

**INTEGRATED NATURAL
RESOURCES MANAGEMENT
PLAN, *ENVIRONMENTAL*
ASSESSMENT and Finding
Of No Significant Impacts
for
ROCK CREEK RESERVE**

2001-Closure

DOE/EA – 1371

**Department of Energy Rocky Flats Environmental
Technology Site and The U.S. Fish & Wildlife
Service**

May, 2001

Dear Stakeholder:

Enclosed is the Final Rock Creek Reserve Integrated Natural Resources Management Plan (Plan), Environmental Assessment (EA), and Finding Of No Significant Impacts (FONSI). The Rock Creek Reserve was dedicated on May 17, 1999, to be jointly managed by the US Fish and Wildlife Service and US Department of Energy. This Plan/EA was developed in accordance with the National Environmental Policy Act (NEPA) process. Through cooperation with the U.S. Fish and Wildlife Service for joint management of the Rock Creek Reserve, the high quality natural resources, and native species will be protected. The public issues and concerns obtained through NEPA scoping sessions were included in the Plan, and all public comments received on the Draft Plan have been addressed. (Appendix 9)

This initiates a new standard of cooperation between the US Department of Energy and the US Fish and Wildlife Service at Rocky Flats and facilitates management of the natural resources in the Rock Creek Reserve through closure. We look forward to a mutually beneficial relationship that will open doors to additional opportunities.

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Date

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Date

PREFACE

This Integrated Natural Resources Management Plan for Rock Creek Reserve (Plan) combines U.S. Fish and Wildlife Service (USFWS or Service) goals and management philosophies with those of the Department of Energy (DOE) in management of the natural resources of the Rock Creek Reserve, located within the Rocky Flats Environmental Technology Site's (Rocky Flats or Site) Buffer Zone. The Buffer Zone has been described in many public forums as a "crown jewel" for its importance as an area relatively unimpacted by agricultural use and development for many decades, and as an important link in the region's efforts to maintain an open space corridor in a rapidly developing area (Fig. 1). A federally-listed, threatened species, the Preble's meadow jumping mouse, resides in all three drainages located on the Site, including Rock Creek.

Implementation of this Plan will not impact the cleanup and closure of Rocky Flats. All other agreements, plans, and policies dealing with cleanup, and existing easements take precedence over this Plan. No funds from cleanup are used for preparation or implementation of this Plan, except where already designated for Buffer Zone activities. Although the term "reserve" carries no legal designations or requirements, it does connote an intention of natural resource-based land use. This may or may not carry over into the final decision for use of Rocky Flats. The Plan will maintain the integrity of this "crown jewel" for the use(s) that will ultimately be decided. Finally, while this Plan is intended specifically to address the management needs of Rock Creek Reserve, both DOE and the Service believe that the actions described herein will have applicability to other undisturbed areas of the Rocky Flats buffer zone.

Adjacent to the northwest corner of the Rock Creek Reserve is the DOE National Wind Technology Center (NWTC). DOE has been conducting wind energy research on that site since the mid-1970's. It also serves as DOE's hybrid energy research and testing center. The NWTC is not associated with the Rocky Flats Environmental Technology Site. For the purposes of this management plan, use of the terms: DOE, Rocky Flats (RF), Rocky Flats Environmental Technology Site (RFETS), or Rocky Flats Field Office (RFFO) does not include the NWTC.

This Plan is intended to serve as the management plan for the area known as the Rock Creek Reserve as long as the area remains under DOE ownership. If Rocky Flats becomes a National Wildlife Refuge, a Refuge planning process will be conducted for the entire Site, and it will be managed in accordance with the enabling legislation and other law and policy applicable to the National Wildlife Refuge System (NWRS). It is anticipated that the transfer of the Rocky Flats property to the USFWS would not occur until the Final Comprehensive Environmental Response, Compensation, and Liability Act Record of Decision for Rocky Flats is issued. The overall actions proposed within this Plan are generally consistent with management of National Wildlife Refuges.

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1.0 GOALS AND THE NEPA PROCESS

This chapter discusses DOE's and the Service's goals for managing Rock Creek Reserve's natural resources and integration of NEPA documentation.

1.1 THE ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE'S MISSION AND VISION

The current mission of the Rocky Flats Technology Site is cleanup and closure. At closure, all nuclear materials and wastes will have been removed from the Site, all buildings will have been demolished, and any remaining contamination will have been remediated per the requirements of RFCA. Current plans call for this mission to be completed late in 2006.

The open space cleanup objective expressed in the RFCA Vision (RFCA, Appendix 9) serves as the foundation for the resource management policies enumerated in the 1998 NRMP. This vision anticipates that the Site will be cleaned up so that it can be used as open space or converted to other appropriate uses consistent with community preferences. DOE will manage resources during cleanup in order to preserve currently available options for Buffer Zone use, so that these options can be considered during post-closure resource management discussions.

1.2 ROCK CREEK RESERVE NATURAL RESOURCES PURPOSE AND GOALS

The purpose for the establishment of Rock Creek Reserve was to create an avenue for agency cooperation in the management of ecologically important natural resource assets which are not expected to be affected by the cleanup activities and restrictions imposed on much of the remainder of the Rocky Flats Site. The Interagency Agreement at Appendix 1 further defines this purpose.

General Rock Creek Reserve natural resources management goals:

Goal 1. To cooperatively manage Rock Creek Reserve under DOE ownership to conserve, protect and enhance native ecosystems, plant communities, and wildlife species in a manner compatible with Rocky Flats' cleanup mission, including future public use parameters and existing real property interests.

Goal 2. Ensure the management of Rock Creek Reserve is compatible with the RFCA, the 1998 NRMP and all federal and State laws regulating the cleanup of Rocky Flats.

Goal 3. Cooperate with the Colorado Division of Wildlife to study and implement introductions of sensitive species.

Goal 4. Inventory, monitor, and manage soils, water, air, vegetation, and wildlife on Rock Creek Reserve with a consideration for biological diversity.

Goal 5. Ensure the management of Rock Creek Reserve is consistent with the protection of cultural and historic resources.

