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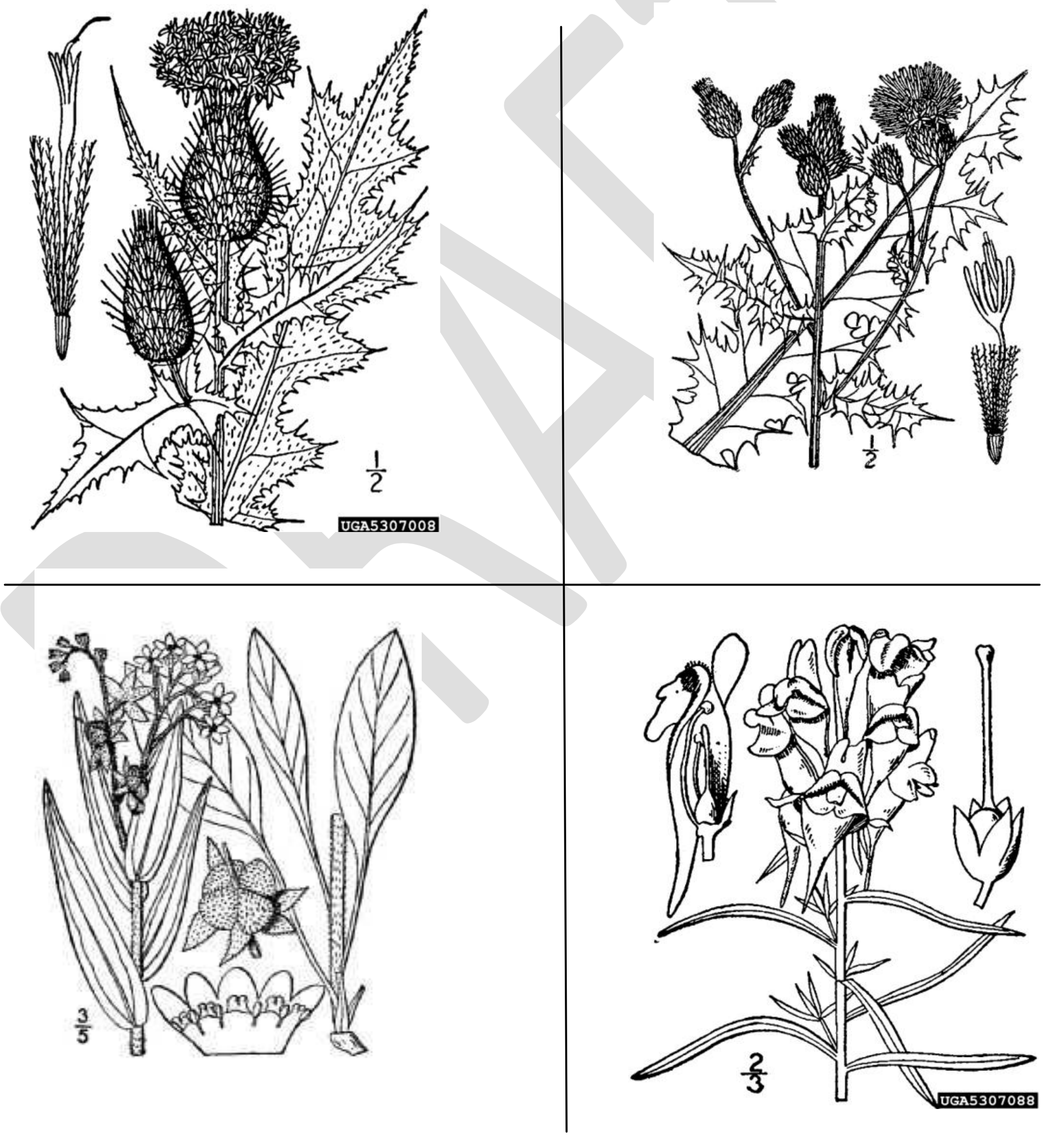
Invasive Species Action Plan
Volume I: Integrated Weed Management Plan and Programmatic Environmental Assessment
CO-800-2008-075 EA



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LIST OF ACRONYMS

ACEC – Areas of Critical Environmental Concern
AMP – Allotment Management Plan
APHIS – Animal Plant Health Inspection Service
ATV – All-Terrain Vehicle
BA – Biological Assessment
BCC- Birds of Conservation Concern
BCR – Bird Conservation Region
BLM – Bureau of Land Management
BMPs – Best Management Practice
BO – Biological Opinion
CANM – Canyons of the Ancients National Monument
CDOW – Colorado Division of Wildlife
CDPHE – Colorado Department of Public Health and Environment
CEQ – Council on Environmental Quality
CFR – Code of Federal Regulations
CNHP – Colorado Natural Heritage Program
DEIS – Draft Environmental Impact Statement
DLMP – Draft Land Management Plan
DNA – Documentation of NEPA Adequacy
EA – Environmental Assessment
EO – Executive Order
EPA – Environmental Protection Agency
EPCA – Energy Policy and Conservation Act
ESA – Endangered Species Act of 1973
ESI – Ecological Site Inventory
FEIS – Final Environmental Impact Statement
FLPMA – Federal Land Policy and Management Act of1976
FO – Field Office
FONSI – Finding of No Significant Impact
FR – Federal Register
GIS – Geographic Information System
HMA – Herd Management Area (Wild Horses)
IM – Instruction Memorandum
IWM – Integrated Weed Management
LAU – Lynx Analysis Unit
LCAS – Lynx Conservation Assessment and Strategy
LMP – Land Management Plan
MSO – Mexican Spotted Owl
NAAQS – National Ambient Air Quality Standard
NEPA – National Environment Policy Act
NHPA – National Historic Preservation Act of 1966
NPS – National Park Service
OHV – Off-highway Vehicle
ORV – Outstandingly Remarkable Values (for Wild and Scenic Rivers evaluation)
PEIS – Programmatic Environmental Impact Statement
PER – Programmatic Environmental Report
PFC – Proper Function Condition
PM – Particulate Matter
PSD – Prevention of Significant Deterioration
RMP – Resource Management Plan
RMZ – Recreation Management Zone
RNA – Research Natural Area
ROD – Record of Decision
ROW – Right-of-Way
SHPO – State Office of Historic Preservation
SJPL – San Juan Public Lands
SJPLC – San Juan Public Lands Center
SJNF – San Juan National Forest
SOPs – Standard Operating Procedures
SWWF – Southwestern Willow Flycatcher
T&E – Threatened and Endangered (species)
TES – Threatened, Endangered, or Sensitive (species)
TNC – The Nature Conservancy
UFB – Uncompahgre Fritillary Butterfly
USDA – U.S. Department of Agriculture
USDI – U.S. Department of Interior
USDOI – also U.S. Department of Interior
USFS – U.S. Forest Service
USGS – U.S. Geological Survey
USFWS – U.S. Fish and Wildlife Service
VRM – Visual Resource Management
WRAP – Western Regional Air Partnership
WSA – Wilderness Study Area
WSR – Wild and Scenic River
WSRA – Wild and Scenic Rivers Act of 1968
WUI – Wildland-Urban Interface

1 Chapter One: Purpose and Need for the Action

1.1 Introduction

Noxious weeds and other invasive vegetation are aggressively competitive and can often out-compete native vegetation, especially on recently disturbed sites. A “noxious weed” is a plant species designated by Federal or State law as generally possessing one or more of the following characteristics: aggressive and difficult to manage; parasitic; a carrier or host of serious insects or disease; or non-native, new, or not common to the United States. “Invasive vegetation,” as defined in Executive Order 13112, is defined as “non-native plants whose introduction does, or is likely to, cause economic or environmental harm or harm to human health.”

Describing the issue of noxious and invasive weeds the Final Programatic EIS (PEIS) Vegetation Treatments Using Herbicides on BLM Lands in 17 Western States Programmatic Environmental Impact Statement (PEIS) (BLM 2007a) summarized that noxious weeds and other invasive vegetation are the dominant vegetation on an estimated 35 million acres of public lands (BLM 2000a). The estimated rate of weed spread on western public lands in 1996 was 2,300 acres per day (BLM 1996). Noxious weeds and other invasive vegetation may compromise the ability to manage public lands in a manner conducive to healthy native ecosystems. Noxious weeds and other invasive vegetation can degrade or reduce soil productivity, water quality and quantity, native plant communities, wildlife habitat, wilderness values, recreational opportunities, and livestock forage, and may be detrimental to the agriculture and commerce of the U.S. and to public health.

This Environmental Assessment (EA) has been prepared to analyze and disclose the environmental consequences of implementing the programmatic Integrated Weed Management (IWM) Plan proposed by the Bureau of Land Management (BLM), San Juan Public Lands Center (SJPLC). The EA tiers to the Vegetation Treatments Using Herbicides on BLM Lands in 17 Western States Programmatic Environmental Impact Statement (PEIS) (BLM 2007a), which analyzed the impacts of using herbicides (chemical control methods) to treat noxious weeds and other invasive weeds on public lands. In addition, this EA incorporates by reference the Vegetation Treatments on BLM Lands in 17 Western States Programmatic Environmental Report (PER) (BLM 2007b), which evaluated the general effects of non-herbicide treatments (i.e., biological, physical, cultural, and prescribed fire) on public lands. The PEIS identifies impacts to the natural and human environment associated with herbicide use and appropriate Best Management Practices (BMPs), Standard Operating Procedures (SOPs), mitigation measures, and conservation measures for avoiding or minimizing adverse impacts. The PER describes the environmental impacts of using non-chemical vegetation treatments on public lands.

1.2 Purpose and Need

The overall goal of the IWM Plan is to improve biological diversity and ecosystem function as well as to help promote and maintain native plant communities that are resilient to disturbance (i.e. wildfire) and invasive species. The SJPLC, through the IWM program (the Proposed Action), would work toward accomplishing these goals by: 1) controlling noxious weeds and other invasive vegetation species using herbicide and non-herbicide treatment methods, and 2) manipulating vegetation to benefit fish and wildlife habitat, riparian and wetlands areas, and overall water quality in priority watersheds. Additional benefits occuring from implementation of the Proposed Action would directly relate to restoration of fish and wildlife habitat and improvement of forest and ecological condition. The Proposed Action would meet BLM and USDI objectives set forth in the *Healthy Forests Restoration Act of 2003*, BLM Handbook H-4180-1 (*Rangeland Health Standards*), and other national, State, and local goals and objectives designed to improve the health of the nation's forests and rangelands.

The proposed IWM Plan for the BLM portion of SJPLC-administered lands [including Canyons of the Ancients National Monument (CANM) is needed to reduce the adverse impacts associated with an increase in noxious and invasive weeds. The proposed IWM Plan also provides a mechanism for evaluating a range of treatment options or combination of options to eradicate or control weed populations. The plan would be implemented in accordance with Federal and State laws, regulations, and policies (Appendix A) and the San Juan Public Lands (SJPL) and CANM land use plans.

The assessment of environmental consequences of the Proposed Action and alternatives (Chapter 3 of this document) is intended to determine whether any "significant" adverse impacts could result from its implementation. NEPA defines "significance" as including both the "context" and "intensity" of an impact (40 CFR 1508.27). If significant adverse impacts are anticipated based on the EA, an EIS would be required to analyze the impacts further. If no significant adverse impacts are anticipated, a Decision Record and Finding of No Significant Impact (FONSI) would be prepared to document a determination that no significant adverse impacts would result, beyond those already analyzed and disclosed in the SJPL and CANM land use plans and the PEIS to which this EA is tiered.

At present, absent an approved programmatic EA at the Field Office level, compliance with NEPA would require the SJPLC prepare a project-specific EA for every new weed treatment activity and location. The Proposed Action would streamline the process for NEPA compliance by allowing the SJPLC to prepare a Documentation of NEPA Adequacy (DNA) tied to the programmatic EA when considering future weed treatment work plans. The DNA process would ensure and document that impacts of weed treatment activities and locations were fully analyzed and disclosed in the programmatic EA, that conditions relevant to the selection and implementation of treatment methods are essentially unchanged from the EA, that no new information is available that would affect SJPLC's selection and implementation of treatments, and that the process conforms to current land use plans.

An Environmental Assessment (EA No. CO-038-95-029) titled *Integrated Weed Management in the Montrose District, San Juan Resource Area,* was completed and signed in February 1995. The treatment of weeds is currently being managed under guidance from this EA, which is considered the No Action Alternative (current management).

1.3 Background

Infestations of noxious and invasive weeds have increased rapidly on public lands across the western United States due to oil and gas development, livestock grazing, off-highway vehicle (OHV) use, wildlife use, and other types of ground-disturbing activities. Noxious weeds are listed by the State of Colorado because they constitute a threat to the "continuous economic and environmental value of lands of the state" (CDA 2003). In 2004, Colorado amended the Noxious Weed Act to list species in three categories: A, B, and C. "A" weeds are rare to the State, and are subject to immediate eradication wherever detected. "B" weeds have discreet statewide distributions, and are subject to eradication, containment, or suppression. "C" noxious weeds are already widespread and well established; therefore, control of these weeds is recommended, but not required by the State (For more details and reference materials on the Colorado Noxious Weed Lists, please visit the Colorado Department of Agriculture's website at: http://www.colorado.gov/cs/Satellite/Agriculture-Main/CDAG/1174084048733). Noxious weeds known to occur in the SJPL area are noted in Table 1.1 State-listed Noxious Weeds Known to occur in the SJPL Area, along with their corresponding areas of occurrence. Priority weed species and potential invaders not yet present are noted in the table as Species of Management Concern deserving of extra management attention.

In some parts of SJPLC-administered BLM lands, recent downward trends within native plant communities can be attributed to increases in noxious and invasive plant populations. The result has reduced quality and quantity of habitat and forage for wildlife and livestock, altered soil productivity, increased potential for soil erosion and adverse impacts on water quality, and resulted in a loss of riparian area function. By evaluating the impacts of weed treatment methods individually or in combination, long-term weed control strategies can be devised to meet different management objectives in different situations.

Currently, the SJPLC is continuing to inventory noxious weed populations through local project work, project monitoring, cooperators, and dedicated inventory crews. At this time there are approximatel 9236 acres of noxious and invasive plants documented on BLM lands administered by the SJPLC. Inventory, while focused on existing species of concern i.e. priority Class A&B noxious weed species, is also focused on potential invaders in surrounding States such as dyers woad, and Camelthorn (Utah), medusahead (NV), and African rue (N.M.), to name a few species.

Treatment is focused on priority species of concern located within riparian areas, roads, trails and other priority spread vectors. Treatment is comprised of both chemical and biological methods. In FY09 1,201 acres of noxious weeds were treated on BLM lands administered by SJPLC. Treatment is conducted by force account crews, contractors, leasees, and County cooperators.

At least 50% of treatments are monitored annually. All data collected – inventory, monitoring and treatment information, is contained in a geo database and can be displayed spatially or in tabular formats. This allows other resource areas to efficiently incorporate noxious weed data in their project planning and implementation.

Table 1.1 State-listed Noxious Weeds Known to occur in the SJPL Area

Species	Category	Habitat and general distribution characteristics	Species of Management Concern
Absinth Wormwood	**List B**	Invades open and disturbed sites such as pastures, rangelands, crop land, stream banks, prairies and old fields	**X**
Black Henbane	**List B**	Commonly found in pastures, fence rows, roadsides, waste places, and riparian areas. It does well in most soils, and will grow in a variety of environmental conditions.	**X**
Bull Thistle	**List B**	Grows in dry to moist habitats. It thrives on nitrogen-rich soils, and it grows on gravelly to clay-textured soils. Bull thistle cannot withstand deep shade, and is nearly absent if light is reduced to less than 40% of full sunlight. Potential habitats include pastures, overgrazed rangeland, roadsides, and logged areas.	
Canada Thistle	**List B**	Common found along roadsides, fields, pastures, meadows, and other disturbed areas statewide in Colorado. In Colorado, Canada thistle is typically found from 4,000-9,500 feet.	
Chicory	**List C**	Widespread and common within the state	
Chinese Clematis	**List B**	Prefer roadsides, riparian corridors and rocky slopes. It is sometimes found in open woods.	
Common Burdock	**List C**	Widespread and common within the state	
Common Mullein	**List C**	Widespread and common within the state	
Dalmatian Toadflax	**List B**	Disturbed open sites, fields, pastures, rangeland, roadsides, cropland and forest clearings. Infestations can begin in small disturbed sites, then spread even to rangeland and wildlife habitats in excellent condition.	**X**
Dames Rocket	**List B**	Gardens, partly shaded woodlands, ditches, roadsides, pastures, rangelands, thickets, open woods, disturbed sites, and other areas that have moist well drained soils and full sun to light shade.	**X**
Diffuse Knapweed	**List B**	Tends to invade disturbed, overgrazed areas. Other habitats may also include rangeland, roadsides, riparian areas, and trails.	**X**
Downy Brome	**List C**	Widespread and common within the state	
Field Bindweed	**List C**	Widespread and common within the state	
Halogeton	**List C**	Widespread and common within the state	

Species	Category	Habitat and general distribution characteristics	Species of Management Concern
Hoary Cress	**List B**	Typically found on generally open, unshaded, disturbed ground. Hoary cress grows well on alkaline soils that are wet in late spring and generally does better in areas with moderate amounts of rainfall. It is widespread in fields, waste places, meadows, pastures, croplands, and along roadsides	
Houndstongue	**List B**	Grows on rangeland, pastures, abandoned cropland, roadsides, and waste places . Houndstongue is found on rangeland, pastures, and roadsides throughout Colorado up to about 9000 feet.	
Jointed Goatgrass	**List C**	Very serious weed in winter wheat and other cereal crops. Jointed goatgrass also infests rangeland surrounding wheat growing areas and land in the Conservation Reserve Program throughout the western United States.	
Leafy Spurge	**List B**	Leafy spurge occurs most commonly on untilled, non-crop areas such as rangeland, pastureland, woodland, prairies, roadsides, stream and ditches, and waste sites. It grows on all kinds of soils, but is most abundant in coarse-textured soils and least abundant on clayey soils	**X**
Mediterranean Sage	**List A**	Invades disturbed pasture, rangeland, meadows, riparian areas, along roadsides, and other open areas. It prefers well-drained soils and dry conditions. In the western states, Mediterranean sage grows in sagebrush steppe and ponderosa pine zones.	**X**
Musk Thistle	**List B**	A highly competitive weed which invades disturbed areas, pasture, rangeland, forest land, cropland, and waste areas throughout most of the United States. Musk thistle spreads rapidly and forms extensive stands, which force out desirable vegetation	
Myrtle Spurge	**List A**	Prefers dry to moist, well-drained soils, in areas that receive partial shade to full sun. It is mainly an escaped ornamental that inhabits disturbed areas and waste places.	**X**
Oxeye Daisy	**List B**	Usually found at higher elevations in meadows, along roadsides, and in waste places. In many places this plant escaped from gardens and established in meadows, around mines and ghost towns in the mountains	
Perennial Pepperweed	**List B**	Most often found in open, unshaded areas on disturbed, and often saline soils.locally common in riparian areas, marshy floodplains, valley bottoms, and seasonally wet areas from 5,500 to 9,000 feet.	**X**

Species	Category	Habitat and general distribution characteristics	Species of Management Concern
Perennial Sowthistle	**List C**	Widespread and common within the state	
Plumeless Thistle	**List B**	Locally abundant in pastures, stream valleys, fields, and along roadsides. Distribution in Colorado: Plumeless thistle is frequently found in Colorado and has the potential of becoming a widespread noxious weed.	
Poison Hemlock	**List C**	Widespread and common within the state.	
Redstem Filaree	**List B**	Dry pasturelands, landscapes, turfgrass and it prefers sandy soils. It can easily outcompete desirable vegetation once established.	
Russian Knapweed	**List B**	Commonly be found along roadsides, riverbanks, irrigation ditches, pastures, waste places, clearcuts, and croplands, especially in areas of high water tables.	**X**
Russian-olive	**List B**	Invades both upland and riparian communities. Creates monotypic stands which replaces native vegetation, altering structure nutrient cycling, and system hydrology. Can grow in a variety of soil and moisture conditions, but prefers open, moist riparian zones.	**X**
Salt-cedar (Tamarisk)	**List B**	Found along floodplains, riverbanks, streambanks, marshes, and irrigation ditches.	**X**
Scotch Thistle	**List B**	Invades rangeland, overgrazed pastures, roadsides, and irrigation ditches. It also prefers high-moist soil areas adjacent to creeks and rivers.	**X**
Spotted Knapweed	**List B**	Highly competitive weed that invades disturbed areas and degrades desirable plant communities. It forms near monocultures in some areas of western North America. Adapted to well-drained, light to coarse-textured soils that receive summer rainfall.	**X**
Yellow Toadflax	**List B**	Highly variable habitat that depends on environmental factors such as shading, grazing, and soil type.	**X**

1.4 Proposed Action

In order to maintain and improve the effectiveness of its vegetation management practices, the SJPLC proposes to treat noxious weeds and other invasive plant species using an IWM approach that combines BLM-approved herbicide and non-herbicide vegetation treatment methods.

The proposed vegetation treatment methods evaluated in this Programmatic EA include:

- *Manual -* Manual treatment of vegetation would involve the use of hand tools and hand-operated power tools in order to cut, clear, and/or prune herbaceous and woody species. Treatments may include cutting undesired plants above the ground level; pulling, grubbing, and/or digging out root systems of undesired plants in order to prevent sprouting and re-growth; cutting at the ground level or removing competing plants around desired species; and/or placing mulch around desired vegetation in order to limit competitive growth.

- *Biological -* Biological treatment of vegetation would involve 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. Biological control would be used in order to reduce the targeted weed population to an acceptable level by stressing target plants and reducing competition with the desired plant species.

- *Chemical -* Chemical treatment of vegetation would include the use of herbicides. Herbicides are chemical agents used to control, suppress, or kill vegetation; or severely interrupt their normal growth processes. Some herbicides are derived from plants. Other herbicides are manufactured synthetically. Herbicides can be categorized as selective or non-selective. Selective herbicides kill only a specific type of plant (such as broad-leaved plants), while non-selective herbicides kill all types of plants. Herbicides can also be classified by their mode of action, and include growth regulators, amino acid inhibitors, grass meristem destroyers, cell membrane destroyers, root and shoot inhibitors, and amino acid derivatives. Typical herbicide treatments 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 would meet or exceed states' label standards. Herbicides can be applied aerially with helicopters or fixed-wing aircraft, or on the ground with vehicles or manual application devices. Manual applications of herbicides are used in small areas, in areas inaccessible by vehicle, and in areas where weeds are scattered. Manual application may be the preferred method when special status plants are known or suspected in all or a portion of a project area. Herbicides may be applied 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 (BLM 2007). A Best Management Practice is proposed that would limit herbicide use within 1,000 feet on either side of the surface water drainage network and extended outward a distance of one-quarter mile from the boundary of recognized municipal watersheds.

- *Cultural -* The use of cultural control methods primarily refers to the prevention of invasive vegetation establishment through the modification or elimination of land use practices by humans that may indirectly cause, or aid in, the spread of noxious weeds. Cultural "treatment" of vegetation would include: 1) prevention, 2) livestock manipulation, 3) wildlife manipulation, 4) soil disturbance activities, and/or 5) public uses.

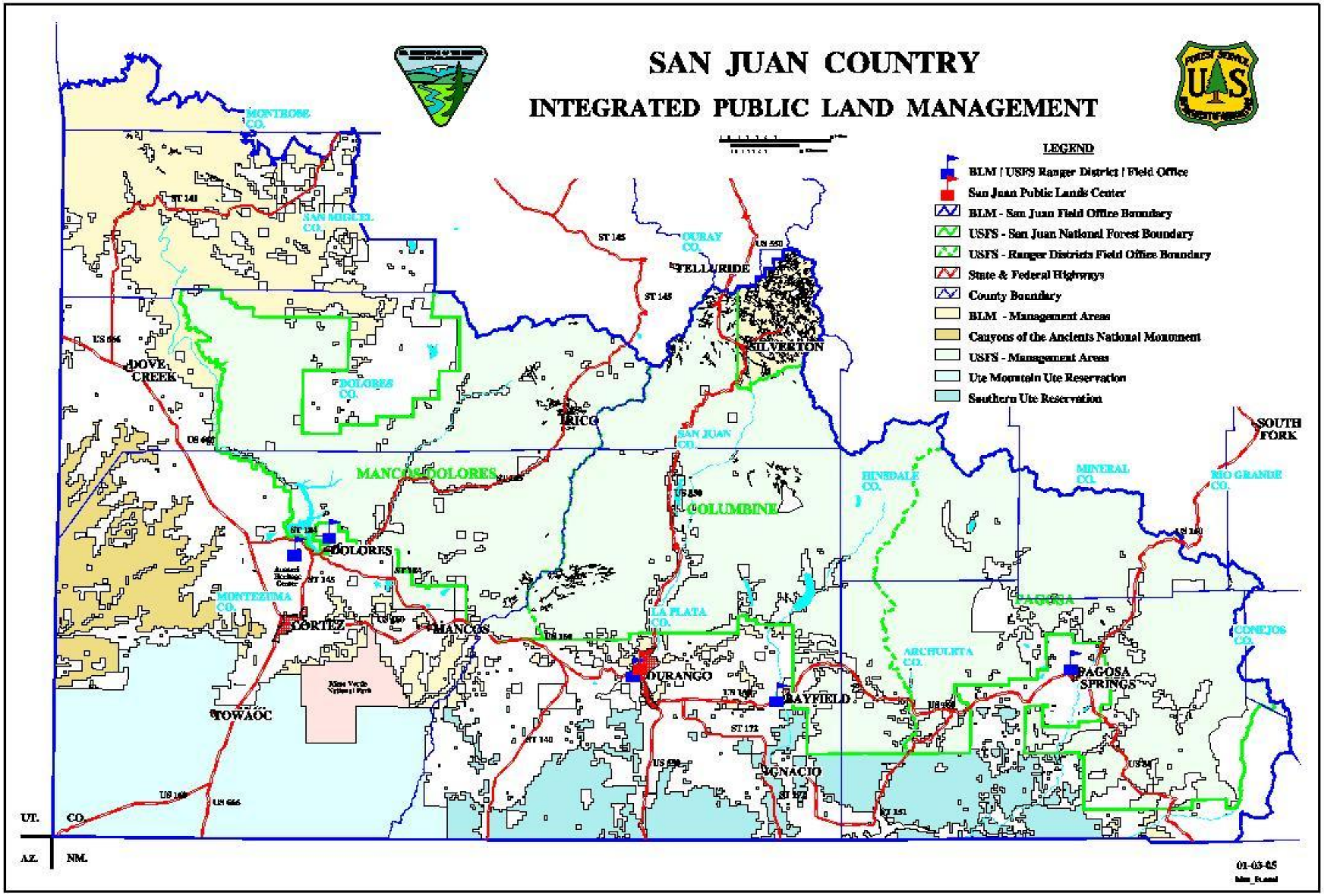
The primary differences between the No Action Alternative (Alternative A) and the Proposed Action (Alternative B) is that the Proposed Action includes potential use of any of the 18 herbicide active ingredients approved in the PEIS (2,4-D, bromacil, chlorsulfuron, clopyralid, dicamba, diflufenzopyr, diquat, diuron, fluridone, glyphosate, hexazinone, imazapic, imazapyr, metsulfuron methyl, picloram, sulfometuron methyl, tebuthiuron, and triclopyr). Four of these—diquat, diflufenzopyr, fluridone, and imazapic—had not previously been approved for use.

In addition, the Proposed Plan includes the option to aerially apply herbicides, expanding the amount of area capable of being treated in a year from 1,000 to 5,000 acres.

1.5 Project Area

The Project area discussed in this EA includes BLM administered lands located in southwestern Colorado managed by the SJPLC and covers approximately 677,500 acres of public lands in Archuleta, Dolores, La Plata, Montezuma, Montrose, San Juan and San Miguel counties (Figure 1.1 Map of Project Area). BLM lands within the Canyons of the Ancients National Monument are included. The western border of the project area is the Utah/Colorado state line. The southern border of the project area is the New Mexico/Colorado state line. The eastern border is the Continental Divide. The northern border is the administrative boundaries of the Rio Grande, Gunnison, Grand Mesa and Uncompahgre National Forests, the BLM Uncompahgre Field Office and the BLM Gunnison Field Office.

Figure 1.1 Map of Project Area



1.6 Conformance with Related Federal and State Laws, Regulations, and Policies

The SJPLC has prepared this IWM Plan in compliance with Department of Interior (DOI) and BLM policy and manual direction, including DOI Manual 517 (*Integrated Pest Management*) and BLM Manual Section 9015 (*Integrated Weed Management*). The EA associated with this plan has been prepared in compliance with NEPA and in accordance with Council on Environmental Quality (CEQ) format requirements. The EA discloses the direct, indirect, and cumulative impacts of the proposed IWM Plan and a reasonable range of alternatives, including no action (continuation of current management), and determines whether significant environmental impacts necessitating an environmental impact statement (EIS) would result from their implementation. For a list of the many Federal laws, statues, regulations, and policies that are associated with this IWM Plan and that guide BLM management activities on public lands, please see Appendix A.

1.7 Land Use Plan Conformance Review

As required by U.S. Department of the Interior regulations (43 CFR 1610.5) and BLM Manual Section 1617, Resource Management Plan Approval, Use, and Modification (BLM 1984b), the Proposed Action and analyzed alternatives are subject to, and in conformance with, current land use plans and amendments.

The BLM portion of San Juan Public Lands is currently being managed under the following land management plan:

- The San Juan/San Miguel Resource Management Plan (BLM 1985): The current Resource Management Plan (RMP) was approved in 1985, and has been amended five times. Seven Wilderness Study Areas (WSAs) were designated in 1980 and are currently being managed under the Interim Management Policy for Lands under Wilderness Review until such time that Congress makes a final wilderness decision (BLM H-8550-1, BLM 1995).

The San Juan/San Miguel RMP (1985) provides management direction for what is now the SJPLC and its four Field Offices: Dolores, Columbine, Pagosa, and Canyons of the Ancients National Monument. It also provides management direction for a portion of the former San Miguel planning area, which is administered by the Uncompahgre Field Office. The San Miguel portion of the RMP will be revised separately by the Uncompahgre Field Office at a later date. The San Juan portion of the RMP is currently being revised by the SJPLC with a Draft Land Management Plan/Draft Environmental Impact Statement (DLMP/DEIS) released in 2007 (USFS, BLM 2007). A separate RMP for Canyons of the Ancients National Monument was approved in June, 2010 (BLM 2010a).

Since being approved, the San Miguel/San Juan RMP has been amended seven times, in:

- 1991, with an amendment related to oil and gas leasing and development;
- 1993, with an amendment related to the San Miguel River ACEC, recreation, riparian, and visual resources (Uncompahgre Field Office);
- 1997, with an amendment related to Colorado Public Land Health Standards;
- 1997, with an amendment related to prescribed fire direction;

- 2000, with an amendment related to the Grandview Ridge (urban interface) Coordinated RMP.
- 2008 by Record of Decision and Resource Management Plan Amendments for Geothermal Leasing in the Western United States December 2008 and
- January 2009 Approved Resource Management Plan Amendments/Record of Decision (ROD) for Designation of Energy Corridors on Bureau of Land Management-Administered Lands in the 11 Western States.

The 1991 Colorado Wilderness Study report made wilderness recommendations for the following wilderness study areas (WSAs) in the San Juan Resource Area: Menefee, Weber, McKenna Peak, and Dolores River; and in the Canyons of the Ancients National Monument: Cahone Canyon, Cross Canyon, and Squaw/Papoose. In total, these WSAs consist of approximately 87,950 acres. Instruction Memorandum (IM) 2003-275 directs that no additional lands will be allocated for management under the non-impairment standard prescribed in the Interim Management guidance.

The RMP revision currently underway in the SJPLC is expected to incorporate the IWM Plan.

1.8 Identification of Issues

The Council on Environmental Quality (CEQ) regulations states: “NEPA documents must concentrate on the issues that are truly significant to the action in question, rather than amassing needless detail” (40 CFR 1500.1(b)). CEQ regulations also state that the scoping process should be used “not only to identify significant environmental issues deserving of study but also to deemphasize insignificant issues narrowing the scope of the EIS process accordingly” (40 CFR 1500.4(g)). Significant issues, which directly influence the initiation, development, and technical design of the proposal, were considered in developing the Proposed Action and the alternatives analyzed in this document.

Issues are considered significant based on (1) the extent of their geographic distribution, (2) the intensity and duration of their effects, or (3) the level of public interest or resource conflict. Non-significant issues are those that are (1) outside the scope of the Proposed Action; (2) already decided by law, regulation, or other higher level decision; (3) unrelated to the decision to be made; or (4) conjectural and not supported by scientific or factual evidence. CEQ regulations at 43 CFR 1501.7 explain this delineation: “…identify and eliminate from detailed study the issues which are not significant or which have been covered by prior environmental review (Sec. 1506.3)….”

The PEIS is used to facilitate the analysis process by providing BLM treatment design features, providing impact assessment data for herbicides, and in overall uniformity of analysis. This EA analysis is based on the PEIS and other applicable FEISs and RODs, including those for land use plans, timber management programs, and grazing management programs. If the analysis finds potential for significant impacts not already described in the PEIS or another existing FEIS, another EIS may be required.

The PEIS (BLM 2007a) identified and analyzed key issues brought up during the scoping process. Those key issues are also applicable to this SJPLC-wide analysis and are incorporated either by tiering or by addressing specific issues of concern on local BLM lands. Public notification through local media was conducted for this analysis. There were no additional issues identified during scoping for this EA. The following resource issues were identified as key for implementation of the IWM Plan on SJPLC-administered BLM lands, based on a determination by the PEIS (to which this EA is tiered) that use of herbicides for weed treatment could result in adverse impacts (BLM 2007a, Record of Decision pages 4-7 to 4-8):

− Terrestrial and aquatic vegetation
− Terrestrial and aquatic wildlife
− Livestock, wild horses, and burros
− Surface water and groundwater quality
− Cultural and paleontological resources
− Visual, wilderness, and recreation resources
− Ranching operations
− Human health and safety

The PEIS concluded that risks to these resources and human uses would be minor, given the use of Best Management Practices (BMP's) and other protections incorporated into the use of herbicides on public lands. The greatest risk of adverse impacts would result from spills of herbicides or their inappropriate application. This EA addresses these resource issues within the context of resources, landscapes, and land uses on BLM lands in the SJPL area and the treatment types and restrictions incorporated into the IWM Plan.

2 Chapter Two: THE PROPOSED ACTION AND ALTERNATIVES

This chapter describes and compares the three alternatives considered for management of noxious and invasive weeds on the BLM lands administered by the SJPLC: Alternative A (No Action or continuation of current management), Alternative B (Proposed Action), and Alternative C (No Herbicides Use). Given current BLM policy, all three alternatives would include implementation of an IWM Plan to guide future weed treatments on BLM lands within the SJPL administrative boundaries. The final plan, however, will be based on the selected alternative.

2.1 Alternatives Considered But Not Analyzed

2.1.1 Prescribed Fire

The use of prescribed fire to control noxious weeds and other invasive vegetation was not considered as part of this Programmatic EA. Many of the invasive plants considered in this proposal would respond positively to burning, thus, prescribed fire may only exacerbate the existing situation. Additionally, the size of the treatment areas proposed is not conducive to successful burning. When situations arise where prescribed fire is an appropriate IWM program option on BLM, a site-specific EA would be completed.

2.1.2 Biological, Cultural, Herbicide, Manual, or Physical Control Alone

As directed by various guidance documents [including USDI Integrated Pest Management Policy; the Federal Insecticide, Fungicide, and Rodenticide Act; and *Partners Against Weeds: An Action Plan for the Bureau of Land Management* (BLM 1996)]; Federal agencies are directed to use an IWM approach in order to manage noxious weeds and other invasive vegetation. Thus, the use of any one technique, exclusively, was not considered in this Programmatic EA.

2.1.3 No Aerial Application of Herbicides

A separate alternative to analyze no aerial application of herbicide was not needed as this describes the current condition which is analyzed under Alternative A- No Action.

2.2 Actions Included in Analyzed Alternatives

Regardless of the alternative selected, the IWM Plan implemented by the SJPLC pursuant to this EA would include the basic components summarized below:

2.2.1 Prevention

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. They are also capable of invading intact communities. Therefore, prevention, early detection, and rapid response are the most cost-effective methods (strategies) of noxious weed control. These strategies would reduce the need for vegetative treatments for noxious weeds, leading to a reduction in the number of acres treated using herbicides in the future (by reducing or preventing weed establishment). Prevention is best accomplished by ensuring the seeds and vegetatively reproductive plant parts of new weed species are not introduced into new areas.

As stated in the BLM's *Partners Against Weeds - An Action Plan for the BLM* (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 non-chemical 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.

The BLM is required to develop a Noxious Weed Risk Assessment when it is determined that an action may introduce or spread noxious weeds (BLM 1992b). If the risk is moderate or high, the BLM may modify the project in order to reduce the likelihood of weeds infesting the site, and to identify proposed control measures if weeds do infest the site.

Under the Proposed Action, in order to prevent the spread of weeds, the SJPLC would take action to minimize the amount of existing non-target vegetation that is disturbed or destroyed during project or vegetation treatment actions. During project planning, the following steps would be taken:

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

During project development, weed infestations would be prioritized for treatment in project operating areas and along access routes. Weeds present on, or near, the site would be identified. A Risk Assessment would be completed, and weeds would be controlled, as necessary. Project staging areas would be weed-free, and travel through weed-infested areas would be avoided or minimized. Examples of prevention actions to be followed during project activities would 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 would be addressed when developing mitigation and prevention plans for activities on BLM lands administered by the SJPLC. These conditions would include excessive disturbance associated with road maintenance, poor grazing management, and high levels of recreational use. Livestock grazing would be managed in a manner designed to maintain the vigor of native perennial plants (especially grasses) in order to reduce the chance of weeds invading rangeland. By carefully managing recreational use, and informing the public on the potential impacts of recreational activities on vegetation, the amount of damage to native vegetation and soil could be minimized at high use areas (such as campgrounds and OHV trails). Early detection in recreation areas would be focused on roads and trails, where much of the weed spread occurs.

The BLM participates in an Early Detection and Rapid Response System for Invasive Plants. 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 by:

- 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 records;
- 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.

On BLM lands administered by the SJPLC, “Weed Wanted” maps may be placed at trailheads as needed. These maps would describe the noxious weeds and other invasive vegetation SJPLC personnel are seeking to detect and eradicate. On an ongoing basis, SJPLC personnel could survey for the weeds listed on the Colorado Noxious Weed List, as well as for BLM species of management concern. The primary method of survey would be ATV/OHV, covering all roads and trials (that can be negotiated), construction and infrastructure improvement sites, energy development sites (including powerlines), ROWs, recreation sites (including campgrounds and other recreation facilities), and timber management and fuels project sites. Special management areas (including WSAs, ACECs/RNAs) that are inaccessible would be inventoried via horseback or hiking.

2.2.2 Education

The goal of this element of the plan is to generate internal and external support for weed control by increasing awareness of noxious and invasive weeds and their impact on native ecosystems. Following BLM’s action plan *Partners Against Weeds* (BLM 1996a), the SJPLC would encourage the participation of employees in training that would include identification of weed species, weed biology, environmental effects, the process for reporting infestations, and employee involvement in reducing the spread of weeds.

To increase the general public’s awareness of noxious and invasive weeds, a variety of outreach efforts would be considered such as assisting county governments and other organizations in the publication and distribution of brochures and other types of educational media such as videotapes, calendars, bumper stickers, posters, and county fair displays.

2.2.3 Coordination and Cooperation

The SJPLC plans to continue and enhance cooperation and coordination with other Federal agencies, State and county/local governments, other organizations, and private landowners in an effort to more effectively manage noxious and invasive weeds. Examples include the following:

- Increase efforts to develop assistance or cooperative agreements with local governments to treat infestations that are located near or across jurisdictional boundaries
- Exchange weed mapping data with other agencies
- Share information on treatment effectiveness
- Participate in periodic coordination meetings with local weed management entities
- Seek opportunities to develop new partnerships

2.2.4 Inventory and Mapping

Information on the presence, location, and distribution of noxious weeds is fundamental to all subsequent management efforts. Funding constraints to date have precluded a complete inventory of BLM lands administered by the SJPLC. Therefore, areas of high human use and high resource value would be selected for inventory priority. These would include, at a minimum:

- Areas proposed for ground-disturbing activities (e.g., oil and gas development, road construction, and range improvements)
- Burned areas
- Areas of Critical Environmental Concern (ACECs)
- Habitat for special status species
- Riparian areas
- Developed recreation sites
- Heavily used roads and trails
- Wildland-Urban Interfaces (WUIs)
- Big game winter range

Once located, noxious weed infestations would be mapped. Mapping a weed infestation provides information about the extent of the infestation, possible modes of spread, potential uninfested areas to be protected and monitored, and the effectiveness of control methods. Over the long term, maps provide historical evidence of the epicenter of an infestation and aid in tracking its spread or decline. Mapping weed locations would use the **Noxious Weeds User Guide; San Juan Public Lands October 16, 2008** (http://fsweb.sanjuan.r2.fs.fed.us/gis/resource_gis.shtml).

2.2.5 Revegetation and/or Temporary Resting from Grazing

Determining the need for revegetation is an integral part of developing an IWM program. The most important component of the process is determining whether active (seeding/planting) or passive (natural recovery) revegetation would be more appropriate. Disturbed areas may be reseeded or planted with desirable vegetation when the native plant community cannot recover and occupy the site sufficiently.

BLM 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, BLM Manual H-1742-1: (*Burned Area Emergency Stabilization and Rehabilitation* Manual, and the *Interagency Burned Area Rehabilitation Guidebook* (USDI and USDA 2006d).

In addition to these handbooks and policy, the 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 in order to stabilize and restore vegetation on disturbed sites, 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 revegetate the site naturally. In order 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 on SJPLC-administered BLM lands would be improved by:

- the selection of seed with high purity and percentage germination;
- the selection of native species or cultivars adapted to the area;
- the planting of vegetation at the proper depth, seeding rate, and time of the year for the region;
- the selection of the appropriate planting method; and
- the removal of competing vegetation, where feasible.

Planting mixtures would be adapted for the treatment area and site uses. A combination of forbs, perennial grasses, and shrubs would be 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) would be selected in order to enhance the value of the site for fish and wildlife, and to improve 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 BLM Native Seed Program was developed in response to Congressional direction to supply native plant material for emergency stabilization and long-term rehabilitation and restoration efforts. The focus of the program is to increase the number of native plant species for which seed is available, as well as the total amount of native seed available for these efforts.

The SJPLC will follow the following Standard Operating Procedures (SOPs) when revegetating sites:

- cultivate previously disturbed sites (in order to reduce the amount of weed seeds in the soil seedbank);
- revegetate sites once work is completed, or soon after a disturbance;
- use native seed of known origin as labeled by Colorado State seed certification programs, when available;
- 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 cheatgrass and other invasive annuals are establishing);
- use clean equipment, free of plants and plant parts, on revegetation projects in order to prevent the inadvertent introduction of weeds into the site;
- include native nectar and pollen producing plants in the seed mixes used in restoration and reclamation projects, where important pollinator resources exist;
- 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;
- avoid grazing by domestic and wild animals on treatment sites until vegetation is well established, where feasible; and
- modify the amount and/or season of grazing in order to promote vegetation recovery within the treatment area, where total rest from grazing is not feasible.

Alterations in permanent or temporary fencing, changes in grazing rotation, and identification of alternative forage sources are also examples of methods that could be used to remove, reduce, or modify grazing impacts during vegetation recovery under the Proposed Action.

2.2.6 Management Objectives and Treatment Selection Process

The "**Invasive Species Action Plan for the San Juan National Forest; San Juan Field Office; Canyons of the Ancients National Monument"** (revised every 3 years**)** provides an action plan for the Prevention and Management of Invasive Species *(current version: http://fsweb.sanjuan.r2.fs.fed.us/invaspecies.shtml).*

Management objectives for noxious weed infestations would be established and treatment priorities assigned based on the weed species and the size, density, and location of the infestation. Management objectives would include:

- Eradication: Eliminate the weed species, including seeds and fruits.
- Containment: Prevent the weed species from spreading beyond the current infestation perimeter.
- Control or Suppression: Reduce the extent and density of the weed species.
- Restoration of native plant communities and habitat using native species that are adapted to the project site (in order to allow them to better complete with invasive vegetation).

