • To the extent feasible, hire local contractors and purchase supplies locally.	• Control public access to treatment areas. • Consult with Native American tribes and Alaska Natives whose health and economies might be affected by the project. • To the extent feasible, hire local contractors and purchase supplies locally.	• Control public access to treatment areas. • Consult with Native American tribes and Alaska Natives whose health and economies might be affected by the project. • To the extent feasible, hire local contractors and purchase supplies locally.	• Control public access to treatment areas. • Consult with Native American tribes and Alaska Natives whose health and economies might be affected by the project. • To the extent feasible, hire local contractors and purchase supplies locally.	• Notify adjacent landowners, grazing permittees, the public, and emergency personnel of treatments. • Control public access until potential treatment hazards no longer exist. • Consult with Native American tribes and Alaska Natives whose health and economies might be affected by the project. • To the degree possible within the law, hire local contractors and purchase supplies locally.
Rights-of-way	• Coordinate vegetation management activities where joint or multiple use of a ROW exists. • Notify other public land users within or adjacent to the ROW proposed for treatment. • Manage burns under powerlines so as to avoid negative impacts to the powerline.	• Coordinate vegetation management activities where joint or multiple use of a ROW exists. • Notify other public land users within or adjacent to the ROW proposed for treatment. • Apply appropriate safety measures when operating equipment within utility ROW corridors. • Minimize exposed soil areas during treatment. • Keep operations within prescribed ROW.	• Coordinate vegetation management activities where joint or multiple use of a ROW exists. • Notify other public land users within or adjacent to the ROW proposed for treatment. • Always use appropriate safety equipment and operating procedures. • Utilize methods for disposal of vegetation that prevent spreading or reinfestation of unwanted vegetation.	• Coordinate vegetation management activities where joint or multiple use of a ROW exists. • Notify other public land users within or adjacent to the ROW proposed for treatment.	• Coordinate vegetation management activities where joint or multiple use of a ROW exists. • Notify other public land users within or adjacent to the ROW proposed for treatment. • Use only herbicides that are approved for use in ROW areas. • Take precautions to minimize drift by not applying herbicides when winds exceed > 10 mph (6 mph for aerial applications) or a serious rainfall event is imminent. • Use drift control agents and low volatile formulations.

TABLE 2-5 (Cont.)
Vegetation Treatment Methods Standard Operating Procedures and Guidelines

Resource Element	Treatment Method				
	Fire Use	**Mechanical**	**Manual**	**Biological**	**Chemical**
Human Health and Safety	• Use some form of pretreatment, such as mechanical or manual treatment, in areas where fire cannot be safely introduced because of hazardous fuel buildup. • Wear appropriate safety equipment and clothing, and use equipment that is properly maintained. • Notify nearby residents who could be affected by smoke. • Maintain adequate safety buffers between treatment area and residences/structures. • Burn vegetation debris off ROWs to ensure that smoke does not provide a conductive path from the transmission line or electrical equipment to the ground.	• Wear appropriate safety equipment and clothing, and use equipment that is properly maintained. • Cut all brush and tree stumps flat, where possible, to eliminate sharp points that could injure a worker or the public. • Ensure that only qualified personnel cut trees near powerlines.	• Wear appropriate safety equipment and clothing, and use equipment that is properly maintained. • Cut all brush and tree stumps flat, where possible, to eliminate sharp points that could injure a worker or the public.	• Wear appropriate safety equipment and clothing, and use equipment that is properly maintained.	• Use protective equipment as directed by the herbicide label. • Maintain adequate buffer widths between treatment area and residences, municipal water supplies, and recreation areas. • Post treated areas with appropriate signs at common public access areas. • Provide public notification in newspapers or other media where the potential exists for public exposure. • Have a copy of Material Safety Data Sheets at work sites. • Notify local emergency personnel of proposed treatments. • Contain and clean up spills and request help as needed. • Secure containers during transport.

are detailed in BLM Manual 8120 (*Tribal Consultation Under Cultural Resource Authorities)* and Handbook H-8120-1 (*Guidelines for Conducting Tribal Consultation).* The BLM consulted with Native American tribes and Alaska Native groups during development of the PEIS. Information gathered on important tribal resources and potential impacts to these resources from herbicide treatments is presented in the analysis of impacts.