Goal 6. Implement this Plan within the framework of the Interagency Agreement developed between the DOE and the Service.

Goal 7. Protect and manage threatened and endangered species and critical habitat in accordance with the Endangered Species Act (ESA), NEPA, USFWS regulations and agreements, and other applicable laws or guidance. Consider species listed by the State of Colorado in the Plan.

1.3 PLAN AND NEPA INTEGRATION

This Plan incorporates NEPA analysis and serves as an Environmental Assessment. This section describes the integration of the Plan with its NEPA documentation. The Plan incorporates by reference the 1999 Rocky Flats Environmental Technology Site Vegetation Management Plan Environmental Assessment, in accordance with 40 CFR Section 1502.21 (CEQ NEPA Implementing Regulations), to “*cut down on bulk without impeding agency and public review of the action*”. Impacts from vegetation management practices are analyzed within that document, and it provides the impact analysis for many of the actions addressed within this Plan. Nothing in this Plan is to be interpreted as a diminishment of the policies, programs and projects as outlined in that Environmental Assessment.

1.3.1 Purpose, Need, and Rationale

The purpose of the Environmental Assessment is to identify and evaluate environmental consequences of implementing certain proposed actions in the Plan that have not undergone previous NEPA analysis, and to summarize concisely those that have. The NEPA determination will be summarized in a Decision Document as an appendix (Appendix 2, to be inserted upon approval). This integration satisfies the requirements of NEPA.

A discussion of alternatives is found within each section in Chapter 4 (Proposed Actions and Alternatives) and analyzed more fully in Chapter 5 (Environmental Consequences). Each management program is discussed under the contexts of selected management options, and other (not selected) management options, including the “no action” alternative when applicable. After five years the Plan will be reviewed and updated as necessary.

1.3.2 Summary Description of the Proposed Action and Alternatives

Management options that are consistent with existing policies, agreements and restrictions, and which still meet the goals of this Plan, were proposed. Alternatives that were not considered in alternative analyses sections include those which could compromise Rocky Flats’ cleanup and closure mission. Therefore, options such as unrestricted public access and recreation, which may inhibit the Site from performing its mission, will not be considered until special nuclear material is removed and completion of an Access and Recreation Study. Provisions are found within the Plan to address this issue for future consideration.

Proposed Action

DOE proposes to fully implement the Plan, during 2001-2006 or until closure, in cooperation with the Service, to conserve, protect, and enhance native ecosystems, and threatened or endangered, sensitive, and native species. The Plan presents information on the management of natural resources on Rock Creek Reserve. It also describes the setting, defines land management units, and describes how the unit designated as Rock Creek Reserve will be managed to sustain ecological functions, to protect and enhance federally-listed and other non-game species, and support possible future uses. Major emphasis is placed on management practices to preserve the unique native plant communities, threatened and endangered species, and to minimize invasive species and restore the native plant and fish communities.

One of the proposed actions within the Plan that bears discussion in this section is to expand the boundaries of Rock Creek Reserve to include most of the Rock Creek drainage and additional areas of tall grass prairie. The entire Rock Creek drainage encompasses approximately 1500 acres, most of which occur on the Site. The proposed expansion would increase the total acreage of Rock Creek Reserve from 800 acres to 1700 acres (Fig. 2). The Service recommended and supports this proposed action. The proposed management options in this Plan will not change with the implementation of the boundary expansion. The expansion area does not include any known contaminated areas or eligible archaeological or historic sites (see Sections 2.1.7 and 3.6.1). The expanded area does include additional easements and a few structures, including a never-used landfill with a small support facility. The expansion would provide a more definable unit (watershed) for an ecosystem management approach.

Options Considered But Not Selected

Individual project options create numerous combinations, each of which could be an alternative to the proposed action. Various laws, compliance documents, DOE regulations, funding, etc. prohibit the implementation of many of these possibilities. For example, building erosion control structures in endangered species habitat may not be a viable option due to public law and DOE policy. On the other hand, selecting management techniques for preventing and controlling erosion is an option, and there are many choices for accomplishing this.

The “options considered but not selected” will be discussed as alternative actions following each management section. Environmental Assessments do not focus on alternatives analyses as much as Environmental Impact Statements do; thus, discussions will often be general and brief.

No Action

The “no action” alternative would be to manage natural resources on Rock Creek Reserve (both the 800 acre and expanded boundary option) as they are managed currently, without the additional guidance and options outlined in this Plan, and without the cooperative management with the Service. Compliance with laws and current management plans would ensure implementation of some programs but would ignore other options presented within this Plan. The “no action” alternative describes the current (baseline) conditions against which the proposed action and alternatives are compared.

When “No Action” is the Preferred Action

Rocky Flats currently manages its Buffer Zone natural resources, including the Rock Creek Reserve area, under existing management plans. The preferred action is sometimes the *continuance* of the current management practice (i.e., no change to the current action), or “no action” and is designated as such throughout the Plan under the heading ***Preferred Action: No Action***. Often, the current practices are adequate to meet the goals of this Plan. To help prevent confusion to the reader as to whether a proposed change is planned, or when no change will occur, the no action alternative is referred to in the Plan as “preferred”, since “proposed” connotes a change. For example, in much of the inventory and monitoring section the no action alternative is the preferred action because of the completeness of those current programs.

2.0 Background

This section provides background information for the designated 800 acre Rock Creek Reserve, except where specified otherwise.

2.1 SETTING AND FACILITIES

More information about the existing facilities and future of the facilities for the Site can be found in the 1998 Natural Resources Management Policy and the 2006 Closure Project Baseline.

2.1.1 Location

Rock Creek Reserve is located on the northern edge of the Rocky Flats alluvial mesa (Fig 1). Near the line separating Boulder and Jefferson counties, the reserve is approximately two to three miles east of the foothills and on the far, western edge of the Great Plains. Rock Creek Reserve is bounded on the north by State Road 128, on the west by private land, other buffer zone area, and the DOE National Wind Technology Center. State Road 93 is in close proximity to the western boundary. The south and east portions of the Reserve are bordered by other portions of Rocky Flats and Indiana Street.