The selection of a management objective is guided by the requirements of the *Colorado Noxious Weed Act*. As described previously, this Act places Colorado noxious weed species into three categories: List A species are designated for statewide eradication, List B species are managed for containment, and List C species are not designated for control because they are widespread. However, counties typically have their own management objectives for weed species. At a minimum, the SJPLC would comply with both State and county management objectives but may establish stricter objectives for eradication or containment in situations where small infestations of a species occurred. Once a management objective is established for a given infestation, its treatment is prioritized in relation to other infestations. Prioritization is necessary because of the large number of infestations requiring treatment, limitations of funding and number of weed personnel available.

The first (highest) priority would be given to treating infestations of species likely to have the most substantial impact on resources and to treating these infestations while they are small and relatively easy to manage. Thus, as a general rule the highest priority would be to eradicate small infestations of List A and List B species in newly disturbed areas (or areas proposed for disturbance) with high resource values.

The second priority would be to limit the spread of established infestations of List B species. The emphasis would be on control of larger infestations in areas that have a high potential for spread. Examples include roads and trails (including rights-of-way), campgrounds and trailheads, stock tanks and corrals, heavily grazed riparian areas, big game winter concentration areas, and other areas of locally intensive use. In these circumstances, it may not be practical to eradicate the entire infestation, and containment or control may be the most cost-effective management goal.

The third priority would also focus on controlling the spread of List B species but would emphasize less developed recreational facilities, riparian areas that receive relatively light use by livestock, big game winter range that receives dispersed rather than concentrated use, and areas in the wildland-urban interface that are subject to reinvasion from adjacent private lands and roadways. Small infestations of List C species would also fall into this category. The most cost-effective management goal would largely depend on the size of the infestation and could include eradication, containment, or control.

The fourth priority would emphasize the containment or control of large infestations of List C species. The large areal extent of these infestations would probably preclude eradication and favor suppression and containment as cost-effective management goals.

The purpose of the prioritization process is to ensure that the treatment method selected is appropriate for the situation while minimizing risks to non-target species. Several variables would be considered when determining what treatment or combination of treatments would be used in a specific situation. These include:

- Potential hazards to human health
- Possible damage to non-target plants and animals
- Adverse impacts to the general environment
- Cost effectiveness over the long- and short-term
- Ease of implementation

2.2.7 Potential Treatment Methods

Depending on which alternative is selected, the IWM Plan implemented by the SJPLC pursuant to this EA would include some or all of the treatment methods described in **Table** 2.1 Treatment Methods under the IWM Plan. For a more in-depth description of method options, please see Appendix B.

Table 2.1 Treatment Methods under the IWM Plan

Manual Control Treatment Method		
Methods Used	**Effectiveness**	**Cost**
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 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 weed germination and growth (BLM 1991b). Hand tools include a handsaw, axe, shovel, rake, machete, grubbing hoe, mattock, Pulaski, brush hook, hand clippers, motorized chainsaw, weed whacker, and power brush saw.	Manual treatments are most effective when weed infestations are small and complete removal of the roots is possible (Rees et al. 1996). Manual treatments work well for annual or biennial species with tap roots or shallow roots that do not resprout from tissue remaining in the soil. Sandy or gravelly soils allow for easier root removal. Repeated treatments are often necessary due to soil disturbance and residual weed seeds in the seed bank. Manual control can be used with minimal impacts and are useful in sensitive habitats, such as wetlands or riparian areas, or where special status species occur. However, manual treatments are labor intensive compared to other treatment methods such as herbicide and biological control.	Typical manual vegetation control costs $70 to $700 per acre (BLM 2007b).

<table>
<tr><th colspan="3">Biological Control Treatment Method</th></tr>
<tr><th>Methods Used</th><th>Effectiveness</th><th>Cost</th></tr>
<tr><td>Biological controls involve the intentional use of domestic animals, insects, nematodes, mites, or pathogens (agents such as bacteria or fungi) that weaken or destroy vegetation. The use of domestic livestock to control weeds requires “prescribed grazing” in which the kind of animals, and the amount and duration of grazing are designed to control a particular species while minimizing impacts to perennial native vegetation. In order for prescribed grazing to be effective, the right combination of animals, stocking rates, timing, and rest must be used. Grazing should occur when the target plant is palatable and viable seeds can be reduced.</td><td>Biological control agents are not currently available for many weed species. They are most effective for large populations of weeds, but it is unlikely that they would completely eradicate a weed population, because as populations of the host plant decreases, populations of the agent would also decline. Biological control agents can take many years to get established and bring about the desired level of control, but can be a useful tool in reducing the initial size or density of a weed infestation, making other treatments more feasible. Biological treatments are most effective when followed with other treatments.</td><td>Biological control using insects, nematodes, mites, or pathogens can range from $80 to $150 per release for ground applications.
Treatment of weeds using domestic animals is relatively inexpensive, costing $12 to $15 per acre.</td></tr>
<tr><td colspan="3">Biological control agents such as insects, nematodes, mites, or pathogens that are approved by the BLM have undergone rigorous testing by the USDA Agricultural Research Service to ensure they are host specific and would feed only on the target plants and not on crops, native flora, or endangered or threatened plant species. Before releasing a new agent, an environmental analysis is prepared by APHIS (Agricultural Plant Health Inspection Service). Once approved, a biological control can be released only in states covered by the environmental assessment. The SJPLC would use only those biological controls approved by APHIS for release in Colorado. Biological control agents would be used in accordance with BLM Manual Section 9014 (BLM1990).

When releasing biological agents on BLM lands, the following process would be followed:

• A Biological Control Agent Release Proposal (BCARP) is an internal BLM document that includes the type of biological control agent, collection origin, number of specimens planned for release, planned release date, number of releases, target pest species, and estimated treatment acres. A BCARP also includes a discussion of sensitive aspects and precautions and mitigations to minimize impacts to non-target vegetation. A BCARP requires review and approval by the Originator, Field Office Manager, State Office Pest Management Specialist, and Deputy State Director.
• A Biological Control Agent Release Record (BCARR) must be completed within 24 hours after release of the biological control. These records must be kept for 10 years. Information on the BCARR includes location of release, actual area (acres) of release, weather conditions, and weed species treated.</td></tr>
<tr><th colspan="3">Chemical Control Treatment Method</th></tr>
<tr><th>Methods Used</th><th>Effectiveness</th><th>Cost</th></tr>
<tr><td>Chemical control involves the use of herbicides to kill or suppress target plants and chemicals applied with the herbicides that improve their efficacy (“adjuvants”). Herbicides can be used selectively to control specific vegetation types or non-selectively to clear all vegetation in a particular area (e.g., bare-ground treatments on oil and gas pads). Manual (i.e., spot) applications are effective for small infestations, areas inaccessible by vehicle, or</td><td>The proper use of herbicides at the optimum time can be the most effective method for controlling persistent weeds, including perennial species. Not all herbicides are equally effective on all weeds, nor can every herbicide be used in every situation. Herbicides can damage or kill non-target plants and can be toxic or cause health problems in humans, livestock, and wildlife. Weed populations may develop a resistance to a particular herbicide over</td><td>The cost of herbicide application is generally $20 to $250 per acre (BLM 2007b).</td></tr>
</table>

areas where minimizing potential impacts to non-target plants is desired. Manual applications include spraying from a backpack unit or spray bottle or wiping (wicking) directly onto the foliar tissue. In remote areas and areas where mechanized equipment is not appropriate (e.g., wilderness areas and wilderness study areas), herbicides may be carried and applied using pack animals. Larger weed infestations in highly disturbed areas with good accessibility can be treated by sprayers mounted on ATVs or trucks. Oil and gas pads, pipeline corridors, and roadsides can be effectively treated in this manner. Herbicides could be applied aerially with helicopters or fixed-wing aircraft for large infestations of weeds in areas where it's not economically and/or physically feasible to treat on the ground (e.g., areas burned in wildfires, cheatgrass treatments, wildlife habitat treatments).	time. Herbicide control is less labor intensive than manual methods and is able to more effectively control larger weed infestations.	
When applying herbicides on BLM lands, the following process would be followed: • Applicator must present current certified pesticide applicator's license. • A Pesticide Use Proposal (PUP) must be approved by the BLM State Office. (A PUP is an internal document that includes the type of herbicide, application rate, application dates, number of applications, and estimated treatment acres. A PUP also includes a discussion of sensitive aspects and precautions and mitigations that will be taken to minimize impacts to non-target vegetation.) A PUP requires review and approval by the Certified Pesticide Applicator, Field Office Weed Coordinator, Field Office Manager, State Office PUP Coordinator, and Deputy State Director. A PUP is valid for 3 years and requires renewal after that time. • The pesticide applicator would fill out a Pesticide Application Record (PAR) within 24 hours of applying herbicides on BLM lands. The pesticide applicator must keep these records for 10 years according to State law. Information on the PAR includes location of application, which and how much herbicide was applied, weather conditions, equipment used, weed species treated, and number of acres treated. Applicators are required to turn in these records to the SJPLC at the end of each year. • The SJPLC would prepare an annual Pesticide Use Report (PUR) which would be submitted to the BLM State Office. This report includes a total of all pesticides applied on the BLM portion of SJPLC-administered lands.		

* *Information taken primarily from BLM 2007b.*

2.2.8 Special Precautions - Special Status Species

The *Endangered Species Act of 1973 (ESA)* established Federal policies and procedures for protecting Federally listed threatened or endangered plant and animal species, and species proposed for listing. *Section 7 of the ESA* specifically requires agencies to work toward the conservation of listed species and to ensure that no agency action is likely to jeopardize a listed species or adversely modify critical habitat.

Before any vegetation treatment or ground disturbance may occur, surveys or file searches may be conducted for listed species if suitable habitat was found at the project site and/or there were potential impacts to that habitat or species as determined by a wildlife biologist and/or botanist. Appropriate personnel would consult with State and local databases, and visit the site at the appropriate season. If a proposed project may affect (impact) a proposed or listed species or its critical habitat, SJPLC personnel would consult with the USFWS. A project with a "may affect, likely to adversely affect" determination would require formal consultation, and a Biological Assessment (BA) would be prepared. A project with a "may affect, not likely to adversely affect" determination would require informal consultation, and would result in a Concurrence Letter from the USFWS (unless that action is to be implemented under the authorities of the alternative consultation agreement pursuant to counterpart regulations established for *National Fire Plan* projects).

The BLM consulted with the U.S. Fish and Wildlife Service (USFWS) during development of the PEIS, pursuant to Section 7 of the ESA, and prepared a programmatic biological assessment (PBA) (BLM 2007d) to evaluate likely impacts to Federally listed or proposed threatened or endangered species as a result of weed treatments. In conjunction with the current EA, the SJPLC prepared a BA (BLM 2010b) for consultation with the US Fish and Wildlife Service. The BA analyzed potential impacts to listed or proposed species in the SJPLC area from implementing the Proposed Action and describing conservation measures to avoid or minimize adverse impacts.

BLM Manual Section 6840*, Special Status Species Management* (BLM 2008), stipulates that "BLM shall designate Bureau sensitive species and implement measures to conserve these species and their habitats, including ESA proposed critical habitat, to promote their conservation and reduce the likelihood and need for such species to be listed pursuant to the ESA." Additionally, "all Federally designated candidate species, proposed species, and delisted species in the 5 years following their delisting shall be conserved as Bureau sensitive species." See Appendix C for a list of special status species known to occur, or with a reasonable potential to occur, in the SJPLC area.

2.2.9 Special Precautions - Wilderness and Other Special Management Areas

Control of invasive plants on public lands within Wilderness Study Areas (WSAs) must comply with and be managed consistent with BLM's *Interim Management Policy Handbook for Lands Under Wilderness Review* (H-8550-1) (BLM 1995). The law provides for, and the BLM's policy is to allow invasive species control on lands under wilderness review in the manner and degree that does not degrade wilderness quality. Invasive plant control methods within WSAs are subject to reasonable regulations, policies, and practices.

Under the Proposed Action, management of vegetation in special management areas, including Wilderness Study Areas, ACECs/RNAs, and other special areas would be directed toward retaining the natural character of the environment and/or for meeting the objectives for management of the designated area. Only native species would be allowed for revegetation.

In special management areas, tools and equipment may be used for vegetation management (in the minimum amount necessary) for the protection of the resource. Areas highlighted for wilderness characteristics and natural processes would limit the use of motorized tools for use in special or emergency cases involving the health and safety of visitors, or for the protection of recognized wilderness characteristics. Habitat manipulation using mechanical or chemical means may be allowed in order to protect threatened and endangered species, and to correct unnatural conditions (such as weed infestations) resulting from human influence.

2.2.10 Special Precautions - Cultural Resources and Tribal Consultation

The impacts of BLM actions on cultural resources are addressed through compliance with the National Historic Preservation Act (NHPA), 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*), as well as State-specific protocol agreements with the SHPOs. The SJPLC's responsibilities under these authorities would be 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 taking actions that affect tribal interests. The BLM's tribal consultation policies 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 (BLM 2007a). Information gathered on important tribal resources and potential impacts to these resources from herbicide treatments is presented in the analysis of impacts presented in the PEIS (BLM 2007a), and is incorporated, by reference, in this Programmatic EA.

Under the Proposed Action, when conducting vegetation treatments, SJPLC personnel will consult with relevant parties (including Native American tribes, native groups, and SHPOs), assess the potential of the proposed treatment to impact cultural and subsistence resources, and devise inventory and protection strategies suitable to the types of resources present and the potential impacts to them.

2.2.11 Monitoring

Monitoring is an essential component of an IWM Plan. Two types of monitoring would be conducted as part of the IWM Plan: implementation monitoring ("Did we do what we said we would do?") and effectiveness monitoring ("Were weed treatments effective?") (BLM 2007a). Evaluating the effectiveness of control techniques and ensuring that Standard Operating Procedures and mitigation and conservation measures are implemented appropriately and are effective are critical components of the IWM Plan. All weed treatments would be monitored. If all mature plants are eliminated, monitoring would continue in order to detect and eliminate new plants arising from seed, propagule, or root stock for the duration of the seed longevity for that species. The monitoring of infestations associated with the objectives of control or containment would continue at periodic intervals for an indefinite period. Table 2.2 lists potential methods used to evaluate treatment effectiveness tied to the management objective for a given infestation.

Table 2.2 Management Objectives, Monitoring Methods, and Measures of Effectiveness

Management Objective	Monitoring Method	Measure of Effectiveness
Eradication	Visually inspect infested area	Absence after a period of time (depends on seed longevity of the weed species)
Control or Suppression	Measure percent cover using most appropriate methods (photo points, or transcects)	Reduction in percent cover
Containment	Measure area of infestation by mapping perimeter via GPS or recording length and width of infestation	Reduction in area of infestation

As seen in Table 2.2, if the management objective for an infestation is eradication, the post-treatment monitoring would emphasize the collection of presence/absence data by visual inspection. In this case, the treatment would be considered successful when the target species is absent from its former location for a specified period of time. Typically, this would be evaluated through the period over which the seed bank would remain viable. In comparison, monitoring associated with the objectives of control/suppression or containment would focus on quantitative methods—i.e., the reduction in percent cover or infestation size.

If monitoring demonstrates that a treatment has not been effective in achieving the management goal, corrective actions (e.g., retreatment with the same or different method or combination of methods) would be identified and implemented to enhance the level of success. Data on treatment effectiveness collected during monitoring would be entered into the National Invasive Species Information Management System (when available). In the interim, these data would be entered into a SJPLC weed management database.

2.2.12 Mitigation Measures

As defined by CEQ regulation 1508.20, mitigation includes: 1) avoiding the impact altogether by not taking a certain action or parts of an action; 2) minimizing impacts by limiting the degree or magnitude of the action and its implementation; 3) rectifying the impact by repairing, rehabilitating, or restoring the affected environment; 4) reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action; and 5) compensating for the impact by replacing or providing substitute resources or environments. (See Appendix G for details on proposed mitigation measures).

The Proposed Action incorporates planning processes that would include:

- compliance with statutory mandates and other BLM program guidance pertaining to vegetation management;
- utilizing an IWM program;
- coordination with other local, State, and Federal agencies, as well as with private landowners, industry, and the public;
- requiring soil and vegetation disturbances be minimized in all SJPLC actions;
- requiring preventative measures designed to reduce invasive plant introductions in all SJPLC actions; and
- Ongoing education and outreach.

Specific mitigation measures for vegetation treatments on SJPLC-administered BLM lands would include:

- compliance with label requirements for herbicide use;
- following the SOPs and Mitigation Measures, as addressed in the V*egetation Treatments Using Herbicides in 17 Western States, Programmatic Environmental Impact Statement, Record of Decision (BLM 2007a);*

- *compliance of a Job Hazard Analysis specific to pesticide use.*
- post-treatment monitoring; and
- Revegetation/restoration, if applicable.

2.2.13 Minimizing Herbicide Impacts

The *Vegetation Treatments Using Herbicides in 17 Western States, Programmatic Environmental Impact Statement* (PEIS) (BLM 2007a) includes SOPs and mitigation measures developed in order to address risks to environmental and human resources from the use of specific herbicides approved for use on public lands. In order to provide for the protection of the human and natural environment, SJPLC personnel would adopt, and adhere to these SOPs (see Appendix F of this Programmatic EA) and the mitigation measures (see Appendix G in this Programmatic EA) as they relate to the use of herbicide and non-herbicide vegetation treatments on public lands under the Proposed Action. In addition, SJPLC personnel would strictly adhere to all herbicide label instructions regarding proper handling, use, storage, and advice regarding minimizing potential risks developed through a Job Hazard Analysis. The Federal Insecticide, Fungicide, and Rodenticide Act FIFRA (**7 U.S.C. §136 et seq. (1996))** mandates that pesticide applicators have legal responsibility to read, understand, and follow all label directions. In addition, all personnel applying herbicides on SJPLC-administered BLM lands would be certified (or under supervision of a certified employee), either through the BLM Pesticide Applicator's Certification Program or through a Colorado State certification program.

2.3 Alternative A – No Action (Continuation of Current Management)

Under the No Action alternative, the SJPLC would continue its current approach to weed management. Specifically, the SJPLC would continue to select herbicides from among those listed in an Environmental Assessment (EA No. CO-038-95-029) titled *Integrated Weed Management in the Montrose District, San Juan Resource Area*, which was completed and signed in February 1995. The treatment of weeds is currently being managed according to this EA, except that the six herbicides dropped in the PEIS would not be used.

Alternative A would also preclude aerial application. The prohibition of aerial spraying would reduce the SJPLC's ability to treat very large weed infestations that cannot be adequately or effectively covered using ground methods. Therefore, the current annual treatment rate of less than 1,000 acres per year would continue, compared to as much as 5,000 acres per year under Alternative B. Except for the lack of aerial spraying, the preferred methods of treatment under this alternative (Table 2.3) would be the same as under Alternative B (Table 2.4).

Table 2.3 Alternative A (No Action) Preferred Methods of Treatment

Priority	Goal	Infestation	Preferred Treatment Method
Highest Priority: ▪ List A species ▪ List B or List C species new to SJPL ▪ Small infestations of List B species in areas of special concern (wilderness, ACECs, habitat for special status plants)	Eradication	Individual plants or small groups	Manual treatment; spot application of herbicide
		Infestations near special status plants	
		Small populations in areas with substantial desirable species	Non-aerial chemical treatment with selective herbicide
		Small populations in areas with minimal desirable species	Non-aerial chemical treatment with non-selective herbicide followed by revegetation
Second Priority: ▪ Large infestations of List B species in areas of special concern ▪ List B species in areas with heavy use or more likely to spread (heavy recreational use, heavy use by livestock, or concentrated use by wintering big game)	Eradication, Control, or containment	Individual plants or small groups	Manual treatment; spot application of herbicide
		Infestations near special status plants	
		Small populations in areas with substantial desirable species or small populations in areas with minimal desirable species	Non-aerial chemical treatment with selective herbicide, or with non-selective herbicide followed by revegetation
		Large infestations in areas with substantial desirable species or large infestations in areas with minimal desirable species	Non-aerial chemical treatment with selective herbicide, or with non-selective herbicide followed by revegetation
			Biological treatment, possibly with selective herbicides along perimeters
Third Priority: ▪ List B species in areas with light use or less likely to spread (less recreational use, light or dispersed use by livestock or wintering big game) ▪ List B species in riparian areas, big game winter range, or wildland-urban interfaces Small infestations of List C species	Eradication, Control, or Containment	Individual plants or small groups	Manual treatment; spot application of herbicide
		Small populations in areas with substantial desirable species or small populations in areas with minimal desirable species	Non-aerial chemical treatment with selective herbicide, or with non-selective herbicide followed by revegetation
		Large infestations in areas with substantial desirable species or large infestations in areas with minimal desirable species	Non-aerial chemical treatment with selective herbicide or with non-selective herbicide followed by revegetation
			Biological treatment, possibly with selective herbicides along perimeters
		Infestations of tamarisk and Russian-olive	Manual treatment, with herbicide applied to stumps, followed by revegetation and control of resprouting
Lowest Priority: ▪ Large infestations of List C species	Control or Containment	Large infestations of List C species, including weeds dispersed throughout degraded rangeland	Biological treatment (including prescribed grazing), possibly with selective herbicides along perimeters and localized revegetation or area-wide interseeding to resist reinfestation

2.4 Alternative B – Proposed Action

The Proposed Action is to implement the IWM Plan presented in this EA as Alternative B to guide the management of noxious and other invasive weeds on BLM lands administered by the SJPLC. The intent of this plan is to provide a comprehensive range of management actions and a decision-making framework to allow resource managers to select actions or combinations of actions to meet the objectives of eradicating, significantly reducing, or containing existing weed infestations and preventing the spread of new infestations. The IWM Plan proposed as Alternative B would differ from Alternative A (No Action) by authorizing the use of four new herbicides approved in the PEIS (BLM 2007a) and the use of helicopters or fixed-wing aircraft to apply herbicides aerially.

The proposed IWM Plan is intended to be broad in scope and to apply weed control associated with any resource management decisions under SJPLC's or CANM's current or future land use plans and plan amendments.

Noxious and invasive weeds would be treated using the best available weed control technique(s) at the appropriate times based on the life history of the target species and cost-effectiveness. Under the Proposed Action, weed treatments could include manual, biological, or chemical control methods, or combinations thereof. Total area of weed treatments under the Proposed Action would not exceed 5,000 acres per year, of which up to 4,000 acres could be treated aerially. The focus of aerial treatments would be large continuous infestations of weeds.

Chemical treatments using selective or non-selective herbicides would comply with the U.S. Environmental Protection Agency (EPA) label directions, follow BLM procedures outlined in Handbook H-9011-1 (*Chemical Pest Control*, BLM 2006a) and BLM Manual Sections 1112 (*Safety*) (BLM 2000) and 9015 (*Integrated Weed Management*) (BLM 1992) and comply with State label standards (BLM 1991b). Herbicide applications would adhere to all State and Federal pesticide laws. All applicators that apply herbicides on BLM lands administered by the SJPLC (i.e., certified applicators or those directly supervised by a certified applicator) would comply with the application rates, uses, and handling instructions specified on the herbicide label or, where more restrictive, the rates, uses, and handling instructions developed by BLM for the PEIS.

The Proposed Action includes potential use of any of the 18 herbicide active ingredients approved in the PEIS (2,4-D, bromacil, chlorsulfuron, clopyralid, dicamba, diflufenzopyr, diquat, diuron, fluridone, glyphosate, hexazinone, imazapic, imazapyr, metsulfuron methyl, picloram, sulfometuron methyl, tebuthiuron, and triclopyr). Four of these—diquat, diflufenzopyr, fluridone, and imazapic—had not previously been approved for use.

Imazapic is the only approved herbicide that effectively controls cheatgrass. Another of the added compounds, diflufenzopyr, is approved only in a formulation with dicamba, called Overdrive®. This formulation holds promise for controlling both annual and perennial broadleaf weeds. BLM could approve diflufenzopyr as a stand-alone herbicide in the future if registered by the U.S. Environmental Protection Agency (EPA) under the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA). The other two newly added herbicides (diquat and fluridone) are primarily for use in aquatic sites and therefore not likely to be used on SJPLC-administered BLM lands where aquatic weeds are not a significant issue.

In addition to approving four new herbicides, the PEIS also dropped six herbicides previously available under the 1991 Vegetation EIS (2,4-DP, asulam, atrazine, fosamine, mefluidide, and simazine). See Appendix E for a complete listing of herbicides and adjuvants currently approved for use on BLM lands.

The proposed IWM Plan would incorporate Best Management Practices (BMPs) for preventing weed infestations and the Standard Operating Procedures (SOPs) and conservation measures for implementing weed treatments (see Appendices E, G,H, and I). These appendices are taken from the PEIS and PER (BLM 2007a, b) and adapted to site-specific conditions in the SJPLC area. Analyses of impacts and risks to humans and to non-target plants, fish, terrestrial wildlife, and other resources or resource uses are presented in detail in the PEIS and summarized in the current programmatic EA prepared by the SJPLC.

Table 2.4 presents preferred methods of treatment under the Proposed Action, given treatment priorities, management goals, and types of infestations. In general, manual treatment are preferred for individual or small isolated populations, while chemical or biological treatments are preferred for larger infestations— depending on the specific weed species and on the presence/absence of special status or other desirable plant species that could be adversely affected by herbicides.

Note in Table 2.4 that the first, second, and third priority categories, which include eradication, control, and/or containment of List A or List B species, specify use of only manual treatment or direct application (including spot spraying) of herbicides onto target weeds near special status plants rather than broadcast spraying by aerial or ground methods. This is intended to avoid injury to special status species by offsite drift or runoff of herbicides.

Prioritization is less of an issue for project proponents (e.g., oil and gas operators, rights-of-ways holders), who typically are required by BLM to manage weeds on the public lands they impact. For these proponents, priorities would not be established in relation to other infestations across SJPLC-administered BLM lands. Instead, they would be required to control noxious and invasive weeds as a Condition of Approval applied to drilling permits, right-of-way grants, or other authorizations by BLM of ground-disturbing activities.

Table 2.4 Alternative B (Proposed Action) Preferred Methods of Treatment

Priority	Goal	Infestation	Preferred Treatment Method
Highest Priority: ▪ List A species ▪ List B or List C species new to SJPLC ▪ Small infestations of List B species in areas of special concern (wilderness, ACECs, habitat for special status plants)	Eradication	Individual plants or small groups	Manual treatment; spot application of herbicide
		Infestations near special status plants	
		Small populations in areas with substantial desirable species	Chemical treatment with selective herbicide
		Small populations in areas with minimal desirable species	Chemical treatment with non-selective herbicide followed by revegetation

Priority	Goal	Infestation	Preferred Treatment Method
Second Priority: ▪ Large infestations of List B species in areas of special concern ▪ List B species in areas with heavy use or more likely to spread (heavy recreational use, heavy use by livestock, or concentrated use by wintering big game)	Eradication, Control, or containment	Individual plants or small groups	Manual treatment; spot application of herbicide
		Infestations near special status plants	
		Small populations in areas with substantial desirable species or small populations in areas with minimal desirable species	Chemical treatment with selective herbicide, or with non-selective herbicide followed by revegetation
		Large infestations in areas with substantial desirable species or large infestations in areas with minimal desirable species	Aerial or non-aerial chemical treatment with selective herbicide, or with non-selective herbicide followed by revegetation
			Biological treatment, possibly with selective herbicides along perimeters
Third Priority: ▪ List B species in areas with light use or less likely to spread (less recreational use, light or dispersed use by livestock or wintering big game) ▪ List B species in riparian areas, big game winter range, or wildland-urban interfaces Small infestations of List C species	Eradication, Control, or Containment	Individual plants or small groups	Manual treatment; spot application of herbicide
		Small populations in areas with substantial desirable species or small populations in areas with minimal desirable species	Chemical treatment with selective herbicide, or with non-selective herbicide followed by revegetation
		Large infestations in areas with substantial desirable species or large infestations in areas with minimal desirable species	Aerial or non-aerial chemical treatment with selective herbicide or with non-selective herbicide followed by revegetation
			Biological treatment, possibly with selective herbicides along perimeters
		Infestations of tamarisk and Russian-olive	Manual treatment, with herbicide applied to stumps, followed by revegetation and control of resprouting
Lowest Priority: ▪ Large infestations of List C species	Control or Containment	Large infestations of List C species, including weeds dispersed throughout degraded rangeland	Biological treatment (including prescribed grazing), possibly with selective herbicides along perimeters and localized revegetation or area-wide interseeding to resist reinfestation

2.5 Alternative C – No Herbicide Use

This alternative would implement an IWM Plan that would contain the elements of the plan described under the Proposed Action, with the exception that herbicides would not be used. The absence of chemical controls would be offset to some extent by an increase in manual and biological controls. As shown in Table 2.5 these would essentially be limited to manual removal of plants in small weed infestations, areas near special status plants, and clumps of tamarisk, or to biological control of specific weeds.

Because of the limitations of manual and biological methods, the total area treated annually under this alternative would likely not exceed 1,000 acres per year. While targeted grazing can cover large areas, the effectiveness (percent removal of target species) is much lower than with herbicides. Biological control of tamarisk using an introduced Asiatic beetle may be used but typically target riparian corridors and not large blocks of acreage.

Table 2.5 Alternative C (No Herbicide Use) Preferred Methods of Treatment

Priority	Goal	Infestation	Preferred Treatment Method
Highest Priority: ▪ List A species ▪ List B or List C species new to SJPL ▪ Small infestations of List B species in areas of special concern (wilderness, ACECs, habitat for special status plants)	Eradication	Individual plants or small groups	Manual treatment
		Infestations near special status plants	
		Small populations in areas with substantial desirable species	
		Small populations in areas with minimal desirable species	
Second Priority: ▪ Large infestations of List B species in areas of special concern ▪ List B species in areas with heavy use or more likely to spread (heavy recreational use, heavy use by livestock, or concentrated use by wintering big game)	Eradication, Control, or containment	Individual plants or small groups	Manual treatment
		Infestations near special status plants	
		Small populations in areas with substantial desirable species or small populations in areas with minimal desirable species	
		Large infestations in areas with substantial desirable species or large infestations in areas with minimal desirable species	Biological treatment
Third Priority: ▪ List B species in areas with light use or less likely to spread (less recreational use, light or dispersed use by livestock or wintering big game) ▪ List B species in riparian areas, big game winter range, or wildland-urban interfaces Small infestations of List C species	Eradication, Control, or Containment	Individual plants or small groups	Manual treatment
		Small populations in areas with substantial desirable species or small populations in areas with minimal desirable species	
		Large infestations in areas with substantial desirable species or large infestations in areas with minimal desirable species	Biological treatment
		Infestations of tamarisk and Russian-olive	Manual treatment, followed by revegetation and control of resprouting
Lowest Priority: ▪ Large infestations of List C species	Control or Containment	Large infestations of List C species, including weeds dispersed throughout degraded rangeland	Biological treatment (including prescribed grazing) and localized revegetation or area-wide interseeding to resist reinfestation

3 Chapter Three: AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

This chapter examines how the Proposed Action (the IWM program using herbicide and non-herbicide vegetation treatments), relative to the No Action Alternative (the continuation of current management), and the No herbicide alternative may impact the natural, cultural, and socioeconomic resources on SJPLC-administered BLM lands (the “affected environment”). Broad effects of using herbicides for vegetation treatments are covered in the BLM Vegetation Treatments Using Herbicides Final Programmatic EIS (BLM 2007a). The PEIS analysis is complimented in this EA to address local resources and objectives in the use of herbicides in an integretated weed management program.

3.1 Impact Analysis Methods and Assumptions

3.1.1 Impact Analysis

The analysis of the 3 alternativies is primarily qualitative and is based on professional judgment and consideration of the context and intensity of allowable uses and management actions anticipated to impact resources and resource uses. Quantification of cumulative impacts may be difficult for the resources, land uses, and management actions due to:

- uncertainties regarding the location, scale, and/or rate of changes on public lands resulting from the alternatives;
- uncertainties about the location, scale, and rate of changes on private lands adjacent to, or near, SJPLC-administered BLM lands that would occur irrespective of the alternative; and
- Uncertainties about the location, scale, and rate of changes resulting from the general human population growth of the surrounding area.

3.1.2 Methods and Assumptions

Analysis is based on a series of assumptions, including, but not limited to:

- This Programmatic EA tiers to the environmental impacts analysis (including the Cumulative Impacts Analysis, the Unavoidable Adverse Impacts Analysis, and the Relationship between the Local Short-term Uses and Maintenance and Enhancement of Long-term Productivity) presented in the PEIS (BLM 2007a) and the PER (BLM 2007b).
- When conducting vegetation treatments, the SJPLC would comply with all Federal, State, Native American tribal, and local regulations that govern activities on public lands.
- The IWM Program would be implemented in compliance with BMPs, SOPs, mitigation measures, and conservation measures (for special status species) presented in Appendices D, F, G and H , and applicable laws, rules, regulations, standards, policies, guidelines, and implementation and land use plans.

- Vegetation treatments would be implemented with consideration for the larger vegetation management context in which they occur. (For example, if a target vegetation type is treated and removed, SJPLC personnel would first consider how the area would be revegetated or stabilized in order to ensure the long-term viability of the project area.
- The BLM would not leave bare ground at treatment sites, which might then allow weeds and invasive species to increase in abundance – negating the treatment effort. Treated vegetation would be removed from treatment sites if it poses a further risk as hazardous fuel.
- Post-treatment follow-up (such as re-seeding and monitoring) would occur, as required under most BLM vegetation programs including Emergency Stabilization (ES) and Burned Area Rehabilitation (BAR).
- The SJPLC would make an investment in maintaining the condition achieved or objectives of the project, rather than implementing stand-alone, one-time treatments.
- The SJPLC would determine the need for the action based upon past monitoring, and additional monitoring would occur after the project in order to ascertain its effectiveness in achieving the resource objective.

3.1.3 Relationship between Programmatic and Site-Specific Analysis

This document contains a planning area-wide level of analysis; therefore, it does not predict what will happen when such broad-based standards and guidelines are implemented on individual, site-specific projects. The focus is on presenting and discussing which consequences are most likely to occur in relation to different resources to document a Finding of No Significant Impact or the need for additional NEPA analyis. Projects for future years will document the adequacy of this analysis and incorporate appropriate surveys and mitigation to be applied to remain within the level impacts analyzed here.

3.2 Elements of the Human Environment Analyzed

Substantive responsibilities for analysis include elements of the Human Environment that are subject to requirements specified in statute, regulation, or Executive Order that *are* considered in NEPA analysis (BLM 2008c).. In addition, other resources screened for impacts (such as soils, vegetation, etc.) are generally considered in EAs. Broad categories for this analysis are listed in Table 3.1. Each element is described in relation to its affected environment (current condition) and environmental consequences for each alternative.

Table 3.1 Essential Analytical Elements, Other Issues Analyzed, and Associated Sections

Elements Analyzed	Section	Elements Analyzed	Section
Special Designation Areas			
ACECs and RNAs	3.3.1	Special Designation Roads, Trails and Unique Landscapes	3.3.4
Wilderness and WSAs	3.3.2		
Wild and Scenic Rivers	3.3.3		
Water Resources			
Water Quality (Surface and Ground)	3.4.1	Floodplains, Wetlands and Riparian Zones	3.4.2
Vegetation Resources			
Invasive Non-native Species	3.5.1	Terrestrial Vegetation	3.5.3
Special Status Plants	3.5.2	Aquatic Vegetation	See Water Resources, Section 3.4.2
Prime or Unique Farmlands	Not present or influenced by IWM in the SJPLC Area		
Wildlife Resources			
Terrestrial Wildlife Including Migratory Birds and Other Special Status Wildlife	3.6.1	Aquatic Wildlife Including Special Status Fish	3.6.2
Other Natural Resources			
Wild Horses and Burros	3.7.1		
Air Quality	3.7.2	Visual Resources	3.7.4
Cultural and Paleontological Resources	3.7.3	Soil Resources	3.7.5
Other Human Elements			
Socioeconomics and Environmental Justice	3.8.1	Livestock and Ranching Operations	3.8.4
Native American Cultural and Religious Concerns	3.8.2	Recreation	3.8.5
Waste, Hazardous and/or Solid	Not present or influenced by IWM in the SJPLC Area	Rights-Of-Ways, Facilities, Roads	3.8.6
Human Health and Safety	3.8.3		

3.3 Special Designation Areas

The BLM manages certain lands (special designation areas) under its jurisdiction that possess unique and important historical, anthropological, ecological, biological, geological, and/or paleontological features. These features include undisturbed tracts with wilderness characteristics, critical habitat, natural environments, open spaces, scenic landscapes, historic locations, cultural landmarks, and paleontologically rich regions. Special designations areas are administered with the objectives to preserve, protect, and evaluate these significant components of the national heritage and are designated by an Act of Congress or by Presidential Proclamation, or are created under BLM administrative procedures.

Because of their special status, special designation areas can have strict guidelines for vegetation treatments. These guidelines prohibit activities that degrade the quality, character, and integrity of these protected lands. The environmental effects from herbicide use in special designation areas in the SJPLC would be the same as or similar to those identified in the PEIS and PER documents (BLM 2007b; BLM 2007c). This section summarizes impacts discussed in the PEIS and PER as they pertain to resources and land uses on SJPLC-administered BLM lands.

3.3.1 Areas of Critical Environmental Concern (ACEC) and Research Natural Areas (RNAs)

The BLM uses the Area of Critical Environmental Concern (ACEC) designation to highlight public land areas where special management attention is necessary in order to protect and prevent irreparable damage to important historical, cultural, and scenic values; fish or wildlife resources; or other natural systems or processes. The ACEC designation may also be used to protect human life and safety from natural hazards. The BLM identifies, evaluates, and designates ACECs through its resource management planning process. Allowable management practices and uses, mitigation, and use limitations, if any, are described in the planning document. Under current guidelines, ACEC procedures are also used to designate Research Natural Areas (RNAs). RNAs are areas that contain important ecological and scientific values and are managed for minimum human disturbance. RNAs are primarily used for non-manipulative research and baseline data gathering on relatively unaltered community types. Since natural processes are allowed to dominate, RNAs also make excellent controls for similar communities that are being actively managed. In addition, RNAs provide an essential network of diverse habitat types that will be preserved in their natural state for future generations.

Affected Environment

The SJPLC currently manages the a portion of the 1985 designated Anasazi ACEC (Mud Springs-1,160 acres) that was not included in the Canyons of the Ancients National Monument (CANM) Proclamation in 2001,(170,965 acres). The SJPLC DLMP/DEIS (USFS and BLM 2007) is considering additional areas such as Big Gypsum Valley, Silveys Pocket and Grassy Hills for ACEC designation in the LMP for an additional 18,239 acres. The CANM Resource Management Plan (RMP) (BLM 2010a) dropped the ACEC designation for the entire Monument (since it is now a National Monument) but maintain it where RNAs exist and are proposed. These areas include the McElmo RNA, the extension to the McElmo RNA, the Cannonball RNA, and the Sand Canyon RNA totaling 8,963+ acres new acres.

Environmental Consequences

Alternative A: No Action: No standard set of restrictions applies to vegetation treatments in ACECs. However, the unique values of these areas must be considered when preparing plans for treatment activities.

Activities proposed within ACECs must consider and protect the identified relevant and important values. The PEIS and PER (BLM 2007b, c) presented a thorough analysis of the effects associated with vegetation treatments proposed for BLM lands.

In ACECs, only treatments that protect and/or improve the natural condition of the identified values for which the area was recognized would be allowed under any alternative. During SJPLC's annual weed treatment planning process under the IWM Plan, all proposals for weed treatments would incorporate, analyze, and document applicable management objectives for ACECs and their related values; the allowable uses, stipulations, and travel management restrictions; and any subsequent special project requirements or restrictions.

Impacts to ACECs under the No Action alternative as a result of herbicide treatments would be similar to those that are currently occurring. Areas that are dominated by invasive species are usually less visually aesthetic and deemed to be impacted by humans and hence not "natural." Under this alternative, the BLM would treat fewer acres than under the Proposed Action (up to 1,000 acres per year versus 5,000 acres) —and hence fewer ACEC acres. Therefore, Alternative A would have both fewer positive benefits and fewer negative impacts associated with use of herbicides to treat noxious weeds and other invasive plants than Alternative B. In addition, the vegetation treatments would probably not be as effective in restoring ACECs where large remote infestations of noxious weeds exist since there is not the ability to use aerial applications or to use the four additional herbicides approved in the PEIS (BLM 2007a).

Alternative B: Proposed Action: The impacts from this alternative would be similar to Alternative A. The ability to use four new chemicals under this alternative would provide additional capabilities for controlling problematic invasive species and would provide long-term benefits to ACEC values through the control or elimination of these species. Because this alternative involves potentially the most treatment acres (up to 5,000 acres per year, compared to 1,000 acres or less for Alternative A), it could also have the greatest short-term adverse impact on ACECs. Short-term impacts could result from impacts to the natural appearing landscape and non-target native vegetation of these areas. Although a small portion of treated acres may be in ACECs, more total acres would be treated under this alternative than any other alternative. Therefore, more acres of sensitive areas may be treated than under the other alternatives.

While this alternative could have the greatest beneficial impact on ACECs by reducing the risk of loss of those values and potentially improving the natural ecosystem processes, treating sensitive areas aerially is unlikely. This conclusion is based on deep canyon terrain, relatively small size, and the high public use of these areas.

Among non-chemical control methods, grazing is generally compatible with the designated uses of these areas, and selective grazing for weed management could be less intrusive than other treatments. In areas that historically did not support livestock and where grazing does not currently occur, the introduction of domestic grazers or a switch to a different species of grazer could adversely affect some relevant and important or outstanding remarkable values. Examples include naturalness and special status species. Therefore, the use of livestock in these circumstances would be unlikely.

<u>Alternative C: No Herbicides</u>: Alternative C would avoid potential negative impacts on ACEC values from accidental exposure to herbicides. However, relying on non-chemical treatment methods for even the most invasive species would greatly reduce SJPLC's ability to control or eradicate large or particularly difficult infestations—including both reducing existing weed populations and responding to new infestations that may arise. This includes some weed species that are a nuisance or could be injurious to humans, livestock, and wildlife or that may disrupt natural ecological process.

Reliance on manual or biological treatment methods in lieu of herbicides would have a greater impact on ACECs in situations where the presence of weeds is in conflict with the associated values. Manual methods can be used with minimal impacts in sensitive habitats, but they are more costly and labor intensive. Options for biological controls are limited for most weed species and could have unexpected consequences from the introduction of non-native biologic agents and/or grazers.

Mitigation Measures: Mitigation for the potential adverse impacts to relevant and important values of the ACECs consists of giving consideration to details such as timing of the treatment to avoid the period of greatest use of the area, conducting surveys for recognized values or spraying in late summer/early fall when other vegetation is cured and brown.

3.3.2 Wilderness and Wilderness Study Areas (WSAs)

The Wilderness Act of 1964 defines wilderness as places "where the earth and its community of life are untrammeled by man, where man himself is a visitor who does not remain." Only Congress can designate a Wilderness Area and designation is aimed at ensuring that these lands are preserved and protected in their natural condition. Wilderness Areas, which are generally 5,000 acres or more in size, offer outstanding opportunities for solitude or a primitive and unconfined type of recreation. These areas may also contain ecological, geological, or other features that have scientific, scenic, or historical value. There are currently no BLM designated Wilderness Areas on SJPLC-administered BLM lands.

Wilderness Study Areas (WSAs) have been designated by the BLM as having Wilderness characteristics, thus making them worthy of consideration by Congress for Wilderness designation. While Congress considers whether to designate a WSA as permanent Wilderness, the BLM manages the area in order to prevent impairment of its suitability for Wilderness designation.

The invasion of wilderness ecosystems by noxious weeds and other non-native plant species is of great risk to wilderness characteristics. Some species have been introduced to Wilderness Study Areas by pack stock, livestock that have been specifically brought into these areas, or wild horses and burros, which may travel in and out of Wilderness Study Areas. Native migratory wildlife, especially birds, can be vectors for spreading nonnative seeds in their droppings or on their fur as they migrate through these areas. Recreational users may also bring in weed seeds on their equipment.