When conducting vegetation treatments, field office personnel consult with relevant parties (including tribes, native groups, and SHPOs), assess the potential of the proposed treatment to affect cultural and subsistence resources, and devise inventory and protection strategies suitable to the types of resources present and the potential impacts to them.

Herbicide treatments, for example, are unlikely to affect buried cultural resources, but might have a negative effect on traditional cultural properties comprised of plant foods or materials significant to local tribes and native groups. These treatments require inventory and protection strategies that reflect the different potential of each treatment to affect various types of cultural resources.

Impacts to significant cultural resources are avoided through project redesign or are mitigated through data recovery, recordation, monitoring, or other appropriate measures. When cultural resources are discovered during vegetation treatment, appropriate actions are taken to protect these resources.

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 CFR 1610.4-9 require that land use plans establish intervals and standards for monitoring and evaluation 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, and 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 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 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 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.

PUPs 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? (USDA Forest Service 2005).

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 or 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 use 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.

BLM 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 (USDI BLM 2002a). 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 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 Rangeland, Inventory, 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 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://www.firescience.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 at: http://www.blm.gov/nifc/st/en/prog/fire/snapshots/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 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.

BLM 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.

Coordination and Education

As demonstrated at public scoping meetings for the PEIS, the public is deeply interested in BLM vegetation treatment activities, especially individuals that live in close proximity to public lands, have commercial operations dependant on vegetation on or adjacent to public lands, or use public lands for recreation. The BLM strives to keep the public informed about its vegetation treatment activities through regular coordination and communication. The BLM also encourages the public to participate in the environmental review process during the development and analysis of local vegetation management programs.

Several laws and Executive Orders set forth public involvement requirements, including involving the public in the environmental analysis, land use planning, and implementation decision-making processes to address local, regional, and national interests (USDI BLM 2000f).

The BLM is ultimately responsible for land use plan decisions, including decisions about vegetation management, on public lands. The BLM has found, however, that collaborative relationships with stakeholders, including individuals, communities, and governments, improves communication, provides a

greater understanding of different perspectives, and helps to find solutions to issues and problems. Input from the public and government agencies has been critical during development of the PEIS and PER.

The NEPA process ensures that the public is allowed input into vegetation management actions on public lands. For treatment projects requiring an EA or EIS, the BLM must notify the public of the proposed project and give the public the opportunity to comment on the site-specific analysis done for the project. Treatment actions may be modified in response to comments posed by the public. The public may also be invited to observe treatment activities and participate in project monitoring.

Public lands are often commingled with private lands, or lands under the jurisdiction of tribal, state, or local governments or other federal agencies. Multijurisdictional planning assists land use planning efforts when there is a mix of land ownership and government authorities, and there are opportunities to develop complementary decisions across jurisdictional boundaries.

Examples of these types of planning efforts include development of weed treatment programs involving the BLM and nearby private landowners, or coordination with parties who hold land use authorizations including ROW, leases, permits, or easements. Many BLM weed coordinators hold classes for public land users to make them aware of the problem and to solicit their help in reporting new weed infestations.

Because vegetation treatments have a direct effect on the productivity and use of grazing allotments, coordination and consultation with the grazing permittee(s), and any other interested parties affected by a vegetation treatment, would be necessary.

It is critical that the BLM notify potentially affected parties of treatment activities that occur on public lands. This can be done through a letter, phone call, meeting, newsletter, newspaper article, or other medium to ensure that potentially affected parties can comment on the proposed action and take any steps needed to protect life and property from proposed actions.

Prior to herbicide treatments, the BLM posts entry points onto public lands where the herbicide application will take place. Information provided in the posting includes herbicide product applied; active ingredients; USEPA registration number; application date; period of time which must elapse before a person without protective clothing may enter a treatment site; and other warnings or information required to ensure the safety of the public.

The BLM enjoys wide participation in various national, state, and local prevention and education efforts pertaining to noxious and invasive species and hazardous fuels management. The BLM participates in state FireWise programs, state Fire Safe Councils, the National Wildfire Coordinating Group Wildland Fire Education Working Team, and the National Wildland Fire Prevention and Education Team. Local education efforts such as Project: FIRE bring BLM natural resource professionals to schools to educate students about fire prevention and safety. Noxious weed and invasive species education programs span the K-12 grades and are led by many local BLM field office ecologists and natural resource professionals. The BLM also participates in Project Learning Tree. Project Learning Tree, one of the most widely-used environmental education programs in the country, provides education curricula for fire and invasive species education.