On a larger scale, Rock Creek Reserve is located in Jefferson County, Colorado (with 39 acres in Boulder County), 16 miles northwest of downtown Denver. Adjacent to the foothills of the Rocky Mountains, the Rock Creek Reserve is part of the 6266-acre Rocky Flats Environmental Technology Site, in close proximity to the large and rapidly growing Denver metropolitan area. Several million people now live within a 50-mile radius of the Site. Population growth is expected to continue along existing trends. Considerable development is now occurring in the vicinity of Rocky Flats.

Rock Creek/Rocky Flats is west of Interstate 25 and north of Interstate 70, the major north-south and east-west connectors across Colorado. Roads near the Site include State Highway 93 to the west, State Highway 128 to the north, Indiana Street on the east, and State Highway 72 to the south. No roads exist along the immediate southern and western boundary, and no public access roads traverse the Site. The Site is about 45 miles from Denver International Airport and about five miles from the Jefferson County Airport, which serves private and some commercial aircraft.

2.1.2 Rock Creek Reserve Acquisition and Acreage

Rock Creek Reserve was created in 1999 through a designation by Secretary of Energy Bill Richardson , and enactment of a cooperative agreement between DOE and the Service for management of Rock Creek Reserve's ecologically important resources. Approximately 800 acres of the northern Buffer Zone was designated as Rock Creek Reserve. One of the proposed actions is the expansion of the reserve to approximately 1700 acres. This alternative is discussed in Section 4.7.3.1.

Most of the Rock Creek Reserve was part of several livestock ranches (the Lindsay Ranch and other agricultural ownerships) before the property was purchased by DOE in 1974 through 1976.

2.1.3. Mineral Rights

When the federal government bought the lands comprising Rocky Flats, the purchases did not include additional mineral rights. A mining permit, called the Bluestone Permit, was granted by the Colorado Division of Mining and Geology, and a zoning variance was passed by the Jefferson County Commissioners in 1995 that included part to the Rock Creek Reserve. The portion of the Bluestone permit lying within Rock Creek Reserve is located in the northwest, and includes approximately 250 acres, of which about 20 acres are permitted for mining and about 230 acres of the permitted area are designated as non-mining buffer. Mining operations have not yet begun in this area.

2.1.4. Rock Creek Reserve Neighbors

Cities and Open Lands:

Rock Creek Reserve is located near the cities of Arvada, Louisville, Westminster, Broomfield, Superior, and Boulder, as well as unincorporated portions of Jefferson and Boulder Counties (Fig. 1). Land around the Site primarily consists of ranchland, preserved open space, mining areas, and low-density residential areas and businesses. However, this rural pattern is beginning to change due to spreading development.

The towns of Superior and Broomfield have already experienced extensive development northeast of the Site. There is potential for similar development south of the Site within Vauxmont, an approved 18,000-acre industrial, office, commercial and residential community. State-owned lands southwest of the Site are used for grazing, mining, and potential environmental purposes. Along Highway 93, an area of land approximately 1,200 feet wide adjacent to the Site's western boundary is zoned industrial for eventual development. The National Wind Technology Center is located immediately adjacent to the northwest corner of the Reserve.

Preserved open space is the primary existing and proposed use of the lands north, west and east of the Site. The City of Boulder recently purchased the Van Fleet and Jewel Mountain properties west of Highway 93. On the west boundary, Rocky Flats is separated from the open space land by private land and the NWTC.

There are two reservoirs just downstream and east of the Site. Standley Lake serves as the drinking water supply for the Cities of Westminster, Northglenn and Thornton. To protect water quality at Standley Lake, a reservoir was constructed downstream on Woman Creek, just off-site, but upstream of Standley Lake. Great Western Reservoir previously served as a drinking water supply for the City of Broomfield. A diversion ditch routes water leaving the Site via Walnut Creek around Great Western Reservoir. Rocky Flats Lake (Smart Reservoir) is located on land adjacent to the southwest corner of the Site. It is generally believed by Site hydrologists, that Antelope Springs flows are partially a result of leakage from Rocky Flats Lake.

Rocky Flats Environmental Technology Site:

1. Industrial Area

Encompassing approximately 400 acres, the Industrial Area is located in the center of Rocky Flats. The Industrial Area has more than 400 structures including manufacturing, chemical processing, laboratory and support facilities. The acreage of the Industrial Area includes the Protected Area.

2. Protected Area

Also located in the center of the Site, the Protected Area consists of 96 acres in the northern portion of the Industrial Area. The Protected Area contains the complex of former plutonium production or support buildings. This area is subject to stringent security requirements and other protection measures.

3. Buffer Zone

Rock Creek Reserve is located in the Rock Creek drainage area of the 5,870-acre Buffer Zone. The Buffer Zone surrounds the industrial area and protects it from potential encroachment by development. The Buffer Zone helps maintain distance to off-site residents in the case of accidental releases of hazardous or radioactive materials. Largely retained as open space, the Buffer Zone contains very few facilities, except for support facilities such as retention ponds, monitoring stations, sanitary landfills and dirt roads used for access and fire breaks. The entire Buffer Zone is fenced and access is regulated at the east and west entry gates.

The 280-acre DOE National Renewable Energy Laboratory (NREL), National Wind Technology Center is located in the northwest corner of the Buffer Zone, immediately adjacent to Rock Creek Reserve, on lands transferred from DOE/Rocky Flats Field Office custodianship to DOE/NREL.

2.1.5 Facilities

Rock Creek Reserve is located on a mostly unimproved area of Rocky Flats.

Structures

The Lindsay Ranch house, barn, some fencing, and an old manmade stock watering pond exist on the site. These structures have not been in use and are in various stages of disrepair. In the proposed boundary expansion, a landfill with small support building, constructed in the mid 1990s and never put into use, is located on the south boundary of the Rock Creek Reserve.

Easements

Rock Creek Reserve has outstanding easements for a U.S. West fiber optic line, a Coors Energy gas pipeline and Public Service has gas line and high voltage transmission line easements. The Upper Church and McKay ditches also flow through a portion of Rock Creek Reserve in the proposed boundary expansion.