Invasive plant control on public lands within Wilderness Study Areas (WSAs) must comply with and be managed consistent with BLM's Interim Management Policy Handbook (H-8550-1) For Lands Under Wilderness Review. The law provides for, and the BLM's policy is to allow, invasive species control on lands under Wilderness review in the manner and degree that does not degrade Wilderness quality. Invasive plant control methods within WSAs are subject to reasonable regulations, policies, and practices.

Affected Environment

The SJPLC currently manages the following seven BLM Wilderness Study Areas totaling 80,977 acres:

- Dolores River Canyon
- Cross Canyon
- McKenna Peak
- Cahone Canyon
- Menefee Mountain
- Squaw/Papoose Canyon
- Weber Mountain

The RMP for CANM includes an additional 5,233 acres managed for wilderness characteristics.

Environmental Consequences

The environmental effects to WSA's in the SJPLC would be the same as or similar to those identified in the PEIS and PER. This section summarizes impacts discussed in the PEIS and PER as pertains to resources and land uses on SJPLC-administered BLM lands.

<u>Alternative A: No Action</u>: Impacts to WSAs would be similar to ACECs. Implementation of both the No Action and the Proposed Action would assist in restoring and maintaining naturalness in the WSAs through eradication/prevention of non-native, invasive species. Throughout all IWM activities, the *Interim Management Policy for Lands under Wilderness Review* (BLM Manual H-8550-1) would be adhered to; therefore, there would be no impact to WSA resources.

<u>Alternative B: Proposed Action</u>: Impacts to WSAs would be similar to ACECs. Eradication or reduction of invasive weeds would have a positive affect on WSAs by restoring/maintaining natural conditions, per the Wilderness Act of 1964. A minimum requirements analysis would be required prior to authorizing aerial spraying, or other means of pesticide application, involving motorized equipment or mechanized transportation.

<u>Alternative C: No Herbicides</u>: Impacts to WSAs would be similar to ACECs.

3.3.3 Wild and Scenic Rivers (WSRs)

National Wild and Scenic Rivers (WSRs) are rivers (or river sections) designated by Congress or the Secretary of the Interior, under the authority of the Wild and Scenic Rivers Act (WSRA) of 1968, to protect remarkable scenic, recreational, geologic, fish and wildlife, historic, cultural, or other similar values and to preserve the river in its free-flowing condition. The law recognizes three classes of rivers:

- *wild* -- wild rivers are free of impoundments and generally inaccessible except by trail, with watersheds or shorelines essentially primitive and water unpolluted.
- *scenic* -- scenic rivers are free of impoundments with shorelines or watersheds largely undeveloped, but accessible in places by roads; and
- *recreational* -- recreational rivers are readily accessible by road or railroad, may have some development along their shoreline, and/or may have undergone some impoundment or diversion in the past.

Affected Environment

The Dolores River from McPhee to Bedrock (a total of 105 miles of river) was recommended for WSR designation in 1977. Of the 105 miles, 33 miles were recommended as wild, 41 miles were recommended as scenic, and 31 miles were recommended as recreational (Colorado Department of Natural Resources et al. 1976). Additional river segments involving BLM lands that were determined to be eligible in the SJPLC DLMP/DEIS include McIntyre Canyon, Summit Canyon, Bull Canyon, Coyote Wash, California Gulch(West Fork Animas), Cinnamon creek, Maggie Gulch, and Cement Creek (see Appendix D of DLMP/DEIS USFS and BLM 2007).

Environmental Consequences

<u>Alternative A: No Action</u>: Impacts to WSRs would be similar to ACECs. No standard set of restrictions applies to vegetation treatments in WSR areas. However, the unique values of these areas must be considered when preparing plans for treatment activities. Eligible or suitable WSR corridors (0.25 mile either side of the river) must consider and protect the identified ORVs, free-flowing nature, and tentative classifications.

<u>Alternative B: Proposed Action</u>: Impacts to WSRs would be similar to ACECs and to Alternative A above.

<u>Alternative C: No Herbicides</u>: Impacts to WSRs would be similar to ACECs.

3.3.4 Special Designation Roads, Trails and Unique Landscapes

Congress, under the National Trails System Act of 1968, designates areas as National Scenic and Historic Trails. National Scenic Trails offer maximum outdoor recreation potential and provide enjoyment of the various qualities (scenic, historical, natural, and cultural) of the areas through which these trails pass. National Historic Trails are extended trails that follow as closely as possible, on Federal land, the original trails or routes of travel with national historical significance. Designation identifies and protects historic routes and their historic remnants and artifacts for public use and enjoyment. A designated trail must meet certain criteria, including having a significant potential for public recreational use or interest based upon historical interpretation and appreciation. Other unique landscapes have been identified and are managed for specific qualities. These specific areas are discussed below.

Affected Environment

The SJPLC manages several important roads, trails and landscapes. A majority of the 232-mile long *San Juan Skyway* runs through SJPLC-administered lands. This Scenic Byway was designated in 1988 by the USFS and in 1989 by the State of Colorado Scenic Byway Commission. The 65-mile long *Alpine Loop National Backcountry Byway* also occurs on SJPLC-administered BLM lands. The *Trails of the Ancients Scenic and Historic Byway* highlights ancestral puebloan settlements through Colorado, Utah, and Arizona with 114 miles of the Byway occurring in Colorado.

A portion of the *Old Spanish Trail*, a National Historic Trail, where early settlers traveled between Santa Fe and Los Angeles crosses SJPLC-administered BLM lands.

The BLM manages several special areas and unique landscapes through the SJPLC. The Canyons of the Ancients National Monument was established by Presidential Proclamation in 2000 and is part of the BLM's National Landscape Conservation System. It is approximately 170,965 acres in size. An additional 106,881 acres of special designation areas are proposed in the SJPLC's DLMP/DEIS and include the following:

- Dolores River Canyon Unique Landscape
- Silverton Unique Landscape
- Mesa Verde Escarpment Archaeological Area
- Spring Creek Wild Horse Herd Area
- Perins Peak Habitat Management Area
- Willow Creek Habitat Management Area

Environmental Consequences

Alternative A: No Action: Impacts to Special Designation Roads, Trails and unique landscapes would be similar to ACECs.

Alternative B: Proposed Action: Impacts to Special Designation Roads, Trails and unique landscapes would be similar to ACECs.

Alternative C: No Herbicides: Impacts to Special Designation Roads, Trails and unique landscapes would be similar to ACECs.

3.4 Water Resources

Water resources are important for fish and wildlife habitat and a variety of human needs such as domestic consumption, industrial activities, crop irrigation, livestock watering, and recreation. Numerous legal and policy requirements have been established to manage water resources for these multiple needs, including the Clean Water Act, the Colorado River Basin Salinity Control Act, and EO 11988 (*Floodplain Management*).

Water resources are classified as either "surface water" or as "groundwater." Surface water resources include rivers, streams, lakes, ponds, reservoirs, and wetlands. The quantity and quality of surface water resources are affected by precipitation, topography, soil type, vegetation, agricultural practices, urbanization, and general land use practices, especially for large tracts of public land. The alteration of vegetative cover from land use practices can have significant impacts on water infiltration, soil erosion, and stream sedimentation.

3.4.1 Water Quality (Surface and Ground)

Water quality is defined in relation to its specified and/or beneficial uses (such as human consumption, irrigation, fisheries, livestock, industry, recreation, etc.). The quality of surface water is determined by interactions with soil, transported solids (organics and sediments), rocks, groundwater, and the atmosphere. The Clean Water Act established the basic structure for regulating discharges of pollutants into the waters of the U.S., and is responsible for setting water quality standards for all contaminants in surface waters. Section 313 of the Clean Water Act requires all Federal agencies to comply with State water quality standards "...to the same extent as any non-governmental entity." Thus, the BLM has a responsibility to fulfill its obligations under the Clean Water Act and Safe Drinking Water Act to maintain waters that meet or surpass designated beneficial uses, to restore impaired water resources in support of their designated beneficial uses, and to provide water for public consumption and use.

Non-point source pollution, the largest source of water quality problems, comes from diffuse or scattered sources rather than from an outlet (such as a pipe, which would constitute a point source). Sediment is a non-point source of pollution. Generally, human impacts stem from non-point sources including agricultural runoff, upstream timber harvesting, streambank modification, roads, and reservoir evaporation. Erosion and delivery of eroded soil to streams is the primary non-point source pollution problem of concern to the BLM (BLM 1980). During snowmelt runoff and especially during intense thunderstorm activity, sediment and salinity yields are likely to be higher than during low-flow periods. Vegetation cover also affects the sediment and salinity yield from watersheds, with sparsely vegetated areas tending to yield higher amounts of sediment and salinity during runoff events than areas with more vegetation cover. During periods of low flow, salinity concentrations are highest in surface waters even though the quantity of salt delivered to streams is lowest during these periods. Two important factors affecting the amount of sediment and salinity in surface water are the proximity of any disturbance to a stream, and how well the vegetation cover between the disturbance and the stream is maintained. Riparian vegetation functions to armor stream banks and act as a filter to remove sediment before it enters the stream.

The most important factors impacting water quality are sediments, microbes, pesticides, nutrients, metals, and radionuclides (Nash 1993). Sedimentation and nutrient loading affect surface waters, while agricultural run-off and industrial wastes can also leach into groundwater. Surface water quality can also be affected by solar loading and shade producing vegetation that affect water temperature, flow, total suspended solids (TSS), total dissolved solids (TDS), turbidity, changes in dissolved oxygen, salinity, and acidity. The susceptibility of aquifers to groundwater contamination relates to geology, depth to groundwater, infiltration rates, and solubility of contaminants. Generally, shallow, unconfined aquifers with rapid recharge rates are the most vulnerable to contamination due to the rapid infiltration of groundwater from the surface to the water table.

Affected Environment

The SJPLC-administered BLM lands are located within the upper Colorado River Basin. The principal rivers that drain these lands are the Dolores, Mancos, La Plata, Animas, Florida, Los Pinos, Piedra, and San Juan Rivers. All of these river systems drain into the Colorado River. In general, the headwaters of these rivers originate in the higher-elevation igneous or metamorphic rocks of the southern Rocky Mountains. Upon leaving the mountainous terrain, the rivers often create canyons and valleys of variable size as they flow through the sedimentary rocks of the Colorado Plateau, which is located to the south and west of the mountains.

Good quality groundwater is in ample supply in the SJPLC area, but there is little reliance on it by outlying ranches because surface water is sufficient to meet the relatively low water demand. The BLM manages watersheds for the protection of both surface water and groundwater resources. Groundwater in the SJPLC is currently being managed primarily under guidance from CDPHE's Water Quality Control Regulations 41 and 42.

Water quality within SJPLC-administered BLM lands is typically good. In the few water bodies having water quality problems, mercury, heavy metals, sediment, and salinity are common pollutants. In some places, mine related heavy-metals pollution is being cleaned up as a result of the aggressive abandoned mine reclamation program being conducted within SJPLC-administered BLM lands. Development and depletion of ground-water resources are emerging issues on SJPL, especially in relation to fluid-minerals extraction and private land development. Factors such as high road densities, poor road locations, and inadequate road design/maintenance have caused water quality, floodplain, and channel morphology changes in some watersheds. For specific water-related issues, please refer to the SJPLC DLMP/DEIS (2007) and the CANM RMP (2010).

Invasive plants can create conditions that modify water quantity and quality. Directly or indirectly, invasive plants can affect streambank stability and sediment input and the turbidity, temperature, dissolved oxygen, and pH of the stream. Water uptake by some invasive plants (e.g., tamarisk) can also reduce water quantity (USFS 2005), and tumbleweeds such as knapweed can contribute to blockage of culverts and irrigation water intakes.
The Colorado Department of Public Health and Environment (CDPHE) has established classifications and water quality standards for streams based on existing or potential water uses, pursuant to Section 305(b) of the Clean Water Act.

Environmental Consequences

Alternative A: No Action: Application of herbicides has a potential of directly and indirectly contaminating both surface water and shallow groundwater quality. Potential sources of contamination could result from improper aerial spraying, herbicide drift, spills, and leaching into shallow groundwater. Using herbicides labeled for aquatic use, following approved application procedures under controlled conditions, and use of buffer strips to control drift when appropriate would limit potential water quality impacts. Herbicide application operations would be suspended when there is a hazard of run-off or precipitation occurring or imminent. These conditions for application would minimize direct impacts to surface or ground water quality. Over the long-term, replacement of weeds with desirable native perennial vegetation could offer improved watershed cover through a diversity of horizontal and vertical above-ground and root structures. Replacing weeds with native species would improve watershed health and function in the uplands and riparian corridors. A decrease in upland erosion and channel scour could occur, resulting in a reduction in sediment and, in some areas, salinity loading in surface waters. Small scale physical treatment of vegetation, whether by pulling or cutting, would not impact water quality. The scale of disturbance would not be adequate to generate a measurable increase in the sediment or salinity level of adjacent streams.

The removal of vegetation via any of the proposed alternatives could cause short-term increases in surface runoff via reduced infiltration and evapotranspiration rates. This could in turn contribute to increased erosion (particularly on steep slopes with fragile soils), decreased surface water quality, and even altered stream channel morphology. Furthermore, reduced infiltration could impact groundwater recharge, leading to decreases in groundwater supply and the magnitude of base flows.

All weed treatments could temporarily affect water quality by reducing nutrient uptake by plants, resulting in a pulse of nutrients to nearby water bodies, even in semiarid environments (Binkley and Brown 1993). Soluble nutrients such as nitrogen would likely enter streams or other water bodies via groundwater, while nutrients adsorbed to soil particles (e.g., phosphorous) could be carried to surface water in runoff. Nutrient enrichment of aquatic systems can lead to algal blooms and hypoxia (oxygen depletion) (Getsinger 2004). Loss of vegetation and erosion in areas with extensive natural sources of salt in the soil can additionally lead to higher levels of salinity in nearby water bodies.

The loss of stream shade due to removal of streamside vegetation could increase water temperatures. In coldwater systems, temperature increases could contribute to water quality degradation and potentially impact recreational fisheries until native vegetation is reestablished (Clark 2001). If well-vegetated buffers between treated areas and water bodies are left untreated, they can intercept herbicides and mobilized sediment, reducing the potential for these contaminants to reach surface water.

The use of biological agents may affect water quality. For example, the spread of tamarisk leaf beetle larvae over time may reduce the presence of tamarisk, allowing the reestablishment of native riparian vegetation. This transition may allow for reduced salts in the soil, fluctuations in water temperature, and greater filtration rates of water entering streams. All proposed alternatives include some level of biological control, including grazing by goats and other ungulates. Hooved animals can increase surface runoff by reducing vegetation cover through herbivory and trampling and by compacting the soil and disturbing the soil surface.

Even some handheld equipment used in invasive plant treatment has the potential to disturb or displace soil, making the soil more vulnerable to erosion. However, impacts to water quality from manual and biological (insect or pathogen) treatments would be minor and short-term, as soil disturbance would be minimal from manual treatments such as pulling and weed whacking due to the small size of treatment areas, and insects or pathogens do not generally kill host species rapidly enough to lead to extensive loss of vegetation cover.

The treatment of weeds would enhance watershed health and reduce sediment and salinity levels in surface waters. However, with the small treatment size, relative to the total watershed area of the respective watersheds, no measurable change in hydrologic characteristics of these watersheds is projected. It is not expected that the IWM program would contribute to measurable water quality degradation. Localized, short-term water quality impacts may occur from improper or excessive herbicide applications; however adhering to application restrictions and BMPs should minimize the chance for these impacts. Long-term impacts would be beneficial due to watershed restoration.

These protective mitigation measures are highlighted here due to their importance:

- suspend chemical treatments when precipitation is imminent or occurring to mitigate runoff of herbicides;
- use SJPLC fish-bearing streams, perennial streams, and publc water supply layers in GIS and limit, or avoid, chemical application in adjacent areas;
- limit the use of diquat in water bodies that have native fish and sensitive aquatic resources;
- know where municipal watersheds and source water protection areas are (these areas provide drinking water for people) and take extra precautions when applying herbicides in these areas;
- conduct mixing and loading operations in an area where an accidental spill would not contaminate an aquatic body and not within 1000 ft of a public water supply;
- minimize use of herbicides that have high soil mobility, especially in areas where soil properties increase the potential for mobility; and
- Use appropriate herbicide-free buffer zones for herbicides not labeled for aquatic use based on risk assessment guidance, with minimum widths of 100 feet for aerial, 25 feet for vehicle, and 10 feet for hand spray applications. No aerial application within ¼ mile of a public water supply.

Treatment of weeds in the uplands would reduce competition with native plants, and could improve watershed condition. Improved cover in the form of additional vegetation and litter could modify the run-off timing, intensity, and duration of flow. However, with the small treatment size, relative to the total watershed area of the respective watersheds, no measurable change in hydrologic characteristics of these watersheds is projected. The treatment of tamarisk alone could increase water flow within adjacent streams.

Under this alternative, the SJPLC would not be able to use the four additional herbicide active ingredients approved in the PEIS (BLM 2007a) but would continue to use the 14 herbicide active ingredients previously approved for use in the 1991 Vegetation EIS (BLM 1991b). Because the SJPLC would not be able to use the herbicide active ingredient imazapic, which is the most effective cheatgrass control, this noxious weed would continue to spread.

The smaller range of available pesticides in this alternative would decrease the opportunity for spot and localized applications of specific weed patches. The area dominated by cheatgrass would likely continue to expand, and the low ability of this weed to hold soil in place would lead to a larger volume of sediment reaching downslope water bodies.

<u>Alternative B: Proposed Action</u>: Impacts from this alternative would be the same as Alternative A. In addition, under the Proposed Action, the SJPLC would be able to treat up to 5,000 weed-infested acres per year using manual, chemical (both ground-based and aerial) and biological controls. The SJPLC could use four additional herbicide active ingredients (diflufenzopyr, diquat, fluridone, and imazapic) approved in the PEIS (BLM 2007a), as well as continue the use of 14 herbicide active ingredients previously approved (BLM 1991b). The SJPLC would be able to

utilize aerial spraying to treat large infestations of cheatgrass or other weed populations that were inaccessible or unable to be treated with ground equipment.

An IWM Plan with a full range of treatment options would allow for early detection and rapid response to new weed infestations as well as a more proactive, coordinated, and site-specific weed management approach for the SJPLC. Of the alternatives, the Proposed Action would result in the most weeds being treated and the least chance of expansion.

Of the four new herbicides that could be applied in this alternative, diquat carries the greatest risk to native fish and plants, and is a known groundwater contaminant (BLM 2007a); while effective in aquatic and riparian weed control, its use should be limited only to areas where vegetation control is the overriding concern and risks to fish and water quality can be adequately mitigated. Imazapic, which would be used primarily to treat cheatgrass, is not known to contaminate surface water or groundwater.

The use of fluridone (which has a high potential for surface water runoff) and diflufenzopyr (which is highly mobile in soils with neutral to alkaline pH) should be to no closer than 1000 ft of either side or ¼ mile upstream or downstream of a public surface water supply. Neither chemical is a known groundwater contaminant (BLM 2007a).

The remaining herbicides proposed have low potential to flow to aquatic bodies in stormwater runoff or base flow following application in upland areas. Since the risk of surface runoff contaminating water bodies and drinking water is moderate to high for treatments using 12 of the 18 currently permitted herbicides (2,4-D, bromacil, clopyralid, diuron, glyphosate, hexazinone, imazapyr, picloram, sulfometuron methyl, tebuthiuron, and triclopyr), the 4 new herbicides could replace these for various treatments and thus reduce risks to water quality (BLM 2007a). In general, strict application of the SOPs and mitigation measures in Appendices E, F, and G would minimize the water quality impacts of this alternative.

If any riparian areas do become denuded as an inadvertent result of nearby weed treatment, these sites would be potential candidates for restoration. Any additional disturbance related to restoration would be minor compared with the benefits of a more rapid reestablishment of vegetation cover.

In summary, reducing the number of acres degraded by weed infestations throughout the SJPLC via this alternative would result in a small reduction in sedimentation in water bodies, improve nutrient cycling, and help return the landscape to normal fire cycles (BLM 2007a). The increase in acres treated and number of potential chemicals used may increase the risk of contamination of water sources. A small reduction in non-point source affects on water quality may also occur due to increases in desirable vegetation cover.

<u>Alternative C: No Herbicides</u>: This alternative would result in the least acres treated annually because of the increased labor, time, and cost associated with manual and biological control options. Consequently, noxious and other invasive weeds would spread at a faster rate than under other alternatives. Many of the noxious weeds in the SJPLC are perennials that are most effectively controlled with herbicides. For example, Russian knapweed and Canada thistle would probably increase from manual treatments because rhizomes and root fragments left behind would create numerous new plants. Cheatgrass would not be treated because herbicides provide the only feasible form of control for this species. Russian-olive would

probably not be treated, because without the use of herbicides to kill the stump and roots, new plants would sprout. Small, isolated weed infestations would be the focus for manual control.

Biological controls could still be used to control weeds for which biocontrols are available. However, biocontrol agents only exist for a few SJPLC weed species. Even for these, such agents work slowly and do not typically eradicate weed populations but work to weaken the vigor of individual plants, gradually reducing their competitiveness. Tamarisk beetle larvae are a good example. The combination of cutting trees then painting stumps with herbicide remains the best option for isolated pockets of tamarisk trees. This alternative would eliminate this option of treatment. Increased use of manual methods, and possibly domestic ungulates, in riparian areas could lead to increases in sedimentation and nutrient loads of adjacent water bodies. As a result, benefits to surface water from weed treatments in the form of sediment control would be fewer and less extensive than in any of the other alternatives.

While some short-term reduction in water body sedimentation would result from reduced weed treatment, compared to alternatives A & B this alternative would have a long term affect on water bodies of an increase in non-point source pollution as a result of increased fire hazard, decreased ability of plant roots to hold soil in place, and the likely increase in ground disturbance due to increased use of goats or other ungulates for biocontrol. To an even greater degree than in Alternative A, the widespread occurrence of cheatgrass would adversely affect surface water quality under this alternative.

Compared to alternative A & B, eliminating herbicide use would also eliminate the possibility of chemical pollution in surface and ground water. Additionally, manual treatment seldom results in large areas of exposed soil; at least some weed material (e.g., tree stumps) would remain in the treatment areas, reducing the risks of sedimentation and alteration to stream flow.

3.4.2 Floodplains, Wetlands and Riparian Zones

Flooding is a natural and recurring event for a river or stream. Statistically, streams will equal or exceed the mean annual flood once every 2.33 years (Leopold et al., 1964). Flooding is a result of heavy or continuous rainfall exceeding the absorptive capacity of soil and the flow capacity of rivers, streams, and coastal areas. This causes a watercourse to overflow its banks onto adjacent lands. Floodplains are, in general, those lands most subject to recurring floods, situated adjacent to rivers and streams.

Wetlands and riparian areas are defined as areas inundated or saturated by surface water or groundwater (i.e. floodplain) at a frequency, and duration, sufficient to support vegetation that is typically adapted for life in saturated soil. Wetlands include bogs, marshes, shallows, muskegs, wet meadows, estuaries, and riparian areas. Wetlands and riparian areas comprise approximately 9 percent of public lands (BLM 2006b). However, the benefits of these vital areas far exceed their relatively small acreage. The functions of wetland and riparian areas include water purification, stream shading, flood attenuation, shoreline stabilization, groundwater recharge, and habitat for aquatic, semi-aquatic, and terrestrial plants and animals (EPA 2001b).

The BLM defines properly functioning wetlands and riparian areas those that:

- support adequate vegetation, landform, or debris to dissipate energies associated with wind action, wave action, and overland flow from adjacent sites, thereby reducing erosion and improving water quality;
- filter sediment and aid floodplain development;
- improve floodwater retention and groundwater recharge;
- develop root masses that stabilize islands and shoreline features against cutting action;
- restrict water percolation;
- develop diverse ponding characteristics that provide the habitat and water depth, duration, and temperature necessary for fish production, waterbird breeding, and other uses; and
- Support greater biodiversity.

Wetlands and riparian areas are influenced by human activity, natural disturbance, and local physical and biological conditions. Noxious weeds and other invasive vegetation degrade wetlands and riparian area function, and present a challenge to vegetation management. Under natural conditions, wetlands and riparian area plant communities have a high degree of structural and species diversity, reflecting past disturbances from floods, fire, and fish and wildlife use (Gregory et al. 1991).

Since European settlement, many wetlands and riparian areas have been drained or altered and, as a result, their functions and values have been lost or reduced. The Clean Water Act (1972) and Executive Order 11990, *Protection of Wetlands and Floodplains* (1977), identified the importance of wetlands and riparian areas and directed Federal and State agencies to focus more attention on the health of these areas. As a result of legislative and policy guidance, the BLM and other land management entities have spent considerable effort and money to restore wetland and riparian functions and values during the past several decades.

Affected Environment

Riparian areas and wetland ecosystems occur at all elevations on SJPLC-administered BLM lands. They occur on valley floors, and in other low-lying landscape positions, and are associated with both intermittent and perennial streams. In some cases, particularly in CANM, riparian corridors are supported by stream flows augmented by irrigation run-off. Although small in area, they represent a very important ecological component of the environment.

Human impacts to riparian areas and wetland ecosystems that have occurred within SJPLC-administered BLM lands include urbanization, agriculture, logging, livestock grazing, mining, and recreation; road, dam, and diversion construction; and the introduction of non-native species (Blair et al. 1996, Dick-Peddie 1993).

These impacts have reduced native hydrophytic species (most notably cottonwood and willows), increased invasive species, changed dominant life-forms from trees and shrubs to herbs, reduced water flow, and lowered water tables. The deciduous forest and mixed-evergreen deciduous forest types have probably been the most affected by human impacts (because they occur in places that offer relatively easy access).

Proper Function Condition (PFC) analysis (BLM TR1737-15, 1998) of riparian areas and wetland ecosystems within SJPLC-administered BLM lands have determined that 61% of the BLM-administered lands are in proper function condition; 31% of the BLM-administered lands are in a functional-at-risk (FAR) condition; and 8% of the BLM-administered lands are in a non-functional (NF) condition.

The seven major community types in SJPL riparian and wetland areas are as follows:

- Coniferous riparian forests and woodland – Dominated by blue spruce or one or more of the conifer species dominating adjacent upland habitats.
- Mixed coniferous/deciduous forests and woodlands – Depending on elevation and other ecological situation, may be dominated by boxelder, plains cottonwood, narrowleaf cottonwood, balsam poplar, or quaking aspen, often mixed with blue spruce or another other conifer species.
- Deciduous forests and woodlands – Dominated by the same conifers mentioned above, but without a substantial conifer component. Two woody noxious weed species—salt-cedar (tamarisk) and Russian-olive—are sometimes associated with this community along the Colorado River and tributary streams at lower elevations.
- Tall willow shrublands – Dominated by one or more of several tall willow species, often more than 2 meters high and commonly in association with one or more other riparian shrub species. Major invasive species include Russian-olive and salt-cedar trees along the Colorado River and tributary streams at lower elevations.
- Short willow shrublands – Dominated by one or more species of short willow species, often less than 1 meter high. Short willows do not offer the same structural diversity as tall willows but provide the same general hydrologic functions.
- Non-willow shrublands – Dominated by a variety of non-willow species. Depending on elevation or other ecological situation may include thinleaf alder, western river birch, hawthorn, redtwig dogwood, and silver buffaloberry, often in association with shorter riparian shrubs such as currants (*Ribes* spp.) and roses (*Rosa* spp.).
- Herbaceous vegetation – Typically dominated by several species of riparian forbs, grasses, and grass-like plants (sedges, rushes, etc.).

Riparian communities are particularly vulnerable to colonization and spread of noxious weeds and other invasive species. Riparian areas typically attract a variety of uses such as recreation, wildlife, and livestock grazing. All of these uses can cause disturbance to native vegetation and introduce the seeds of noxious weeds. Once noxious weeds are established in riparian areas, their seeds can be easily transported by water, resulting in spread to new areas. Prevalent riparian weeds on SJPLC-administered BLM lands include Russian knapweed, Canada thistle, and houndstongue.

The exotic shrub tamarisk has invaded much of the Dolores River Canyon and its lower tributaries, as well as other areas on SJPLC-administered BLM lands. Tamarisk out-competes native cottonwoods and willows, limiting the regeneration success of those native species (Finch et al. 1995). Native to China and Kazakhstan, tamarisk was first imported from Asia in the 1800's as an ornamental shrub and for erosion control. Once it escaped gardens, it quickly invaded riparian zones, seeps and ponds. By 2004, tamarisk covered 55,000 acres in Colorado.

In 2007 tamarisk leaf beetle larvae (Diorhabda elongate) were introduced into McElmo Canyon which bisects the southern portion of CANM. In 2004 The Nature Conservancy released beetles on the San Miguel River which have now moved into stretches and tributaries of the Dolores River and Dry Creek Basin.

In addition to tamarisk beetle larvae, aerial spraying of tamarisk within the CANM also occurred in 2008. Imazapyr (Habitat) was aerial sprayed using a rotary wing aircraft on approximately 200 acres of public lands along portions of Yellow Jacket, Sandstone and Woods Canyons. Monitoring in the summer of 2009 documented that this treatment has been effective in controlling tamarisk. Future monitoring is planned to document the continued effectiveness of these treatments.

Environmental Consequences

Alternative A: No Action: Under the No Action alternative, the IWM Plan implemented by the SJPLC would not include aerial spraying, thereby reducing the risk of drift into non-target areas. This would be a potential benefit compared to the Proposed Action. However, the protective measures applied to all alternatives involving use of herbicides (see Appendices E and F) would reduce that risk. The No Action alternative would also prohibit the SJPLC from approving treatments using the four newly approved herbicides. These include two herbicides (imazapic, and fluridone) that could be used to control weeds in aquatic sites. No herbicide available to SJPLC under current management is registered for use in aquatic sites.

Alternative B: Proposed Action: The proposed IWM plan affect floodplains, riparian and wetland zones by decreasing the competition between noxious weeds and native riparian vegetation. Many noxious weeds are introduced plants that have no native biological controls, which gives them an edge in terms of establishment along riparian and wetland zones. All herbicide guidelines and restrictions would be followed in and around riparian and wetland zones. Biological controls, such as tamarisk leaf beetle larvae, are a great tool against some noxious weeds in these zones. Any mechanical control would include mitigation of soils and displacement of native plants where applicable. Fire may be used as a tool in wetlands and riparian areas, if noxious weeds targeted for treatment are susceptible. The surfactant Agri-Dex would be used in wetlands and riparian areas. Agri-Dex is a proprietary: heavy range paraffin-based petroleum oil with polyol fatty acid esters and polyphenol derivatives and is classified as an oil-based surfactant. This surfactant is non-ionic dispersible in water as micelles. Biodegradation is presumed to be rapid, but no formal studies have been conducted. This surfactant is practically non-toxic through oral routes to mammals and practically non-toxic to fish and other aquatic biota. This surfactant is approved for use by BLM. Agri-Dex surfactant has an aquatic toxicity of 271 PPM for rainbow trout 96-hr LC50 and 386 PPM for rainbow trout 24-hr LC50.

A Best Management Practice is proposed that would limit herbicide use within 1,000 feet on either side of the surface water drainage network and extended outward a distance of one-quarter mile from the boundary of recognized municipal watersheds.

There would be very little impact to floodplains by either biological or chemical treatments, as long as chemical treatment was to follow suggested guidelines for wetter areas. Mechanical treatment in floodplain areas would need to minimize the amount of soil disturbance, and if soil disturbance were to occur, mitigation measures would need to be in place to deal with accelerated erosion and misplaced native plants.

Alternative C: No Herbicides: A benefit of not using herbicides under Alternative C would be the elimination of risks to desirable nontarget riparian, wetland, and aquatic plants due to accidental spills, drift, and persistence in the environment. However, this benefit would likely be offset by an increase in weeds that are treated effectively through the use of herbicides. A number of weeds in riparian areas cannot be eradicated manually because they resprout from rhizomes or roots (e.g., Canada thistle, Russian-olive, and tamarisk). Invasive species that are not controlled can dominate native vegetation and increase the incidence of fire and other conditions that can result in loss of ecosystem function in wetlands and riparian areas.

3.5 Vegetation Resources

The present-day composition and distribution of plant communities in the western U.S. have been influenced by many factors, including physical factors (i.e. climate, drought, wind, geology, topography, elevation, latitude, slope, and exposure) and natural disturbance and human-management patterns (i.e. insects, disease, fire, cultivation, domestic livestock grazing, and wildlife browsing) (Gruell 1983). Other activities that have a direct and/or indirect effect on plant communities include logging, minerals extraction and reclamation activities, recreational activities, and ROW development (including road construction and maintenance). In addition, competition with non-native invasive plant species has resulted in the loss of native plant communities in portions of the western states. The rapid expansion of invasive plant species across public lands continues to be a primary cause of ecosystem degradation, and control of these species is one of the greatest challenges in ecosystem management (BLM 2007a).

Vegetation communities are affected by the spread of invasive non-native species through mechanisms related to habitat fragmentation by roads, recreation use, exurban development, and climate change. Each of these facilitates the spread of invasive non-native species and may contribute to declines in communities and sensitive plant species populations. (Romme et. al. 2009)

3.5.1 Invasive Non-native Species

Noxious weeds and other invasive vegetation are, basically, undesirable plants that infest land, deplete water resources, and result in ecosystem degradation. Noxious weeds are invasive plants designated and regulated by State and Federal laws (such as the Federal Noxious Weed Act). They are detrimental to agriculture, commerce, and/or public health. Generally, noxious weeds and other invasive vegetation are non-native invasive plants that have been either accidentally or intentionally introduced. Many invasive species have transformed both the structure and function of ecosystems by changing nutrient cycling or disturbance regimes (D’Antonio et al. 1999; Rejmanek et al. 2005). The spread of weeds and other invasive vegetation threatens the structure and function of many ecosystems worldwide (Higgens et al. 1996; Drake et al. 1989). Certain invasive plant species have the ability to spread over large areas or acutely threaten an ecosystem over its continental range (Hobbs and Humphries 1995). There are estimated to be over 2,000 species of non-native plants in the U.S. (U.S.

Congress Office of Technology and Assessment 1993). Over 1,000 of these plants are invasive (Rejmanek et al. 2005). Approximately 10 percent of invasive species have profound impacts on biodiversity, and clearly demand a major allocation of resources for containment, control, and/or eradication (BLM 2007a).

In addition to ecological changes, noxious weeds and other invasive vegetation can result in adverse impacts to public safety. The spread of cheatgrass has increased the frequency and severity of fires, to the detriment of native plants and animals, as well as property and human safety.

Traits of Noxious Weeds and Other Invasive Vegetation: Noxious weeds and other invasive vegetation have biological traits that enable them to colonize new areas and successfully compete with native species. Not all invasive species share many of these traits; however, most species have one or more that allow them to compete successfully. These traits may include deep tap root systems and very little surface foliage (allowing the plants to grow later in the summer than most native rangeland plants); earlier growth and reproduction than most natives; long-lived seeds in a viable seedbank; adaptations for spreading long and short distances; production of many seeds from one plant; long lifespan; ability to delay flowering; ability to reproduce vegetatively; tolerance for a wide range of physical conditions; rapid growth; self pollination; ability to compete intensively for nutrients; and production of toxic compounds that negatively affect neighboring plants (adapted from USDA Forest Service 2005).

Some plant communities and ecosystems are more susceptible to plant invasion than others. Very few invaders are successful in successionally advanced plant communities. Open and disturbed communities are more invaded, while undisturbed forests are less invaded (Rejmanek et al. 2005).

*Mechanisms of Invasion: I*nvasive plants have been introduced into the U.S. through a variety of pathways. Some non-native species were intentionally introduced for beneficial reasons and, later, became invasive. (For example, Purple loosestrife, which was originally introduced in ballast water dumped from ships coming from Europe, is still sold as an ornamental plant in garden centers in many states. Dalmatian toadflax is another introduced ornamental that can still be found in garden seed mixes. Saltcedar was introduced for erosion control. Many other invasive plants have been introduced unintentionally via air, water, rail, or road transportation pathways. Common methods of introduction include contaminated seed, feed grain, hay, straw, and mulch; movement of contaminated equipment across uncontaminated lands; animal fur and fleece; spreading of gravel, roadfill, and topsoil contaminated with noxious weed seed; and plants and seeds sold through nurseries as ornamentals (BLM 1996).

Once introduced, invasive plants are spread primarily by vehicles, humans, wild horses, livestock, wind, water, and wildlife. Initially, noxious weeds and other invasive vegetation may occur along roads and trails, firebreaks, landing pads, oil and gas development sites, wildlife and/or livestock concentration areas, and campgrounds; however, they may also invade relatively undisturbed sites.

Affected Environment

The Colorado Department of Agriculture has three noxious weed designations: Class A (which are those weeds targeted for eradication within the State); Class B (which are those weeds that are to be managed for containment); and Class C (which are those weeds where optional, more intensive management can be undertaken by local organizations, such as by counties). There are 18 Class A, 39 Class B, and 14 Class C noxious weed species, for a total of 71 noxious weed species.

The SJPLC has formal cooperative agreements with five of seven counties to treat, monitor, and inventory noxious weeds. In addition, SJPLC has partnerships with other local entities (including the Dolores River Tamarisk Action Group) to support tamarisk management.

Table 3.2 Noxious Weed Inventory on BLM Lands Administered by SJPLC*

Noxious Weed	Acres on BLM	Noxious Weed	Acres on BLM
Black henbane	1	Musk thistle	3,114
Bull thistle	<14	Perennial pepperweed	9
Canada thistle	337	Russian knapweed	2,468
Dalmatian toadflax	82	Russian thistle	38
Cheatgrass	462 +	Tamarisk	1,278
Halogeton	12	Spotted knapweed	1
Hoary cress	20	Yellow toadflax	70
Houndstongue	<1	Unknown	50
Jointed goatgrass	1		

* Data from 2004-2009. Other locations may be on maps or aerial photos, but have not been ground verified to be included in this inventory. Acres by species were queried for years 2004 – 2009. They may be in exact because they were queried by dominant species and may not pick up those species identified as associated species.

Table 3.3 Noxious weeds have been located near SJPLC-administered BLM lands or are on the "watch list" and are considered potential noxious weed invaders.

Noxious Weed	Noxious Weed
African rue	Hydrilla
Bouncing bet	Leafy Spurge
Camel thorn	Medusahead
Chicory	Mountain tarweed
Chinese Clematis	Orange hawkweed
Common mullein	Oxeye daisy
Corn/Scentless chamomile	Purple loosestrife
Diffuse knapweed	Scotch thistle
Dyers woad	Squarrose knapweed

Noxious Weed	Noxious Weed
Eurasian watermilfoil	Sulphur Cinquefoil
Giant salvinia	Yellow starthistle

As part of an Invasive Species Action Plan, the SJPLC developed a treatment priority list for both BLM and USFS administered lands in the DLMP/DEIS. This plan would be updated and reviewed every 3 years.

Table 3.4 Species Action Plan for the SJPLC.

Species	Management Objective	Colorado Noxious Weed List Status	Comments
Bull thistle	Containment	List B -Containment	Annually treat priority areas.
Canada thistle	Containment	List B - Containment	Annually treat priority areas.
Dalmatian toadflax	Eradication	List B - Containment	Approximately 240 acres. Good candidate for biological control. Eradication is reasonable as the pest has only been found in isolated areas near Dolores.
Cheatgrass	Containment	List C - Optional Management	Treat high priority areas as needed. Benefiting function should help fund project.
Hoary cress	Containment	List B - Containment	Approximately 231 acres. Containment within roadside ROWs in order to reduce the chance of invasion into native systems.
Houndstongue	Containment (Columbine, Pagosa) Eradication (Dolores	List B - Containment	Approximately 3,132 acres. Found along the old railroad grade, and associated meadows, on the railroad and La Plata allotments on the Dolores office. Contain the infestation east of Cherry Creek and eradicate it west of Cherry Creek on the Dolores unit. Contain the infestation within the Piedra area above the Piedra Road Bridge, and within the Piedra River drainage below the Piedra Road Bridge on the Pagosa unit.
Musk thistle	Containment	List B - Containment	Annually treat priority areas.
Puncturevine	Eradication	List C - Optional Management	Approximately 5 acres. Eradicate in Deep Canyon and Kenny Flats Road on the Pagosa Road.

Species	Management Objective	Colorado Noxious Weed List Status	Comments
Russian knapweed	Containment (Dolores) Eradication (Pagosa)	List B - Containment	Approximately 7,685 acre. Eradicate infestations located in the Lower Valle Seco, First Fork Trailhead, and Horse Creek on the Pagosa unit. Contain on BLM and the Monument. Incorporate biocontrol such as with the nematode *Subanguina picridis.*
Spotted knapweed	Eradication	List B - Containment	Approximately 167 acres. Refer to part 4.7.4 of the State Noxious Weed Act for specific spotted knapweed management requirements. This pest should be targeted for eradication outside of specific portions of La Plata County (see part 4.7.6 exhibit 8). Found in isolated locations within the Missionary Ridge Wildfire, Bear Creek (Columbine RD) McPhee campground, Dolores office site, House Creek CG, McPhee Park,, Gordon Creek Gravel Pit, Devil Mtn. Res., Newtjack Rd., and along the WAPA ROWs.
Tamarisk	Containment (BLM, Monument) Eradication (USFS)	List B - Containment	Approximately 1,041 acres. Refer to part 4.7.5 of the State Noxious Weed Act for specific tamarisk management requirements. Yellow Jacket Canyon is a priority treatment area on theMonument.
Yellow toadflax	Containment	List B - Containment	Approximately 1,182 acres. Potential candidate for biological control. Species should be targeted for eradication in Scotch Creek, Cherry Creek, and Box Canyon Reservoir areas on the Dolores office.

New trends and needs have emerged since the development of 1985 San Juan/San Miguel Resource Management Plans, including:

- *The Missionary Ridge Wildfire of 2002:* This fire burned approximately 70,000 acres. The resulting noxious-weed population doubled to approximately 6,200 acres. In spite of a 4-year contract to inventory and treat noxious weeds within the fire area, successful long-term management may continue to require large amounts of capital and labor.

- *Hazardous fuels program:* In spite of increased awareness regarding limiting the spread of noxious weeds in SJPLC-administered BLM lands, ground disturbance may continue to provide a seedbed for new noxious weed infestations.

- Increased awareness: As the result of internal and external outreach and education, noxious-weed impacts have evolved from a range management problem to a community problem. This awareness has produced cooperation between the CDOW and Federal land management agencies, with the goal of restricting the use of uncertified hay on public lands within the State.

- Integrated pest management: Integrated pest management (e.g., cultural, mechanical, chemical, and biological control), as opposed to strictly herbicide treatment, has evolved over time.

- *New noxious weeds:* New noxious species are poised to invade public lands. These are described in Table 3.3 above. There was no analysis and direction regarding these species in the older land and resource management plans.

- Increased legislative support to manage noxious weeds: Several new laws, EOs, and initiatives have all resulted in raising awareness about invasive species.

- *Improved development and implementation of standard noxious weed mitigation measures in contracts and other agreements*: Noxious weed assessments are produced for every project and supporting NEPA analysis in order to outline the necessary mitigation measures for a proposed action on public lands.

- *Improved biological control methods*: There are approved biological control agents for leafy spurge, Canada thistle, musk thistle, Dalmatian, and yellow toadflax.

  Improved herbicide formulations: Over time, herbicide formulations have improved. This has resulted in less overall herbicides being used; however, control success rates have improved.

- *Drought: The on-going drought* has the potential to permanently change rangeland vegetation*composi*tion to favor invasive species (including cheatgrass). Cheatgrass is prevalent in l*ower-el*evation rangelands; however, it has increased its density in those areas, and is now invading higher-elevation lands.

- *Cheatgrass invasion: The inv*asion of cheatgrass has the potential to alter public land f*orage q*uality and seasonal availability. It also has the potential to increase fire frequency beyond the range of natural variation. This may, in turn, adversely impact wildlife habitat and water quality, among other resources.