Transportation System

Rock Creek Reserve is currently accessed primarily through the Site's west gate along State Highway 93, which is in close proximity to the western part of the reserve. Several unpaved access roads traverse the reserve.

Water

Rock Creek Reserve depends entirely on groundwater seeps, springs and surface water runoff to feed the streams. Local surface water is generated as storm runoff, snowmelt and discharge from springs into the stream channel of Rock Creek.

Currently, there is no water rights ownership within Rock Creek Reserve. Water rights are held both upstream (groundwater) and downstream (groundwater and surface water) of Rock Creek Reserve.

Storm Water Drainage System

Storm water on Rock Creek Reserve is not collected or treated. Storm water flows via over-ground flow through natural drainages and streams, washes, etc., to deposit in river drainages.

2.1.6 Projected Changes in Facilities

There are no projected changes in DOE facilities within the Rock Creek Reserve over the course of the 5-year period for which this Plan is intended. The change in facilities (including removal) for the remainder of Rocky Flats is described in the 2006 Closure Project Baseline.

2.1.7 Type and Extent of Contamination on Rock Creek Reserve

Characteristic of this part of Colorado, Rock Creek Reserve has low levels of radionuclides due to naturally occurring uranium in the Colorado Rocky Mountains and due to fallout from past atmospheric testing of nuclear weapons (fallout radionuclides). A 1995 report entitled "Geochemical Characterization of Background Surface Soils" (Executive Summary at Appendix 3), confirms the validity of the Rock Creek area as background for naturally occurring radionuclides. This report provides information on the background levels for naturally occurring metals and radionuclides and supporting parameters, as well as for fallout radionuclides. A 1999 Colorado Department of Public Health and Environment report "Buffer Zone Contamination Review" identified from aerial photographs several disturbed areas in the Buffer Zone that were considered to have a potential for contamination. These areas included the Lindsay Ranch, possible trenches and slump areas in the Rock Creek Reserve. Subsequent investigations on the ground found no further evidence of contamination at those sites.

Two fires in the industrial area, as well as dispersal from leaking drums stored on the 903 pad, have deposited radionuclides in some portions of the Buffer Zone. In general, most of the Buffer Zone is not contaminated with radionuclides or hazardous wastes. This is especially true of Rock Creek Reserve, which is located both upwind and upgradient of the Industrial Area. The Rock Creek Reserve basin drains the northwest portion of the Buffer Zone. This basin is topographically isolated from the developed areas and receives no water from the Industrial Area (described in Section 2.1.4). After crossing Highway 128, flow continues to the northeast until its confluence with Coal Creek.

2.2 LAND USE AND MANAGEMENT UNITS

2.2.1 Land Use

The acreage in Rock Creek Reserve, along with most of the remaining Buffer Zone surrounding the Industrial Area, has been utilized as a buffer area since it was acquired. The area is relatively undisturbed compared to areas east and northeast of Rocky Flats. Rock Creek Reserve is traversed by maintained dirt or gravel roads. Environmental remediation has disturbed less than 50 acres of the Buffer Zone, none of which has occurred in Rock Creek Reserve. Approximately 700 acres of the Site, with about 250 acres of that total in the Rock Creek Reserve, are under existing mining permits for minerals such as sand, gravel and clay (see Section 2.1.3). Land use on Rock Creek Reserve will not change during the time period this Plan covers.

2.2.2 Management Units

2.2.2.1 Rock Creek Reserve and Proposed Expansion

The established 800-acre Rock Creek Reserve is separated as a management unit for the purposes of this Plan because of the increased cooperative management with the Service in this particular area. The Service currently cooperates with Rocky Flats as a reviewer and in a consultation capacity when required. Rock Creek Reserve differs from the rest of the Site, however, in that the Service takes on a more proactive role in determining natural resource management priorities, policies and management recommendations. Expansion of Rock Creek Reserve to 1700 acres is proposed (Fig. 2). The Service recommends this expansion to provide a more comprehensive inclusion of the Rock Creek drainage area (watershed), which is approximately 1500 acres. Land management units are generally viewed and treated at a watershed level in contemporary management practices. A portion of the headwaters of the Rock Creek watershed occur off the Site to the west on privately owned land and the NWTC could not be included. Expansion of the boundaries of the Reserve will allow inclusion of all the Rock Creek watershed that exists on RFETS. Use of the term watershed in this plan refers only to the area of the watershed within RFETS and does not include the portion of the watershed off site..

The expansion would not impact any of the general management options listed in Chapter 4 of this Plan. The expansion does not include any known contaminated areas or eligible cultural sites. The expansion would include more of the xeric tallgrass prairie and Preble's meadow jumping mouse protection areas into one, more definable, management unit (watershed) than is currently described.

2.2.2.2 Remaining Buffer Zone

The remainder of the Buffer Zone will continue to be managed as currently outlined in existing management plans, policies and strategies. Many of these plans are updated annually. Buffer Zone drainages (Walnut Creek and Woman Creek) have been altered. No land use changes in the remaining Buffer Zone are anticipated over the course of this Plan.

2.2.2.3 Industrial Area

The Industrial Area, approximately 400 acres in the middle of the Site that comprise the nuclear weapons production plant, is where most of the closure and clean-up activities will occur. The cleanup and closure of the Industrial Area is driven primarily by the Rocky Flats Cleanup Agreement. Land use in the Industrial Area will not change significantly over the course of this Plan, but may change following closure.

3.0 AFFECTED ENVIRONMENT

Much of the background information presented in this Chapter is taken from the 1998 Natural Resource Management Policy, 1997 Ecological Resource Management Plan for the Rocky Flats Environmental Technology Site, 1994 Rocky Flats Environmental Technology Site Environmental Report, 1994 Rocky Flats Plant Wetlands Mapping and Resource Study, and the 1992 Baseline Biological Characterization of the Terrestrial and Aquatic Habitats at Rocky Flats Plant. More detailed discussions of many topics discussed below are found in the above-mentioned reports, and in the Rocky Flats Cleanup Agreement. The most current lists of vegetation and wildlife species for the entire Site can also be found at <http://www.rfets.gov/>. This Web site provides ecological information under the “Environmental Data” button, then the “Ecology” button.