Environmental Consequences

<u>Alternative A: No Action</u>: All herbicides are intended to cause mortality or injury to target plants, which may vary in intensity and extent. Herbicides offer an effective and often resource-efficient means of treating and managing undesirable vegetation. Manual methods are often more time and labor intensive, and can create soil disturbance which can lead to additional weed establishment. Biological control provides an affordable method to control larger weed infestations that are not cost-effectively or feasibly controlled by other methods.

However, biological control by domestic animals could introduce weed disseminules (seeds or fruits) to a site, attached to an animal's fur or deposited in its feces. Eradicating and/or controlling weed infestations would benefit native plant communities by decreasing the growth, seed production, and vigor of undesirable species, thereby releasing native species from much of this competition. However, if too little vegetation remains following treatment, other weeds may invade the area. To minimize this potential, areas with a minor component of desirable species or that must be treated with a non-selective herbicide to control the targeted species may be revegetated following treatment. Seeding or interseeding these types of areas can hasten the establishment of desirable native species and help prevent colonization by weeds.

Revegetation can also disturb the soil and create conditions favorable for weeds if the seeded species do not become established. Monitoring of revegetated areas is critical to ensure that the area is recovering as intended or, if not, provide a basis for additional weed control and/or seeding.

Under alternatives A and B, herbicide treatments would comply with the U.S. Environmental Protection Agency label directions and follow BLM procedures outlined in BLM Handbook H-9011-1 (*Chemical Pest Control*) and BLM Manual Sections 1112 (*Safety*), 9011 (*Chemical Pest Control*), and 9015 (*Integrated Weed Management*) and meet or exceed State label standards. Herbicide applications would adhere to all State and Federal pesticide laws. All applicators that apply herbicides on the SJPLC (i.e. certified applicators or those directly supervised by a certified applicator) would comply with the application rates, uses and handling instructions on the herbicide label, and where more restrictive, the rates, uses, and handling instructions developed by the BLM.

The SJPLC would follow SOPs, mitigation measures, and conservation measures adapted from the PEIS to avoid or minimize adverse impacts to human health and the environment during weed treatments. These measures, presented in Appendices E, F, and G of this document would be applied to all weed treatments permitted or conducted by the SJPLC.

Not having the newly approved herbicide imazapic available would greatly impair the SJPLC's ability to effectively treat cheatgrass, which is very aggressive, difficult to control, and widespread in the SJPLC area. Because the most extensive infestations within the SJPLC boundaries often consists of cheatgrass, the combination of no aerial spraying and no imazapic under the No Action alternative would likely result in continued expansion of this species.

<u>Alternative B: Proposed Action</u>: Under the Proposed Action, the SJPLC would be able to treat up to 5,000 weed-infested acres per year using manual, chemical (both ground-based and aerial) and biological controls. The SJPLC could use four additional herbicide active ingredients approved in the PEIS, as well as continue use of 14 herbicide active ingredients previously approved in the 1991 Vegetation EIS. The newly approved herbicides include imazapic, which is effective on cheatgrass.

Another newly available herbicide (Overdrive®), which contains diflufenzopyr in combination with diquat, appears to have good potential for controlling a variety of broadleaf weeds and annual grasses. The Proposed Action would also include aerial spraying to treat large infestations of cheatgrass or other weed populations that are infeasible or ineffective to treat with ground methods.

Alternative C: No Herbicides: This alternative would result in the least acres treated annually of any alternative because of the increased labor, time, and cost associated with manual and biological control options. Noxious weeds would spread at a faster rate than under other alternatives. Many of the noxious weeds in the SJPLC, such as cheatgrass, are effectively controlled only with herbicides.

Manual treatments would be practicable only for small weed populations or individual plants due to limited resources. Some perennial weeds such as Russian knapweed and Canada thistle could actually increase following manual treatment due to growth of new plants from rhizomes and root fragments left in the soil. Manual treatment of Russian-olive and tamarisk would also be relatively ineffective without chemical treatment to kill the stump and roots and prevent sprouting.

Biological controls could be used to treat infestations too large for manual control such as the use of the tamarisk leaf beetle larvae. However, few biocontrols are currently available, and these generally work slowly by weakening the target species, thereby reducing its competitiveness over time rather than eradicating it.

3.5.2 Special Status Plants

BLM policy states that BLM actions must not adversely impact Special Status Species, which include species that are listed under the ESA, given some form of special designation to denote rarity by the State, or are listed as sensitive by the BLM. The *Vegetation Treatments on Bureau of Land Management Lands in 17 Western States Programmatic Biological Assessment (BA)* (BLM 2007c) provides a description of the distribution, life history, and current threats for each federally listed plant species, as well as species proposed for listing. The BA also discusses the risks to threatened and endangered species, and species proposed for listing (collectively referred to as TEP plants) associated with each of the herbicides used by the BLM. In conjunction with the current EA, the SJPLC prepared a BA (BLM 2010b) for consultation with the US Fish and Wildlife Service. The BA analyzed potential impacts to listed or proposed species in the SJPLC area. Information contained in these documents will be used as a guideline by the SJPLC when developing local projects.

The draft San Juan Public Lands DLMP/DEIS (USFS, BLM 2007) seeks to manage special status plants within the context of ecosystem management where plant species are evaluated, and provided for by protecting the composition, structure, and function of the major vegetation types within the planning area. The assumption is that a variety of species representing a majority of the native flora and fauna found within those ecosystems would be sustained. A species-approach, focused on the specific needs of individual species, would be implemented for those plant species that are rare or endemic, at risk of decline, or are not adequately covered by the ecosystem management approach. The RMP for the Canyons of the Ancients National Monument includes similar objectives for special status species.

Special Status plant species are particularly prone to the affects of noxious weed invasion and herbicide treatment since they occupy limited geographic space and are not mobile.

Affected Environment

BLM Special-Status Species are those species designated as federally endangered, threatened, proposed, or candidate under the ESA; those designated by the CDOW as State endangered or threatened; and BLM Sensitive Species (Appendix C).

3.5.2.1 Federal threatened, endangered and candidate species

The USFWS Colorado Field Office County List updated March 2010 (USFWS 2010a) identifies one Federally listed threatened plant: Mesa Verde Cactus (*Sclerocactus mesae-verdae*), two Federally listed endangered plant species: Knowlton Cactus (*Pediocactus knowltonii*) and Mancos Milk-vetch (*Astragalus humillimus*), and two Federal candidate plant species: Sleeping Ute Milkvetch (Astragalus tortipes) and Pagosa skyrocket (Ipomopsis polyantha) that occur or may occur within the counties under the SJPLC jurisdiction.

Mesa Verde Cactus, Mancos Milkvetch, Sleeping Ute Milk Vetch are documented to occur in Montezuma County on Ute Mountain Ute tribal lands but have not been located on public lands (CNHP 2005b). Knowlton's cactus is known from only one location on the Colorado/New Mexico border (CNHP 2004b).

The Mesa Verde cactus (Sclerocactus mesae-verdae) is a long-lived perennial species that occurs on sparsely vegetated, low rolling clay hills in San Juan County, New Mexico, and Montezuma County, Colorado (New Mexico Rare Plant Technical Council 1999). Plants require a substrate of highly eroded clay derived from shales and mudstone of marine origin, and typically occur in habitats characterized by little or no ground cover (CNHP. 2004a). Percent of range in Colorado is low with known populations in Colorado occurring on Ute Mountain Ute Tribal lands (CNHP 2005b).

Knowlton's cactus (*Pediocactus knowltonii)* occurs in sagebrush and pinyon/juniper ecosystems in San Juan County, Northwestern New Mexico. Extensive searches in nearby potential habitat in La Plata County, Colorado have failed to locate additional natural populations. There are no known populations in Colorado but potential habitat does exist (CNHP. 2004a; CNHP 2004b). The natural habitat of Knowlton's cactus is mostly confined to a single population occurring within a 25-acre (ac) preserve that was donated by the Public Service Company of New Mexico to The Nature Conservancy (TNC). This cactus is not known to occur in Colorado (USFWS 2010b).

Mancos Milk-vetch (*Astragalus humillimus*) occurs on Point Lookout and Cliff House sandstones, and tan Cretaceous sandstones of the Mesa Verde series. Dominant associated species are Oryzopsis hymenoides, Gutierrezia sarothrae, Yucca angustissima, and Artemisia tridentata. Known occurrences are from Mancos Canyon, Colorado, southward to just south of the San Juan River in San Juan County, New Mexico. Habitat: Percent of range in Colorado is low with known occurrences within a 4x5 mile area restricted to Point Lookout sandstone at south end of Mesa Verde (CNHP. 2004; CNHP 2005b).

Sleeping Ute Milkvetch (Astragalus tortipes) is a Federal Candidate species known only from an area of about 6 square mile area in extreme southwestern Colorado. The species occurs in scattered colonies on the lower slopes of ridges and knolls of Cretaceous Mancos Shale which separates mountain foothills from desert badlands. In mixed desert scrub with Atriplex confertifolia, Chrysothamnus greenei, Eriogonum clavellatum, Frankenia jamesii and Gutierrezia sarothrae. Habitat: Endemic to Colorado where occurrences are found on lower slopes of Sleeping Ute Mountain on gravels over Mancos shale (CNHP. 2004a).

Pagosa skyrocket (Ipomopsis polyantha) is a Federal Candidate species. Endemic to Colorado where it occurs in outcrops of Mancos Shale with Ponderosa pine on outcrops of late Cretaceous Period the specie is found from Durango to Pagosa Springs north to Hinsdale County, Colorado and south through Pagosa Springs into New Mexico. One of the rarest plants in the state, the Pagosa skyrocket was found for the first time on public lands in Archuleta county in 2004 (CNHP. 2005a).

3.5.2.2 Sensitive Species

Sensitive Species are species under status review by the USFWS, species with numbers declining so rapidly that Federal listing may become necessary, species with typically small and widely dispersed populations, or species inhabiting ecological refugia or other specialized or unique habitats.

For Colorado BLM, the State Director's Sensitive Species were identified using criteria found in the BLM Manual 6840- Special Status Species Management (as revised, December 2008), and comments received by the BLM Field Offices, Colorado Division of Wildlife (CDOW), U.S. Forest Service (Region 2), U.S. Fish and Wildlife Service (Region 6), and the Colorado Natural Heritage Program. This list was also coordinated and shared with neighboring BLM states. Species considered for designation as BLM sensitive in Colorado, were reviewed against the following criteria:

1. Species occurs on BLM Colorado public lands.
2. Species has a documented or predicted downward trend such that, the species is at risk across all or a significant portion of its range.
3. Species inhabits ecological refugia or unique/specialized habitats.
4. Actions on BLM lands may influence habitats or species populations to a degree that the species is at risk across all or a significant portion of its range.
5. Species occur in small or widely dispersed populations.
6. Species under status review by FWS, or is being managed under a Species Conservation Management Plan (BLM 2009).

Appendix C Table C-3 lists those species, their habitat association and documented occurrence on SJPLC-administered BLM lands.

Environmental Consequences

<u>Alternative A: No Action</u>: The SJPLC prepared a BA to evaluate likely impacts to Federally listed or proposed threatened or endangered species (BLM 2010b). The BA reached a determination of "No Effect" for the Knowlton's cactus, Mesa Verde cactus, Mancos Milk-vetch, and Sleeping Ute Milkvetch. That determination was based on BLM's adherence to the SOPs, mitigation measures, and conservation measures (see Appendices G, H, and I) for avoiding or minimizing risks to this species and the lack of known occurrence and limite habitat available on BLM lands administered by the SJPLC. The SJPLC is consulting with the USFWS on this BA to evaluate

likely impacts to Federally listed threatened, endangered, or proposed species (BLM 2010b) (see Appendix I of this document). Prior to conducting noxious weed treatments using herbicides the USFWS concurrence on this determination is required.

For this analysis, effects are considered to be similar for each special status plant species. In general, vegetation treatments have the potential to affect most plant species in much the same way: all are intended to cause mortality or injury to target plants, and may vary in intensity and extent. However, species with the lowest numbers or limited distribution are the most sensitive to impacts.

If herbicide treatments were to occur in special status plant habitat, plants could be crushed by trucks and/or ATVs during ground applications. Ecological Risk Assessments (ERAs) cited in the PEIS predicted the potential for special status plants to suffer negative effects as a result of exposure from BLM-approved herbicides. Modes of exposure include direct spray of plants, accidental spills, offsite drift, surface runoff, and wind transport of soils from treatment sites. Possible negative effects could include one or more of the following: mortality, loss of photosynthetic foliage, reduced vigor, abnormal growth, or reduced reproductive output.

Biological control by domestic animals could cause mortality and injury to special status plants through grazing, browsing, and trampling. Biological control by domestic animals could lead to soil compaction from soil trampling, increased soil erosion from loss of plant cover, and loss of biological soil crusts which have an important role in hydrology and nutrient cycling.

Biological control agents such as insects and pathogens do not typically have an effect on non-target plant species or habitats, but some have been known to attack species in addition to the target plant. All biocontrol agents utilized by the SJPLC would be tested prior to release to ensure they are host specific. According to the PEIS, “as a general rule, it is assumed that biocontrol agents that attack target species in the same genus as a special status plant would have a negative effect on that special status plant species, unless extensive research has shown otherwise” (BLM 2007a).

Bio-control agents such as insects and pathogens would be expected to have long-term positive effects on special status plant species by controlling undesirable vegetation in occupied or potential habitats. Competition for resources would be reduced and more suitable habitat would be available for special status plant species.

In general, the effects of manual treatment methods would be minimal because of both the low level of environmental impact of this method and the limited areas for which manual use is feasible. Special status plants could be directly killed or injured if accidentally removed during a treatment or if trampled on by workers treating a site.

Revegetation could include broadcast seeding followed by raking or harrowing or drill seeding, or possibly cultivation (discing) prior to seeding. Plants could be crushed by tractors or ATVs during the drill-seeding, or injured or killed during cultivation or raking. Prior to any proposed cultivation, cultural and biological surveys would be conducted prior to ground disturbance and a site-specific NEPA document would be prepared. Safety buffers around special status plants would prevent direct impacts. Revegetation could increase desirable vegetation around special status plant species, creating more competition and limiting resources available to special status plants. It could also create a beneficial effect to special status plants by restoring the site with native vegetation that was present before weeds dominated the area.

Weed treatments could alter species composition. Elimination or reduction of non-native species could create more suitable habitat for special status plant species. Provided herbicides were able to avoid negatively affecting populations of special status plant species on or near the treatment site, long-term benefits to these populations could potentially occur.

A long-term beneficial effect to special status plant species would be expected from manual treatments. Removal of undesirable, competing vegetation could increase the health or vigor of existing populations, or increase suitable habitat of unoccupied sites. Soil disturbance and risks of erosion would be minimal with manual methods.

The SJPLC would follow the SOPs and mitigation measures presented in Appendices G and H to ensure that adverse impacts to special status plants from weed treatments are avoided or minimized. In addition, the SJPLC would implement conservation measures in Appendix H to protect Federally listed, proposed, or candidate threatened or endangered species. The conservation measures include buffer distances based on the information provided in previous Ecological Risk Assessments. Adherence to the SOPs and the mitigation and conservation measures will ensure that all practicable means to avoid or minimize harm to special status species have been adopted by the SJPLC.

Herbicide use does pose potential risks to Special Status Species. However, these risks can be minimized by following certain SOPs, which can be implemented according to specific conditions. These SOPs include:

- Survey for Special Status Species before treating an area. As part of the weed treatment program, the weed staff will consult the GIS database for the sensitive plants located therein before any projects are undertaken. The treatment crews will carry the Colorado Rare Plant Field Guide (with current official updates) as part of their kit. To date, none of the sensitive plant locations have overlapped with any treatments. Most of the weed infestations are associated with a disturbance (road, gas pad, pond, etc). The SJPLC would continue this protocol of mapping sensitve plant locations in conjunction with treatment projects.

- Consider impacts to Special Status Species when designing herbicide treatment programs.

- Use drift-reduction agents in order to reduce the risk of drift hazard.

- Use a selective herbicide and a wick or backpack sprayer I order to minimize risks to Special Status Species.

- Herbicide treatments will not be conducted in areas where special status plant species may be subject to direct spray by herbicides during treatments.

- Suitable buffer zones will be established between treatment sites and populations (confirmed or suspected) of special status plant species to avoid negative effects from aerial drift, runoff, or wind erosion during and following treatments.

- Applicators will be required to review, understand, and conform to the “Environmental Hazards” section on herbicide labels (this section warns of known pesticide risks and provides practical ways to avoid harm to organisms or the environment).

- Applicators will be required to follow all instructions and SOPs to avoid spills and direct spraying into aquatic habitats that support special status plant species.

- Applicators will be required to follow all SOPs for avoiding herbicide treatments during weather conditions that could increase the likelihood of aerial drift or surface runoff into non-target areas.

Under the No Action alternative, the SJPLC would not use aerial spraying to treat large or remote infestations of cheatgrass and other weeds. Because fewer acres would be treated and aerial spraying not used, this alternative would have less risk of exposure of special status plants to herbicides. However, this benefit is small because the risk of exposure is minimized for all alternatives that include herbicides by the protective measures outlined in Appendices E, G, and I.

Alternative B: Proposed Action: In addition to impacts described under Alternative A, up to 5,000 acres SJPLC-administered BLM land could be treated annually. Based solely on acres treated, special status plant species would be more likely to be exposed to herbicides under this alternative than under the other alternatives. The risks to terrestrial plants associated with exposure to the four herbicides (especially imazapic) available in this alternative under accidental direct spray, spill, and off-site drift scenarios are lower than those associated with exposure to bromacil and chlorsulfuron and similar to or lower than the risks associated with exposure to the other pre-approved herbicides. The potential risk is increased by the use of aerial spraying, which has a greater risk of offsite drift than with ground methods. However, the application of SOPs (Appendix F) to ensure that spraying does not occur under conditions favorable to drift and of mitigation measures (Appendix G) to provide an adequate buffer between target and non-target areas is expected to minimize this risk. The conservation measures listed in Appendix H would provide additional protections when treating areas that contain or are located near special status plant species.

Alternative C: No Herbicides. Under this alternative, the SJPLC would not approve weed treatments using herbicides. Therefore, special status species would not be exposed to these chemicals unless drifting onto BLM lands from treatments by other parties on nearby non-BLM lands. Therefore, the risks from herbicide exposure would be near zero under this alternative.

The SJPLC would be able to control weeds less effectively under this alternative, allowing them to spread at a faster rate and possibly competing with or threatening special status plant populations. Although manual and biological controls could be used instead of herbicides, not all weeds are effectively treated by these other methods. Even spot treatments with herbicides, which can be effective for infestations in areas that are too sensitive to receive wide-scale treatments, would occur under Alternative C. Therefore, existing populations for special status plants would be at risk of future population decline or extirpation. Manual treatment may also impact special status plants if they are inadvertently removed or trampled by workers removing targeted species.

3.5.3 Terrestrial Vegetation

Terrestrial Ecosystems are defined as ecosystems that occur in relatively dry, upland landscape positions. Within the context of ecosystem management, plant species are evaluated, and provided for. By protecting the composition, structure, and function of the major vegetation types on SJPLC-administered BLM lands, the assumption is that a variety of species representing a majority of the native flora and fauna found within those ecosystems would be sustained.

Affected Environment

The IWM area comprises all of the plant communities in the SJPLC area. There are some plant communities that are in less than optimal health, due in part, to unwanted plants. All of the vegetation types are capable of supporting weed populations. Table 3.5 lists the major vegetation types found on BLM lands administered by the SJPLC and is consistent with habitat types described in the Wildlife Section of this assessment but does not include riparian/wetland as it is considered as aquatic vegetation is discussed in section 3.4.2.

Table 3.5 Vegetation types and acres found on BLM lands administered by SJPLC

Description	Type Code	Acres	Approximate Percent
Semi-Desert Grassland	DS_GRA	34,133	5.09%
Semi-Desert Shrubland	DS_SHR	64,393	9.61%
Mountain Grassland	MT_GRA	7,740	1.15%
Mountain Shrubland	MT_SHR	50,942	7.60%
Sagebrush Shrubland	SSA	88,182	13.16%
Pinyon-Juniper Woodland	TPJ	283,201	42.26%
Ponderosa Pine Forest	TPP-PP	14,238	2.12%
Aspen Forest	TAA	2,457	0.37%
Aspen Forest w Conifers	TAA-SW	2,711	0.40%
Cool Moist-Mixed Conifer Forest	TMC-CM	6,436	0.96%
Warm-Dry Mixed Conifer Forest	TMC-WD	5,268	0.79%
Spruce Fir	TSF	11,171	1.67%
Alpine Vegetation	ALP	14,523	2.17%
Riparian Vegetation	RIP	8,968	1.34%
Rock/Bare Soil/Water	NRS/WAT	75,806	11.31%
TOTAL		670,170	100.00%

Alpine: Alpine ecosystems occur on mountain landscapes at elevations above approximately 11,500 feet. The alpine climate zone is characterized by short cool growing seasons, long cold winters, snow, high wind, and intense light. Rock outcrop and talus slopes are common. Climate, geomorphologic processes, and on-going disturbances (including nivation, solifluction, and frost action) are major factors influencing the distribution of biota in alpine ecosystems. Diverse geology and topography (including glacial features) add to the complexity and diversity of the alpine type. There are approximately 14,523 acres of this type on BLM lands within SJPLC-administered lands (which is approximately 2 % of the total acres).

<u>*Spruce-Fir Forests*</u>: The spruce-fir forest type is dominated by Engelmann spruce (*Picea engelmanii*), and subalpine fir (*Abies lasiocarpa*), trees. This forest type occurs throughout SJPL on mountain and mesa landscapes in the subalpine climatic zone at elevations ranging from about 9,000 to 11,800 feet. There are about 11,170 acres of this type on BLM lands within SJPL, which is less than 2 % of the total acreage.

<u>*Aspen-Conifer Forests:*</u> The aspen-conifer forest type is dominated by Quaking aspen (*Populus tremuloides*) trees. Conifer trees such as Douglas-fir (*Pseudotsuga menziesii*) and Ponderosa Pine *(Pinus ponderosa)* are common, displaying greater than or equal to 20% canopy cover. This type occurs throughout SJPLC-administered BLM lands on mountain and mesa landscapes at elevations ranging from approximately 8,000 to 11,200 feet. They are associated with the subalpine and montane climate zones. There are approximately 2,711 acres of this type on BLM lands within SJPLC-administered area (which is less than 1% of the total acreage).

<u>*Mixed-Conifer Forests:*</u> The cool-moist mixed-conifer forest type is dominated by white-fir (*Abies concolor*) and Douglas-fir trees. This forest type occurs on mountain and mesa landscapes at elevations ranging from approximately 8,500 to 10,000 feet. They are associated with the montane and subalpine climate zones. There are approximately 6,436 acres of this type on BLM lands within SJPLC administered area (which is less than 1 % of the total acreage).

The warm-dry mixed-conifer forest type is dominated by ponderosa pine, white-fir, and Douglas-fir trees. This forest type occurs on mountain and mesa landscapes in the montane climate zone at elevations ranging from approximately 7,500 to 9,000 feet. They occur on warmer and drier sites, usually at lower elevations, when compared with the cool-moist mixed-conifer type. There are approximately 5,268 acres of this type on BLM lands within SJPLC-administered area (which is less than 1% of the total acreage).

<u>*Mountain Grasslands:*</u> Grasslands consist of perennial grasses often intermixed with native forbs (broadleaf herbs) and lowgrowing shrubs or subshrubs (species that are woody only at the base). These communities often occur on windswept ridges, south-facing slopes, or deeper soils in valley bottoms. Mountain grasslands occur as openings in forest-dominated landscapes and occurs on upland sites with well-drained soils in mountain and mesa landscapes. At low to middle elevations, needle-and-thread grass, bluebunch wheatgrass, and western wheatgrass (*Pascopyrum smithii*) are often dominant. At higher elevations, subalpine grasslands are dominated by Thurber's fescue (*Festuca thurberi*), Columbia needlegrass (*Achnatherum nelsonii*), and Letterman's needlegrass (*A. lettermanii*). Grasslands are associated with the lower montane, montane, and subalpine climate zones at elevations ranging from approximately 7,500 to 11,600 feet. There are approximately 7,740 acres of this type on BLM lands within SJPLC-administered area (which is less than 1% of the total acreage).

<u>*Ponderosa Pine Forests:*</u> The ponderosa pine forest type is dominated by ponderosa pine trees. This forest type occurs on mountains, hills, and mesas in the lower montane climate zone at elevations ranging from approximately 7,000 to 8,500 feet. Gambel oak is a major component of these forests, occurring in most stands. Arizona fescue and mountain muhly are important bunchgrasses that occur in these forests. There are approximately 14,238 acres of this type on BLM lands within SJPLC-administered area (which is approximately 2.1% of the total acreage).

Mountain Shrublands: The mountain shrubland type is a diverse, shrub-dominated type that occurs on mountains, hills, and canyon slopes at elevations ranging from approximately 6,000 to 9,000 feet. This type occurs as relatively pure stands of Gambel oak, or as a mix of Gambel oak (*Quercus gambelii*) and other deciduous shrubs (including snowberry (*Symphoricarpos* spp.), mountain mahogany (C*ercocarpus montanus)*, serviceberry (*Amelanchier alnifolia*), and chokecherry (*Prunus virginiana*). It occurs on upland sites with well-drained soils, and is often found on steep slopes with southerly aspects. It is found in association with pinyon-juniper, ponderosa pine, and warm-dry mixed-conifer vegetation types, in the lower montane and montane climate zones. There are approximately 50,942 acres of this type on BLM lands within SJPLC-administered area (which is approximately 7.6% of the total acreage).

Pinyon-Juniper Woodlands: Pinyon-juniper woodlands consist of three primary species Colorado pinyon pine (Pinus edulis), Utah Juniper (Juniperus osteosperma) and Rocky Mountain Juniper (J. scopulorum). This woodland type typically occurs between 5,000 and 7,000 feet elevation. Annual precipitation is typically from 10 to about 15 inches in pinyon-juniper woodlands, and tree species in these communities have evolved both drought and cold resistance. Pinyons tend to dominate higher elevations, and form more closed-canopied stands. Juniper tends to grow at lower elevations and in more arid areas as its scaled foliage allows it to conserve water more effectively than pinyon pine. Juniper-dominated woodlands tend to include open savannas of scattered trees. It is found in the northwest, southwest and southeast sections of the planning area, but is most developed in the northwest. There are approximately 283,201 acres of this type on BLM lands within SJPLC-administered area (which is approximately 42.3 % of the total acreage).

The pinyon-juniper woodland type on SJPLC-administered BLM lands has been greatly altered in some places during the last 120 years due to livestock grazing and mechanical tree removal (Romme et al. 2006). Historic over-grazing has resulted in changes in plant species composition in some areas so that sites once dominated by native grass species are now a monoculture of cheatgrass (Bromus tectorum). Mechanical tree reduction (chaining) during the 1950s and 1960s converted many pinyon-juniper woodlands to shrubland or grassland types and, in the process, fragmented many of the woodlands (Knight et al. 2000).

Primary threats to the pinyon-juniper woodland system are improper grazing; mining, oil and gas exploration and extraction, with associated road construction and fragmentation; and recreational use (ATVs, hunting, camping). Many of these pursuits include all-terrain vehicles which can rapidly turn paths and trails into roads (PIF 2005). Most of these disturbances are manifested in the quality of the understory, where they may increase soil erosion, damage cryptobiotic crusts and introduce invasive non-native plant species. Trees are susceptible to large scale fires and insect infestations. In addition, many of the communities within this system have been impacted by past range practices of chaining, tilling, and reseeding with exotic forage grasses (TNC 2005).

Sagebrush Shrublands: The sagebrush shrubland type is a sagebrush-dominated type that includes basin big sagebrush (A. tridentate ssp. tridentata), Wyoming sagebrush (Artemisia t.ssp. wyomingensis), mountain big sagebrush (A. t. var. pauciflora), or subalpine big sagebrush (A. t. var. vaseyana), depending on elevation, soil, and aspect. These shrublands occur on hills, mesas, and valley floors at elevations ranging from approximately 5,000 to 9,000 feet. This type occurs on moderately well to well-drained soils in the semi-arid and lowers montane climate zones. There are approximately 88,182 acres of this type on BLM lands within SJPLC-administered area (which is approximately 13.2% of the total acreage). The big sagebrush system is most abundant in the northwest section, with over 56,000 acres mapped (USGS 2004). Large contiguous expanses of the system occur in the Dry Creek Basin area, where patches reach 15,000 acres. Adjacent systems are pinyon-juniper woodlands and shrublands, greasewood, and semi-desert Shrublands. In the southwest section, the largest patches are found near the Utah border, both north and south of McElmo Creek. Patches here may be up to 7000 acres.

Much sagebrush has been removed in the interest of improving forage productivity on grazing lands.. Other factors compromising the ecological integrity of sagebrush shrublands include invasion by exotic (e.g., cheatgrass) or native (e.g., pinyon-juniper) plant species, conversion to agricultural, residential and other developed land types, and changes in natural fire regimes.

Semi-desert Grassland Type: The semi-desert grassland type occurs on hills, mesas, alluvial flats, and valley floors, at elevations ranging from approximately 4,500 to 7,600 feet. Semi-desert grasslands occur in small to large patches throughout the northwest and southwest sections. Common native grass species of these grasslands include needle-and-thread, Indian ricegrass, galleta, bottlebrush squirreltail, blue grama, purple threeawn, sand dropseed, and alkali sacaton. This type occurs in association with semi-desert shrubland and sagebrush shrubland vegetation types. It occurs mostly on well-drained soils in the semi-arid climate zone. There are approximately 34,133 acres of this type on BLM lands within SJPLC-administered area (which is approximately 5.1 % of the total acreage). The largest occurrences are in the northwest near the head of Big Gypsum Valley, and in the southwest on the Negro Canyon and Bowdish Canyon quadrangles.

The semi-desert grassland system is very vulnerable to invasion by exotic species, particularly cheatgrass. Although frequent fires in grasslands may have been common historically, the introduction of cheatgrass has altered the dynamics of the system, and fire often results in cheatgrass dominance. Once overtaken by cheatgrass, more frequent fires are encouraged by the dry flammable material, leading to further domination by cheatgrass. and drilling, especially in Big Gypsum Valley, where some of the most extensive grasslands of the resource area are located. In addition to direct disturbance and replacement, the risks of introducing more exotic species are high (TNC 2005).

Semi-desert Shrublands: The semi-desert shrubland type occurs on hills, mesas, alluvial flats, and valley floors at elevations ranging from approximately 4,500 to 7,600 feet. This type occurs in the semi-arid climate zone in association with semi-desert grassland and sagebrush shrubland vegetation types. Soils are mostly well drained, but some sites near drainages have a higher water table and flood intermittently. There are approximately 64,393 acres of this type on BLM lands within SJPLC-administered area (which is approximately 9.6 % of the total acreage). Although common in small patches of from 1 to 200 acres in the southwest (for example, on the Wickiup Canyon quadrangle in Canyons of the Ancients National Monument), at about 5000 to 5200 ft., this system is most abundant in Disappointment Valley, upstream from a large area dominated by greasewood, between 5600 and 6600 ft. Here, most of 19,000 acres is dominated by the system, with small patches of big sagebrush and shale barrens interspersed. These areas are dominated by saltbushes such as shadscale (Atriplex confertifolia), fourwing saltbush (A. canescens), and Gardner's saltbush (A. gardneri). Other common shrubs include greasewood (Sarcobatus vermiculatus), Wyoming big sagebrush, and rabbitbrush.

Environmental Consequences

Impacts common to all alternatives,

The SJPLC would follow SOPs presented in the ROD of the PEIS (Appendix F) to ensure that risks to human health and the environment from weed treatments are kept to a minimum. In addition, the SJPLC would implement measures to mitigate potential adverse environmental effects as a result of weed treatments (Appendix G). Adherence to the SOPs and mitigation measures will ensure that all practicable means to avoid or minimize environmental harm have been adopted by the SJPLC. Direct and indirect impacts would be greater by virtue of the increase risk of invasive non-native species occurring on lower elevation lands where development is greater and in vegetation communities that comprise the bulk of the BLM lands within the San Juan Public lands (Semi-Desert Grassland, Semi-Desert Shrubland, Mountain Shrubland, Sagebrush Shrubland and Pinyon-Juniper Woodland- approximately 78%). This is consistent with the PEIS projections that under the no action and preferred alternatives the majority of treatments are anticipated to occur in the Temperate Desert Ecoregion targeted primarily toward sagebrush, rabbitbrush, and other evergreen shrubland species, and annual grass and perennial forb weeds and in the Temperate Steppe Ecoregion targeted on annual and perennial grasses and forbs, including downy brome, knapweeds, and thistles (BLM 2007a).

Herbicides could come into contact with and impact non-target plants through drift, runoff, wind transport, or accidental spills and direct spraying. Potential impacts could include one or more of the following: mortality, loss of photosynthetic foliage, reduced vigor, abnormal growth, or reduced reproductive output. Plants could be crushed by trucks and/or ATVs during ground applications, and injury or mortality to plants could occur. Risks to non-target plants from spray drift are greater with smaller buffer zones between target and non-target vegetation and application from greater heights (i.e., aerial application or ground application with a high boom). Application rate is a major factor in determining risk, with higher application rates associated with greater risk to plants.

Biological control by domestic animals could cause mortality and injury to non-target plants through grazing, browsing, and trampling. Biological control by domestic animals could lead to soil compaction from soil trampling, increased soil erosion from loss of plant cover, and loss of biological soil crusts which have an important role in hydrology and nutrient cycling. Domestic animals selectively feed on palatable species which would change species composition over time.

Biological control agents such as insects and pathogens do not typically have an effect on non-target plant species or habitats. However, some biological control agents have been known to attack species in addition to the target plant. All biocontrol agents utilized by the SJPLC would be tested prior to release to ensure they are host specific.

In general, the effects of manual treatment methods would be minimal, both because of the low level of environmental impact of this method and the limited area in which manual use is feasible. Plants could be directly killed or injured by treatment or trampling by applicator personnel. Subsequent revegetation of treated areas could cause plants to be crushed by tractors or ATVs during drill-seeding, or injured or killed during cultivation or raking. Prior to any proposed cultivation (discing) activities, cultural and biological surveys would be conducted and a site-specific NEPA document would be prepared.

All weed treatments would likely affect plant species composition of an area and might affect plant species diversity. Elimination or reduction of non-native species would benefit native plant communities by removing competition from weeds. This would provide more resources (e.g., water and nutrients) to native plants, allowing them to reestablish sites previously dominated by weeds. Because certain herbicides target broadleaf species, non-broadleaf species like grasses may begin to dominate the site, changing the species composition.

Use of herbicides that target broadleaf species could reduce or eliminate native forbs in the treated areas. This could result in a long-term change in the plant community composition. The less a native plant community is disrupted by treatment, the more likely it would be to retain or regain characteristics that could resist weed invasion.

Manual methods would likely cause small amounts of soil disturbance which could increase soil erosion. Revegetation could create soil disturbance and lead to additional weed establishment and erosion if seeded (desirable) species did not successfully reoccupy the site. Seed drills could cause soil compaction and damage soil crusts.

Alternative A: No Action:

Under this alternative, the SJPLC would continue current weed management. Because of the continued inability to use aerial spraying, very large or remote infestations could not be effectively treated. Additionally, Alternative A would not allow use of the newly approved herbicide imazapic, which is the only effective treatment currently available for cheatgrass.

Direct negative impacts to vegetation would be lower than under the Proposed Action because of the fewer acres treated (no aerial application). Conversely, long-term benefits to plant communities may be less under this alternative since large scale infestations of noxious and invasive weeds would continue to spread, increasing damage to native plant communities and inhibiting ecosystem functions.

Alternative B: Proposed Action: Under this alternative, the SJPLC would treat up to 5,000 acres of BLM land annually using both ground-based and aerial treatment methods. This alternative would allow all 18 currently approved herbicide active ingredients to be used in the SJPLC. This includes a newly approved herbicide (imazapic) that is effective in controlling cheatgrass. The most extensive impacts to vegetation (both negative and positive) would result from this alternative because it includes the greatest treatment acreage among the alternatives. In turn, because of the larger treatment area, Alternative B would have the greatest risk of accidental exposure of non-target plants. However, impacts from herbicide exposure would not be substantially different than under the other alternatives, since the SJPLC would design herbicide treatments to avoid substantial risks to non-target plants through the use of protective SOPs and mitigation measures (Appendices E and F).

Alternative C: No Herbicides: This alternative would avoid the risks of adverse impacts to non-target plants from herbicide use. Although non-target species could still be affected by manual and biological controls, the negative impacts to non-target plants would likely be less severe and much more limited.

Positive benefits to the ecosystem may be less than under the No Action and Proposed Action alternatives because herbicide use is the only effective treatment for many noxious weeds in the SJPLC and treatment with manual or biological controls may be impracticable due to cost, time, accessibility, and ineffectiveness on some species. Weeds would increase at a faster rate under this alternative, outcompeting desirable species for resources and degrading native plant communities to a much greater extent than under the other alternatives.

3.6 Wildlife Resources

Public lands sustain an abundance and diversity of wildlife and associated habitats. Public lands across the United States provide a permanent or seasonal home for more than 3,000 species of amphibians, reptiles, birds (including migratory birds protected under the Migratory Bird Treaty Act), and mammals (BLM 2006b). Wildlife populations are found in areas where their basic needs (such as food, shelter, water, reproduction, and movement) are met. The area in which the needs of a particular population are met is referred to as habitat. Many animals have special behaviors and physical traits that allow them to successfully compete with other animals in only one or a few habitats; many threatened and endangered species fall into this category. Other animals (such as mule deer, coyote, and American robin) are less specialized and can use a wider range of habitats.

There is a direct correlation between public needs and concerns for adequate supplies of clean water and subsequent impacts on fisheries and aquatic species. The waters of the SJPLC area support a variety of ecosystems. In southwestern Colorado, these aquatic communities and ecosystems can be found at many different elevations and within many different habitats. In general, the most common aquatic biota within SJPLC-administered BLM lands can be categorized as fishes, aquatic plants, aquatic insects, and the embryonic and larval stages of amphibians (e.g., frogs and toads). Less obvious, and less well understood, biota include the phytoplankton and algal, zooplankton, and microbe species associated with aquatic environments (especially in lakes, reservoirs, and ponds). Undoubtedly, these organisms play important roles in ecosystem processes (including nutrient cycling and energy fluxes, as well as in the composition of aquatic food chains).

Under all alternatives, the SJPLC would follow SOPs presented in the ROD of the PEIS (Appendix F) to ensure that risks to human health and the environment from weed treatments are minimized. In addition, the SJPLC would implement measures to mitigate potential adverse environmental effects as a result of weed treatments (Appendix G).

3.6.1 Special Status Wildlife

BLM policy states that BLM actions must not adversely impact Special Status Species, which include species that are listed under the ESA, given some form of special designation to denote rarity by the State, or are listed as sensitive by the BLM. The *Vegetation Treatments on Bureau of Land Management Lands in 17 Western States Programmatic Biological Assessment (BA)* (BLM 2007c) provides a description of the distribution, life history, and current threats for each federally listed animal species, as well as species proposed for listing. The BA also discusses the risks to threatened and endangered species, and species proposed for listing (collectively referred to as TEP wildlife) associated with each of the herbicides used by the BLM.

In conjunction with the current EA, the SJPLC prepared a BA (BLM 2010b) for consultation with the US Fish and Wildlife Service. The BA analyzed potential impacts to listed or proposed species in the SJPLC area. Information contained in these documents will be used as a guideline by the SJPLC when developing local projects. Appendix C provides a list of Federally listed and BLM sensitive species that may occur on SJPLC-administered BLM lands.

If Federally listed, proposed, or candidate threatened or endangered species would potentially be affected by the weed treatments, SJPLC would implement the conservation measures listed in Appendix H of this EA and incorporated into the accompanying BA (BLM 2010b).

In accordance with legal requirements set forth under the Endangered Species Act of 1973. Under the Act, federal agencies are prohibited from authorizing, funding or carrying out any action that would jeopardize a listed species, or destroy or modify critical habitat. The USFWS Colorado Field Office County List updated March 2010 (USFWS 2010a) identified Threatened, Endangered, Proposed, or Candidate species that could potentially occur within the planning area include: Black-footed ferret (Mustela nigripes) (E), Southwestern willow flycatcher (Empidonax traillii extimus) (E), , Mexican spotted owl (Strix occidentalis lucida) (E), Canada lynx (*Lynx Canadensis*) (T), Uncompahgre fritillary butterfly *(Boloria acrocnema) (E) and* yellow-billed cuckoo (Coccyzus americanus) (C).

The SJPLC is consulting with the USFWS on a BA to evaluate likely impacts to Federally listed threatened, endangered, or proposed species (BLM 2010b). A determination in the BA of "**No Effect**" for the Mexican spotted owl and Black-footed ferret. A "**Not Likely to Adversely Affect**" determination for the Canada lynx, Southwestern Willow Flycatcher, Uncompahgre fritillary butterfly (E) as a consequence of implementing the Proposed Action. The determinations were based on BLM's adherence to the SOPs, mitigation measures, and conservation measures for avoiding or minimizing risks to these species (see Appendices E, F, and G). Prior to conducting noxious weed treatments using herbicides the USFWS concurrence on this determination is required.

3.6.2 Terrestrial Wildlife including Migratory Birds

Several features make some habitats better for wildlife than others. In turn, the more of these features that are present, the greater the diversity of wildlife species that is likely to be present. These features include:

- *structure* – shape, height, density, and diversity of the vegetation and other general features of the terrain.
- *vertical layers* – layers of vegetation (e.g., herbaceous, shrub, and forest canopy).
- *horizontal zones* – vegetation and other habitat features that vary across an area.
- *complexity* – an integration of vertical layers and horizontal zones.
- *edge* – the area where two types of vegetative communities meet (such as a forest and shrub community).

- *special features* – unique habitat features needed for survival or reproduction, including snags (dead trees), water, and rock outcrops (Cooperrider et al. 1986).

Historically, landscapes provided a continuous mosaic of vegetation types adapted to climatic and natural disturbance regimes. Plant communities were dynamic and resilient, tending to return to some developmental (successional) pathway after a disturbance. Although structural complexity varied depending on the characteristics of the dominant vegetation (e.g., forestlands tend to be more structurally complex than grasslands), even structurally “simple” habitats provided numerous niches for wildlife to exploit. For example, grasslands may provide only one or two strata, or levels, of vegetation for wildlife to use, but still contain a diversity of wildlife species (Payne and Bryant 1998). At the ecoregion level, habitats showed little change over decades or even hundreds or thousands of years. Disturbances consisting of infrequent, high-intensity events (such as drought, flood, and major fire) interspersed with frequent, low intensity events (wildlife grazing, low intensity burns, disease) constantly shaped and modified the environment. As a result, habitat types varied over time and space and resulted in different species groups being dominant at different times depending on the characteristics of the habitat.

An important activity of the BLM is managing vegetation in order to improve wildlife habitat. Plants are an important component of habitat, providing food and cover for wildlife. Food is a source of nutrients and energy, while good cover prevents the loss of energy by providing shelter from extremes in wind and temperature. Cover also affords protection from predators.

Areas that have been impacted by noxious weeds and other invasive vegetation may support fewer native wildlife species in areas with intact native plant communities. Noxious weeds and other invasive vegetation can change habitat conditions and vital ecosystem functions in such a way that some native species are not able to adapt to the altered ecosystem. These areas may also support an increased number of non-native wildlife species, which compete with native wildlife for available resources.

Affected Environment

Recent habitat assessments of landscape conditions and trends on lands administered by the SJPLC have identified several major factors influencing change in forested and non-forested habitat conditions that have occurred since early Euro-American settlement. Depending upon the vegetation type examined, these factors include fire exclusion, timber harvesting, road and urban development, livestock grazing, and recreational uses associated with a rapidly growing human population. These conditions and trends have implications for wildlife species that include:

- Changes in forest structure and composition that may contribute to uncharacteristic wildfire behavior in lower-elevation forest types;

- Road densities that may fragment habitat, varying from a high of about 6 miles per square mile to a low of about 0.3 mile per square mile;

- Competition from invasive plant species that compromises plant diversity, habitat quality, and connectivity;

- A reduction or degradation of habitats for some wildlife and plant species where human impacts have occurred, and/or where natural disturbance regimes have been altered;

- Urban development and infringement into some traditionally important wildlife habitats (including big game winter range), typically at lower to moderate elevations;

- A rapidly increasing human population that places uses and demands upon the landscape that alter habitat security and contribute disturbances to wildlife species; and

- Increased demand for oil and gas on certain portions of SJPLC-administered BLM landsthat may influence various wildlife species and their habitats.

Attention to specific species, or to groups of species, is an important aspect of bird conservation within SJPLC-administered BLM lands. Examples include the Birds of Conservation Concern list produced by the USFWS (USFWS 2002) and the priority species and habitats identified in the Colorado Landbird Conservation Plan (Beidleman 2000). The Birds of Conservation Concern lists were produced in order to high-light species of particular interest within large geographic areas of the United States, referred to as Bird Conservation Regions (BCRs); on the other hand, the Landbird Conservation Plan provides information for more localized bird conservation priorities. Lands administered by the SJPLC occur within the Southern Rockies Colorado Plateau Bird Conservation Region (BCR 16), which encompasses portions of Colorado, New Mexico, Arizona, Utah, and Wyoming. The Birds of Conservation Concern list for BCR 16 involves 29 species, some of which do not occur, or would be considered incidental within SJPLC-administered BLM lands.

The following subsections describe the important characteristics of terrestrial wildlife and habitats in the SJPLC area, focusing primarily on the vegetation component of habitat and how wildlife species use this vegetation. The descriptions emphasize recreationally important big game species, ecologically important avian predators (raptors), upland gamebirds, migratory birds on the USFWS list of Birds of Conservation Concern (BCC) for the region (USFWS 2008), Neotropical migrant birds, and reptiles and amphibians.

Alpine: Alpine areas generally occur above treeline. Several species utilize the alpine tundra at least seasonally, and some species depend upon alpine habitat for breeding or life-cycle requirements. Several species of voles, mice, and shrews occur in alpine tundra vegetation; other species, such as pika and yellow-bellied marmots occur where boulder fields and rocks are present. Rocky Mountain bighorn sheep and elk also utilize alpine habitats during summer; however, must migrate to lower elevations when winter begins. Alpine tundra is important breeding habitat for local bird species, such as white-tailed ptarmigan and American pipit. Alpine cirques with boulder fell fields offer the primary denning habitat for wolverines in States such as Idaho, and may do so in Colorado if the species is still extant (surviving) (Byrne and Copeland 1997). Alpine tundra in southern Colorado also provides the only known habitat for the Uncompahgre fritillary butterfly.

Spruce-Fir Forests: Spruce-fir forest habitats are rich in mammal and bird species; however, they support relatively few reptiles or amphibians because of the higher elevations. However, one amphibian species of particular interest, the boreal toad (which has historic occurrence within SJPLC-administered BLM lands) is closely associated with streams and wetlands within the spruce-fir forest type. Examples of other closely associated wildlife species include the southern red-backed vole, American marten, Canada lynx, American three-toed woodpecker, boreal owl, olive-sided flycatcher, golden-crowned kinglet, and hermit thrush. Spruce-fir forests are also important to big game, such as mule deer and elk, on a seasonal basis, and provide much of the summer range for these and other species. When geological features such as rocks and cliffs are present, spruce-fir habitat also supports species such as pika, yellow-bellied marmots, and Rocky Mountain bighorn sheep.

*Aspen/Aspen-Conifer Forests***:** Aspen is an extremely rich habitat type for many wildlife species. DeByle (1995) lists 134 species of birds and 56 species of mammals that use aspen habitat types. Amphibians such as chorus frogs are also common because of the moist environments. Typical species associated with aspen within SJPLC-administered BLM lands include red-naped sapsucker, violet-green swallow, warbling vireo, elk, as well as many small mammal species. Aspen is a key component for nesting northern goshawks in much of southern Colorado (Ferland 2005). Aspen is also the preferred food source for beaver (and, where available, apsen will influence their numbers and distribution). In the latter structural stages, aspen is a key structural attribute for many primary and secondary cavity-nesters.

*Mixed-Conifer Forests***:** Mixed-conifer forests are often rich in wildlife use. This is due to the variety of elevations, moisture gradients, tree species, and other factors. Examples of associated wildlife species include Williamson's sapsucker, blue grouse, brown creeper, black bear, elk, and mule deer. In cool-moist mixed-conifer, species such as Canada lynx and hermit thrush may be present. In warm-dry moisture gradients; however, species such as pygmy nuthatch and western bluebird may be more abundant. Due to the diversity and variety of habitat features, however, no species in Colorado is restricted to the mixed-conifer forest types. Mixed-conifer forests also commonly support aspen- and grassland-associated species because these vegetation types are often found in this forest type.

*Grasslands***:** Mountain grasslands are rich in small mammal species, such as voles and shrews; and several fossorial mammals, such as marmots, badgers, and pocket gophers (which occur most frequently in grasslands or on grassland/rock edges). Mountain grasslands are especially important to native ungulates for foraging. Within SJPLC-administered BLM lands, all of the big game species may utilize different elevational grasslands on a seasonal basis. The diversity and density of bird species in these grasslands vary, depending upon elevation. Many species of sparrows and other ground-nesters are represented in this vegetation type. In general, mountain grasslands do not support many species of reptiles or amphibians, except where water, cliff/rock, or other unique features are present.

*Ponderosa Pine Forests***:** Ponderosa pine forests support a rich and diverse wildlife community, including some habitat specialists that reach their highest densities in this vegetation type (such as Abert's squirrel, flammulated owl, pygmy nuthatch, and Williamson's sapsucker). Ponderosa pine forests are also used extensively by big game species (such as mule deer and elk) and may be particularly important as transitional habitat or winter range areas.

*Mountain Shrublands/Oak***:** The vegetation of mixed mountain shrublands varies substantially depending on elevation, slope, aspect, and soil. More mesic (moist) sites such as on north-facing slopes and along minor drainageways are typically dominated by Gambel's oak and serviceberry, while more xeric (dry) sites such as south-facing slopes are typically dominated by mountain-mahogany, bitterbrush, snowberry, and sagebrush. Mountain shrublands/oak habitat provides valuable food and cover for many wildlife species, and some species (such as black bears) depend heavily upon the mast crops. Fewer small rodent species utilize mountain shrubland habitats in Colorado; however, some small mammals (such as Nuttall's cottontail) may reach high densities in this habitat type. At least 24 bird species in Colorado utilize mountain shrublands. Local bird species that are closely associated with this habitat type include the green-tailed and spotted towhee, Virginia's warbler, and wild turkey.

Pinyon-Juniper Woodlands: Pinyon-juniper woodlands often support a rich and diverse wildlife community. They are very important to avian species, and support the largest assemblage of nesting bird species of any upland vegetation type in the western United States. Typical bird species that utilize local pinyon-juniper habitats include the bushtit, pinyon jay, and mountain chickadee. Pinyon-juniper habitats are utilized by many big game species, at least on a seasonal basis, and may provide year-round habitat for mule deer and elk when food and water resources are available. Pinyon-juniper habitats are also frequently associated with desert bighorn sheep (when in proximity to the cliff/rock/talus habitat type). Numerous small mammal species may occupy pinyon-juniper (including deer mouse, bushy-tailed woodrat, white-footed mouse, and white-tailed jackrabbit). Large carnivores (such as mountain lions) may also frequent pinyon-juniper, especially when prey species are available. The diversity of reptile species within these woodlands is nearly as high as that encountered in semi-desert shrublands (and species such as the western rattlesnake may be most common in this habitat type). Pinyon-juniper habitats also support the highest diversity of bat species in Colorado; this is especially valuable where wetlands and riparian habitats occur. Bat species such as the fringed myotis and Yuma myotis are also known to utilize pinyon-juniper trees (and the associated cliff and rock habitat) as roosting areas. In general, amphibian species are scarce in pinyon-juniper woodlands, except where water is available.

Sagebrush Shrublands: The sagebrush shrubland community type, like the mixed mountain shrubland type, varies considerably depending on elevation, slope, aspect, and soil. Extensive stands of Wyoming big sagebrush provide cover, food, and nesting habitat. Sagebrush shrublands represent an extremely important vegetation type to many wildlife species, especially birds. This is because many of the birds that occur in this type are sagebrush obligate species that exhibit sensitivity to habitat edges and fragmentation. Many of these species also nest on, or near, the ground beneath the shrubs, and are, therefore, vulnerable to impacts. Examples of local sagebrush shrublands obligates include sage sparrow, Brewer's sparrow, and Gunnison sage-grouse, a BLM sensitive species..

During winter, deer and elk rely on sagebrush and associated species including bitterbrush, squawapple, or snowberry for winter browse, particularly during severe winters when mixed mountain shrublands are not accessible due to deeper and more persistent snow cover. Stands of mountain big sagebrush at higher elevations may support similar types of uses as Wyoming big sagebrush at middle elevations but are generally less extensive. Stands of basin big sagebrush are found along valley floors. Basin big sagebrush provides severe winter range for deer and elk and is a critical element in Gunnison sage grouse conservation providing food and nest sites for this BLM sensitive species. Jackrabbit and cottontail species may reach high population densities in this habitat type. As with mountain shrublands, sagebrush shrublands can support a high diversity of reptile species, especially when interspersed with semi-desert shrublands, rock/cliff habitat, and other dry habitat types. However, amphibians are generally absent, except where water sources are present.

Semi-desert Shrublands/Grasslands: This habitat type provides perching, feeding, and nesting sites for a much less abundant and diverse assemblage of wildlife as the habitats described above due to sparser and lower height of the cover and dominance by woody and herbaceous species that generally are of lower forage quality. Stands dominated by shadscale or fourwing saltbush interspersed with sagebrush receive some winter use by deer and elk, especially during severe winters when higher quality sagebrush shrubland, mixed mountain shrubland and pinyon-juniper woodland are inaccessible due to deep and persistent snow cover. Several small mammal species may occupy the semi-desert shrublands/grasslands vegetation types includingthe kangaroo rat, deer mouse, Wyoming ground squirrel, and Gunnison's prairie dog. Some native ungulates also occupy semi-desert shrublands at least on a seasonal basis, with antelope and mule deer probably being the most prevalent. The diversity and density of bird species is typically low in semi-desert shrublands with typical species assemblages characterized by the horned lark, western meadowlark, and mourning dove. However, semi-desert shrublands often support specialized species such as loggerhead shrikes, and may provide important habitat for several raptors of local concern including the burrowing owl, prairie falcon, and golden eagle.

Riparian Areas and Wetlands: Riparian woodlands and shrublands typically provide cover, feeding, and nesting habitats for a much greater number of species and individuals than adjacent habitats due to the vertical and horizontal diversity of the community, the proximity to water, and the proximity to other habitat types. All riparian woodland and shrubland habitats provide food and cover for deer and elk; the season of use depends largely on the elevation at which a specific community occurs. In Colorado, it is estimated that at least 40% of the vertebrate species are closely associated with riparian habitats (Hoover and Wills 1984). These species include approximately 70% of the breeding birds in Colorado; as well as big game species, small mammals, furbearers, and a variety of other non-game species. Bird species found in cottonwood forests include two BCC species: the bald eagle, which was recently removed from the Federal list of threatened or endangered species, and Lewis's woodpecker. Neotropical migrants include the cordilleran flycatcher, Bullock's oriole, yellow warbler, and American goldfinch in cottonwood woodlands and the willow flycatcher, song sparrow, and fox sparrow in willow shrublands. Raptors commonly associated with cottonwood woodlands include the red-tailed hawk, Cooper's and sharp-shinned hawks, great horned owl, and long-eared owl. The great blue heron nests singly or colonially in mature cottonwoods and may travel several miles to hunt for fish in streams, ponds, and lake margins. Riparian areas and wetlands ecosystems within SJPLC-administered BLM lands also support a high number of amphibian and reptiles. All local bat species concentrate around riparian habitats for foraging and water; making slow-water pools and open wetlands especially important.

It is estimated that the SJPLC area may support approximately 193 species of breeding birds, as well as additional species that utilize stop-over habitats during their annual migration. Of these 193 species, approximately 74 species are considered neotropical migrants that breed during the summer on, or near, the SJPL. Generally, these species winter south of the United States border. Most bird species are still common; however, some populations are declining. Neotropical migratory bird species are of particular concern within SJPLC-administered BLM lands because of the international issues associated with their conservation. The SJPLC area contributes most heavily to species that utilize habitats such as spruce-fir, pinyon-juniper, mountain shrubland, sagebrush, and ponderosa pine. However, habitats that make up smaller portions of the land base, such as riparian areas and wetlands ecosystems, are also of conservation concern due to their critical importance to bird species, as well as to other wildlife groups.

Game species on SJPLC-administered BLM lands are important due to their economic and cultural importance to State and local communities. Primary big game species in the SJPLC area include Rocky Mountain elk, mule deer, moose, black bear, bighorn sheep (both Rocky Mountain and desert subspecies), mountain goats, and mountain lions. Other game species include blue grouse, wild turkey, mourning doves, bank-tailed pigeon, ring-necked pheasant, cottontail and various species of waterfowl. The pursuit of furbearers declined when most trapping became illegal in Colorado in 1996. However, legal methods of take are currently allowed for the taking of beaver, muskrat, bobcat, coyote, red fox, and badger.

Special Status animal species include Federally listed Threatened, Endangered and Proposed species; and BLM Sensitive Species. Other animals of interest include Migratory Birds and Game Species.

Environmental Consequences

Alternative A: No Action: See Alternative B for an in depth analysis of all alternatives. This alternative would be the same as Alterantive B except that aerial application of herbicide would not be allowed and neither would the use of four herbicides: Diquat, Diflufenzopyr, Fluridone, and Imazapic.

Under Alternative A, the IWM Plan would continue as at present, which does not include the use of imazapic or aerial spraying. Wildlife impacts (positive and negative) would be similar to those that have occurred in previous years. Negative impacts to wildlife could be lower than under the Proposed Action because of the much smaller area treated. These would include loss of non-target vegetation used by wildlife, and effects to wildlife health from exposure to herbicides. Long-term positive impacts on wildlife habitat communities (i.e., improvements in habitat and ecosystem function) would be less under this alternative than under Alternative B since invasive plant populations would likely continue to expand at the current rate or greater (i.e. cheatgrass), increasing damage to native plant communities and wildlife habitat and inhibiting associated ecosystem functions.

Alternative B: Proposed Action: The SOPs, mitigation measures, and conservation measures (Appendices E, F, and G) would be implemented under any alternative. The following is a summary of direct impacts to wildlife of herbicide use to control weeds on BLM lands. In general, field studies suggest that appropriate herbicide use is not likely to have significant direct toxicological effects on wildlife (e.g., Cole et al. 1997, Sullivan et al. 1998). However, some potential exists to individuals, populations, or species with both proper and improper use of chemical controls (e.g., see USFS 2005). Possible adverse direct effects to individual animals include death, damage to vital organs, change in body weight, decrease in healthy offspring, and increased susceptibility to predation.

The Ecological Risk Assessment portion of the PEIS (BLM 2007a) evaluated toxicological risks to biological receptors of ten herbicides: bromacil, chlorsulfuron, diflufenzopyr, diquat, diuron, fluridone, imazapic, Overdrive® (dicamba + diflufenzopyr), sulfometuron methyl, and tebuthiuron. Risks to terrestrial vertebrates from weed treatments using these ten herbicides would be as follows:

- Chlorsulfuron, Diflufenzopyr, Fluridone, Imazapic, and Sulfometuron Methyl – No risk to any wildlife group from direct spray at either the typical or maximum application rate.

- Bromacil and Overdrive® – Low risk to insects and large herbivores from direct spray at the maximum application rate.

- Diquat and Diuron – Low risk to insects, birds, and mammals from direct spray at the maximum application rate and less so at the typical application rate.

- Tebuthiuron – Low risk to large mammalian herbivores and large avian herbivores and high risk to small mammalian herbivores from direct spray at the maximum application rate.

The remaining eight herbicides approved for use by BLM (2,4-D, clopyralid, glyphosate, hexazinone, imazapic, imazapyr, metsulfuron methyl, picloram, and triclopyr) were assessed in PEIS in relation to human health. Assuming that exposure risks to human receptors also apply to other terrestrial vertebrates, the following potential risks to Federally Listed Threatened, Endangered, Proposed and Candidate wildlife species would be expected from use of the eight additional herbicides:

- Imazapic, Imazapyr, and Metsulfuron Methyl – No risk for any exposure scenario analyzed.

- Glyphosate and Picloram – No risk for most exposures; low risk from ingesting water sprayed directly at the maximum application rate or subjected to a spill.

- Triclopyr – Moderate risk from direct spray onto skin at the maximum application rate; low or no risk from other scenarios.

- 2,4-D and Hexazinone – Moderate from ingesting directly sprayed fruit or ingesting fish from a pond contaminated by aerial drift; no or low risk for most exposures.

These results indicate generally no or low risk of toxic effects from herbicides. However, some herbicide/exposure combinations represent moderate to high risks that would be given special consideration when planning herbicide treatments to avoid harm to wildlife (see Appendices E, F, and G).

The impacts of herbicides on wildlife would depend on the sensitivity of each species to the particular herbicides used, the pathway by which the individual animal was exposed to the herbicide, and indirectly on the degree to which a species or individual was positively or negatively affected by changes in habitat.

Species that reside in an area year-round and have a small home range (e.g., insects, small mammals, territorial birds), would have a greater chance of being directly adversely impacted if their home range was partially or completely sprayed because they would have greater exposure to herbicides—either via direct contact upon application or indirect contact as a result of touching or ingesting treated vegetation. In addition, species feeding on animals that have been exposed to high levels of herbicides would be more likely to be impacted, particularly if the herbicide bioaccumulates in their tissues.

Wildlife inhabiting subsurface areas (e.g., insects, burrowing mammals) may also be at higher risk if soils are non-porous and herbicides have high soil-residence times. The degree of interception by vegetation, which depends on site and application characteristics, would also affect direct spray impacts. Soil organisms, such as nitrogen-fixing bacteria, are killed by herbicides that infiltrate the ground. Mycorrhizae, which mobilize water and nutrients to higher plants, are killed. The resultant drop in soil productivity would be minimal (localized) and short term as the result of IWM vegetation treatment.

The impacts of herbicide use on wildlife would primarily be site- and application-specific, and as such, site assessments would have to be performed at the field level, using available impact information, to determine an herbicide-use strategy that would minimize impacts to wildlife, particularly in habitat that supports special status species.

Because herbicides are designed to kill plants, most are far less toxic to birds than is true of other pesticides. The pesticide 2-4D, in high enough concentrations over a broad area, has been shown toxic to birds. Glyphosate (Roundup® et al.) and triclopyr (Garlon™ et al.) are both shown to be toxic with sublethal consequences. The IWM program proposes, for the most part, very local applications with no opportunity for “taking” birds. Broader distributions (such as aerial applications of herbicides) would have a greater chance of take. If triclopyr were to be used in this manner on tamarisk, bird mortalities could occur. Imazypic (Plateau™), for cheatgrass and possibly whitetop, has stability in water, which poses a long-term risk; however, its use was analyzed in the PEIS (BLM 2007a). Glyphosate has been shown to lower sperm counts in mammals. Increased dead and abnormal sperm has been observed. After acquiring doses achievable under normal applications of triclopyr rabbits experienced decreased litter sizes and birth weights. Miscarriage rates increased. Triclopyr is associated with abnormal nervous system development in utero. All herbicide labels recommend precautions for handlers. The “inactive” ingredients also can be harmful. Carriers and surfactants, although having greater implication to aquatic systems, can be toxic anywhere (diesel fuel in Garlon-4™, formaldehyde in Oust®). These effects at normal application rates are usually less than lethal. As would be practiced under the IWM, the direct adverse toxic effects would be none to negligible. If the program were to acquire authority for large scale applications, such use would continue to be under label rules and there would be a team approach to avoid harm to wildlife.

Nectaring insects seek thistles, knapweeds, and houndstongue as some of the best source of energy. The IWM program would greatly reduce this food source, yet no insect species is believed in jeopardy. Nectar insects are not plant species specific in the adult nectaring stage, and other flowering species including native thistles would be unaffected. Weeds, almost by definition, produce many seeds. Seeds compose the diet of many birds and rodents. The IWM program would have no impact on the vast majority of weedy species, only the noxious ones. The species on the “C” list of weeds have become established. Removing plants such as tamarisk and Russian olive would have an immediate adverse impact on the wildlife that uses these plants for cover, nesting substrate, and foraging.

Adverse indirect effects include reduction in plant species diversity and consequent availability of preferred food, habitat, and breeding areas; decrease in wildlife population densities within the first year following application as a result of limited reproduction; habitat and range disruption if treated areas are avoided due to habitat changes; and increase in predation of due to loss of cover (EPA 1998b).

The extent of direct and indirect impacts to wildlife would vary by the effectiveness of herbicide treatments in controlling target plants and promoting the growth of native vegetation, as well as by the extent and method of treatment (e.g., aerial vs. ground) and chemical used (e.g., toxic vs. non-toxic; selective vs. non-selective), the physical features of the terrain (e.g., soil type, slope), and weather conditions (e.g., wind speed) at the time of application.

Because of the relatively low risk of toxicological effects to most wildlife even with direct spraying, it can be said that the main risk to wildlife from herbicide use is habitat modification. In forests, for example, herbicide use may result in minor and temporary effects on plant communities and wildlife habitats following single applications to young stands or stands following harvest, including some beneficial effects, but it usually results in a significant drop in forage the season following treatment. However, forage species and wildlife use of treated areas are likely to recover two to several years after treatment (Escholz et al. 1996, McNabb 1997, Miller and Miller 2004).

The “A” and “B” lists present some highly undesirable weeds. All of the weed species on the lists do not have equally adverse implications for wildlife, yet the IWM goal of total control of the “A” and “B” species would result in the preservation of wildlife habitat. The strategy of “triage” for sites occupied by “C” species is appropriate for conserving wildlife habitat values. It is neither too aggressive impacting wildlife using the exotic vegetation, nor too lax missing the chance to restore native conditions.

<u>Alternative C: No Herbicides</u>: No use of herbicides under Alternative C, would eliminate the possibility of exposing wild horses to the toxic effects of some of the active ingredients. Primary effects would stem from other vegetation treatment methods. Positive ecosystem and habitat benefits as a result of vegetation management could be reduced under this alternative, since certain invasive species can be effectively treated only with herbicides due to the limitations of manual and biological controls. For example, rugged terrain may prevent treatment by methods requiring terrestrial vehicle and/or foot access, while aerial treatment with herbicides in these areas may be possible. In addition, it often is difficult to eradicate species that resprout from roots or rhizomes left behind by manual treatments. Pre-emergent herbicides that persist in the soil are the most effective means of controlling invasive plants with seeds that remain viable for long periods.

In the absence of herbicide treatments, invasive plants would likely continue to spread, possibly at increasing rates, and cause further damage to susceptible native plant communities and wildlife habitat, particularly in areas and for species where other treatment methods are infeasible or ineffective.

3.6.3 Aquatic Wildlife including Special Status Fish

The BLM administers lands directly affecting almost 155,000 miles of fish-bearing streams and 4 million acres of reservoirs and natural lakes (BLM 2006c). These habitats range from isolated desert springs of the Southwest to large interior rivers and their numerous tributaries. Fish, the dominant aquatic vertebrate in the analysis area, constitute a key component of aquatic systems on public lands. Fish are a critical resource to humans and, as such, have influenced the development, status, and success of social and economic systems in the western U.S. Aquatic organisms such as insects and other aquatic invertebrates provide food for fish. The health of fish and other aquatic organisms is often indicative of the health of the watershed. Fish and other aquatic organisms are often more sensitive than humans and wildlife to herbicides and other chemicals in their environment, and thus can be an indicator of the concentrations of these pollutants in aquatic bodies.

Today, the rapid expansion of invasive species across public lands is one of the primary threats to ecosystem health, and is one of the greatest challenges in ecosystem management. The BLM herbicide treatment program is designed to benefit ecosystems by removing and controlling the spread of invasive plant species. In aquatic systems, these plants (such as Eurasian watermilfoil, water-thyme) may clog slow-moving water bodies, thereby contaminating water with an overabundance of organic material. This organic material reduces light and dissolved oxygen levels, thereby eliminating habitat and decreasing growth or killing native plants and animals (BLM 2007a).

Riparian systems may be invaded by non-native species, which can be detrimental to native aquatic species. In riparian areas, non-native plants (such as common reed, saltcedar, Japanese knotweed) often support fewer native insects than native plant species. This, in turn could affect food availability for insectivorous fish species (such as salmonids). The replacement of native riparian plant species with some invasive species may adversely impact stream morphology (including shading and instream habitat characteristics), bank erosion, and flow levels. Removal of noxious weeds and other invasive vegetation through herbicide use, when physical and climatic conditions and herbicide formulations allow treatments to be safe for native species and water quality, can help to restore a more complex vegetative and physical structure and natural levels of processes (such as sedimentation and erosion) (BLM 2007a).

Special Status aquatic animal species are found on public lands throughout the United States. In arid habitats, (such as in Colorado), many Special Status fish species are found in the rare and fragile desert wetlands and springs, as well as in the major rivers such as the Colorado and the Rio Grande. In the deserts of the Great Basin and Colorado Plateau, terminal lakes, marshes, and sinks provide important habitats for Special Status fish species that are adapted to their warm, saline conditions (BLM 2007a).

Affected Environment

Within SJPLC-administered BLM lands, most aquatic insects or macroinvertebrate communities are composed of bottomdwelling insects that live among the boulders, cobble, and gravel in streams. They are dominated by taxonomic orders that require clean water. Macroinvertebrates such as true flies *(Diptera)*, mayflies *(Ephemeroptera)*, stoneflies *(Plecoptera)*, and caddisflies *(Tricoptera)* are abundant in many streams and rivers within SJPLC-administered BLM lands. The richness, distribution, and abundance of macroinvertebrates are often indicators of the water quality conditions in their environments.

SJPLC-administered BLM lands contain native and desired non-native fish species. Although non-native fish introductions have increased fish diversity, they have also resulted in negative impacts to native fish populations. Historic and current forest/rangeland management activities have impacted, and may continue to impact, the characteristics and functions of aquatic ecosystems.

Federally listed fish of concern include the endangered bonytail chub and humpback chub; as well as the Threatened Colorado pikeminnow; and razorback sucker. These are big river fish are found in the Colorado and San Juan Rivers and don't actually occur in the upper tributaries and reaches of these rivers. There is no designated Critical Habitat on SJPLC-administered BLM lands. An incidental location of a pikeminnow was documented in CANM but southwest Colorado public lands can produce upland impacts that affect these species downstream.

All four species are found downstream of SJPLC-administered BLM lands in the mainstems of the San Juan and Dolores Rivers. These species fall under the purview of Section 7 of the ESA, which outlines the procedures for Federal interagency cooperation designed to conserve federally listed species and designated critical habitats. Section 7(a)(2) of the ESA states that any action authorized, funded, or carried out by a Federal agency would not likely jeopardize the continued existence of a listed species, or result in the destruction or adverse modification of designated critical habitat.

Four native fish species are listed as both USFS and BLM Sensitive Species on SJPLC-administered BLM lands: roundtail chub, flannelmouth sucker, Colorado River cutthroat trout, and bluehead sucker. All four species are also identified as species of special concern by the State of Colorado. Generally, the roundtail chub, flannelmouth sucker, and bluehead sucker are found in main-stem Rivers at lower elevations within SJPLC-administered BLM lands. The Colorado River cutthroat trout populations are found mostly in headwater streams and lakes that are tributary to the Dolores and San Juan River systems.

Amphibians may use streams for reproduction but are associated more closely with marshes, seasonal ponds, or permanent ponds. Where they are present in streams, egg masses or larvae of the amphibians present or potentially present in the SJPLC area are generally found in waters that do not have strong flows or support predatory fishes—e.g., beaver ponds.

Environmental Consequences

Alternative A: No Action: See Alternative B for an in depth analysis of all alternatives. This alternative would be the same as Alterantive B except that aerial application of herbicide would not be allowed and neither would the use of four herbicides: Diquat, Diflufenzopyr, Fluridone, and Imazapic.

Under this alternative, the SJPLC would not utilize aerial spraying to treat large infestations of cheatgrass or other weeds. The SJPLC would therefore treat fewer acres of weeds on an annual basis (1,000 acres per year compared to 5,000 acres for Alternative A). Because fewer acres would be treated and aerial application would not be allowed, resident fish species would have a lower risk of toxic effects from exposure to herbicides than with the Proposed Action.

The lesser area of weed treatment annually would also reduce the potential for indirect effects from the transport of sediments off large areas treated aerially. However, this temporary benefit would be more than offset by the reduced ability to treat cheatgrass. Infestations of this species, which cover hundreds of acres within the SJPLC area, would likely expand because of the inability to use aerial spraying.

Additionally, this alternative would not include the use of the newly approved herbicide imazapic, which is the most effective treatment for cheatgrass. This would further increase the likelihood for expansion of cheatgrass. The presence of cheatgrass, which can form a dense canopy of standing biomass that is brown throughout the growing season, increases the risk for larger fires on a more frequent basis. This in turn increases the potential for adverse impacts on resident fishes from sediment transport and debris flows into aquatic habitats. This would be a greater risk for Colorado River and greenback cutthroat trout than for the big river nongame fishes, which are well adapted to high sediment loads.

The long-term benefits to fisheries and aquatic habitats—and to special status species and their habitats—associated with weed treatment would be less under this alternative than under the Proposed Action. The continued proliferation of weeds throughout the SJPLC area would continue to degrade upland and riparian habitats important to the long-term sustainability and functionality of fisheries.

Alternative B: Proposed Action: Because this programmatic EA tiers to BLM's herbicide treatment PEIS (BLM 2007a), the SOPs, mitigation measures, and conservation measures included in that document would also be applied to protect aquatic organisms in connection with weed treatments within the SJPLC area (see Appendices E,F, and G). Because of these measures, impacts to fish and other aquatic organisms would be substantially reduced if not entirely eliminated.

In general, manual and biological methods for treating noxious weeds and other invasive non-native species as proposed in this EA would have no or minimal adverse impacts on fish or other aquatic vertebrate or invertebrate species, while herbicide treatments would pose some risk from chemical exposures. Conversely, the benefits of weed treatments on aquatic systems—by reducing or removing invasive plants in adjacent habitat and facilitating recovery of a more diverse community—would be greater with the use of herbicides because of the ability to treat larger areas and more aggressive species.

The following summaries of direct and indirect impacts to fish and other aquatic organisms are taken from the PEIS (BLM 2007a). Following the summaries are discussions related to species and habitats that occur in the SJPLC area and would be potentially affected by weed treatments.

Direct effects were determined primarily from literature review and the previous Ecological Risk Assessment cited in the PEIS to assess the impacts to fish and other aquatic resources from the use of chemical herbicides. Fish and other aquatic organisms are exposed to chemical herbicides in three primary ways:

- Uptake through the skin during swimming in contaminated water
- Uptake through the gills during respiration in contaminated water
- Uptake through the digestive system during ingestion of prey from contaminated water

The major factor influencing the potential for exposure to fish is aerial drift from treated areas into untreated areas and non-target resources (e.g., waterbodies). Other means by which herbicides could reach aquatic habitats is through runoff from treated areas, inadvertent direct spraying, and accidental spills. As discussed previously, the SOPs, mitigation measures, and conservation measures in Appendices E, F, and G of this document would substantially reduce the potential for these exposures.

Species-specific toxicological data do not exist for most ecological receptors, including fish. Thus, the ERAs cited in the PEIS (BLM 2007a) were used for evaluating potential adverse impacts from exposure to herbicides. Surrogate species used were the bluegill or unspecified sunfish (*Lepomis* spp.) to represent warmwater species and the rainbow trout to represent coldwater species.

Based on the ERA portion of the PEIS, the majority of the chemicals evaluated have little or no potential to negatively impact fish or aquatic invertebrates through acute exposures, and only one (diuron) has the potential to bioaccumulate in fish tissue. Acute toxicological effects to fish and aquatic invertebrates of the herbicides evaluated in the ERA from direct or indirect exposure scenarios normally associated with weed treatments may be summarized as follows:

- Chlorsulfuron, Imazapic, Imazapyr, Metsulfuron Methyl, and Sulfometuron Methyl – Potentially high risk to fish due to the toxicity of ALS (acetolactate synthase) inhibitors.

- Bromacil – Low risk from direct spray and spills mixed for the maximum application rate. No risk from offsite drift or runoff.

- Dicamba, Diflufenzopyr, and Overdrive® (Dicamba + Diflufenzopyr) – No risk to fish and aquatic invertebrates from direct spray, spills, offsite drift, or runoff, at either the typical or maximum application rate.

- Diuron –Moderate to high risk to fish and aquatic invertebrates from direct spray or spills. Low risk to fish from runoff into streams, mostly at the maximum application rate. Low risk from aerial drift with proper buffers.

- Diquat and Glyphosate –For diquat, high risk to fish and aquatic invertebrates from spills and to aquatic invertebrates from direct spray; low risk to fish from direct spray. No risk from offsite drift or runoff at either application rate. Risks from use of glyphosate probably similar, except for formulations specifically licensed for use in aquatic sites.

- Fluridone – Moderate to high risk from direct spills; no or low risk from direct spray at the maximum application rate. No risk from offsite drift or runoff.

- Tebuthiuron – No acute risk from direct spray, offsite drift, or runoff. Potential acute risk to fish from spills. Low to moderate chronic risk to fish and invertebrates from direct spray and spills and to invertebrates from runoff.

Since most of the fish species on SJPLC-administered BLM lands are relatively short-lived (lifespans generally less than 7 years), the potential for chronic toxicity to the fish or to piscivorous predators that feed on them such as the bald eagle, double-crested cormorant, and the great blue heron is generally minimal. The endangered Colorado River fishes, being long-lived, are at greater risk for chronic effects (see below).

Direct effects on aquatic larvae of non-special status amphibians (tiger salamander, Woodhouse's toad, leopard frog, western chorus frog) are expected to be comparable to those on the fishes described above.

Direct impacts to Colorado River cutthroat trout and mountain sucker (BLM sensitive species) would be the same as discussed above for non-special status species.

Direct effects of herbicide treatments on the four Federally listed endangered species (Colorado pikeminnow, bonytail, humpback chub, and razorback sucker) and the three BLM sensitive species (bluehead sucker, flannelmouth sucker, and roundtail chub) would generally be the same as described above for key non-special status species. However, the long lifespans of the big-river fishes (from 30 to 50 years) creates the potential for chronic toxic effects from bioaccumulation (retention in tissues of contaminants taken up from the surrounding environment), bioconcentration (accumulation in tissues of contaminants at high concentrations higher than those found in the surrounding environment), and biomagnification (increase in concentrations as contaminants move through progressively higher trophic levels in the food chain). Colorado pikeminnow, which is both long lived and piscivorous, would presumably be at greater risk of toxic effects than the other big-river species. However, only one of the chemicals evaluated in the PEIS, diuron, has a tendency (low to moderate) to bioaccumulate in the tissue of aquatic organisms (BLM 2007a).

In accordance with legal requirements set forth under the Endangered Species Act of 1973. Under the Act, federal agencies are prohibited from authorizing, funding or carrying out any action that would jeopardize a listed species, or destroy or modify critical habitat. The USFWS Colorado Field Office County List updated March 2010 (USFWS 2010a) identified Threatened, Endangered, Proposed, or Candidate aquatic species that could potentially occur within the planning area include four endangered fishes: bonytail, razorback sucker, humpback chub, and Colorado pikeminnow.

The SJPLC prepared a BA to evaluate likely impacts to Federally listed or proposed threatened or endangered species (BLM 2010b). The BA reached a determination of “May Affect, Not Likely to Adversely Affect” for the four Colorado River fishes based on the SOPs, mitigation measures, and conservation measures (Appendices E, F, and G) for avoiding or minimizing impacts. Prior to conducting noxious weed treatments using herbicides the USFWS will be consulted for their concurrence on this determination.

Combined with SOPs, mitigation measures, and project design criteria, it is anticipated that negative effects would be minimized. In addition, all site-specific projects would be implemented with the objective of creating long-term beneficial effects on fish species and their habitats.
A general reduction in vegetation cover and biomass in riparian areas, which could occur by any of the treatment methods under any of the alternatives, could have multiple consequences for aquatic organisms, particularly those associated with coldwater streams. These could include an increase in water temperature and sedimentation and a decrease in water storage capacity. Riparian cover provides shade, which cools water temperatures and reduces temperature fluctuations. Riparian vegetation also stabilizes the soil on streambanks, helping to preventing sediment transport and the loss of riparian vegetation by slumping into the stream. Tree and shrub canopies intercept rainfall, helping to reduce the flashiness of overland flow, while the herbaceous layer (grasses and forbs) captures or retards the transport of sediment and

pollutants. Last, the diverse structure and composition of most riparian habitats provides a source of terrestrial insect prey. See Platts (1991).

Increased sedimentation entering aquatic habitats as a result of destabilized streambanks and increased erosion can cover spawning and rearing areas, thereby reducing the survival of fish embryos and juveniles. Excessive sedimentation can also fill in important pool habitats, making them unusable by fish and other aquatic organisms. Pool habitats are important as thermal refugia for fish during the temperature extremes of summer and winter seasons. Excessive sediment can fill in the interstitial spaces between stream substrates that are important for aquatic invertebrate productivity. A number of sublethal effects to aquatic species may also occur as a result of sedimentation, including avoidance behavior, reduced feeding and growth, and physiological stress (Waters 1995). Over the long-term, increased sediment loads reduce primary production in streams. Reduced instream plant growth, combined with the reductions in riparian vegetation, can limit populations of terrestrial and aquatic insects, which also serve as food sources for many fish as well as bat and bird species.

Within the SJPLC area, impacts associated with potential increases in sediment would be to species most sensitive to increases in sediment—primarily members of the order almoniformes. These species in the SJPLC area include rainbow, brown, brook, and cutthroat trout and mountain whitefish. The mottled sculpin in the order Scorpaeniformes is also sensitive to sediment increases and occurs in the area.

Depending on the size and timing of treatment and the lag time for target species die-off and reestablishment of desired native riparian species, impacts could be more prolonged and greater in intensity and scope. Trout within the SJPLC area generally reside in small mountain streams that are sensitive to changes in sediment input.

Excessive inputs of sediment in the fall could be detrimental to these fish as during the fall, streams and rivers are generally at or near base (low) flow conditions. These reduced flows would minimize the ability of streams to efficiently move increased sediments through the system. Rainbow and cutthroat trout and mottled sculpin are spring spawning fish that generally produce eggs from March-June depending on elevation. These fish generally spawn during increased spring flows associated with snowmelt which helps to scour and maintain channels and more efficiently move increased sediments through the system. Thus impacts to spawning members of these species would be reduced.

Removal of large amounts of riparian vegetation can alter the nutrient dynamics of the aquatic habitat. In areas where riparian vegetation has been lost, a shift in energy inputs from riparian organic matter to primary production by algae and vascular plants have been predicted (Minshall et al. 1989) and observed (Spencer et al. 2003). The increased solar radiation that results from the loss of streamside (or poolside, etc.) vegetation causes temperatures, light levels, and autotrophic production (i.e., plants and algae) to increase. This change in the food web of an aquatic habitat could alter the composition of food and thus energy sources that are available to fish and aquatic invertebrates. In addition, increased stream temperatures could affect some species.

Impacts associated with potential increases in stream temperature would be to species most sensitive to changes in stream temperature—primarily the same species as addressed above for sediment. Trout generally occupy small mountain streams within the area. Small streams can be sensitive to changes is water temperature, which could impact fish by slowing their growth rate and increasing their susceptibility to disease. All fish species could be negatively impacted by shifts in composition of food resources, which could also reduce growth and survival.

By exposing more surface area of soil directly to rainfall, and increasing the overland flow of water into the aquatic habitat, removal of vegetation could result in decreased water storage capacity of the soil. Over the long-term, overland flow can erode the topsoil and cut rills and gullies or deepen existing gullies, concentrating runoff. As a result, sediment production is increased. Reduced infiltration and increased runoff may decrease the recharge of the saturated zone and increase peak flow discharge. Thus, the amount of water retained in the watershed to sustain base flows is reduced.

Increases in stream flow can lead to alterations in channel morphology. Doubling the speed of streamflow increases its erosive power by four times and its bedload and sediment carrying power by 64 times. Accelerated runoff can thus cause unstable stream channels to downcut or erode laterally, accelerating erosion and sediment production. Lateral erosion results in progressively wider and shallower stream channels, which can negatively affect fish populations by reducing the amount of important summer and winter thermal refugia pool habitats. Pool/riffle and width/depth ratios, which are important habitat components for many fish species, may also be altered.

Impacts associated with potential increased peak flows and reduced base flows could impact all species of fish. Lowered base flows could result in increased stream temperatures and lowered pool depths, and loss or reduced use of important micro-habitats important to many fish including backwaters, spawning areas, and undercut banks. Increased peak flows as discussed could result in stream habitat impacts as streams are widened and width to depth ratios become out of balance. This can reduce important pool habitat needed for over summer and over winter survival, and result in increased stream velocities with little holding habitat (runs and pools). This would be more pronounced on small mountain trout streams but could also affect habitat complexity in larger river habitats within the area.

The severity of the effects would vary by treatment method, location, the amount of plant material removed, and the distance from the aquatic habitat. Most of the effects would also be increased in severity if vegetation were removed prior to a period of heavy precipitation. Therefore, timing of the treatments is another important factor. The effects of vegetation removal would persist until riparian areas were adequately revegetated with desired native vegetation with root masses capable of providing good streambank stability.

In the SJPLC area, large scale treatments of the woody noxious weed, tamarisk, has occurred through the application of aerial spraying and the introduction of the leaf beetle larvae as a biocontrol. Results of the biocontrol are pending long-term repeat defoliation. Aerial spraying results were mixed with some tamarisk kill but also unintended kill of willow and cottonwood shrubs and trees.

In riparian areas with extensive houndstongue and Canada thistle, it is anticipated that existing sedges and rushes and other riparian grasses would quickly revegetate the sites. Overall, the indirect impacts addressed above would be very site specific and minor in scale within the SJPLC, except where tamarisk is involved.

Over the long-term, all treatment methods that remove non-native and competing vegetation are likely to have a beneficial effect on the habitat of aquatic species, provided that native or other desirable plant species are not substantively removed in the process and return to those habitats after the treatments. Noxious weeds can have substantial negative effects on stream/riparian areas by outcompeting more desirable riparian vegetation, reducing biodiversity, altering aquatic habitats (e.g., reducing streambank protection, undercut bank cover, overhanging vegetation cover, pool depth and volume, and detrital and nutrient inputs; and increasing erosion and fine sediment deposition, stream width, and thermal relationships), and altering natural ecosystem processes (National Fire Plan Technical Team 2002). Vegetation treatments that target plant communities adjacent to aquatic habitats should result in conditions that would be more suitable for supporting native aquatic species. Therefore, vegetation treatments would eventually increase the amount of suitable habitat, potentially leading to an increase in desired species populations.

Another long-term benefit of the removal of non-native fuels from riparian habitats is the decrease in the risk of a future high severity wildfire. Diverse, vigorous, and dense stands of native riparian vegetation are less susceptible to wildfire and help to protect streams from the direct and indirect effects of wildfires by buffering streams from the effects of temperature increases and filtering ash and debris flows. These benefits are less in small mountain streams or high-gradient canyon reaches with narrow riparian zones.

For the big-river fishes, including the Colorado pikeminnow, bonytail, humpback chub, and razorback sucker (Federally listed as endangered), increased sediment loads due to short-term losses of streamside vegetation would not represent the same type of adverse impact. All of these species are well adapted to high sediments loads in the Colorado River and its major tributaries. In general, periodic to frequent influxes of sediment are important in the creation and maintenance of important microhabitats for these species.