As discussed in the preface, it is often impossible to discuss the affected environment of Rock Creek Reserve without discussing the background and environment of the region as a whole. The affected environment includes not only the remainder of Rocky Flats, but also the area extending from Standley Lake on the east to the foothills of the Rocky Mountains to the west. When appropriate, affected environment for the region and its relationship to Rock Creek Reserve will be discussed.

3.1 TOPOGRAPHY, PHYSIOGRAPHY, GEOLOGY AND SOILS

3.1.1 Topography and Physiography

The environment at Rocky Flats is influenced by the Site’s proximity to the Front Range of the Rocky Mountains and its location on a broad, eastward sloping plain of coalescing alluvial fans. As shown on U.S. Geological Survey maps, the Front Range trends north-south at elevations of about 9,800 feet above sea level, with elevations increasing to 13,000 feet along the Continental Divide about 16 miles west of Rocky Flats. The elevation of Rocky Flats varies from approximately 6200 feet at the western boundary to approximately 5650 feet at the southeastern corner. This suggests a gently sloping landscape. However, the Rock Creek Reserve, with a stream channel ranging from 6220 feet in the west to 5710 feet in the eastern portion, has slopes in the Rock Creek drainage that are the steepest of the three drainages located at the Site. Differences in the eroded depth of the three stream channels at the Site has resulted in formation of different soil-forming materials in Rock Creek than in Woman and Walnut Creeks, which have similar soils. Rock Creek’s steeper ravines have a southwest-to-northeast orientation, while the other two creeks have wider valleys that trend west to east. This difference in aspect and slope can influence soil moisture, and thereby the habitat for plant community formation. Minor rock outcrops occur largely in the Rock Creek section of the site. Scattered Ponderosa Pines are located on these outcrops.

3.1.2 Geology

Rock Creek Reserve is located just east of the Front Range in the Denver Basin – an asymmetrical, north-south trending syncline with a steeply dipping western limb and a shallowly dipping eastern limb. The Denver Basin contains more than 9,840 feet of Pennsylvanian to Cretaceous sedimentary deposits. Geologic units at the Site, including Rock Creek Reserve, consist of unconsolidated surficial material and bedrock. Cretaceous deposits of the Arapahoe Formation, Laramie Formation, and Fox Hills Sandstone are unconformably overlain by Quaternary alluvial gravels, colluvial deposits, and artificial fill. Fox Hills

and Laramie Formation sandstones form a prominent hogback that strikes north-northwest from Leyden Gulch north to the town of Marshall. Immediately west of Rocky Flats where the hogback is not visible, these sandstones are exposed in clay and gravel pits excavated through the Quaternary gravels. Soils are from several series, derived from surficial geologic formations.

3.1.2.1 Hydrogeology

The uppermost aquifer at the Site is comprised of the Rocky Flats Alluvium, valley fill alluvium, colluvium, bedrock sandstones, and weathered claystones of the Arapahoe and Laramie Formations. In general, groundwater in the uppermost aquifer occurs under unconfined conditions. Sitewide groundwater flow moves from the higher elevations in the west toward the lower drainages in the east. Sources of groundwater recharge to the uppermost aquifer include infiltration of precipitation, snowmelt, and surface water in ditches, streams and ponds. Discharge occurs through evapotranspiration from plants and as seeps when the table intersects the ground surface or surface water features such as streams, ditches, ponds or stream-eroded valleys. Groundwater levels at the Site rise annually in response to spring recharge and decline the remainder of the year as less precipitation occurs.

3.1.3 Soils

Soils at Rocky Flats are chiefly moderate to deep, well-drained clay, cobbly clay, and sandy loams, with moderate to low permeability. Soil types for the entire Site, including Rock Creek Reserve are shown in Fig. 3. Bottomland (floodplain and low terraces) soils are largely stratified loamy alluvium, made up of mesic Ustic Torrifluvents from the Haverson series. The Haverson series is well drained and commonly found on slopes of 0 to 9 percent. Soils of the terraces and upper hillsides, where gravel and cobble are common, are represented by combinations of the Denver and Kutch series. Both of these soils are well drained, deep (Denver) to moderately deep (Kutch), and are found on moderately steep slopes, 0 to 15 percent and 5 to 25 percent for Denver and Kutch, respectively. These mesic Torric Argiustolls are sandy loam formed from Rocky Flats Alluvium. Lower hillsides and areas toward the eastern boundary of the Site have soils from the Standley, Nunn, and Valmont series, which are largely mesic Ardic Argiustolls. These soils that vary in slope are deep and well drained. The slope for Standley, Nunn, and Valmont series are 0 to 60, 0 to 25 and 0 to 3 percent, respectively.

More information on the geology, hydrogeology, and soils of Rock Creek Reserve can be found in the 1991 Baseline Study for Rocky Flats and the 1995 Seepage Characterization Work Plan for the Rocky Flats Environmental Technology Site (EG&G, Rocky Flats Inc).

3.2 WATER RESOURCES

3.2.1 Surface Water/ Wetlands

Surface water flows from the Site via five streams which pass through or are adjacent to the Site. Three of these streams, North Walnut Creek, South Walnut Creek, and Woman Creek, contain detention ponds to protect neighboring cities' water supplies. Those creeks are part of the Big Dry Creek watershed. Rock Creek flows in a more northerly direction into Coal Creek off-site, and ultimately to the South Platte. The Industrial Area is located between two stream-cut valleys: North Walnut Creek and Woman Creek. This section focuses on the Rock Creek drainage.

Surface water originates from two main sources on Rock Creek Reserve. The most important sources for the formation and maintenance of the aquatic ecosystem are groundwater discharges that form springs and seeps in numerous places along Rock Creek. These seeps and springs are perennial discharges that augment stream flow and provide stable habitats for aquatic organisms and plant communities that require additional water resources. Surface water runoff also contributes water to the ecosystem; but, in the semiarid climate of the Front Range, precipitation is sparse, and the hot dry winds can evaporate water at the soil surface. The presence of perennial marshland and riparian communities greatly increases the plant and animal diversity of Rock Creek Reserve.