Movement and redistribution of sediments helps to create and maintain backwater habitats important to many life stages of these fish. Periodic inundation of floodplain areas with water/sediment provides optimal seedbed areas for native cottonwood regeneration to occur. Any increased sediment loading resulting from proposed treatments would be site specific and short-term in duration (until such time as native or other desirable vegetation reestablishes at the site) and should have no negative impact to any of these species or their habitats.

Based on the fact that, under all alternatives, proper implementation of SOPs, mitigation measures, and conservation measures would be implemented, it is unlikely that negative indirect impacts would occur to these fishes or their habitat.

Under all alternatives, the SJPLC would follow SOPs presented in the ROD of the PEIS (Appendix F) to ensure that risks to human health and the environment from weed treatments are minimized. In addition, the SJPLC would implement measures to mitigate potential adverse environmental effects as a result of weed treatments (Appendix G). If Federally listed, proposed, or candidate threatened or endangered species would potentially be affected by the weed treatments, SJPLC would implement the conservation measures listed in Appendix H of this EA and incorporated into the accompanying BA (BLM 2010b).

An advantage of this alternative compared to the other alternatives is the ability to use all of the currently approved herbicides. These include two newly approved compounds: imazapic for cheatgrass control and fluridone for control of aquatic broadleaf weeds.

Based on the above, the Proposed Action would provide the most long-term benefits to riparian habitats that support key and special status fish, amphibians, and other aquatic organisms by improving the naturalness and diversity of vegetation adjacent to streams and other aquatic sites.

<u>Alternative C: No Herbicides</u>: Herbicides would not be used to treat noxious and invasive weeds. Therefore, fish and other aquatic organisms would not be exposed to these chemicals, and none of the potential impacts identified above would result. The total area of annual weed treatments would be much less due to the limitations of manual and biological controls.

The lesser area of annual weed treatment would reduce the potential for indirect effects from the transport of sediments off large areas treated aerially. However, this temporary benefit would be more than offset by the reduced ability to treat cheatgrass. This species, which is widespread and covers hundreds of acres in the SJPLC area, would proliferate because chemical treatment is the only effective means of controlling this noxious weed. The presence of cheatgrass increases the risk for larger fires on a more frequent basis, which in turn would increase the potential for adverse impacts from sediment transport and debris flows into aquatic habitats.

3.7 Other Natural Resources

3.7.1 Wild Horses and Burros

The BLM manages wild horses and burros on BLM-administered lands through the *Wild Free-Roaming Horse and Burro Act of 1971*. In 2005, wild horse and burro populations on public lands (both BLM and USFS) totaled over 31,760 animals which is approximately 4,000 above the Appropriate Management Level (AML) of 27,500. The AML is an estimate of the number of wild horses and burros that public lands can support while maintaining a thriving natural ecological balance (USDI BLM 2006b;c). Colorado is estimated to have a free-roaming population of 800 wild horses and no burros on public lands.

Affected Environment

The Spring Creek Basin Herd Management Area (HMA) is located in Disappointment Valley and lies approximately 18 miles south of Naturita, Colorado. The HMA boundaries largely coincide with the boundaries of the Spring Creek Grazing Allotment. The HMA is approximately 21,857 acres in size with 94% Federal land, 3% State land and less than 1% private land. The general boundaries surrounding the HMA include Klondike Basin and Horse Park to the north, McKenna Peak to Brumley Point on the east, County Road 19Q on the south and low rolling foothills to the west.

The Appropriate Management Level (AML) for the Spring Creek Basin HMA is a population expressed as a range, with a minimum of 35 adult horses and a maximum of 65 adult horses.

Environmental Consequences

Alternative A: No Action: Under Alternative A, the IWM Plan would continue as at present, which does not include the use of imazapic or aerial spraying. Impacts to wild horses within the herd area would be similar to those that have occurred in previous years. Short term negative impacts to the wild horse herd could possibly be lower than under the Proposed Action because of the much smaller area treated. These impacts may include the temporary loss of non-target forage vegetation used by horses, as well as potential effects to wild horse health from exposure to herbicides.

Long-term positive impacts on wild horse habitat within the herd management area (i.e., improvements in habitat, ecosystem function and forage availability) would be less under this alternative than under Alternative B since invasive plant populations would likely continue to expand at the current rate or greater, increasing damage to native plant communities as well as potentially reducing the long-term forage base for horses within the HMA.

Alternative B: Proposed Action: Because this programmatic EA tiers to BLM's herbicide treatment PEIS (BLM 2007a), the SOPs, mitigation measures, and conservation measures included in that document would also be applied to protect the wild horse population in connection with weed treatments within the Spring Creek Basin HMA (Appendices G, H, and I). Because of these measures, potential direct and indirect impacts to wild horses would be substantially reduced.

Under this alternative the use of four new herbicides approved in the PEIS (BLM 2007a) and the use of helicopters or fixed-wing aircraft to apply herbicides aerially would be approved. The ability to use the four new herbicides (diquat, fluridone, imazapic, and Overdrive) would allow for more options in choosing the least toxic herbicides that best match the treatment goals and application conditions. As a result, there could be and increase in benefits and a decrease in risks to wild horses within the HMA. The benefits would include improved vegetation conditions that should increase the the quality and amount of forage due to a larger amount of area being treated. The risks of herbicide effects on the horses health would be decreased by allowing a wider array of herbicide choices which would allow more options for selecting a less toxic herbicide or a herbicide which requires lower amounts to be used in the environment.

Mitigation Measures, SOPs, BMPs:

1. Minimize potential hazards to wild horses and burros by ensuring adequate escape opportunities.
2. Minimize the use of herbicides in areas actively grazed by wild horses and/or using herbicides of low toxicity to horses to reduce potential impacts.
3. Take into account the different types of application equipment and methods to limit the probability of contaminating non-target food and water sources.

Alternative C: No Herbicides: No use of herbicides under Alternative C, would eliminate the possibility of exposing wild horses to the toxic effects of some of the active ingredients. Positive ecosystem and habitat benefits for wild horses could be reduced under this alternative, since certain invasive species can be effectively treated only with herbicides due to the limitations of manual and biological controls. For example, rugged terrain may prevent treatment by methods requiring terrestrial vehicle and/or foot access, while aerial treatment with herbicides in these areas may be possible. In addition, it often is difficult to eradicate species that resprout from roots or rhizomes left behind by manual treatments. Pre-emergent herbicides that persist in the soil are the most effective means of controlling invasive plants with seeds that remain viable for long periods.

3.7.2 Air Quality

Air pollution can directly pose health risks and cause significant welfare impacts to humans; therefore, improvement of air quality in the U.S. is an important regulatory goal. The Clean Air Act (originally passed in 1955 and amended several times since), establishes a mandate to reduce emissions of specific pollutants via uniform Federal standards. Under the Act, the EPA is responsible for setting standards and approving State Implementation Plans (SIPs) to ensure that local agencies comply with the Act.

Affected Environment

The mountain and desert country in the SJPLC area offer world class scenery, viewed by millions of people annually. Residents and tourists visiting the area expect, and anticipate, clean air. Large oil and gas production fields and many coal power plants are located in the Four Corners region. These industries produce air pollution emissions that are recognized as major contributors to degraded air quality impacting SJPLC-administered BLM lands Air pollutants in the region are also caused by fugitive dust from the southwest deserts, unpaved roads and streets, seasonal sanding for winter travel, motor vehicles, and wood-burning stove emissions. Seasonal wildfires throughout the western U. S. may also contribute to air pollutants and regional haze. State agencies, the USFS, the BLM, and the National Park Service have installed several monitoring stations to track existing conditions and trends for local and regional air quality. These stations track several pollutants of concern. For more information on air quality and global warming as it pertains to both the region and specifically the SJPLC area, please see the PEIS (BLM 2007a) and the SJPLC DLMP/DEIS (USFS, BLM 2007).

Environmental Consequences

<u>Alternative A: No Action</u>: Aerial and ground application of herbicides may transport herbicides through drift, allowing airborne herbicides to move beyond the intended target. The primary factors that influence drift are droplet size, wind speed, humidity, formulation of the herbicide, height of emission, equipment and application techniques, and the size of the area treated with the herbicide. Procedures that can be used to reduce herbicide drift include: 1) using a lower spray nozzle height, 2) using the lower end of the pressure range, 3) increasing the spray nozzle size, 4) using drift-reducing nozzles, 5) using drift control additives, and 6) using sprayer shields (Hofman and Solseng 2001).

Impacts to air quality could result from the emissions of particulates associated with hydrocarbons and other byproducts of combustion associated with the use of vegetation treatment equipment. Indirect impacts from air emissions include impacts to human health and global climate change. These impacts may be regionally additive (e.g., increased concentrations of specific pollutants) or synergistic (e.g., chemical reactions that form ozone). Technology has played an important role in reducing air emissions from engine operation.

Alternative B: Proposed Action: Impacts to air quality would be the same as for Alternative A. This alternative could also improve air quality through the treatment of cheatgrass and the resulting reduction in emissions of particulates associated with wildfire. Since cheatgrass increases the risk of wildfire and shortens the fire interval, reductions in cheatgrass would help to bring the fire regime closer to historic levels.

Alternative C: No Herbicides: Impacts to air quality could result from the emissions of particulates associated with hydrocarbons and other byproducts of combustion associated with the use of vegetation treatment equipment would be similar or slightly higher due to the need for increased vehicle trips related to non herbicide treatments.

3.7.3 Cultural & Paleontological Resources

Cultural Resources: Cultural resources include archaeological, historic, or architectural sites, structures, or places with important public or scientific uses. Cultural resources may include definite locations (sites or places) of traditional cultural or religious importance to specific social or cultural groups. Cultural resources are concrete, material places and things that the BLM locates, classifies, and ranks. The BLM manages cultural resources according to their relative importance in order to protect significant cultural resources from inadvertent loss, destruction, or impairment, and to encourage and accommodate the appropriate uses of these resources through planning and public participation.

Section 106 of the National Historic Preservation Act (NHPA) (P.L. 89-665; 80 Stat. 915; 16 U.S.C. 470) and its implementing regulations found at 36 CFR Part 800 require Federal agencies to take into account the effects their actions will have on cultural resources for any endeavor that involves Federal monies, Federal permitting or certification, or Federal lands.

Paleontological Resources: Paleontological resources, plant and animals fossils are the remains and traces of once-living organisms, now preserved in rocks of the Earth's crust. They convey the story of origins and endings of extraordinary varieties of ocean-dwelling, fresh-water, and terrestrial creatures that have lived on the Earth. The western U.S. has a fossil record that includes almost all of the geologic periods from the Cambrian (500+ million years ago) to the Holocene (the last 10,000 years), and nearly every imaginable ancient environment. Many fossil deposits are of national and international importance, and many thousands of different kinds of fossils were originally made known to the scientific world from specimens first found in the West (BLM 2007a).

The BLM manages fossils as a natural heritage resource on the lands it administers under the Omnibus Public Land Management Act of 2009 (Pub.L. 111-11, H.R. 146 Title VI). Fossils are managed in a manner designed to promote their use in research, education, recreation, and to protect significant fossil resources. Paleontological localities are an important consideration in developing land use management decisions. More than 200 properties, totaling more than 5 million acres, are managed either wholly or in part for paleontological values or contain paleontological values that may require special management strategies in the future. Significant paleontological resources can also be found on other public lands estimated to total over 20 million acres. Due to the increasing interest and activity related to fossils over the past 3 decades, it is estimated that there are more than 50,000 fossil sites documented on public lands (BLM 2007a).

Affected Environment

Native American occupation of the area dates back approximately 10,000 years. The archaeological record contains some of the earliest agricultural societies in the region. The historic period brought Spanish and Euro-American explorers, trappers, miners, and settlers into the region. This long record of human occupation has left one of the highest densities of prehistoric and historic heritage and cultural resources to be found in the United States. These sites have national, international, and Native American tribal significance.

Heritage and cultural resources are non-renewable resources that include historic and prehistoric artifacts, structures, sites, districts, and archival materials important for their scientific, educational, economic, and social values. Throughout the region advanced archaeological and historical research is an on-going endeavor. There is a great public interest in visitation to heritage and cultural resources. This visitation is an integral part of the region's economy. Twenty-five Native American Tribes and Pueblos claim cultural affiliation with heritage and cultural resources located within SJPLC-administered BLM lands (See Native American Cultural and Religious Concerns Section).

The average density of sites on BLM lands administered by the SJPLC outside of the CANM is 16 sites per square mile. Within CANM, however, some areas contain a site density of over 100 sites per square mile with a total estimate of 20,000-30,000 sites for the entire Monument.

No comprehensive study or evaluation of paleontological resources has been conducted in the SJPLC area.

Fossils found within SJPLC-administered BLM lands are Paleozoic, Jurassic and Cretaceous in age. They include various plants (mostly as petrified wood), invertebrates, and vertebrates (mostly dinosaurs). Within SJPLC-administered BLM lands, formations are classified into categories that indicate the likelihood of significant fossil occurrence. The geological formations that are known to contain significant vertebrate, invertebrate, and plant fossils include, but are not limited to, the following in the SJPLC area (BLM 1991):

- San Jose (vertebrate/dinosaurs);
- Mancos Shale (invertebrates, skate or ray teeth, ammonites, pelecypods, scaphites, oysters, gastropods, baculites, and stromatolites);
- Dolores (flowering plants);
- Morrison (vertebrates and invertebrates);
- Chinle (vertebrate/fish, and plants);
- Mesa Verde (invertebrates); and
- Navajo Sandstone (diverse ichnofauna (e.g., protomammal, dinosaur, pterosaur, crocodile, lizard, and invertebrate traces); petrified wood; remains of prosauropod and theropod dinosaurs; aetosaur; and therapsid vertebrate fossils).

Environmental Consequences

<u>Alternative A: No Action</u>: Under the No Action alternative, the IWM Plan implemented for lands administered by the SJPLC would not include aerial application of herbicides or the use of imazapic or other newly approved active ingredients. Control of noxious and invasive weeds

would be conducted as under current management and would be limited to no more than 1,000 acres per year, versus 5,000 acres for the Proposed Action.

Any proposed noxious and invasive weed control action has some potential to affect cultural resources in the SJPLC area. For archaeological sites, direct impacts result primarily from disturbance of surface and subsurface sediments. For historic properties with protohistoric or historic structural remains, direct impacts result from damage to or destruction of these structures. Direct impacts to cultural resources can happen any time the ground is subject to alteration. The best method to reduce or eliminate direct impacts will be designing the Proposed Action to avoid these known resources.

This alternative would not change the current management of cultural resources. Specific vegetation treatment proposals would continue to follow standard procedures for identifying cultural resources, in compliance with Section 106 of the NHPA, as implemented through the Colorado State protocol. In addition, this alternative would reduce the chance of non-target species/native plant communities and cultural sites being affected by drift of herbicides from areas of aerial application.

Cultural resources are known to be present in varying densities throughout the entire project area, and can be impacted either directly through surface disturbance or rarely by contamination. This is most relevant to two types of archaeological sites that could be encountered by weed management projects: shallow hearths (where datable materials may be disturbed by physical treatment or by high intensity heat from prescribed fire pile burning), and at rock art sites where chemical drift could contaminate the site or heat from pile burning could cause spall.

The effect of herbicide treatments on cultural resources depends on the method of herbicide application and the herbicide type used. Some chemicals can cause soil acidity to increase, which would result in deterioration of artifacts. Application of chemical treatments can also result in impacts such as altering or obscuring the surfaces of standing wall masonry structures, rock art panels, and organic materials.

Paleontological resources (plant and animal fossils) are non-renewable. Since most paleontological material is buried, the location of plant and animal fossils is predictable only to a limited degree, and most fossil localities remain unknown, making assessment of cumulative impacts difficult. In many settings, paleontological resources are well protected by nature, in that they are so deeply buried and completely encased in sediments or rock that virtually nothing can impact them aside from excavation. In other instances, they are located on or near the ground surface and, as a result, are very susceptible to impacts. Once paleontological resources are impacted or displaced from their natural context, the damage is irreparable and cumulative. Except, perhaps for mechanical treatments for revegetation purposes, vegetation treatment methods do not present a substantial threat to paleontological resources.

Invasive plants may have long-term negative impacts on cultural resource sites by displacing native vegetation and increasing the potential for soil erosion. This, in turn, may potentially lead to a loss of cultural resources. In addition to limiting these impacts, removal of invasive vegetation would contribute to the restoration and maintenance of historic and ethnographic cultural landscapes (NPS 2003).

Alternative B: Proposed Action: Impacts are the same as Alternative A.

Alternative C: No Herbicides: This alternative would implement an IWM Plan that includes the manual and biological control elements of the Proposed Action but does not include the use of herbicides. In the absence of chemical controls, there would be an increase in the use of manual and biological control techniques, but the total area treated annually would be much less than under the other alternatives due to the limitations and inefficiencies of these other methods.

3.7.4 Visual Resources

The public lands administered by the BLM contain many outstanding scenic landscapes. Visual resources in these landscapes consist of land, water, vegetation, wildlife, and other natural or human-made features visible on public lands. Roads, rivers, and trails on public lands pass through a variety of characteristic landscapes where natural attractions can be seen, and where cultural modifications exist. Activities occurring on these lands (such as recreation, mining, timber harvesting, grazing, or road development) have the potential to disturb the surface of the landscape and impact scenic values.

Humans have had a profound effect on landscapes across the western U.S. and Alaska. While much of Alaska is still primarily a natural landscape with scenic qualities that have not been changed substantially by humans, changes to the landscape in the lower 48 states have been substantial (USFS and BLM 1997; BLM 2005c). Much of this change reflects past land management goals that focused on resource allocation, as commodity production took precedence over custodial protection of land. Since the 1970s, however, concern for ecosystem conditions has gained importance and is reflected by a greater effort on the part of Federal, State, Native American tribal, and other land stewards to restore ecosystems to near historic conditions. The objective of these efforts is to provide continued, predictable flows of resources, including visual resources, which contribute to both traditional and current human demands and values (USFS and BLM 2007).

Public lands have a variety of visual (scenic) values that warrant different levels of management. The BLM uses a system called VRM (*Visual Resource Management*; Manual 8400) to systematically identify and evaluate these values in order to determine the appropriate level of scenery management (BLM 1984b).

The VRM process involves:

- identifying scenic values;
- establishing management objectives for those values through the land use planning process; and
- designing and evaluating proposed activities in order to analyze impacts and develop mitigations to meet the established VRM objectives (BLM 1986a).

The BLM *Visual Resource Inventory Handbook* (Handbook 8410-1; BLM 1986a) sets forth the procedures for inventorying scenic values and establishing VRM objectives (referred to as Management Classes). A visual resource inventory is informational in nature and does not set forth management direction. A visual resource inventory is based upon an analysis of 3 primary criteria influencing visual values: 1) inherent scenic quality, 2) public sensitivity to landscape change, and 3) distance zones from primary travel ways or special areas. These criteria are ranked for all acres of public land and a final VRM inventory rating is identified. These ratings are then used during the land use planning process, and are considered along with other resource objectives to determine final VRM objectives, or classes.

BLM policy requires that every acre of BLM land be inventoried and assigned a VRM class ranging from Class I to Class IV. After VRM classes have been established, BLM policy requires all management activities to be designed to meet the assigned classes. Class IV allows for the most visual change to the existing landscape, while Class I allows the least (see Table 3.6).

Table 3.6 Visual Resource Management (VRM) Classes and Objectives and Appropriate Management Activities

VRM Class	Visual Resource Objective	Change Allowed (Relative Level)	Relationship to the Casual Observer
Class I	Preserve the exiting character of the landscape. Manage for natural ecological changes.	Very Low	Activities should not be visible and must not attract attention
Class II	Retain the existing character of the landscape.	Low	Activities may be visible, but should not attract attention
Class III	Partially retain the existing character of the landscape.	Moderate	Activities may attract attention but should not dominate the view
Class IV	Provide for management activities which require major modification.	High	Activities may attract attention and may dominate the view

Source: http:www.blm.gov/pgdata/etc/medialib/blm/wo/Planning_and Renewable_Resources

Affected Environment

As development around SJPLC-administered BLM lands continues, and as populations and tourism grow, demand for, and concern about, scenic quality is also increasing. Visitors and residents place a high value on the protection of intact natural and cultural landscapes. The economic and lifestyle benefits of high-quality scenery are a primary contribution to the wealth of this region. Within the SJPLC area, management activities have altered the natural landscape character with the most visible impacts on BLM lands a result of energy development. Valued scenic and cultural landscapes associated with scenic byways remain in jeopardy of development and degradation from a variety of impacts.

Scenery is dependent upon a healthy ecosystem. Natural disturbance elements (including fire, flood, landslides, and avalanches) are normal ecosystem processes, and create or perpetuate natural scenic conditions. In particular, wildfire is a disturbance factor that has been profoundly affected (impacted) by landscape management.

Environmental Consequences

Alternative A: No Action: Under Alternatives A and B, —both of which involve the use of herbicides to treat infestations of noxious weeds and other invasive plant species—impacts to visual resources would be evaluated by comparing the existing characteristic landscape with the anticipated changes in the basic design elements of form, line, color, and texture likely to result from use of herbicides. Any of the alternatives involving use of herbicides to control weeds would create the potential for short-term and long-term changes to existing landscapes that contain substantial amounts of weeds.

In general, herbicide treatments would have short-term negative effects and long-term positive effects on visual resources. The effects of treatments over a large portion of the landscape are more likely to be observed by people than the effects of small-scale treatments. Impacts to visual resources from herbicide treatments would begin to disappear within one or two growing seasons in most landscapes. Regrowth of native vegetation on the site would eliminate much of the stark contrasts and visual impacts within a cleared area.

The removal of vegetation could have short-term effects to the visual qualities of treatment sites by creating openings and obvious changes in color or texture due to direct mortality of the weeds and some non-target plant species that provide a noticeable visual contrast to the surrounding areas of green vegetation. The degree of these effects would depend on the amount of area treated, the appearance of the background vegetation and the vegetation being removed, the type of treatment, the season of treatment, and the sensitivity of the viewshed. Over the long term, vegetation treatments would likely improve visual resources on public lands. Treatments that aim to rehabilitate degraded ecosystems, if successful, would result in plant communities that are dominated by native species, which is considered to be positive and would significantly outweigh any short-term negative impacts.

Under any of the alternatives involving use of herbicides, the SOPs and mitigation measures described in Appendices E and F would be implemented to reduce adverse impacts to the environment. In general, many of these measures would also benefit the protection of visual quality by minimizing mortality of non-target plant species and ensuring prompt reclamation of areas not expected to recover naturally within a reasonable timeframe. In addition, the following mitigation measures specific to visual resources would be applied:

- For very large and dense weed infestations in VRM Class I or Class II areas that have a high degree of sensitivity, consider treating the infestations in multiple applications at different times so that changes in landscape character are staggered. This measure would not be used if it would compromise the effectiveness of the treatment (e.g., by allowing weeds to invade treated areas from untreated areas).

- For very large and dense weed infestations in VRM Class I and II areas that are highly visible or have high sensitivity, consider reseeding to hasten recovery rather than relying on natural processes, even if natural processes are anticipated to be effective eventually.

Continuation of current management under Alternative A would have both fewer short-term adverse impacts and fewer long-term benefits than the Proposed Action due to the lack of aerial spraying and resultant smaller area treated annually (up to 1,000 acres per year versus 5,000 acres for the Proposed Action). Weed control efforts would generally be concentrated in small areas of disturbance and along travel corridors where a disturbance is already present. No large-scale weed control would be expected in VRM Class I areas due to the largely undisturbed and natural appearance of the existing landscape, and few large scale projects would be expected in VRM Class II areas. Large-scale treatment within VRM Class II areas may require special project requirements to reduce long term contrasts that may attract attention of casual observers.

<u>Alternative B: Proposed Action</u>: All IWM activities would meet VRM Class Objectives. Any IWM activities in these units would include actions to minimize visual contrasts through utilization of blending or "feathering" treatments to create natural mosaics or patterns especially when using mechanical, chemical, and revegetation. IWM activities would assist in meeting VRM objectives by eradicating invasive and noxious weed species that can adversely impact scenic quality.

The Proposed Action would have the greatest potential for both adverse short-term impacts and beneficial long-term impacts from use of herbicides to treat noxious and other invasive weeds. This conclusion is based on the fact that Alternative B is the only alternative that would include the use of helicopters or fixed-wing aircraft to apply herbicides to large or remote infestations that may be difficult or inefficient to treat with other methods. No large-scale weed control would be expected in VRM Class I areas (WSAs and ACECs) due to the largely undisturbed and natural appearance of the existing landscape, and few large scale projects would be expected in VRM Class II areas. Large-scale treatments within VRM Class II areas may require special project requirements to reduce long term contrasts that may attract attention of casual observers.

<u>Alternative C: No Herbicides</u>: With no herbicide treatments taking place under Alternative C, visual resources would not be adversely affected by changes in vegetation related to the presence of dead or dying plants. Conversely, visual quality aspects adversely affected by a dominance of weeds would not improve over time and instead would become further degraded as invasive plants continue to spread. Many types of weed infestations (e.g., knapweeds, non-native thistle, etc.) cannot be effectively controlled by manual or biological treatments, particularly if the infestations are large. Therefore, efforts would generally belimited to small areas that can be treated manually. Even small stands may not be effectively controlled manually because new plants may arise from roots and rhizomes that remain in the ground.

In the case of tamarisk leaf beetle larvae used as biological control, large swatches of vegetation along riparian corridors would appear dead or dying as defoliation takes place. Eventually the hope is after repeat defoliation, native riparian vegetation would return and visual integrity would be improved.

3.7.5 Soil Resources

Soils are a physical element of the environment made up of mineral particles (e.g., sand, silt, and clay), air, water, and organic matter. Soils form by the interaction between climate, organisms, topography, parent material, and time. Soils store water, supply nutrients for plants, and provide a medium for plant growth. Soils also provide habitat for a diverse number of below-ground organisms. Due to their slow rate of formation, soils are essentially a non-renewable resource. Healthy soil is fundamental to high functioning ecosystems, contains a diverse, thriving community of organisms, and functions in a manner to protect down-gradient ecosystems by functioning as a physical and biological filter of chemicals in the environment (BLM 2007a).

The concept of soil quality encompasses a soil's capacity to function and to sustain plant and animal productivity, air and water quality, and human health (Soil Quality Institute 2001). It is a function of each soil's inherited properties (texture, type of minerals, depth), as well as more dynamic properties that can change with management (porosity, infiltration, effective ground cover, and aggregate stability). The ability of a soil to filter, buffer, degrade, immobilize, and detoxify herbicides is a function of the soil quality.

Noxious weeds and other invasive vegetation can impact soil function and reduce soil biodiversity. The amount of moisture in the soil can be altered if infiltration is reduced and run-off is increased on sites dominated by weeds (Lacey et al. 1989). Many noxious and invasive weeds have relatively sparse canopies. This allows for greater evaporation from the exposed soil than does dense vegetative cover. Sites infested with weeds often have more extreme soil temperatures that can alter soil moisture regimes. Noxious and invasive weeds may alter soil nutrient availability for native species, alter soil constituents (such as soil fungi and bacteria), and slow the rate of natural plant succession. Some weeds also produce toxins or allelopathic compounds that can suppress the growth and germination of other plants (BLM 2007a).

Biological Soil Crusts: Biological soil crusts (also known as cryptogamic, microbiotic, cryptobiotic, or microphytic crusts) are commonly found in semi-arid and arid environments. They provide important functions, including improving soil stability and reducing erosion, fixing atmospheric nitrogen and contributing nutrients to plants, and assisting with plant growth. Crusts are composed of a highly specialized non-vascular plant community consisting of cyanobacteria, green and brown algae, mosses, and lichens, as well as liverworts, fungi, and bacteria (BLM 2007a).

Biological soil crusts can reach up to several inches in thickness and vary in terms of color, surface topography, and surficial coverage. Generally, crusts cover all soil spaces not occupied by vascular plants, which may be 70 percent or more in arid regions (Belnap 1994). They are well adapted to severe growing conditions; however, they are influenced by disturbances such as compression from domestic livestock grazing, tourist activities (hiking, biking, and OHVs), mechanical treatment and agricultural practices (extensive tillage and planting), and application of herbicides).

Disturbance of biological crusts results in decreased soil organism diversity, nutrients, stability, and organic matter. Trampling may reduce the number of crust organisms found on the surface and increase run-off and the rate of soil loss without apparent damage to vegetation. Burial of crusts by sediments kills non-mobile photosynthetic components (mosses, lichens, and green algae) of the crust. Fires can result in severe damage to biological crusts. Recovery is possible, however, depending upon fire size and intensity. Shrub presence (particularly sagebrush) may increase fire intensity, thereby decreasing the likelihood of early vegetative or crust recovery after a burn (BLM 2007a, USGS 2003).

Micro and Macroorganisms: Microorganisms help to break down and convert organic remains into forms that can be used by plants. Microorganisms (such as mycorrhizal fungi), nitrogen-fixing organisms, and certain types of bacteria assist plant growth, suppress plant pathogens, and build soil structure. One of the main benefits of mycorrhizal fungi is the improved uptake of nutrients (predominantly phosphorous) and water by plants (Allen 1991). Soil microorganisms are also important in the breakdown of certain types of herbicides.

Macroorganisms (such as insects, earthworms, and small burrowing mammals) mix the soil and allow organic matter on the surface to become incorporated into the soil. These organisms are part of a food chain that is essential to the cycling of nutrients within the soil. Soil microorganisms are also important in the breakdown of certain types of pesticides.

Soil Erosion: Soil erosion is a concern throughout the western U.S. especially in semi-arid rangelands (such as Colorado). The quantity of soil lost by water or wind erosion is influenced by climate, topography, soil properties, vegetative cover, and land use. Erosion occurs under natural conditions; however, rates of soil loss may be accelerated if human activities are not carefully managed.

It is possible to control rates of soil erosion by managing vegetation, plant residues, and soil disturbance. Vegetative cover is the most significant factor in controlling erosion because it intercepts precipitation, reduces rainfall impact, restricts overland flow, and improves infiltration. Biological soil crusts are especially important for protecting the soil and controlling erosion in desert regions; however, they are easily disturbed by grazing and human activities.

Wind erosion is most common in arid and semi-arid regions where lack of soil moisture greatly reduces the adhesive capability of soil (Brady and Weil 2002). In addition to moisture content, soil particle size (texture), mechanical stability of aggregates and clods, and presence of vegetation also affect the ability of wind to move soil. Wind erosion is difficult to quantify; however, the presence of natural vegetation on most public lands is generally sufficient to keep wind erosion from becoming a serious problem. Most wind erosion problems result from bare, exposed soils with weak or degraded soil structure (such as along trails or on sand dunes or disturbed surfaces) (BLM 2007a).

*Soil Compaction: S*oil compaction occurs when moist or wet soil aggregates are pressed together and the pore space between them is reduced. Compaction changes soil structure, reduces the size and continuity of pores, and increases soil density. Wheel traffic, large animals, vehicles, and people can cause soil compaction. Generally, soils made up of particles of about the same size compact less than soil with a variety of particle sizes. Numerous rock fragments can create bridges that reduce compaction. Plant litter and roots, and soil organic matter, structure, moisture, and texture all affect a soil's ability to resist compaction. In areas where compaction exists, compacted soil extends generally less than 6 inches below the soil surface, although it can be as deep as 2 feet under heavily used tracks and roads (USDA Natural Resource Conservation Service 1996). Compaction becomes a problem when the increased soil density limits water infiltration, increases run-off and erosion, or limits plant growth or nutrient cycling (Soil Quality Institute 2001).

Affected Environment

Most soils within the SJPLC area have not been affected (impacted) by historic management activities. Project designs, as well as the implementation of BMPs and design criteria, have served to protect soils and soil productivity on lands where past management activities did occur.

Some lands, most notably in the mountain grassland vegetation type, display some soil compaction and erosion. This is the result of livestock grazing, most of which presumably occurred before 1983 (Romme et al. 2006). Some soils within SJPLC-administered BLM lands have experienced slope failures and mass movement of soils. Steep canyon sideslopes, lands with shale substrates, and lands found within the Morrison and Mancos Shale geologic formations are highly susceptible to these naturally occurring disturbance events.

The sand dunes on BLM-administered lands in Flodine Park and Yellowjacket Canyon are ecologically unique and subject to severe wind erosion.

Gypsum-derived soils on BLM-administered lands in Big Gypsum Valley are ecologically unique because they are associated with rare lichens and plants.

Environmental Consequences

<u>Alternative A: No Action</u>: Herbicide applications inevitably result in contact with soils, either intentionally for systemic treatments, or unintentionally as spills, overspray, spray drift, or windblown dust. In addition to direct application, transmission to soil may occur when an herbicide is transported through the plant from sprayed above-ground portions to roots, where it may be released into soil. In addition, some herbicides remain active in plant tissue and can be released into the soil during plant decay and result in residual herbicide activity (BLM 2007a).

Generally, herbicide applications impact soils through persistence of chemical substance and their effects on the soil, vegetation, and organic material, as well as through increased erosion (especially if bare ground results from the application). Persistence may affect soil organisms and, therefore, the tilth and nutrient cycles of the soil. It may also restrict non-target plant growth and soil productivity. he impacts of chemical application to soils depends upon soil texture, organic matter content, permeability, moisture content, and temperature.

Differences in chemical solubility, adsorptive characteristics, volatility, and degradability, plus soil properties that affect water movement, biological activity, and chemical retention, affect the amount of a herbicide that may leach to groundwater. The speed at which leaching of chemicals through soil occurs is dependent on the soil characteristics. Soil texture (sand, silt, and clay) affects the movement of water and herbicides through soil. The coarser the soil, the faster the movement of percolating water and the lower the opportunity for adsorption of dissolved chemicals. Soils with more clay and organic matter tend to hold water and dissolved chemicals longer. These soils also have far more surface area onto which herbicides can be adsorbed (LaPrade 1992). Herbicides can be potentially transported by blowing soils after application. Herbicides bound to soil particles may be moved offsite by wind erosion events.

Management activities can result in changes in certain soil properties (such as soil porosity, organic matter, biological activity, and susceptibility to erosion). In turn, these changes can affect the fate of herbicides in soils. For example, disturbances that result in increased susceptibility to erosion will affect the off-site movement of certain herbicides that are designed to bind to soil particles. Herbicides can alter soil organism diversity and composition. Compaction or surface disturbance may affect soil-activated herbicides from reaching the root zone of target plants (BLM 2007a).

Certified applicators would be used in vegetation treatments requiring herbicide use. Soil maps would be consulted before any chemical application, to determine soil textures (generally) and other soil information that may be pertinent to following label restrictions. (For example, herbicides usually have greater mobility in sandy textured soils, and application rates and procedures specified on the label would be followed in order to avoid violating soil specific label restrictions or warnings.) Chemical use for treatment of saltcedar or other weeds in or near wetlands and riparian areas, or areas with a high water table, would be approved for application near water. Herbicide label directions would be followed at all times in order to avoid contamination of the water table or waterway.All three alternatives would involve the removal of noxious weeds from areas where newly bare slopes could experience increased erosion until vegetation regrows to the point where it can once again hold the soil in place and shield it from rain splash. Soil compaction associated with ungulate biocontrol and use of motorized equipment for other treatment methods—particularly ground broadcasting of herbicides—could also reduce water infiltration and soil productivity by eliminating pore spaces used for water storage and air exchange. These effects would typically last until a vegetation layer is restored at treatment sites. As stated earlier, prompt revegetation using native species can reduce the erosion hazard, but can also create additional temporary soil disturbance.

Weed removal in infested areas can reduce soil fertility, at least temporarily, through various processes. These include reductions in the supply of carbon and other nutrients, the soil's moisture-holding capacity, and the evapotranspiration rate, all of which combine to cause loss of soluble nutrients by leaching. Soil fertility can also be affected by soil erosion, which causes loss of organic matter and adsorbed nutrients through offsite transport by wind or water (Bonneville Power Administration 2000). Soils with low initial organic matter content are most susceptible to reductions in soil fertility through these processes.

The PEIS and PER describe measures to protect soils during weed treatments (see Appendices E, F, and G). For all alternatives, these measures would include the following:

- Where feasible, access work site only on existing roads, and limit all travel on roads when damage to the road surface will result or is occurring.
- Where listed or proposed aquatic species occur, consider ground-disturbing activities on a case by case basis, and implement SOPs to ensure minimal erosion or impact to the riparian habitat.
- Within riparian areas, do not use vehicle equipment off established roads.
- Outside riparian areas, allow soil-disturbing treatments and driving off established roads only on slopes of 20% or less.
- Do not conduct biomass removal activities that will alter the timing, magnitude, duration, and spatial distribution of peak, high, and low flows outside the range of natural variability.
- Avoid hydromulching within buffer zones established at the local level.
- Establish appropriate buffer zones to downstream water bodies, habitats, or species/populations of interest.

- Leave suitable quantities of excess vegetation and slash onsite.
- Employ appropriate livestock dispersion techniques, including judicious placement of salt blocks, troughs, and fencing to prevent damage to riparian areas but increase weed control.
- Do not conduct weed treatments involving use of domestic grazers in riparian areas affecting listed, proposed, or candidate threatened or endangered species, except where it is determined that these treatments will not damage the riparian system, or will provide long-term benefits to riparian and adjacent aquatic habitats.

All alternatives involve some manual treatments, which would have less direct impact on soils than other proposed treatments. Workers and vehicles accessing the site could disturb topsoil and/or surface organic matter, increasing the opportunity for re-invasion by weedy species; however, the extent of this disturbance would be limited. Coarse-textured soils and steep slopes would be the most fragile. Some potential exists for contamination of the soil from petroleum products used in hand-held power equipment, but these effects would be extremely localized. Where domestic animals are used for biological weed control, their hooves can cause shearing and compaction of soil; this in turn may increase the soil's susceptibility to both water and wind erosion and reduce the availability of water and air to plant roots. These effects can be severe in heavily grazed areas (Trimble and Mendel 1995). Domestic animals could additionally alter nutrient cycling processes in soils by depositing organic nitrogen in urine and feces. In some instances, the formation of soil nitrogen hotspots could increase localized productivity to such a degree that weeds would be favored over native plants adapted to low nitrogen conditions (Evans and Ehleringer 1993).

Manual, hand-spraying, and ungulate biocontrol weed treatments could further result in localized disturbance to biological (cryptogamic) soil crusts, which could reduce soil quality and ecosystem productivity, increase susceptibility to erosion, encourage weed establishment, and reduce water infiltration (Belnap et al. 2001). The duration of these effects would vary, but soil crust recovery rates typically are much slower than the recovery of vascular plants (BLM 2007b).

Over the long term, all treatments that remove invasive vegetation and restore native plants should enhance soil quality on public lands (BLM 2007a). For example, sites dominated by spotted knapweed display substantially higher surface runoff and stream sediment yield than sites dominated by native perennial grasses (Lacey et al. 1989). Cheatgrass dominance and associated fires also reduce biological soil crusts, which affect soil erosion, water infiltration, and nutrient cycling (Belnap et al. 2001). Tamarisk dominated sites indicate higher levels of salt in soils than riparian zones with native vegetation.

Projects would be designed in order to minimize adverse impacts, and the implementation of design criteria and guidelines would serve to protect soils and soil productivity. Sites that currently display compacted soils (including some mountain grasslands, log landings, heavily used skid trails, and temporary roads) are expected to recover over time as the natural processes of freeze/thaw, nutrient cycling, plant root movement, and soil biota movement act to create openings and pore space within the compacted soil.

All weed treatment alternatives would further benefit soil quality by reducing the risk of wildfire by managing cheatgrass. Wildfires cause a loss of soil nutrients and the consumption of soil organic matter. Given the ability of severe wildfires to cover large areas, their impacts on soil quality could potentially be quite high.

Under this alternative, the SJPLC would not be able to use the four additional herbicide active ingredients approved in the PEIS. Because of the inability to use imazapic, which is the most effective cheatgrass control, this invasive annual grass would continue to spread. Aerial application of herbicides would also not occur, limiting the total potential area treated. As a result, positive impacts to soils from weed treatments would be fewer and less extensive than in Alternative B.

While short-term impacts from erosion would be less due to the smaller area treated, long-term impacts would be greater from the increased fire hazard and from the decreased ability of plant roots to hold soil in place associated with areas dominated by annual grasses and annual/biennial forbs than with areas dominated by perennial native grasses. In particular, soil properties affected by cheatgrass would be negatively impacted by this alternative. These properties include soil texture and fertility (primarily in response to fire occurrence), and the presence of biological soil crusts.

Alternative B: Proposed Action: Because the Proposed Action alternative would increase the range of herbicides available to BLM managers, it would allow more options in choosing herbicides to match treatment goals and application conditions. This should beneficially affect soil resources since potential negative impacts to non-target vegetation (and the underlying soil) would be minimized; riparian vegetation buffers would be maintained; and native vegetation ground cover would increase, holding soil in place better than most invasive species (e.g., non-native grasses).

Alternative C: No Herbicides: While some short-term reduction in potential erosion of treated areas would accompany the smaller amount of weed treatments, over the long term soils would suffer due to increased fire hazard and the decreased soil quality and decreased ability of plant roots to hold soil in place in areas dominated by invasive annual grasses and annual or biennial forbs. To an even greater degree than in Alternative A, the widespread occurrence of cheatgrass under Alternative C would adversely affect soils. In addition, the likelihood of greater dependence on ungulate biocontrol for certain weed species would increase soil compaction and erosion, particularly in areas adjacent to streams and stock ponds.

3.8 Other Human Elements

3.8.1 Socioeconomics and Environmental Justice

Demographics: The western U.S. is more sparsely populated than the rest of the U.S., containing about 32 percent of the total U.S. population, but comprising approximately 65 percent of the total land area. However, population growth between 1990 and 2000 averaged over 16 percent, which was slightly higher than the national average. Many of the western states exceeded the national average, with growth rates of 20 percent or higher during this time period. Within regions of the western states, mobility patterns of the population were evident. Population declined in rural areas and increased in urban areas. Growth of the western states during this time occurred predominantly in WUI areas, due to expansion of urban population areas into previously rural areas (BLM 2007a).

Environmental Justice: The western U.S. contains a large percentage of the nation's minority populations, including over 60 percent of the nation's Hispanics and American Indians, and over 50 percent of the nation's Asian/Pacific Islanders. The age distribution of the population of the western U.S. is similar to the nationwide distribution. Approximately 27 percent of the population is under 18 years of age, while about 11 percent is over 65 (BLM 2007a).

Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations,* and an accompanying Presidential memorandum require all Federal agencies to make the consideration of environmental justice part of their mission. Federal agencies must address the potential for their actions to have disproportionate impacts on minority populations and/or low-income populations. Population growth can stimulate economic growth and provide economic diversification. However, development in support of the growing population is encroaching on previously undeveloped areas near public lands. Growth also increases demands on public lands for timber, minerals, livestock grazing, and other commodities, and for recreation and roads. Because public lands and open space are an important component of the western landscape, they are valued by westerners, who expect the BLM to manage public lands in order to ensure their protection and enhancement. These conflicting demands can make it challenging for BLM land managers to meet the multiple need requirements under FLPMA, while still preserving the natural characteristics of the landscape.

Agency social and economic policy has long emphasized the goal of supporting rural and Native American tribal communities by promoting the continued production of goods and services from public lands for those communities deemed dependent upon timber harvest and processing, mineral extraction, and livestock forage. In addition, the BLM promotes the use of services provided by communities in support of BLM management activities (including herbicide applications) (USFS and BLM 2007, BLM 2006b).

Social and Economic Values in Relation to Noxious Weed: Herbicide treatments have the potential to impact people, communities, and economies in, and adjacent to, public lands that could receive treatments. The susceptibility of these entities to social and economic impacts stems from the importance of public lands to the lives of the people and communities in the West, especially in the States with the largest amounts of public land. Public lands commonly provide a major portion of economic sustenance, especially in rural areas, by supporting ranching (grazing leases), mining, active and passive recreation opportunities, as well as a myriad of other activities that westerners rely on. The dollar value of the social sustenance may not be readily quantifiable; however, it is important to the way of life of westerners. "Wide open spaces" are not just a cliché in western songs and novels, they are a tangible part of the experience that attracts and/or retains people who live in western states.

The large expanses of Federal lands are a significant contributor to the open spaces that define the "sense of place" in many parts of the West. Through support of economies and the social context of the West, Federal lands are highly important to the western states. Actions that affect Federal lands, including the application of herbicides, have the potential to impact the economic and social environment of the area. The most pervasive impacts would likely occur in States with large amounts of public land, such as Colorado. Site-specific socioeconomic analysis would be required during the development of actual herbicide treatment projects. Public participation in developing the details of such proposals would be encouraged at appropriate times in those processes.

Affected Environment

The West has been in a measurable growth cycle since before the U.S. Census Bureau began keeping tabs on demographics. The West's share of the country's population has been expanding for more than 150 years now. In just 15 years between 1990-2005, the counties comprising most SJPL (Archuleta, Dolores, La Plata, Montezuma, San Juan, San Miguel) have experienced a 52% increase in full-time resident population. The Colorado State Demographer's office projects a near doubling of the 2005 population by 2035. (http://www.dola.colorado.gov/dlg/demog/pop_colo_forecasts.html)

The differences in the age structure and the population during the height of the recent accelerated growth, and the age structure of the nation as a whole, reveal a slightly "top-heavy" population in which youth are underrepresented and Baby-Boomers are slightly over-represented. The decennial census contains detail about the population's age structure; therefore, the data for the year 2000 is the most recent. In relation to age structure, the lower proportion of youth in the area demonstrates that the population growth is dominated by a migration of older people into the area, and not due to the birth rate.

Current distribution of employment by industry, trends in employment, and average earnings per job are important measures of an area's economic health. Service industries are the leading employer in the San Juan area. Trade, accommodations, food service, and recreation-based firms provide over one-quarter of all jobs. Professional, administrative, and personal service firms provide just under one-quarter of total jobs. Construction, finance, insurance, and real estate account for another 17%. The smallest sectors are mining, transportation, and manufacturing.

Income can be divided into three basic parts: 1) labor income which is considered to be "earned income", 2) Investment income (i.e. rent income or other investments) which is considered to be "non-earned income", and 3) transfer payments (Social Security, Medicare, etc.) which is considered to be "non-earned income". As an established destination for retirees and those in their mid- or late-career stage, non-earned income is becoming increasingly important in southwestern Colorado. The San Juan area exceeds the State, as well as the national, share of non-earned income.

The cost of living in the Rocky Mountain West can be somewhat higher than it is in parts of the country, especially the Midwest and South. La Plata, Archuleta, and San Juan Counties are in the mid-range of Colorado counties, while Montezuma and Dolores Counties are among the most affordable. Housing costs are highly influential in the overall cost of living; therefore, the index is also a good indicator of real estate values.

Environmental Consequences

Alternative A: No Action: The management of noxious weeds can have an influence on the economics of individuals and communities. Cheatgrass is one of the most invasive species in the western United States. Cheatgrass is often perpetuated by frequent fire intervals. These wildfires can be destructive to property and human safety. The removal of cheatgrass and other noxious weeds can improve rangeland health and productivity. This in turn, helps sustain ranching businesses and communities dependent on ranching incomes. In the process of rehabilitating weed treatment sites, however, livestock grazing may be temporarily suspended which may have a short-term impact on individual operators.

The control of noxious weeds on public lands can have an economic benefit by helping to control the spread of weeds onto adjacent private lands, including crop lands. Although the spread of noxious weeds often begins on private land, controlling them no matter where they are would help to curb future costs of controlling larger expanses.

Although it is difficult to quantify the benefits, improved aesthetics from the control of noxious weeds and the promotion of native vegetation can improve recreation experiences.

The cost of noxious weed control on commercial operations (i.e. mineral extraction, road construction) is considered minor when compared to allowing infestations to take hold and expand.

A greater cost may occur with this alternative since there is a loss of flexibility in weed treatment since the four additional herbicides and aerial application would not be included.

<u>Alternative B: Proposed Action</u>: Regardless of the type of method used to control noxious weeds, the costs and benefits are much the same as Alternative A. A greater benefit may occur with this alternative since there is greater flexibility in weed treatment with the addition of four new herbicides and aerial application would be allowed.

<u>Alternative C: No Herbicides</u>: Regardless of the type of method used to control noxious weeds, the costs and benefits are much the same as Alternative A. A greater cost may occur with this alternative since there is a loss of the ability to use herbicides of any kind whether applied manually or aerially.

3.8.2 Native American Cultural and Religious Concerns

The American Indian Religious Freedom Act of 1978 act established national policy designed to protect and preserve, for Native Americans, their inherent right of freedom to believe, express, and exercise their traditional religions (including the rights of access to religious sites, use and possession of sacred objects), and freedom to worship through traditional ceremonies and rites.

SJPLC-administered BLM landsare situated at the boundaries of two distinct physiographic and cultural areas: the Rocky Mountains and the Colorado Plateau. Native Americans associated with the two cultural areas have lived on, or traversed through, the lands within SJPLC-administered BLM lands for thousands of years. They hunted, fished, gathered plant foods, farmed, buried their dead, and conducted religious ceremonies on these lands.

Affected Environment

The 25 Native American Tribes and Pueblos maintain active interests in SJPLC-administered BLM lands. Individual tribal members occasionally use public lands to gather plants or other native materials, and to hunt. Consultation efforts with these groups are on-going. The tribes and pueblos have expressed concerns over the preservation and protection of specific archaeological sites.

Traditional Cultural Properties (TCPs) are places associated with the traditional lifeways, cultural practices, or beliefs of a living community. These sites are rooted in the community's history and are important in maintaining cultural identity. Locations of TCPs, such as traditional plant gathering areas, are often not known to the BLM, but may still be present in SJPLC-administered BLM lands. To date, no cultural sites have been formally established as Traditional Cultural Properties.

Table 3.7 Tribes and Pueblos with Cultural Ties or interests in SJPLC-administered BLM lands

Tribes and Pueblos		
Ute Mountain Ute Tribe	Pueblo of Isleta	Pueblo of San Juan
Uintah-Ouray Ute Tribe	Pueblo of Jemez	Pueblo of Sandia
Southern Ute Tribe	Pueblo of Laguna	Pueblo of Santa Ana
Navajo Nation	Pueblo of Nambe	Pueblo of Santa Clara
Hopi Tribe	Pueblo of Picuris	Pueblo of Santo Domingo
Jicarilla Apache	Pueblo of Pojoaque	Pueblo of Taos
Pueblo of Acoma Pueblo of Cochiti	Pueblo of San Felipe Pueblo of San Ildefonso	Pueblo of Tesuque Pueblo of Zia
		Pueblo of Zuni

Environmental Consequences

<u>Alternative A: No Action</u>: Any proposed control of noxious and other invasive weed species has some potential to affect areas of Native American religious concern in the SJPLC area. The best method to reduce or eliminate direct negative impacts would be by designing the weed treatment to avoid these areas. Even the proximity of a weed control action to native plant communities, cultural sites, or areas of Native American religious concern may in fact adversely impact the significance of the area by changing the setting, location, association, and feeling.

Cultural resources can also be natural features including native plants localities that are considered to be important to a culture, subculture, or community. There is a potential for proposed vegetation treatments to cause impacts to cultural resources and to native plants utilized by the Ute tribes. Specific vegetation treatment proposals would follow standard procedures for identifying cultural resources, in compliance with Section 106 of the NHPA, as implemented through the Colorado State protocol. The process includes necessary consultations with the Colorado State Historic Preservation Office (SHPO) and interested tribes.

Long-term effects to Tribal cultural uses could be associated with enhancing culturally significant plant and animal habitat as well as improving vegetation cover on eroding archaeological sites. Long-term impacts could also result from ground disturbance associated with the effects of the chemicals or physical damage from vehicles taken off-road to apply the chemicals. Short-term impacts could result from loss of access during treatment.

Herbicides could harm traditional use plants, or threaten the health of the people gathering, handling, or ingesting recently treated plants, fish, or wildlife that are contaminated with herbicides (BPA 2000). Since roots and other plant materials harvested by Native peoples may be found in close proximity to weed treatment areas, the potential exists for herbicides to drift from treatment areas onto areas used by Native peoples (ENSR 2001). In some cases, vegetation important to Native peoples, including juniper, may be treated in areas where these plants are invasive and crowding out more desirable vegetation (BLM 2007a).

While native plants identified as being important in traditional subsistence, religious, or other cultural practices could benefit from manual and biological control techniques and the non-use of chemicals, the spread of invasive species may or may not increase erosion on cultural sites depending upon the nature of the invasive species. If weed encroachment causes soil erosion, artifacts may be exposed and collected or displaced; losing their context. The direct loss of cultural resources due to erosion and exposure as well as replacement of native species would occur over the long term. As weeds spread, native plants available for use by Native American groups would be reduced.

Depending on the selected application method for herbicide treatment plans, the BLM might be unable to avoid plants identified by local tribes as being important in traditional subsistence, religious, or other cultural practices. Consultation would be undertaken with tribes and groups to locate any areas with plants that are of importance to the tribe and that might be affected by chemical treatments. Certain herbicides could also pose a possible health risk through residues left on plants used as traditional foods or for ceremonial purposes or as a result of contaminating other food sources or drinking water.

This alternative would not change the current management of weeds as it affects areas of Native American religious concern. Specific treatment proposals would continue to follow standard procedures for identifying cultural resources. In addition, Alternative A would reduce the chance of native plant communities, cultural sites, or areas of Native American religious concern being affected by drift of herbicides from treated areas into non-target areas since no aerial application of herbicides is allowed.

Herbicide treatments are unlikely to affect buried cultural resources; however, they might result in an adverse impact to traditional cultural properties comprised of plant foods or materials significant to local tribes and native groups. These treatments, therefore, would 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 would be avoided through project redesign, or would be mitigated through data recovery, recordation, monitoring, and/or other appropriate measures. When cultural resources are discovered during vegetation treatment, appropriate actions would be taken in order to protect these resources.

<u>Alternative B: Proposed Action</u>: The impacts from this alternative would be the same as Alternative A. In addition, the threat of drift from herbicides would increase with the ability to apply herbicides aerially in this alternative.

<u>Alternative C: No Herbicides</u>: While areas of Native American religious concern would benefit from no use of chemicals, the spread of invasive species may or may not increase erosion on these sites, depending upon the nature of the invasive species. If weed encroachment causes soil erosion, artifacts may be exposed and collected or displaced, losing their context. As weeds

spread and replace native populations, plants available for use by Native American groups would be reduced.

3.8.3 Human Health and Safety

The use of herbicides under a variety of application methods, as proposed in this Programmatic EA, involves potential risk or the perception of risk to workers and members of the public living or engaging in activities in, or near, herbicide treatment areas. As part of the PEIS (BLM 2007a) a Human Health Risk Assessment (HHRA) was conducted in order to evaluate potential human health risks that may result from herbicide exposure both during and after treatment of public lands. The HHRA was conducted to be scientifically defensible, to be consistent with currently available guidance where appropriate, and to meet the needs of the BLM vegetation treatment program. Risk to two types of human "receptors" was evaluated: occupational receptors and public receptors (receptors are representative population groups that could have specific exposures to the herbicides). Occupational receptors included those workers that mix, load, and apply herbicides and operate transport vehicles, recognizing that in some cases an occupational receptor may perform multiple tasks, increasing his or her exposure. Public receptors included those members of the public most likely to come into contact with applied herbicides. The public receptors included adult hiker/hunters and anglers, and adult and child berry pickers, swimmers, Native Americans, and residents. Receptors were evaluated assuming both accidental (e.g., direct spray or spill onto skin) and routine exposure scenarios (e.g., ingestion of berries that have been recently sprayed). [Please see the PEIS (BLM 2007a) for a full discussion of the HHRA.]

Affected Environment

People living in or visiting the SJPLC area are routinely exposed to a variety of health and safety risks. The four most common causes of death in the U.S., as well as Colorado, are heart disease/stroke, chronic respiratory disease, cancer, and accidents (Minino et al. 2002). In Colorado, mortality rates from these causes in 2002-2003 differed from the national rates as follows (number per 100,000 population; Colorado rates presented first): heart disease/stroke – 231.4 vs. 295.5; chronic respiratory disease – 53.0 vs. 43.4; cancer – 169.5 vs. 193.0; and accidents – 42.0 vs. 36.6. Nationally, mortality rates for males are nearly 1.5 times those for females, and mortality rates for African Americans are nearly 1.5 times those for Caucasians (NCHS 2007, cited in BLM 2007a).

Risks from disease in addition to heart attack/stroke and chronic respiratory disease include a variety of other illnesses, both infectious and non-infectious. Non-infectious diseases include those related to occupational exposures, including respiratory, neurological, and dermatological disorders associated with occupational exposures to pesticides and other chemicals.

Risks from cancer are such that approximately one in four people will be diagnosed with a cancer during their lifetime (Calabrese and Dorsey 1984). Causes of cancer include incidental exposure to carcinogens in the environment, food, and tobacco, and occupational exposure to carcinogens in the workplace. In the U.S., one-third of all cancers are attributed to tobacco smoking. Work-related cancers are estimated to account for 4 to 20 percent of all malignancies. The NIOSH has reported that approximately 20,000 cancer deaths and 40,000 new cancer cases each year in the U.S. are attributable to occupational hazards.

Risks from accidents include acute trauma from occupational injury in addition to those associated with motor vehicle accidents, falls, drowning, lightning, poisoning, and other causes. Risks from use of herbicides on public lands appear to be negligible. For example, only one minor injury associated with the application of herbicides was reported in 2005 (BLM 2007a). No data are available on the incidence of cancer or non-infectious diseases attributable to exposure of herbicide applicators to chemicals in the course of treating weeds on public land.

Environmental Consequences

<u>Alternative A: No Action</u>: See Alternative B for an in depth analysis of all alternatives. This alternative would be the same as Alterantive B except that aerial application of herbicide would not be allowed and neither would the use of four herbicides: Diquat, Diflufenzopyr, Fluridone, and Imazapic.
The No Action alternative would continue the current approach to weed treatments on BLM lands within the SJPLC area—i.e., precluding use of the four newly approved herbicides and of aerial application of herbicides. Not using aerial applications would allow less effective treatment of some large or remote infestations. The total area treated annually under Alternative A would be no more than 1,000 acres, compared to 5,000 acres for the Proposed Action. The lack of availability of the four new herbicides would probably not affect impacts to human health, unless this lack would result in greater use of the three higher risk herbicides bromacil, diuron, and tebuthiuron. A reduced ability by BLM to effectively control weeds on public lands may result in new infestations along roadways or in adjacent non-BLM lands. This may in turn result in more use of herbicides by the Counties, the Forest Service, or private landowners.

<u>Alternative B: Proposed Action</u>: Treating weeds by pulling, digging with a shovel, or cutting off the flowering heads of biennials prior to seed dispersal would not affect human health or safety except perhaps through the usual risk of accidents working with hand equipment.

Use of insects, pathogens, or domestic grazing animals to manage weed infestations would not affect human health or safety.

Use of herbicides for control of noxious weeds and other invasive plant species poses some potential risk of adverse impacts on human health and safety. The PEIS (BLM 2007a) included a Human Health Risk Assessment (HHRA) to evaluate herbicide use on public lands. The HHRA addressed occupational receptors (who mix, load, transport, and apply herbicides) and public receptors (hikers, hunters, and anglers; swimmers, berry pickers; Native Americans; and residents).

Occupational Receptors: Exposure risks to occupational receptors consist primarily of direct exposure (whether through the skin, inhalation, or incidental ingestion) by workers who mix, transport, or apply the herbicides. Greatest exposure doses are likely to be associated with mixing herbicides, pouring the contents into containers for use in application, and cleaning up any residue or minor spillage. An additional risk to applicators results from exposure via dermal contact, inhalation, or incidental ingestion while walking or riding/driving through an herbicide mist. Most occupational exposures result in temporary skin or eye irritation or in other short-term effects such as nausea, dizziness, or reversible nervous system abnormalities. Long-term effects are much less common but can include damage to organs, the nervous system, or the immune system and potentially inheritable mutations that can be passed on to offspring.

Both the short-term and long-term effects to occupational receptors can be greatly reduced by adherence to operational safety guidelines, use of protective clothing, equipment checks, and personal hygiene. BLM has attempted to minimize risks to applicators involved with herbicide treatments on public lands in the SJPLC by specifying that their use be limited to certified herbicide applicators, except in a few special circumstances (e.g., spot applications to one or a few plants by trained BLM personnel using pre-mixed, consumer-grade herbicides). Professionals who are trained, experienced in handling chemicals, and use suitable personal protective equipment are much less likely to be exposed at potentially toxic levels than are those who use herbicides infrequently and may be unaware of the risks and how to minimize them.

Public Receptors: Public receptors within the SJPLC area consist mostly of residents and outdoor recreationists (hikers, hunters, anglers). These receptors would be exposed less frequently and at much lower doses than would occupational workers who deal with herbicides regularly and at higher concentrations.

Rural residential areas and some small urban areas are distributed throughout the SJPLC along highways and county roads. Applications are expected to be along these and BLM roads that provide access to recreational, grazing, and oil and gas uses and in specific areas disturbed by these activities. The potential for public exposure to herbicides is mostly limited to infrequent and short-duration use of the public lands and by inadvertent dispersal of airborne or waterborne herbicides from treated areas toward rural residential or agricultural lands.

Much of the BLM land within the SJPLC area is heavily used—although only seasonally—by hunters. Hikers and anglers use the area less intensively but in a more protracted (year-round) pattern, with greatest use from spring through fall. Boating (including rafting, kayaking, and canoeing) is another seasonally important public use on the Animas and Dolores Rivers. In terms of exposure risk, boaters are more similar to anglers than to swimmers in terms of the frequency and duration of potential exposure to waterborne chemicals. Waterbodies used for swimming are very limited in the area. Other waterbodies are generally either unsuitable for regular use by swimmers or not located near BLM lands subject to herbicide treatments. No agricultural uses exist that are comparable to berry pickers in terms of protracted handling of treated plant material. Use of the area by Native Americans, including traditional uses of plant foods and fibers, is also minor.

Herbicide Toxicity and Exposure: The HHRA portion of the PEIS addressed a total 24 herbicide active ingredients, of which 18 are currently approved by BLM and proposed for use in the SJPLC area (Appendix E). The 18 approved compounds include six evaluated by BLM for the PEIS, nine evaluated by the USFS, and three of nine additional compounds evaluated by BLM in EISs from the period 1988 to 1999 (the remaining additional compounds evaluated in the earlier EISs are no longer approved).

Risks to humans were evaluated in relation to both occupational and public receptors, based on the toxicity of each compound and the assumed exposure dose under three assumed scenarios: routine exposure at typical application rates, routine exposure at maximum application rates, and accidental exposure. Routine exposure of workers consists of dermal contact, inhalation, and incidental ingestion while mixing or applying an herbicide. Accidental exposure of workers results from a spill or direct spray onto the skin. For public receptors, routine exposures result from typical uses of public lands that have been treated, or of both public and private lands onto which an herbicide has drifted. These exposures include dermal (skin) contact with foliage or surface water, inhalation of a pesticide mist, or ingestion of fruits onto which an herbicide has settled. Accidental exposures of the public include entering an area that is being or has recently been treated or (for some compounds) drinking water or eating fish from a waterbody into which the compound has been spilled.

The six herbicides evaluated by BLM for the PEIS (dicamba, diflufenzopyr, diquat, fluridone, imazapic, and sulfometuron methyl) were characterized as having “slight to very slight acute toxicity to humans” (acute but reversible skin and eye irritation), and none of the six is designated as a potential carcinogen. Risks to public receptors from these compounds except diquat were rated as none or low for typical or maximum application rates and accidental exposures. Risks were comparable for workers, although slightly higher (low to moderate) for accidental exposures. Diquat showed a higher risk than the other compounds, with a rating of low to moderate for accidental exposures of the public and high for accidental exposures of workers or for routine exposures of mixer-loaders with aerial application at the maximum rate.

Three of the nine additional herbicides evaluated by BLM in EISs from 1988 to 1991 (bromacil, diuron, and tebuthiuron) showed generally low risks to workers and the public, with somewhat greater risks from accidental exposures. However, high risks were associated with some exposure categories for bromacil, diuron, and tebuthiuron. In addition, bromacil was the only one of the 18 herbicides planned for use in the SJPLC that poses a cancer risk (to pilots and mixer-loaders for aerial applications at the maximum application rates). The six other compounds for which the PEIS compiled information from earlier EISs (2,4-DP, asulam, atrazine, fosamine, mefluidide, and simazine) were dropped from the list of approved herbicides due to a combination of infrequent use and a determination by BLM that “the risks to non-target plants and animals, and especially sensitive species of concern, have not been adequately evaluated.” None of these six herbicides would be used in the SJPLC under any of the alternatives.

The nine USFS-evaluated herbicides (2,4-D, chlorsulfuron, clopyralid, glyphosate, hexazinone, imazapyr, metsulfuron methyl, picloram, and triclopyr) showed slight to very slight toxicity to humans and no carcinogenicity. Risks were generally rated as low to none for both receptor groups and all three exposure rates. Risks were higher (moderate) for hexazinone from accidental exposure (direct spraying onto the body), consumption of pond water containing a spill, and subsistence-level consumption of fish from contaminated ponds. Consistently greatest risks were associated with exposure to 2,4-D. These included several moderate ratings for workers and public receptors and high ratings for consumption of contaminated pond water and subsistence-level of fish from a contaminated pond. The HHRA portion of the PEIS found no risks to humans from the inert ingredients associated with the herbicides, including adjuvants (Appendix E).

Based on the toxicity and exposure assessments of the HHRAs, risks of adverse effects to both occupational and public receptors from the use of herbicides on BLM lands are generally negligible (none) for routine exposures at typical application rates. Somewhat greater risks (low for public, low to moderate for occupational) are associated with routine exposures at maximum application rates. Risks from accidental exposures to a concentrated chemical are generally low to moderate for both groups.

Exceptions to the generalization of no or low risks to the public and low to moderate risks to mixers and applicators from the use of herbicides include the following exposure scenarios:

- Accidental exposure of occupational receptors (mixer-loaders and applicators) to 2,4-D, bromacil, diquat, diuron, fluridone, and tebuthiuron.
- Routine exposure of occupational receptors (mixer-loaders and pilots) to bromacil at maximum concentration rates. This includes a cancer risk for bromacil—the only one of the 18 herbicides proposed to be used by the SJPLC documented to have this risk.
- Accidental exposure of public receptors to 2,4-D, bromacil, diuron, and tebuthiuron, including being directly sprayed, drinking directly sprayed water, eating fish from directly sprayed water, or eating fruit that has been directly sprayed.

No high risk is associated with routine application of herbicides, under either typical or maximum concentration exposures or for either occupational or public receptors.

To minimize risks to occupational and public receptors from exposure herbicides, implementation by the SJPLC of any alternatives involving herbicides would include the following SOPs (Appendix F):

- Establish a buffer between treatment areas and human residences based on guidance given in the HHRA, with a minimum buffer of 0.25 mile for aerial applications (Alternative B only) and 100 feet for ground-based applications, unless a written waiver is granted.
- Use protective equipment as directed by the herbicide label.
- Post treated areas with appropriate signs at common public access areas.
- Observe restricted entry intervals specified by the herbicide label.
- Provide public notification in newspapers or other media where the potential exists for public exposure.
- Maintain 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.
- Follow label directions for use and storage.
- Dispose of unwanted herbicides promptly and correctly.

In addition to SOPs, the SJPLC would implement the following mitigation measures to minimize risks to workers and the public for the alternatives including use of herbicides (Appendix G):

- Avoid the maximum application rate when using 2,4-D, bromacil, diquat, diuron, fluridone, hexazinone, tebuthiuron, and triclopyr.
- Avoid applying bromacil or diuron aerially.
- Evaluate the need to use diuron on a case-by-case basis due to moderate or high risks to workers with all application methods.
- Avoid applying chlorsulfuron at the maximum rate when using broadcast ground spray.
- Avoid applying diquat using the horseback or backpack methods.
- Avoid applying diquat near human residential or subsistence food-gathering areas.
- Avoid applying hexazinone using an over-the-shoulder broadcast applicator.

The Proposed Action would represent a somewhat greater risk to both occupational and public receptors than the other alternatives analyzed with the inclusion of aerial applications methods.

The SOPs and mitigation measures noted above would reduce these risks to acceptable levels (none or low) for a given herbicide, application rate, and treatment method.

<u>Alternative C: No Herbicides</u>: Implementing Alternative C would preclude the use of herbicides to control weeds in the SJPLC area and thus eliminate the associated risks to occupational and public receptors described for the other alternatives. This would be accompanied by a greatly diminished ability to reduce the current acreage of noxious or other invasive weed species and prevent new or expanded infestations. While some manual or biological control methods are effective for certain weeds in certain situations, they are limited in their effectiveness for treating large populations or more aggressive species. An inability by BLM to effectively control weeds on public lands may result in new infestations along roadways or on adjacent private lands. This may in turn result in more use of herbicides by the Counties, the Forest Service, or private landowners, somewhat increasing risks from application on non-BLM lands.

3.8.4 Livestock and Ranching Operations

The BLM administers grazing lands under 43 CFR Part 4100 and BLM Handbooks 4100 to 4180, and conducts grazing management practices through BLM Manual Handbook H-4120-1 (*Grazing Management*; BLM 1984a). Management of livestock grazing is authorized and enforced through both permits and leases, and is commonly carried out through the development and implementation of Allotment Management Plans (AMPs) and/or terms and conditions of the grazing permit or lease. The grazing permit establishes the allotment(s) to be used, the total amount of use, the number and kind of livestock, and the season of use. The grazing permit may also contain terms and conditions as appropriate to achieve management and resource condition objectives. AMPs further outline how livestock grazing is managed in order to meet multiple-use, sustained-yield, and other needs and objectives, as determined through land use plans. The majority of the grazing permits issued by the BLM involve grazing by cattle, with fewer and smaller grazing permits for other kinds of livestock (primarily sheep and horses).

Geographically specific rangeland health standards and guidelines are identified for each State to help direct the grazing program for those States. Each year the BLM conducts reviews of land within its jurisdiction to determine the level of compliance with rangeland health standards. At a minimum, grazing is managed to ensure that:

- watersheds are in or making significant progress towards properly functioning physical condition;
- ecological processes including the hydrologic cycle, nutrient cycle, and energy flow are maintained;
- water quality complies with State water quality standards; and
- significant progress is being made toward restoring or maintaining habitats for all Special Status Species, including federally listed threatened or endangered species.

Reviews of rangeland health standards are often conducted when grazing permits or leases expire, especially when those permits or leases are within high priority watersheds.

Affected Environment

The SJPLC administers 150 BLM livestock grazing allotments. The grazing season on BLM-administered lands is usually fall, winter, or early spring (with the exception of 7 sheep allotments in the Silverton area that are only grazed during the summer). Over the last several decades, forage demand on public lands has remained constant. Market factors, predator control issues, and Federal government policies eliminating wool subsidies, have resulted in a significant reduction in sheep numbers.

Management directed at improving and maintaining rangeland health (as opposed to increasing livestock numbers) has been a trend in public land management for the past 20 years. In some cases livestock numbers may remain stable; however, adjustments to operations may occur in order to solve resource problems at the project level. Prolonged drought can impact rangeland productivity and can result in the decline in conditions, which, in turn, require management adjustments. In addition, permanent unfavorable changes to rangeland vegetation, such as cheatgrass invasion into healthy rangelands has occurred which can require permanent livestock management changes. Forage competition between domestic livestock and big game will continue to increase as more private land is developed. As more habitat is impacted on private lands, there will be less available forage overall increasing forage conflicts on public land.

Environmental Consequences

Alternative A: No Action: All treatments that successfully reduce the cover of noxious weeds on rangelands would benefit livestock by increasing the number of acres suitable for grazing and the quality of forage. Noxious weed infestations can greatly reduce the land's carrying capacity for domestic livestock, which tend to avoid most weeds (Olson 1999). Cattle, in particular, preferentially graze native plant species over weeds, which often have low palatability as a result of toxins, spines, and/or distasteful compounds (Young 1992, Beck 1999, Olson 1999). Although goats and sheep are more likely to consume alien weeds than cattle, they also tend to select native or introduced forage species over weeds (Walker et al. 1994, Olson and Wallander 1998, Olson 1999). In addition, some noxious weeds (e.g., common tansy, houndstongue, Russian knapweed and St. Johnswort) are poisonous to livestock. The success of weed removal would determine the level of benefit of the treatments over the long term.

Treatments that control populations of non-native species on public lands would be expected to benefit native plant communities by reducing the importance of non-native species and aiding in the reestablishment of native species through natural recovery or post-treatment revegetation. The use of herbicides or other treatment methods to simply kill vegetation is often inadequate, especially for large infestations. Introducing and establishing competitive plants is also needed for successful management of weed infestations and the restoration of desirable plant communities (Jacobs et al. 1999). The degree of benefit would depend on the success of these treatments over both the short and long term. Some treatments are very successful at removing weeds over the short term, but are not successful at promoting the establishment of native species in their place. In such cases, seeding of native plant species would be beneficial. Weeds may resprout or reseed quickly, outcompeting native species, and in some cases increasing in vigor as a result of treatments. The success of treatments would depend on numerous factors, and could require the use of a combination of methods discussed below to combat undesirable species.

The proposed vegetation treatments would cause disturbances to rangeland plant communities by killing both target and non-target plants. In areas that have been highly degraded, merely restoring disturbance to the ecosystem could adversely affect native plant communities by encouraging the spread of weeds or the persistence of an altered vegetation structure and species composition. Treatments could require temporary rest from livestock grazing, forcing livestock operators to graze animals elsewhere.

The abundance of cheatgrass has caused some livestock producers to rely on it as a source of early spring forage. The disadvantage for livestock producers is the narrow window of grazing opportunity and the wide variation of total forage production from year to year.

Manual treatments would have minimal effects on livestock and their forage. Manual treatments would target the removal of undesirable species but would not affect desirable species. Therefore, any effects on livestock forage would be beneficial. The duration of these benefits would depend on the species' ability to resprout, which could be controlled using a combination of treatments (e.g., manual treatment plus herbicides).

Use of domestic animals as a biological control to manage undesirable vegetation could affect the livestock that regularly graze on public lands under a grazing permit or lease. When managed improperly, these animals could compete for the same forage resources. Under proper conditions, it has been demonstrated that the use of sheep and goats to manage leafy spurge through prescribed grazing has improved the conditions of the range, opening up infested sites for grass regrowth, and thus providing additional forage for authorized livestock grazing. Insects and pathogens released to manage noxious weeds on rangelands would not be likely to affect livestock. These agents target undesirable species and could result in a long-term increase in the quality of forage on a treatment site. However, it is possible that in some situations use of these agents could prohibit animals from using a pasture for short periods of time.

Use of herbicides to control weeds would have a number of both adverse impacts and benefits compared to the manual and biological controls. Adverse impacts from herbicides in areas used for grazing of domestic livestock include the following:

The extent of direct and indirect effects to livestock from herbicide treatments are evaluated in the PEIS (BLM 2007a). Several factors influence the effectiveness of the herbicide application, including timing and method of application, herbicide used, application site characteristics, and environmental conditions. The direct effects of herbicide use on livestock depend on the sensitivity of each species to the particular herbicide used. Indirect effects include the degree to which a species or individual is positively or negatively affected by changes in rangeland conditions.

- Livestock would have a greater chance of being adversely affected by herbicide use if their entire range or areas where they concentrate are treated. However, livestock could be specifically removed from an area during vegetation treatment, as directed on the herbicide label, or treatments could be scheduled to occur when livestock were not present, adhering to the reentry interval specified on the herbicide label. If livestock were removed from the area specifically to facilitate the vegetation treatment, the grazing permittee would be adversely affected as a result of the area being unavailable for grazing. The permittee would need to either find alternative grazing areas, or modify ranching operations to account for the unavailable forage. Even though large treatments would usually occur when livestock were not in the treated area, some risk of indirect contact and consumption of contaminated vegetation over a large area would still exist.

- The use of spot treatment applications, in accordance to label directions, would reduce the potential effect on livestock. The effects of herbicide use on livestock would be site and application specific, and as such, site assessments would have to be performed, using available information, to determine an herbicide-use strategy that would minimize effects to livestock.

- The BLM and USFS risk assessments suggest several possible common effects of herbicides to livestock (SERA 2001, ENSR 2005a-j). Livestock that consume large quantities of grass have greater risk for harm than livestock or wildlife that feed on other herbaceous vegetation or seeds and fruits, because herbicide residue is higher on grass than it is on other plants (Fletcher et al. 1994, Pfleeger et al. 1996). However, exposure to harmful doses of herbicide would be unlikely, since animals would be removed from the area if there was a chance they could be harmed by an herbicide, as required by the label instructions.

- In conjunction with the identified grazing restrictions listed on herbicide labels, additional restrictions may be identified that require the livestock owner to remove the livestock from the treated area for a specified period of time prior to slaughter. In reviewing the grazing and slaughter restrictions listed on herbicide labels, it is important to recognize that additional grazing restrictions may apply to grazing lactating dairy animals. As described for other vegetation treatment methods, some herbicide treatments may require additional rest from livestock to ensure that more desirable vegetation has the opportunity to increase and reestablish on those sites from which undesirable vegetation has been removed.

Beneficial effects from use of herbicides would offset some of the negative effects listed above. Anticipated benefits are summarized below:

- In cases where herbicide treatments are able to reduce the cover of noxious and unpalatable weeds on grazed lands, there would be short- and long-term benefits to livestock as a result of increased quality of forage. In some cases, herbicides are the most effective means of controlling or eradicating invasive plant species.

- The extent of positive and negative effects to livestock would depend on the relative amount of each herbicide used, whether herbicides would be applied in rangeland environments, and the method of application. The risk of negative effects would be greatest if diuron, diquat, bromacil and/or 2,4-D are used extensively. However, diquat would be used by BLM exclusively as an aquatic herbicide, and the non-selective herbicides bromacil and diuron are not likely to be used extensively in rangelands. If these herbicides are used in restricted scenarios, as is proposed, and other herbicides are used effectively to increase the abundance of native forage relative to unpalatable weeds, positive effects to livestock could outweigh negative effects.

The SOPs and mitigation measures designed to minimize impacts to livestock and ranching operations in the PER/ PEIS (BLM 2007a, b) have been adapted and included in Appendices G and H of this programmatic EA. No additional mitigation is suggested.

Under the No Action alternative, current weed management would continue, which does not include the four new herbicides newly approved in the PEIS or the use of aerial herbicide applications. Among these is imazapic, which is the most effective treatment for cheatgrass would not be available to BLM. Not having this herbicide available makes it likely that cheatgrass infestations would continue to expand, reducing the quality and quantity of forage in the affected rangeland. Additionally, the four new herbicides represent a low risk to livestock from toxic effects. Not having these compounds available could increase risks to livestock if more injurious herbicides (e.g., 2,4-D, bromacil, diuron, tebuthiuron, and triclopyr) are used.

<u>Alternative B: Proposed Action</u>: Greater coordination, which is identified in the Proposed Action, would also benefit adjacent land owners or in-holding land owners (many of which are grazing permittees) by reducing the threat of weeds moving from one land status to another. This also will provide an economic benefit to land owners. Alteration of grazing practices, such as periodic rest or changes in livestock movement due to weed treatments or associated revegetation efforts, may result in short-term adverse impacts to the grazing permittee; however, in the long term, they may result in a beneficial impact through the reduction of weeds. Coordination with

the permittee prior to the specific project would reduce impacts to the permittee. Requiring the cleansing of equipment for the purposes of maintaining range improvements would involve additional efforts for permittees but again will be well worth it in the long term.

The ability to use the four new herbicides proposed for use (diquat, fluridone, imazapic, and Overdrive®), as well as future herbicides that become registered with the EPA, would give BLM more options in choosing herbicides that best match treatment goals and application conditions and are less toxic. As a result, there could be an increase in benefits and a reduction in overall risks to livestock (three of the four new herbicides present little to no risk to livestock) and an increase in habitat and ecosystem benefits from treatment.

<u>Alternative C: No Herbicides</u>: Under Alternative C, livestock would not be affected by herbicide use. Primary impacts would stem from manual and biological control techniques. Positive benefits to rangelands as a result of vegetation management could be reduced under this alternative, as certain species are only effectively controlled by herbicides, and in some situations other methods are impractical due to cost, time, or public concerns.

Under this alternative, without the use of herbicides, invasive plant populations would likely continue to spread, possibly at increasing rates. The spread of invasive plant populations would cause further damage to susceptible native plant communities, including rangeland communities that provide forage for livestock, particularly in situations where other treatment methods would not be effective or feasible. The spread of invasive plant populations would likely have deleterious effects on livestock. In addition, acres infested by noxious weeds that are toxic to livestock, including common tansy, leafy spurge, Russian knapweed, common St. Johnswort, tansymustard, and yellow starthistle, would increase; in contrast, these species would be targeted by the BLM for herbicide treatments under the other alternatives.

3.8.5 Recreation

Over 4,000 communities with a combined population of 23 million people are located within 25 miles of public lands, and approximately 40 percent of public lands are located within a day's drive of a major urban area (BLM 2006b). Public lands provide visitors with a wide range of recreational opportunities, including hunting, fishing, camping, hiking, dog-mushing, cross-country skiing, boating, hang gliding, OHV-driving, mountain biking, birding, viewing scenery, and visiting natural and cultural heritage sites. The BLM's long-term goal is to provide opportunities to the public for environmentally responsible recreation (BLM 2007a).

Most BLM-administered lands are managed as Extensive Recreation Management Areas (ERMAs) or Special Recreation Management Areas (SRMAs). In ERMAs, management consists primarily of providing basic information and access. Dispersed recreation occurs in ERMAs, and visitors have the freedom of recreational choice with minimal regulatory constraints. Significant public recreation issues or management concerns are limited in these areas, and nominal management suffices.

SRMAs are areas where special or intensive recreation management is needed. SRMAs include congressionally recognized areas, such as WSRs, parts of the National Trail System, National Recreation Areas, and Wilderness Areas. In addition, administratively recognized areas where issues or management concerns may require special or intensive management are also designated. Areas where visitor use may result in user conflicts, visitor safety problems, or resource damage are also included. These more intensively used areas require direct supervision of recreational activities and of commercial and BLM-regulated recreation operations. Most SRMAs require selective vegetation treatments in order to protect visitors from hazards and/or adverse impacts associated with certain plants, and replanting of vegetation in highly disturbed areas to improve appearance.

Public lands host over 68 million visitors annually. Most of the focus of the recreation program is on providing visitor services; however, the BLM's most daunting challenge is to manage travel on public lands. Technological advances in modes of transportation, coupled with the explosive growth of this activity, have created a management challenge to meet these needs while protecting land resources (BLM 2005a). As identified during scoping for the PEIS (BLM 2007a), the public recognizes the potential for travel access routes to spread weeds and for off-road travel activities to degrade land, leading to conditions that favor the establishment and spread of unwanted vegetation.

Affected Environment

The State of Colorado attracts visitors who embrace its image as a place for adventure and recreation. Outdoor recreation is a big business and accounts for approximately 31 percent of all travel into Colorado (including business travel and skiing). A variety of attractions and activities, during all seasons, provide a stable tourism industry that is important to the regional economy, as well as to the fiscal well-being of the sales tax dependent local governments. Tourism and out-of-area incomes are often the primary economic engines of an economy which boasts renowned recreation opportunities.

Outdoor adventure in southwestern Colorado has a reputation for diversity and excellence, and its appeal is contagious. More than two-thirds of a random sample of prospective visitors views Colorado as an “exciting” place. Portions of SJPLC-administered BLM lands near communities are gaining social value due to the increasing demand for the available recreation settings. Aging Baby-Boomers and people engaging in amenity migration are helping establish more active (and less “retired”) populations settling near SJPLC-administered BLM lands boundaries. Many residents value the ability to conveniently access SJPLC-administered BLM lands near their homes, for a variety of recreational activities.

Key national recreation findings indicate that the five fastest growing outdoor recreation activities are expected to be: visiting historic places (“heritage tourism”), downhill skiing, snowmobiling, sightseeing, and nonconsumptive wildlife activity. The five slowest growing outdoor recreation activities (activity days) are expected to be: fishing, primitive camping, cross-country skiing, off-road vehicle driving, and hunting.

Developed recreation sites and facilities have been constructed to enhance recreation opportunities, protect resources, manage activities, or reduce recreation use conflicts Developments range from campgrounds to trailheads with simple bulletin boards to developed river access.

Environmental Consequences

Alternative A: No Action: Weed treatments using manual, biological, or chemical controls as allowable and appropriate under each alternative would have some short-term negative but more substantial long-term positive impacts. In general, direct impacts to recreational users and opportunities would result primarily from temporary closures of areas being treated. These closures would be related to protection of human health and safety and would be based on the specific treatment method. Temporary closures of treated areas could adversely affect visitors who are unaware of the closure and travel to the area, only to find that they cannot use it at that time or on that day.

Manual weed control methods, to be used for small populations of weeds, may not require any closures other than setbacks from areas of active weed-whacking or other methods that could represent a safety hazard in the immediate vicinity during the period of active treatment. Biological controls, such as releasing an insect or pathogen known to injure or kill a certain weed species or using livestock to reduce weed vigor by removing above-ground biomass and/or seed heads, could also require temporary closures to prevent conflicts with recreational users.

Chemical controls would have a much greater potential for direct adverse impacts due to the toxicity of some compounds to human receptors. This risk of toxic exposures could result from accidental direct spray, contact with freshly sprayed foliage by walking through a treatment area, inhalation or incidental ingestion of aerial drift outside a sprayed area, and ingestion of berries and other fruits that have been sprayed directly or subject to deposition from aerial drift.

Visitors may be impacted by the inconvenience associated with temporary closure of treated areas, especially if they made plans and traveled to a site expecting that it would be open. Visitors may also acknowledge indirect, short-term, site-specific negative effects associated with dead or dying vegetation following herbicide applications. Human-caused landscape alterations can negatively impact the physical (including visual) and social qualities of the recreation setting in areas perceived to be relatively “natural” and dominated by natural ecological processes. Considering details such as timing of the treatment (e.g., spraying in late summer and early fall when other vegetation is also cured and brown) can reduce indirect impacts to recreation setting character quality resulting in less impact to the visitors’ recreation experience.

The following are measures to avoid or minimize adverse impacts of herbicides to recreation uses. Also see Appendices G and H for SOPs and mitigation measures presented in the PEIS (BLM 2007a).

<u>All Treatments</u>

- Address site-specific recreation use (e.g., SRMAs, peak use periods, visitor health and safety issues, and commercial use) in annual operational plans or proposed aerial application projects.

- Avoid treatments near concentrated recreational areas during on weekends and during holiday periods.

<u>Other Treatments</u>

- Post signs and/or use dye as appropriate to temporarily close treatment areas during herbicide application or manual treatment. The scale and duration of the closure will be based on the type of treatment.

- When appropriate, mix a degradable dye with the herbicide to help visitors see the treated areas near developed recreation sites and high use trails. Mitigation for impacts on recreational uses of wilderness and other special areas (e.g., streams eligible for listing as Wild and Scenic Rivers) is addressed in section 3.3.3.

Under the No Action alternative, weed treatments would continue as at present. Therefore, aerial application would not be allowed. As a result, although this alternative would represent some of the direct and indirect impacts to visitors described above, these would generally be less than under the Proposed Action. This applies to the long-term positive impacts of weed control as well as the short-term negative impacts of conflicts with recreation resulting from temporary closures and a temporary decrease in visual quality of treated vegetation at trailheads, boat put-ins and take-outs, and other areas of concentrated human use.

<u>Alternative B: Proposed Action</u>**:** The Proposed Action would have no adverse impacts on recreation, and may positively impact some experiences that depend directly or indirectly on natural settings. Further, through the education and prevention portions of the IWM, visitors would become more educated about area weed issues and management efforts designed to address these issues. A more educated visitor may assist in identifying and notifying BLM about certain weed areas, and may take measures to assist with the problem (voluntary cleaning of vehicles, ATVs, mountain bikes, etc.). The BLM may include site-specific weed stipulations within its conditions of use for permitted recreation activities.