Section 404 of the Clean Water Act delegates jurisdictional authority over wetlands to the U.S. Army Corps of Engineers (Corps) and the Environmental Protection Agency (EPA). The EPA is the lead agency, however, at CERCLA sites such as Rocky Flats. The Corps of Engineers and the EPA jointly define wetlands as “...areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas”.

Wetlands on Rock Creek Reserve and the rest of the Site are not rare or unique, but the large amount of seep/spring related wetlands in the Buffer Zone are rare along the Front Range of Colorado. These wetlands serve valuable and important functions, as do wetlands everywhere. They perform the role of a water purification system by retaining nutrients, sediments, and metals. They also provide forage, cover, and nesting habitat, which is very important in maintaining wildlife values. Figure 4 shows the location of Site (including Rock Creek Reserve) wetlands.

The 6,266-acre Site has approximately 1,100 wetlands covering approximately 191 acres that were identified and mapped in the 1994 Rocky Flats Plant Wetlands Mapping and Resource Study, U.S. Army Corps of Engineers. These wetlands include riparian (streamside) habitat, ponds, seeps, and hillside wetlands. Riparian areas are well known for the diversity of plant and animal communities they support. The Site Great Plains Riparian Woodland complex encompasses three vegetation community types, and provides important habitat for numerous songbird species, deer, and raptors, in addition to supporting the greatest number of the federally-listed, threatened Preble’s meadow jumping mouse at the Site. The sustained quantity and timing of streamflows is required to support the riparian communities.

The 1994 Wetlands Mapping and Resource Study identified 25.4 acres of stream wetlands, and 32.2 acres of slope (seep) wetlands for a total of 57.6 acres of wetlands for Rock Creek and its subdrainages. Rock Creek was identified in that study as a high quality wetland based on the biodiversity of the wetlands. The largest, best watered, and most diverse of the slope wetlands are located in the Rock Creek and Woman Creek watersheds according to the study. The only significant manmade drainage feature on Rock Creek within the Reserve is the Lindsay Pond, used as a stock-watering pond prior to 1974, by the Lindsay Ranch. Other wetlands on Rock Creek Reserve are primarily associated with seeps along the northern slopes.

3.2.2 Groundwater

Groundwater at Rocky Flats, including Rock Creek Reserve, is relatively small in volume and slow to move, hence, slow to move off the Site. Rock Creek Reserve is unaffected by groundwater contamination, which moves in a southeasterly direction from the Industrial Area. The closest groundwater contamination plume to Rock Creek Reserve is the Property Utilization & Disposal plume, from a previous sanitary landfill, located south of Rock Creek Reserve. This plume, contaminated with volatile organic compounds (mainly solvents), migrates south and east, away from Rock Creek Reserve.

There are a number of small near-surface groundwater reservoirs, which feed important ecological features, such as upland wetlands. Upland wetlands include primarily wet meadow/marsh ecotone and the tall and short marshes. Groundwater seeps support the tall upland shrubland in Rock Creek Reserve.

3.2.3 Water Quality

The groundwater and surface water quality in Rock Creek Reserve is considered good. Supporting data can be found in “Event-Related Surface-Water Monitoring Report, EG&G, September 1994. Section 2.1.7 describes additional contamination related issues for Rock Creek Reserve. Sampling outlined in Section 4.2 may determine if there are any impacts to Rock Creek affecting groundwater and/or surface water quality.

3.3 CLIMATE AND AIR QUALITY

3.3.1 Climate

Typical of the Rocky Mountain Front Range, the climate at Rocky Flats is continental and semiarid. A climate is termed “continental” when the most profound influences on temperatures are determined by the air masses that form over the interior of the continents, in this case, North America. Frigid air masses that form over the Northwest Territories and central Canada, Alaska, and Siberia in winter occasionally affect eastern Colorado. During the summer months, very warm air masses form over the deserts and high plateaus of the southwestern United States. These air masses account for the hottest days along the Front Range. Continentality accounts for the large seasonal temperature variations and, in part, for the occasionally large temperature changes over short periods of time experienced at Rocky Flats.

In addition to the continental climate, the Site’s sloping geographical location and its proximity to a major mountain range permit dramatic changes in temperature and rapidly changing weather conditions. The location of Rocky Flats can also work to moderate the otherwise continental climate. Air masses approaching from the west and descending the eastern slope of the Continental Divide are warmed and dried out upon reaching the foothills and adjacent plains. These situations result from a strong pressure differential that develops across the Continental Divide, between low pressure over the plains and high pressure building over the Great Basin.

Large centers of high pressure build over the Great Basin and central Rockies and frequently dominate weather along the Front Range with dry and sunny periods, especially in autumn and mid-winter. On average, the number of days with fair and dry conditions at Rocky Flats generally exceeds the number of

days with inclement weather. It is not uncommon to see a month of dry and mostly clear days when large areas of high pressure build over the intermountain region.

3.3.1.1 Precipitation and humidity

The lower elevations of the Front Range, including Rocky Flats, are considered semiarid because of the relatively small amount of precipitation received. A semiarid climate has a precipitation range of 10 to 20 inches per year and/or an amount exceeded by potential evaporation and transpiration. Rocky Flats receives approximately 15 inches of precipitation each year. Of this amount, 70 percent usually falls in April through September. Thunderstorms occur about 40 days each year, mostly in summer. The average seasonal snowfall is about 65 inches. Great distances from a major water source and shadowing and downsloping from the Rocky Mountains are the primary reasons for the semiarid climate of the Front Range. Severe drought conditions will develop occasionally along the Front Range during unusually prolonged dry periods. These conditions often lead to wildfires in the prairies, which sometimes affect the Buffer Zone, including Rock Creek Reserve and other surrounding areas

The average relative humidity in mid-afternoon is about 40 percent. Humidity is higher at night, and the average at dawn is about 60 percent.

3.3.1.2 Temperature

Temperatures in the region are moderate with hot and cold extremes usually of short duration. The thin atmosphere at the relatively high elevation of Rocky Flats allows large diurnal temperature variations, with strong daytime warming and nighttime cooling. The historic temperature extremes have ranged from 29 degrees below zero (all temperatures are expressed in degrees Fahrenheit) in February 1989 to 102 degrees in July 1971. January, the coldest month, has an average daily minimum temperature of 18 degrees. Average daily temperatures in winter range from 20 to 45 degrees. July, the hottest month, has an average daily maximum temperature of 85 degrees. Average daily temperatures in summer range from 55 to 85 degrees, though short periods may be much hotter. The temperature range affects the plant growing season, the number of consecutive days when minimum daily temperatures exceed the freezing point from spring until fall. At Rock Creek Reserve the growing season can be expected to continue from mid-May to the end of September during 50 percent of the years.

3.3.1.3 Winds

The combination of clear skies, light winds and sloping terrain causes locally produced winds to form and flow along sloping terrain. Daytime heating causes upslope breezes to form either southeasterly winds which flow up the Rocky Flats slope, or northeasterly winds which flow up the South Platte River Valley. Winds reverse at night with a shallow northwest wind draining down the Rocky Flats slope.

During winter and early spring, downslope winds, known as chinooks, often produce strong westerly winds and large and rapid temperature increases. On occasion, chinooks can be damaging and dangerous but generally are just a temporary nuisance. Wind gusts will typically exceed 70 miles per hour a few times in a normal year. Peak gusts have been measured over 100 miles per hour.

3.3.2 Air Quality

National Ambient Air Quality Standards have been established to protect public health and the environment for six “criteria” pollutants: carbon monoxide, sulfur dioxide, nitrogen dioxide, ozone, particulate matter less than 10 microns in size (PM-10), and lead. Total suspended particulate (TSP) matter is also designated as a criteria pollutant by the State of Colorado. This Plan is primarily concerned with PM-10 and TSP emissions since they are the pollutants likely to be generated from management practices on Rock Creek Reserve.

Rock Creek Reserve is located within the boundary of the Denver Metropolitan Area for air quality planning purposes. This region is classified as “non attainment” for carbon monoxide, ozone, and PM-10, which means that the ambient air quality in the area does not meet National Ambient Air Quality Standards. Regulatory requirements may control the timing of certain natural resources management activities, such as prescribed burning, which requires a permit from the State. This helps to avoid contributing to the non-attainment of the Metro area and violating the Site’s air quality permit.

Concentrations of TSP and PM-10 are determined by five air monitoring stations at the site boundary and are operated by the Colorado Department of Public Health and Environment. These stations monitor PM-10 and TSP as well as other criteria pollutants. Two of these stations are located just off-site at the northeast and southeast site boundary along Indiana Street. These sampling locations are downwind of Rock Creek Reserve and are thus representative of Site impacts. All criteria air pollutants are emitted from the Site in quantities less than the State of Colorado reporting thresholds under baseline conditions.

3.4 VEGETATION

The following sections present species information that has been observed the past nine years during monitoring and other routine activities within the Rock Creek drainage basin.

The distribution and composition of vegetation in the region has been affected by a series of natural and human-caused disturbances, including intense grazing until the land was acquired by DOE in 1974, natural fire suppression, and adjacent ground disturbing activities. Large areas of grassland have been invaded by diffuse knapweed and dalmatian toadflax over the past ten years (1999 Annual Vegetation Report for the Rocky Flats Environmental Technology Site). Other native grassland areas and riparian areas have been invaded by several species of exotic plants.

3.4.1 Vegetation Types

The uniqueness and diversity of the plant communities of Rock Creek Reserve are indicative of the entire Site, and have been documented by a number of studies. The topography and close proximity of the Site to the mountains has resulted in an interesting mixture of prairie and foothills plant communities at the Site. Federal threatened or endangered plant species are not known to occur on Rock Creek Reserve, or anywhere else at the Site. Plant communities range from xeric (dry) grassland communities to more hydric (wet) communities such as wet meadows and marshes.

Rocky Flats plant communities include:

- xeric tallgrass prairie (a large portion of which occurs on Rock Creek Reserve);
- xeric needle-and-thread grass prairie ;
- mesic mixed grassland;
- reclaimed mixed grassland;
- shortgrass prairie;
- grassland composed of annual plants;
- wet meadow-marsh ecotone;
- short marsh and tall marsh;
- both short and tall upland shrublands (most of which occur on Rock Creek Reserve);
- Savannah shrublands;
- several types of riparian (stream bank) shrublands.
- riparian woodland, ponderosa pine woodland; and
- mudflats.

Figure 5 shows the various vegetation types and distribution for the entire Rocky Flats site. Rock Creek Reserve (current) and Rock Creek Reserve expansion (proposed) are demarcated on the map.

3.4.2 Vegetation Inventory

In developing the Rock Creek Reserve plant species list, only those plants that were identified to species (415 species), and confirmed against the Site's reference herbarium, are included in the species list in the 1999 Annual Vegetation Report for the Rocky Flats Environmental Technology Site. This list is based on the 800 acre boundary for the Reserve, and will be updated to include the expansion. By growth form, there are 86 grass species, 283 forbs, 2 vines, 5 cacti, 22 shrubs, and 17 tree species. Of the species recorded in Rock Creek Reserve, 81% (337) are native to the area. Species found in Rock Creek Reserve are listed in Appendix 4.

The Colorado Natural Heritage Program (CNHP) assessed the Buffer Zone for its ecological value (The Natural Heritage Resources of the Rocky Flats Environmental Technology Site and Their Conservation, Phase II: The Buffer Zone [CHNP Research Report No. 53, 1996]). The CNHP is a research entity of the Nature Conservancy housed at Colorado State University's College of Natural Resources. Natural Heritage programs across the country are part of an international network of conservation data centers. The CNHP study concluded the Site contains highly significant natural elements important for the protection of Colorado's natural diversity and encourages DOE to take actions to protect and appropriately manage the Site.