Because Alternative B would include aerial applications—allowable only under this alternative—it would represent an additional risk to recreational users due to the greater area to be treated annually (up to 5,000 acres per year, compared to 1,000 acres under the other alternatives) and the greater risk from drift of herbicides into non-target areas. However, health risks to recreational users are low for most of the herbicides approved for use on BLM lands, including inadvertent exposure to an herbicide mist or contact with freshly sprayed vegetation. Exceptions are bromacil, diuron, and tebuthiuron, all of which represent some risk to public receptors from these exposure scenarios.

The risk of incidental exposure from aerial applications would probably be greatest for visitors who are traveling cross-country through dense vegetation into remote areas where the use of aerial applications is more likely to be the preferred treatment method. This risk would be greatest during the fall big game hunting season when dispersed use is high and when visitors camp and hunt in remote areas.

The following measures would help to avoid or minimize adverse impacts:

- Avoid aerial applications of bromacil, diuron, and tebuthiuron in areas likely to receive high recreation use during or within 1 week after spraying.• .

- Sign main access routes into the aerial application area with notices explaining when the aerial application of herbicides is going to be performed and the associated precautions.

Alternative C: No Herbicides: Relying solely on manual and biological controls for noxious weeds and other invasive non-native species would avoid the short-term conflicts with visitors resulting from temporary closures of sprayed areas and from a decrease in visual quality from dead or dying vegetation in areas being used for recreation use. Over the long term, weed infestations could result in a decline in the quality of the recreation opportunity, especially for those activities dependent on healthy native plant and animal populations, such as wildlife viewing and hunting.

3.8.6 Rights-Of-Ways, Facilities, Roads

Under the FLPMA and the Mineral Leasing Act provisions, the BLM issues Rights-of-Way (ROW) grants in order to authorize the construction, operation, and maintenance of a wide range of projects on public lands. These include petroleum pipelines, electrical transmission lines, telecommunications lines, energy development and distribution facilities, water facilities, communication sites, and roads. ROWs for roads, trails, and other infrastructure needs are appropriated for use by the BLM and other Federal agencies under Section 507 of the FLPMA. Demand for ROWs on public lands is expected to increase substantially during the next decade, due to energy needs, changes in the utility industry, and increased urbanization.

Vegetation can interfere with site access to ROWs and facility maintenance, interfere with electric power flow, and pose safety problems for workers and other users of ROWs. The development and maintenance of ROWs has significant impacts on vegetation. The removal of the existing vegetation during construction activities results in increases in bare ground that can facilitate the introduction and spread of non-native and invasive plant species. The relatively open nature of ROW makes them attractive to many recreationists (including OHV enthusiasts, horseback riders, and hikers). However these activities can also facilitate the spread of invasive species that are present on ROWs. The scope and intensity of vegetation management treatments within ROWs are operationally specific and highly variable. Inspections are conducted at periodic intervals in order to assess vegetation treatment needs within the ROWs. Several techniques are used to manage vegetation in ROWs. Pre-emergence or post-emergence herbicides can be applied in order to prevent or control young emerging and existing vegetation. Mechanical methods (such as mowing) are also used in order to eliminate undesirable vegetation. In certain situations, livestock have been used to selectively remove undesirable plant species, in a targeted approach (BLM 2007a).

The BLM operates, or oversees operations on, numerous facilities on public lands (including oil, gas, geothermal, and mineral exploration and production sites). Construction and operations disturbance can often introduce noxious weeds and other invasive vegetation to facility sites and roads. In general, vegetation management at facilities focuses on controlling vegetation that can pose a safety or fire hazard, or is not aesthetically pleasing. In such situations, the vegetation is managed using several methods that can be integrated into an effective management process. Residual herbicides, applied to vegetation before or after emergence, offer extended management in areas where bare ground is required for safety purposes. Mechanical methods (such as mowing) and manual control (such as hand pulling) have been used to manage vegetation along roads, as well as in sensitive areas.

Travel is associated with many of the activities that take place within SJPLC-administered BLM lands. Both motorized and non-motorized access are important for outdoor recreation, wildfire management, managing livestock and wildlife, developing natural resources (including timber and minerals), gathering fuel wood, accessing private in-holdings, maintaining electronic sites and utility corridors, and managing and monitoring SJPLC-administered BLM lands.

Modes of vehicle travel within SJPLC-administered BLM lands include large commercial trucks, automobiles, pickups, fourwheel drive vehicles, snowmobiles, all-terrain and off-highway vehicles (ATVs and OHVs), motorcycles, mountain bikes, and wheelchairs. Other travel modes include cross-country skiing, horseback riding, and hiking. These modes of travel may be used on designated roads that include paved highways, gravel and dirt roads, unimproved roads, four-wheel drive roads, and trails designated for motorized and/or non-motorized use. Motorized off-road and off-trail travel is allowed only in designated areas.

Affected Environment

Major electrical transmission lines are found throughout SJPLC-administered BLM lands. Lines are most common along the southern boundary, concentrated from Cortez to Pagosa Springs. Some electrical transmission lines occur in the smaller headwater areas around Durango; however, these do not comprise a major portion of the lines. The San Juan/San Miguel RMP was amended in 2009 to include designation of a portion an electric transmission corridor in San Miguel County. The RMP encouraged location of new transmission facilities along previously disturbed routes, as well as the sharing of ROWs for compatible transmission uses. The design and construction of the existing crossing of the Dolores River by the Trans-Colorado Pipeline has resulted in localized slope instability.

Electronic sites are areas authorized for the location of facilities for communication by radio, television, microwave, and cell telephone systems. Generally, these sites are at the local topographic high points, depending upon maximum line-of-sight. Typically, sites are serviced by electric power lines and access roads. Twelve electronic sites occur on BLM-administered lands within the SJPLC.

Currently, there are more than 3,000 miles of authorized USFS and BLM roads and more than 500 miles of authorized USFS and BLM motorized trails within the SJPLC area. Authorized roads and trails may be permanent or temporary routes constructed to meet some access need. BLM roads are typically native surface, high-clearance roads. In addition to authorized roads and trails, it is estimated that there are more than 3,400 miles of unauthorized roads and trails on SJPLC-administered BLM lands. Unauthorized roads and trails are not considered SJPL system routes; therefore, they are not managed. Within SJPLC-administered BLM lands, the annual cost to maintain the entire road system to standard is considerably higher than the amount allocated.

Environmental Consequences

<u>Alternative A: No Action</u>: Weed treatment at and along ROWs, facilities, and roads is common. Since these areas are typically locations of ground disturbance, they an often be colonized by invasive plant species. It is important to treat weeds in these areas as soon as they are detected as these areas also act as trabelways for the rapid spread of noxious weeds. Weed treatment in these areas, whether by manual, biological, or chemical methods has little or no impact on the facility itself.

<u>Alternative B: Proposed Action</u>: Same as Alternative A.

Alternative C: No Herbicides: Same as Alternative A.

3.9 Cumulative Impacts

In order to understand past, present and foreseeable future conditions for integrated weed management, three primary aspects of management on public lands surfaces:

- Health of Native Ecosystems
- Introduction and Spread Factors
- Noxious Weed Management

Understanding past conditions provides an insight into how invasive weeds gained a strong hold in our area. By understanding the past and knowing current conditions will help in avoiding new infestations, further expansion of existing infestations, and possibly mechanisms for control and eradication.

3.9.1 Health of Native Ecosystems (past, present, foreseeable future)

Historic impacts related to mechanical fuels treatments have primarily occurred in the ponderosa pine forest and in the pinyon-juniper woodland types (where trees and shrubs were thinned and canopy covers were opened up). Foreseeable future mechanical fuels treatments may occur, and may impact the composition, structure, and function of pinyon-juniper woodlands (including old-growth sites, as these ecosystems would be targeted for treatments). Historic impacts related to oil and gas development primarily occurred in sagebrush shrublands, semi-desert grasslands, semi-desert shrublands, pinyon-juniper woodlands, and ponderosa pine forests. These adverse impacts included the complete removal of vegetation from well pads and roads, which, in turn, resulted in the mortality of native plant species and the loss of their habitat. This completely changed the composition and structure of the cleared sites, which will remain devoid of vegetation for the 25- to 30-year life of the wells.

Adverse impacts related to livestock grazing began around the turn of the century, as livestock grazed, and overgrazed, rangelands. This resulted in changes to plants and soils on many lands. The greatest impacts occurred to the mountain grassland, semi-desert grassland, sagebrush shrubland, semi-desert shrubland, ponderosa pine forest, pinyon-juniper woodland, and riparian area and wetland ecosystem vegetation types.

Historic impacts related to livestock grazing included a decrease in the abundance and distribution of native bunchgrasses (including Arizona fescue and Thurber fescue) and willows within SJPLC-administered BLM lands. These impacts, described above, are still present in many places. Livestock grazing may continue into the foreseeable future within SJPLC-administered BLM lands; therefore, additional adverse impacts to vegetation types, as well as to their associated plants and soils, may occur.

Riparian areas and wetland ecosystems within SJPLC-administered BLM lands were settled on, and developed for, townsites, agriculture uses, and road construction. This resulted in vast acres of riparian areas and wetland ecosystems being cleared of vegetation and modified beyond recognition (Blair et al. 1996). Within SJPLC-administered BLM lands, the construction of dams, reservoirs, and diversions not only cleared the vegetation and modified the topography, but also decreased and regulated water flow, blocked movements of aquatic organisms, and changed the natural geomorphic stream processes of channel formation and erosion/deposition. The associated drop in water tables, as well as the lack of flooding, has resulted in significant changes to the abundance, distribution, and reproductive mechanisms (germination and seedling survival) of native riparian area plant species, especially willows and cottonwoods (Glinski 1977, Brady et al. 1985).

The impacts related to livestock grazing on riparian areas and wetland ecosystems are well documented in the literature (Platts 1984). Platts summarized this body of information as follows, “It is clear from the literature that improper livestock grazing can affect the riparian-stream habitat by eliminating riparian vegetation, widening stream channels, causing channel aggradation through increased sediment transport, changing stream bank morphology, and lowering surrounding water tables.” The reduction or elimination of woody riparian species by livestock is especially detrimental to riparian areas and wetland ecosystems that are dependant upon those species to stabilize banks and hold those systems together. Extensive cattle and sheep livestock grazing, as well as the associated adverse impacts, began within SJPLC-administered BLM lands in the 1870s, when Euro-American settlers arrived in increasing numbers (Savage 1991). Heavy grazing continued into the Twentieth Century, with much of this unregulated grazing occurring in forests and meadows in the national forests.

The reduction or elimination of native riparian areas and wetland ecosystem plant species within SJPLC-administered BLM lands resulting from the human impacts described above, has allowed exotic species (including Russian olive and tamarisk) to become established and highly competitive in these ecosystems. Tamarisk and Russian olive can out-compete native cottonwoods and willows, which, in turn, can limit the regeneration success of these native woody plants (Finch et al. 1995).

Foreseeable future impacts to riparian areas and wetland ecosystems resulting from management activities conducted within SJPLC-administered BLM lands are expected to be minor. This is due to the fact that riparian areas and wetland ecosystems would be avoided in most cases, as well as to the fact that project design and design criteria would be implemented. Livestock grazing would continue into the foreseeable future throughout SJPLC-administered BLM lands; therefore, additional adverse impacts to riparian areas and wetland ecosystems may occur.

Over the next 20 years, natural ecological processes (including fire, insects, and succession) may have the greatest influence on the ecosystems and general ecology within SJPLC-administered BLM lands. Wildfire, such as the Missionary Ridge Wildfire of 2002, can quickly change the composition, structure, and function of ecosystems on thousands of acres. Insect epidemics, such as the ips beetle that recently killed many of the pinyon-pine trees within SJPLC-administered BLM lands, may likewise result in major impacts.

3.9.2 Introduction and Spread Factors

Noxious weeds, and other invasive species, were brought into the area from actions such as homesteading, vehicles, mineral development, timber sales, watershed improvement projects, and purposeful introductions. With the introduction of invasive species, there were adverse impacts to wildlife habitat and native species, decreased rangeland productivity, and watershed health. Invasive forage species, such as crested wheatgrass and smooth brome, were introduced in order to retard soil erosion and to provide forage and hay for livestock.

A variety of past, ongoing, and future activities have, are, or will occur on public lands within the SJPLC area. Ground disturbance from various activities including rights-of-ways, natural gas development, livestock grazing, recreation and travel management, mining, fire and fuels management, forestry, and others will continue to occur in the SJPLC. All of these activities have contributed to the current weed infestations that exist. All ground disturbing activities have the potential to open niches for weeds to move in and increase. If weed management is not emphasized, stream and riparian habitat degradation will likely increase over time, resulting in reduced habitat quality for fish and other aquatic species.

Ground-disturbing activities will continue to increase in the SJPLC area as oil and gas companies explore new areas, new ROWs are permitted, and new trails and user areas are developed. Vectors for weed dispersal such as vehicles, recreationists, livestock, and wildlife will continue to be present, spreading weed disseminules to new sites. Ground disturbance from various activities will continue to increase in the SJPLC, creating new weed infestations. If weeds are not effectively controlled, native plant communities will continue to be degraded, decreasing the areal extent of these communities.

3.9.3 Noxious Weed Management

Legislative efforts to control the spread of noxious weeds began to control livestock losses from poisonous plant consumption. Budgets were limited and noxious weed control was usually funded out of the rangeland management program. Common weeds (including Canada and musk thistle, knapweeds, leafy spurge, toadflaxes, whitetop, cheatgrass, and tamarisk) were all introduced over the last 120 years or so.

Legislation has legally restricted the introduction and spread of noxious weeds and invasive species. Laws (including the Federal Land Policy and Management Act of 1976, the Federal Noxious Weed Act of 1974, and the Plant Protection Act of 2000) have all benefited invasive species management. In addition, local, State, and Federal partnerships have proven valuable to invasive species management. Educational outreach by local, State, and Federal entities (as well as associated budgets) have increased dramatically over time.

In spite of increased acres being treated, noxious weed populations are continuing to increase. There are many causes (including increased wildfires, prolonged drought, increased vehicle use to access public lands, increased oil and gas activity, increased recreation activities, increased off-road vehicle use, and an increased number of visitors coming from different parts of the country) contributing to the spread of noxious weeds and other invasive species. Noxious weeds will continue to spread even if no additional oil and gas leasing occurs. The current noxious weed inventory for SJPLC-administered BLM lands shows approximately 52,583 acres of noxious weeds infesting BLM lands (SJNF 2007).

Noxious weeds will continue to spread. The biennial thistles, Russian knapweed, whitetop, houndstongue, and Canada thistle, may become naturalized. New invasive species may invade local public lands. Some of these species may include camelthorn, yellow starthistle, African rue, orange hawkweed, medusahead, purple loosestrife, and the painted turtle. Newly introduced invasive species would be the highest priority for treatment, followed by Colorado Class A and B noxious weeds, respectively. Newer invasive species have been found on

SJPLC-administered lands within the last 5 years (including dyers woad, black henbane, sulfur cinquefoil, and dames rocket).

Treatment costs would continue to increase; therefore, control and containment along more easily accessible areas (including roads, campgrounds, and facilities) should occur first. However, the spread of noxious weeds along trails and other less-accessible areas would continue to be more expensive to control (as horses and foot traffic would be used to access more remote areas). Overall long-term costs, however, may be reduced if biological control methods become more widely used, and become more successful.

Legislation may continue to be enacted in order to limit the introduction and spread of invasive species. Cooperative efforts between local, State, and Federal entities would continue to be strengthened. Public awareness regarding invasive species impacts will continue to improve.

Conversely, aggressive weed management would help eliminate, control, and reduce the acres of noxious and invasive weeds within the SJPLC and help maintain and improve stream and riparian habitats important to fish, amphibians, and other aquatic organisms.

4 Chapter Four: Preparers and Contributors

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5 Chapter Five: References

Allen, A.W. 1987. The Relationship between Habitat and Furbearers. Pages 164-179 in Wild Furbearer Management and Conservation in North America (M. Novak, J.A. Baker, M.E. Obbard, and B. Malloch, eds.). Ontario Ministry of Natural Resources. Toronto, Ontario.

Anderson, L. 2001. Terrestrial Wildlife and Habitat. Chapter 7 in Fire Effects Guide. National Wildfire Coordinating Group, National Interagency Fire Center. Boise, Idaho. Anderson, D. G. (2004, December 21). *Ipomopsis polyantha* (Rydberg) V. Grant (Pagosa ipomopsis): a technical conservation assessment. [Online]. USDA Forest Service, Rocky Mountain Region. Available: http://www.fs.fed.us/r2/projects/scp/assessments/ipomopsispolyantha.pdf

Beidleman, C.A. (facilitator). 2000. Colorado Partners in Flight Land Bird Conservation Plan. Colorado Partners-In-Flight. Estes Park, Colorado.

Belnap, J. 1994. Potential Role of Cryptobiotic Soil Crust in Semiarid Rangelands (pp. 179-185 *in* Proceedings—Ecology and Management of Annual Rangelands; S.B. Monsen and S.G. Kitchen, eds. General Technical Report INT-GTR-313. U.S. Department of Agriculture Forest Service. Intermountain Research Station. Ogden, Utah.

Belnap, J., J.H. Kaltenecker, J. Hilty; R. Rosentreter, S. Leonard, J. Williams, and D. Eldridge. 2001. Biological soil crusts: ecology and management. BLM Technical Reference 1730-2. Denver, Colorado.

Binkley, D., and T.C. Brown. 1993. Management impacts on water quality of forests and rangelands. USDA Forest Service General Technical Report RM-239. Fort Collins, Colorado.

Blair, R., T.A. Casey, W.H. Romme, and R.N. Ellis. 1996. The Western San Juan Mountains, their Geology, Ecology, and Human History. University Press of Colorado. Fort Lewis College Foundation. Durango, Colorado.

Brady, N.C. and R.R. Weil. 2002. The Nature and Properties of Soils (13th Edition). Prentice-Hall, Inc. Upper Saddle River, New Jersey.

Bureau of Land Management (BLM)

BLM. 1980. Control of Salinity from Point Sources Yielding Groundwater Discharge and from Diffuse Surface Runoff in the Upper Colorado River Basin. U.S. Department of the Interior, Bureau of Land Management. BLM Service Center. Denver, Colorado.

BLM. 1984. Visual Resource Management. Handbook Number 8400-1. Washington, D.C.

BLM. 1984. Visual Resource Inventory. Handbook H-8410-1. Washington, D.C.

BLM. 1984a. Grazing Management. Handbook H-4120-1 U.S. Washington, D.C.

BLM. 1984b. Resource Management Plan Approval, Use, and Modification. BLM Manual Section 1617. Washington, D.C.

BLM. 1985. San Juan/San Miguel Resource Management Plan. U.S. Department of the Interior, Bureau of Land Management. San Juan Field Office. Durango, Colorado. As Amended in 1991, 1993, 1997, and 2000.

BLM. 1990. Use of Biological Control Agents of Pests on Public Lands. BLM Manual Section 9014. Washington, D.C.

BLM. 1991. Colorado Oil and gas Leasing and Development Final Environmental Impact Statement and Amendment to the San Juan/San Miguel Resource Management Plan. U.S. Department of the Interior, bureau of Land management. Montrose District. Durango, Colorado.

BLM. 1991b. Vegetation Treatment on BLM Lands in Thirteen Western States, Final Environmental Impact Statement. BLM Wyoming State Office, Casper, Wyoming. BLM.

BLM. 1992. Integrated Weed Management. BLM Manual Section 9015. Washington, D.C.

BLM. 1993. Management of Designated Wilderness Areas. BLM Manual Section 8560. Washington, D.C.

BLM. 1995. Interim Management Policy and Guidelines for Lands under Wilderness Review. Handbook H-8550-1. Washington, D.C.

BLM. 1995. Interim Management Policy and Guidelines for Lands under Wilderness Review. Handbook H-8550-1. Washington, D.C.

BLM. 1995. Integrated Weed Management in the Montrose District, San Juan Resource Area. Environmental Assessment and Finding of No Significant Impact/Decision Record Mp/ CO-038-95-29. February 1995.

BLM. 1996. Partners Against Weeds: An Action Plan for the Bureau of Land Management. U.S. Department of the Interior, Bureau of Land Management. Washington, D.C.

BLM. 1998. Pulling Together: National Strategy for Invasive Plant Management. U.S. Department of the Interior, Bureau of Land Management. Washington, D.C. Available on the Internet at: http://www.blm.gov/weeds/PullingTogether/PullingTogether.htm.

BLM. 2000a. Strategic Plan FY 2000-2005. U.S. Department of the Interior, Bureau of Land Management. Washington, D.C.

BLM. 2000. Safety. BLM Manual Section 1112. Washington, D.C.

BLM. 2001. Land Health. BLM Manual Section 4180. Washington, D.C.

BLM. 2001a. Wilderness Inventory and Study Procedures. Handbook H-6310-1. Washington, D.C.

BLM. 2003. Instruction Memorandum No. 2003-275. Consideration of Wilderness Characteristics in Land Use Plans (Excluding Alaska). Department of the Interior, Bureau of Land Management. Washington, D.C.

BLM. 2004 Wildland Fire Management. BLM Manual Section 620. Washington, D.C. Departmental Memorandum 3 2004.

BLM. 2006a. Chemical Pest Control. Handbook H-9011-1. Washington, D.C.

BLM. 2006b. The United States Department of the Interior Bureau of Land Management Budget Justifications and Performance Information Fiscal Year 2007, and Annual Performance Report Fiscal Year 2006. U.S. Department of the Interior, Bureau of Land Management. Washington, D.C.

BLM. 2006c. Public Land Statistics Fiscal Year 2005. U.S. Department of the Interior, Bureau of Land Management. Washington, D.C.

BLM. 2007a. Vegetation Treatments Using Herbicides on BLM lands in 17 Western States, Final programmatic Environmental Impact Statement (PEIS) Reno, Nevada.

BLM. 2007b. Vegetation Treatments on BLM Lands in 17 Western States, Final Programmatic Environmental Report (PER). Reno, Nevada.

BLM. 2007c. Vegetation Treatments on Bureau of Land Management Lands in 17 Western States Biological Assessment. U.S. Department of the Interior, Bureau of Land Management. Washington, D.C.

BLM. 2007d. Final Biological Assessment, Vegetation Treatments on BLM Lands in 17 Western States. Reno, Nevada.

BLM. 2008a. Special Status Species Management. BLM Manual Section 6840. Washington, D.C.

BLM. 2008b. Renewable Resource Improvements and Treatment. BLM Manual Section 1740. Washington, D.C.

BLM 2008c. H-1790-1 NATIONAL ENVIRONMENTAL POLICY ACT HANDBOOK. January, 2008.

BLM. 2009. 2010 Sensitive Species List. Colorado State Office Information Bulletin No. CO-2010-007 . December, 2009.

BLM. 2010a. Canyons of the Ancients National Monument Resource Management Plan. June, 2010.

BLM. 2010b. BIOLOGICAL ASSESSMENT. Programmatic Integrated Weed Management Plan for the Bureau of Land Management, San Juan Public Lands Center Parts of Archuleta, Dolores, La Plata, Mesa, Montezuma, San Juan, and San Miguel Counties, Colorado. June 2010.

Bonneville Power Administration (BPA). 2000. Transmission system vegetation management program, Final Environmental Impact Statement. Portland, Oregon.

Brady, W., D.R. Patton, and J. Paxton. 1985. The Development of Southwestern Riparian Gallery Forests. In: Johnson, R.R., C.D. Ziebell, D.R. Patton, P.F. Ffolliott, R.H. Hamre (technical coordinators). Riparian Ecosystems and their Management: Reconciling Conflicting Uses. GTR-RM-120. First North American Riparian Conference. Tucson, Arizona.

Byrne, G. and J. Copeland. 1997. An Aerial Survey for Wolverine in Colorado. Unpublished Report. Colorado Division of Wildlife. Denver, Colorado.

Calabrese, E.J., and M.W. Dorsey. 1984. Healthy Living in an Unhealthy World. Simon and Schuster. New York, New York.

Clark, B. 2001. Chapter V - Soils, water, and watersheds. *In* Fire Effects Guide. National Wildfire Coordinating Group. Boise, Idaho. Available at: http://www.nwcg.gov/pms/RxFire/FEG.pdf.

Cole, E.D., W.C. McComb, M. Newton, C.J. Chambers, and J.P. Leeming. 1997. Response of Amphibians to Clearcutting, Burning, and Glyphosate Application in the Oregon Coast Range. Journal of Wildlife Management 61:656-664

Colorado Department of Agriculture (CDA). 2003. Rules pertaining to the administration and enforcement of the Colorado Noxious Weed Act (8 CCR 1206-2). Denver.Colorado

Department of Natural Resources; U.S. Department of Agriculture, U.S. Forest Service; U.S. Department of the Interior, Bureau of Outdoor Recreation (Colorado Department of Natural Resources et.al. 1976). Wild and Scenic River Study Report of the Dolores River. December 1975 (Revised March 1976).

Colorado Natural Heritage Program (CNHP). 2000. A Natural Heritage Assessment San Miguel and Western Montrose Counties, Colorado.

Colorado Natural Heritage Program (CNHP) 2004a. The First Annual Colorado Rare Plant Symposium: Threatened, Endangered and Candidate Plants of Colorado. Symposium Minutes.

Colorado Natural Heritage Program (CNHP) 2004b. Assessment of Critical Biological Resources La Plata County, Colorado.

Colorado Natural Heritage Program (CNHP). 2005a. Rare Plant Survey of San Juan Public Lands, Colorado

Colorado Natural Heritage Program (CNHP). 2005b. Survey of Rare Plants San Juan Public Lands in Dolores and Montezuma Counties, Colorado.

Colorado Natural Heritage Program (CNHP). 2007. Rare Plant Survey of BLM Lands Gateway, Colorado.

Fifth Annual Colorado Rare Plant Symposium - Minutes. 2008.

Cooperrider, A.Y., R.J. Boyd, and H.R. Stuart (eds.). 1986. Inventory and Monitoring of Wildlife Habitats. U.S. Bureau of reclamation. Washington, D.C.

D'Antonio, C.M., T.L. Dudley, and M. Mack. 1999. Disturbance and Biological Invasions: Direct Effects and Feedbacks (pp. 413-452 *in* Ecosystems of the World: Ecosystems of Disturbed Ground, L. R. Walker, ed.). Elsevier. Amsterdam, The Netherlands.

DeByle, N.F. 1995. Wildlife. In: DeByle N.F., Winokur R.P. (Eds), Aspen: Ecology and Management in the Western United States. USDA Forest Service RM-119, pp. 29-33.

Dick-Peddie, W.A. 1993. New Mexico Vegetation: Past, Present, and Future. University of New Mexico Press. Albuquerque, New Mexico.

Drake, J.A., H.A. Mooney, F. Di Castri, R.H. Groves, E.J. Kruger, M. Rejmanek, and M. Williamson. 1989. Biological Invasions: A Global Perspective. John Wiley and Sons. Chichester, England.

ENSR Consulting Engineering and Remediation

2001. The Effects of Herbicides on Plants Used for Subsistence by native Americans on Yakima Training Center, Washington. Prepared for the Department of the Army, Fort Lewis, Washington. Redmond, Washington.

2005a. Vegetation Treatments Programmatic EIS – Chlorsulfuron Ecological Risk Assessment Final Report. Prepared for the U.S. Department of the Interior Bureau of Land Management, Nevada State Office, and Reno, Nevada. Westford, Massachusetts.

2005b. Vegetation Treatments Programmatic EIS – Diflufenzopyr Ecological Risk Assessment Final Report. Prepared for the U.S. Department of the Interior Bureau of Land Management, Nevada State Office, and Reno, Nevada. Westford, Massachusetts.

2005c. Vegetation Treatments Programmatic EIS – Diquat Ecological Risk Assessment Final Report. Prepared for the U.S. Department of the Interior Bureau of Land Management, Nevada State Office, and Reno, Nevada. Westford, Massachusetts.

2005d. Vegetation Treatments Programmatic EIS – Diuron Ecological Risk Assessment Final Report. Prepared for the U.S. Department of the Interior Bureau of Land Management, Nevada State Office, and Reno, Nevada. Westford, Massachusetts.

2005e. Vegetation Treatments Programmatic EIS – Fluridone Ecological Risk Assessment Final Report. Prepared for the U.S. Department of the Interior Bureau of Land Management, Nevada State Office, and Reno, Nevada. Westford, Massachusetts.

2005f. Vegetation Treatments Programmatic EIS – Imazapic Ecological Risk Assessment Final Report. Prepared for the U.S. Department of the Interior Bureau of Land Management, Nevada State Office, and Reno, Nevada. Westford, Massachusetts.

2005g. Vegetation Treatments Programmatic EIS – Overdrive® Ecological Risk Assessment Final Report. Prepared for the U.S. Department of the Interior Bureau of Land Management, Nevada State Office, and Reno, Nevada. Westford, Massachusetts.

2005h. Vegetation Treatments Programmatic EIS – Sulfometuron Methyl Ecological Risk Assessment Final Report. Prepared for the U.S. Department of the Interior Bureau of Land Management, Nevada State Office, and Reno, Nevada. Westford, Massachusetts.

2005i. Vegetation Treatments Programmatic EIS – Tebuthiuron Ecological Risk Assessment Final Report. Prepared for the U.S. Department of the Interior Bureau of Land Management, Nevada State Office, and Reno, Nevada. Westford, Massachusetts.

2005j. Vegetation Treatments Programmatic EIS Human Health Risk Assessment Final Report. Prepared for the U.S. Department of the Interior Bureau of Land Management, Nevada State Office, and Reno, Nevada. Westford, Massachusetts.

Environmental Laboratory. 1987. Corps of Engineers Wetland Delineation Manual. Technical Report Y-87-1. U.S. Army Engineers Waterways Experimental Station. Vicksburg, Mississippi.Eschholz, W.E., F.A., Servello, B. Griffith, K.S. Raymond, and W.B. Krohn. 1996. Winter Use of Glyphosate-treated Clearcuts by Moose in Maine. Journal of Wildlife Management 60(4): 764-769.

Evans, R.D., and J.R. Ehleringer. 1993. A break in the nitrogen cycle in aridlands? Evidence from isotope of soils. Oecologia 94:314-317.

Ferland, C. 2005. Northern Goshawk (*Accipiter gentillis atricapillus*) Breeding Status in the San Juan and Rio Grande National Forests, Southwestern Colorado. Unpublished Report. Prepared for the San Juan and Rio Grande National Forests. U.S. Department of Agriculture, U.S. Forest Service. Washington, D.C.

Finch D.M. and J.A. Tainter. 1995. Ecology, Diversity, and Sustainability of the Middle Rio Grande Basin. USFS General Technical Report RM-GTR-268. U.S. Department of Agriculture, U.S. Forest Service. Rocky Mountain Forest and Rang Experiment Station. Fort Collins, Colorado.

Fletcher, J.S., J.E. Nellessen, and T.G. Pfleeger. 1994. Literature review and evaluation of the EPA foodchain (Kenaga) nomogram, an instrument for estimating pesticide residue on pants. Environmental Toxicology and Chemistry 13(9):1383-1391.

Getsinger, K. 2004. Aquatic plant management best management practices handbook in support of fish and wildlife habitat. The Aquatic Ecosystem Restoration Foundation. Lansing, Michigan.

Glinski, R.L. 1977. Regeneration and Distribution of Sycamore and Cottonwood Trees along Sonoita Creek, Santa Cruz County, Arizona. In: Johnson, R. R., and D.A. Jones (technical coordinators). Importance, Preservation and Management of Riparian Habitats: A symposium. GTR-RM-43. Tucson, Arizona.

Gregory, S.V., F.J. Swanson, W.A. McKee, and K.W. Cummins. 1991. An Ecosystem Perspective of Riparian Zones. Bioscience 41:540-551.

Gruell, G.E. 1983. Fire and Vegetative Trends in the Northern Rockies: Interpretations from 1871-1982 Photographs. General Technical Report INT-158. U.S. Department of Agriculture Forest Service Intermountain Research Station. Ogden, Utah.

Higgins, S.I, D.M. Richardson, and R.M. Cowling. 1996. Modeling Invasive Plant Spread: The Role of Plant-Environment Interactions and Model Structure. Ecology 77(7):2043-2054.

Hobbs, R.J., and S.E. Humphries. 1995. An Integrated Approach to the Ecology and Management of Plant Invasions. Conservation Biology 9(4):761-770.

Hofman, V., and E. Solseng. 2001. Reducing Spray Drift. North Dakota State university Extension Service, Agricultural and Biosystems Engineering. Fargo, North Dakota.

Hoover, R.L. and D. Wills. 1984. Managing Forested Lands for Wildlife. Colorado Division of Wildlife. Denver, Colorado.

Jacobs, J.S., M.F. Carpinelli, and R.L. Sheley. 1999. Revegetating Noxious Weed-infested Rangeland. Pages 133-144 in Biology and Management of Noxious Rangeland Weeds (R.L. Sheley and J.K. Petroff, eds.). Oregon State University Press. Corvallis, Oregon.

Kauffman, J.B., W. C. Krueger, and M. Vavra. 1983. Impact of Cattle on Streambanks in Northeastern Oregon. Journal of Range Management 36: 683-685.

Knopf, F.L., R.R. Johnson, T. Rich, F.B. Samson, and R. Szaro. 1988. Conservation of Riparian Ecosystems in the United States. Wilson Bulletin. 100 (2): 272-284.

Lacey, J.R., C.B. Marlow, and J.R. Lane. 1989. Influence of Spotted Knapweed (*Centaurea macuolosa*) on Surface Runoff and Sediment Yield. Weed Technology 3:627-631.

LaPrade, J.C. 1992. Fate of Pesticides in Soil and Water. Alabama Cooperative Extension System, Community Resource Development, Auburn University Document Number ANR-737. Auburn, Alabama.

Leopold, LB. 1968. Hydrology for Urban Land Planning, U.S. Geological Survey Circular 554 (Reston, Virginia: U.S. Geological Survey).

Mack, R.N., D. Simberloff, W.M. Lonsdale, H. Evans, M. Clout, and F.A. Bazzazz. 2000. Biotic Invasions: Causes, Epidemiology, Global Consequences, and Control. Ecological Applications 10(3):689-710.

McNabb, K. 1997. Environmental Safety of Forestry Herbicides. Alabama Cooperative Extension System ANR-846.

Miller, K.F., and J.H. Miller. 2004. Forestry Herbicide Influences on Biodiversity and Wildlife Habitat in Southern Forests. Wildlife Society Bulletin 32(4):1049-1060.

Minino, A.M., E. Arias, K.D. Kochanek, S.L. Murphy, and B.L. Smith. 2002. Deaths: Final data for 2000. National vital Statistics Reports Volume 50, Number 15. Centers for Disease Control and Prevention, Division of Vital Statistics. Washington, D.C.

Minshall, G.W., J.T. Brock., and J.D. Varley. 1989. Wildfires and Yellowstone Stream Ecosystem. BioScience 39:707-715.

Nash, L. 1993. Water Quality and Health (pp. 25-39 *in* Water in Crisis: A Guide to the World's Fresh Water Resources, P.H. Gleick, ed.. Oxford University Press. New York, New York.

National Academy of Sciences (NAS). 1968. Principles of Plant and Animal Pest Control, Volume 2: Weed Control. Washington, D.C.

National Fire Plan Technical Team. 2002. Criteria for At-Risk Salmonids: National Fire Plan Activities. Version 2.1.

NatureServe. 2009. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer. (Accessed: March , 2010).

New Mexico Rare Plant Technical Council. 1999. New Mexico Rare Plants. Albuquerque, NM: New Mexico Rare Plants Home Page. http://nmrareplants.unm.edu (Latest update: 27 January 2010).

Olson, B.E., 1999. Grazing and Weeds. Pages 85-97. In Biology and Management of Noxious Rangeland Weeds (R.L. Sheley and J.K. Petroff, eds.). Oregon State University Press. Corvallis, Oregon.

Olson, B.E., and R.T. Wallander. 1998. Effect of Sheep Grazing on a Leafy Spurge-infested Idaho Fescue Community. Journal of range management 51(2):247-252.

Partners in Flight (PIF). 2005. Land Bird Conservation Plan. Rocky Mountain Bird Observatory, available online at http://www.rmbo.org/pif/bcp/phy87/sage/sasp.htm

Payne, N.F., and F.C. Bryant. 1998. Wildlife Habitat Management of Forestlands, Rangelands, and Farmlands. Krieger Publishing company. Malabar, Florida.

Pfleeger, T.G., A. Fong, R. Hayes, H. Ratsch, and C. Wickliff. 1996. Field evaluation of the EPA (Kenaga) nomogram, a method for estimating wildlife exposure to pesticide residues on plants.

Platts, W.S. 1991. Livestock Grazing. Pages 389-424 in Influences of Forest and rangeland management on Salmonid Fishes and Their habitats (W.R. Meehan, ed.). American Fisheries Society, Publication 19. Environmental Toxicology and Chemistry 15(4):535-543.

Platts, W.S. and R.F. Raleigh. 1984. Impacts of Grazing on Wetlands and Riparian Habitat. In: Developing Strategies for Rangeland Management. National Research Council/National Academy of Sciences. Westview Press. Boulder, Colorado.

Rees, N.E., P.C. Quimby Jr., G.L. Piper, E.M. Coombs, C.E. Turner, N.R. Spencer, and L.V. Knutson (eds.). 1996. The biological control of weeds in the west. Western Society of Weed Science. Bozeman, Montana.

Rejmanek, M., D.M. Richardson, and P. Pysek. 2005. Plant Invasions and Invisibility of Plant Communities *in* Vegetation Ecology (E. van der Maarel, ed.). Blackwell Publishing. Malden, Massachusetts.

Romme, W.H., M.L. Floyd, and D.D. Hanna. 2006. Final Report. Landscape Condition Analysis for the South Central Highlands Section, Southwestern Colorado and Northwestern New Mexico. U.S. Department of Agriculture, U.S. Forest Service. Washington, D.C.

Romme, W.H., M.L. Floyd, and D.D. Hanna. 2009. Historic Range of Variability and Current Landscape Condition Analysis: South Central Highlands Section, Southwestern Colorado and Northwestern New Mexico. U.S. Department of Agriculture, U.S. Forest Service. Washington, D.C.

Savage, M. 1991. Structural Dynamics of a Southwestern Pine Forest under Chronic Human Influence. Annals of the Association of American Geographers 81:271-289.

Schneider, A., P. Lyon, and G. Nesom. 2008. *Gutierrezia elegans* sp. nov. (Asteraceae: Astereae), a shale barren endemic of southwestern Colorado. J. Bot. Res. Inst. Texas 2(2): 771-774.

Simberloff, D. 1996. Impacts of Introduced Species in the United States. Consequences – the Nature and Implications of Environmental Change 2(2):13-22.

Soil Quality Institute. 2001. Soil Quality – Introduction, Prepared by the Soil Quality Institute, National Soil Survey Center, Natural Resource Conservation Service, U.S. Department of Agriculture, and the National Tilth Laboratory, ARS, U.S. Department of Agriculture. Available on the Internet at: http://soils.usda.gov/sqi/concepts/concepts.html.

Spencer, C.N., K.O. Gabel, and F.R. Hauer. 2003. Wildfire Effects on Stream Food Webs and Nutrient Dynamics in Glacier National park, USA. Forest Ecology and Management 178:141-153.

Sullivan, T.P., C. Nowotny, and R.A> Lautenschlager. 1998. Silvicultural Use of Herbicide in Sub-boreal Spruce Forest: Implications for Small Mammal Population Dynamics. Journal of Wildlife Management 62(4):1196-1206.

Swetnam, T. 1990. Fire History and Climate in the Southwest United States (pp. 6-17 *in* Proceedings of Symposium: Effects of Fire Management of Southwestern Natural Resources. General Technical Report RM-191). U.S. Department of Agriculture Forest Service Rocky Mountain Forest and Range Experiment Station. Fort Collins, Colorado.

Syracuse Environmental Research Associates, Inc. (SERA). 2005. Herbicide risk assessment locator: herbicides and surfactants analyzed in the invasive plants EIS. Prepared for U.S. Department of Agriculture Forest Service, Arlington, Virginia. Fayetteville. New York. Available at: http://www.fs.fed.us/r6/invasiveplant-eis/Risk-Assessments/Herbicides-Analyzed-InvPlant-EIS.htm.

The Nature Conservancy (TNC). 2005. San Juan Planning for Biodiversity Model Project *Phase 1 Report to BLM* July 29, 2005

The Nature Conservancy, 2009. Colorado Rare Plant Conservation Strategy The Rare Plant Conservation Initiative May, 2009 Colorado Rare Plant Conservation Strategy (accessed March 2010)

Trimble, S.W., and A.C. Mendel. 1995. The cow as a geomorphic agent: A Critical Review. Geomorphology 13:233-253.

United States Code of Federal Regulations. 43 CFR 1500.1(b) Hazardous Substances and Articles; Administration and Enforcement Regulations.

United States Code of Federal Regulations. 43 CFR 1610.5 Resource management Planning

United States Code of Federal Regulation. 43 CFR 6300, Wilderness Management.

U.S. Congress Office of Technology and Assessment (OTA). 1993. Harmful Non-Indigenous Species in the United States. OTA-F-565. U.S. Government Printing Office. Washington, D.C.

United States Environmental Protection Agency

EPA. 2001b. Notice of Availability of National Management Measures to Protect and Restore Wetlands and Riparian Areas for the Abatement of Nonpoint Source Pollution. EPA 841-B-01-001. U.S. Environmental Protection Agency, Washington, D.C.

EPA. 2003. Laws and Regulations, Clean Water Act. Washington, D.C. Available at: *http://www.epa.gov/region5/water/cwa.htm.*

United States Department of Agriculture

USDA. Forest Service (USFS). 2005. Preventing and Managing Invasive Plants, Final Environmental Impact Statement. Seattle, Washington. http://www.fs.fed.us/r6/invasiveplant-eis/.

USDA. Forest Service (USFS) and Bureau of Land Management (BLM). 2007. San Juan Public Lands Draft Land Management Plan/Draft Environmental Impact Statement. December.

USDA Natural Resources Conservation Service. 1996. Soil Quality Indicators: Organic Matter. Soil Quality Information Sheet Series. Natural Resources Conservation Service National Soil Survey Center in Cooperation with the Natural Resources Conservation Service Soil Quality Institute, and the Agricultural Research Services National Soil Tilth Lab.

United States Department of the Interior

USDI Fish and Wildlife Service (USFWS). 2002. Birds of conservation Concern 2002. Division of Migratory Bird Management. Arlington, Virginia.

USDI. Fish and Wildlife Service (USFWS). 2008. Birds of Conservation concern. U.S. department of the Interior, Fish and Wildlife Service, division of Migratory Bird Management. Arlington, Virginia.

USDI Fish And Wildlife Service (USFWS) 2010a. Ecological Services Colorado Field Offices. Colorado Field Office County List Updated March 2010 http://www.fws.gov/mountain-prairie/endspp/CountyLists/Colorado.pdf

USDI Fish And Wildlife Service (USFWS) 2010b. Knowlton's Cactus (*Pediocactus knowltonii*) 5-Year Review: Summary and Evaluation**.** Available on the Internet at: http://www.fws.gov/southwest/es/Documents/R2ES/Knowltons_Cactus_5-Year_Review.pdf

USDI USGS GAP Analysis Program. 2004. 'PROVISIONAL' Digital Landcover Dataset for the Southwestern United States. Digital data. Available online at http://earth.gis.usu.edu/swgap

USDI Geological Survey (USGS). 2003. An Introduction to biological Soil Crusts. Canyonlands Research Station, Southwest Biological Science center. Moab, Utah.

USDI National Park Service (NPS). 2003. Invasive Exotic Plant management Plan and Environmental Assessment Rocky Mountain national park. Colorado.

USDI and USDA. 2006d. Interagency Burned Area Rehabilitation Guidebook. February 2006. Washington, D.C.

Walker, J.W., S.L. Kronberg, S.L. Al-Rowaily, and N.E. West. 1994. Comparison of Sheep and Goat Preferences for Leafy Spurge. Journal of Range Management 47:429-434.

Waters, T.F. 1995. Sediment in Streams: Sources, Biological Effects and Control. American Fisheries Society Monograph 7. Bethesda, Maryland.

Young, J.A. 1992. Ecology and Management of Medusahead. Great Basin Naturalist 52:245-252.