3.4.3 Plant Communities

The CNHP identified the plant communities of greatest ecological significance on Rock Creek Reserve, and the entire Site, as the xeric tallgrass prairie, the Great Plains riparian community, the tall upland shrubland community, and wetlands. Distributions of these and other plant communities are shown in Fig 5.

Xeric tallgrass prairie. The CNHP classifies the xeric tallgrass prairie plant community at the Site as very rare. Most of the remaining xeric tallgrass prairie in Colorado is found in Boulder and Jefferson

counties in small, dispersed parcels. The CNHP report on Site natural heritage resources identifies the Site macrosite as the largest known remnant of xeric tallgrass prairie in Colorado, and probably the largest remaining parcel in all of North America. Macrosites provide boundaries for large, landscape level conservation planning, which includes areas adjacent to Rock Creek Reserve. A community comprised of big bluestem, little bluestem, mountain muhly, Fendler sandwort, and Porter's aster, less than 20 occurrences of the xeric tallgrass prairie are known worldwide. Approximately 1,800 acres of this xeric tallgrass prairie unit is within Rocky Flats' boundaries. About 56% of the site's xeric tallgrass prairie falls within the Rock Creek Reserve proposed expansion.

Great Plains riparian community. Identified by CNHP as Great Plains Riparian Woodland, this community is classified as rare and declining. It is characterized by a diverse mixture of plains cottonwood, peach-leaved willow, and coyote willow. Examples of this community are found in the Rock Creek, Walnut Creek, Woman Creek, and Smart Ditch drainages. The Great Plains riparian community also includes the communities described in the following sections. The riparian shrubland communities normally exist as an integral part of woodlands throughout the Great Plains.

Riparian shrubland. Two types of riparian shrubland are often found in association with the Great Plains Riparian Woodland community at the Site. These communities are dominated by leadplant or by coyote willow, and provide important habitat for many of the bird and mammal species found here, including the Preble's meadow jumping mouse. Combined with the Great Plains riparian community, these habitats support a prey base for many Site birds of prey, such as prairie falcons, great horned owls, screech owls, and red-tailed hawks.

Tall upland shrubland. The tall upland shrubland community is found on north-facing slopes primarily in the Rock Creek drainage. This community commonly occurs just above wetlands and seeps. The dominant tall shrubs are hawthorne, American plum and choke cherry, which are associated with other shrubs and plants common in the foothills to the west of the Site. Rock Creek Reserve harbors 94% of the tall upland shrubland plant community at Rocky Flats. Although the tall upland shrubland represents less than 1 % of the total area of the Site, it contains 55 % of the Site Vegetation species. In 1996, 333 species of vascular plants were recorded there. The herbaceous understory contains a number of species that are restricted to the cool, shaded microhabitat provided by the canopy. Many of these native species are predominant in the understory of the largest patches of tall upland shrubland on the Site. Their presence may indicate that these patches were affected less by past cattle grazing, or that they have returned to a more native state since the cessation of grazing. These native species include Fendler waterleaf, spreading sweetroot, anise root, carrionflower greenbriar, fragile fern, Colorado violet, Rydberg's violet, and northern bedstraw. Other studies reveal that the tall upland shrubland contains one of the highest species richness of birds on the Site and is very important as bird and other wildlife habitat, providing food, thermal and hiding cover, nesting locations, and deer fawning areas.

The tall upland shrubland was identified by the CNHP as a potentially unique shrubland community, possibly not occurring anywhere else. This community is used by many animals and birds throughout the year for cover and is used during the spring by mule deer as fawning areas. Several rare bird species, such as chestnut-sided warbler and blue-gray gnatcatcher, also inhabit this community during the breeding season. It is within this community that the globally rare (CNHP designation) hops blue butterfly has been observed, due to the abundance of wild hops growing there.

Other. Although some of the plant communities, such as the mesic mixed grasslands of the eastern

portion of the Site (and Rock Creek Reserve) are not rare, they add important buffer areas and habitat elements to the Site ecosystem. The grasses in this community are turf-like, with different species (western wheatgrass, Kentucky bluegrass, blue grama, green needlegrass and Canada bluegrass) intermingling in a nearly continuous ground cover. The mesic grasslands on the south-facing hillsides provide important forage for mule deer in the winter. Large tracts of grasslands provide essential habitat to several prairie species. Mesic mixed grasslands cover approximately 55 percent of the entire Site, mostly in the Walnut Creek and Woman Creek watersheds. Mule deer are very dependent on these grasslands at certain times of the year, many raptor species depend on open grasslands for foraging areas, several species of prairie birds rely on these grasslands as nesting and foraging habitat, and several species of reptiles require this habitat as well.

3.4.4 Noxious Weeds

Noxious weed invasions are considered the foremost threat to the native plant communities of Rock Creek Reserve by the CNHP, Service and DOE. These weeds inhabit the understory of the tall upland shrubland, the riparian woodland, and have invaded the prairie grasslands. Control of noxious weeds is arguably the most important component of any natural resources management program for the Rock Creek Reserve. The native fauna, from the large herbivores to the invertebrates that depend on these plant communities, are directly affected by impacts to these areas. Predators that depend on these herbivores are indirectly affected by these adverse impacts.

Ten years ago, there was little diffuse knapweed in the Buffer Zone; now, this Colorado-listed noxious weed inhabits more than 60 percent of the Buffer Zone. Noxious weeds are defined by the State as exotic, aggressive plants that invade native habitat and cause adverse economic or environmental impacts. Typically, these exotic plants are resistant to the native plant predators and tolerant of or resistant to grazing. These weeds can displace native plant species by taking nutrients, water, light, and space from native vegetation. Invasion of these aggressive, damaging plants poses a serious threat to Rock Creek Reserve and remaining Buffer Zone plants and animals that depend on native plants.

Several species of noxious weeds are found in Rock Creek Reserve, as representative of the rest of the Buffer Zone. The presence of these weeds is a regional and sometimes national problem. Several species of these weeds are found across the entire region and are spreading rapidly, especially in disturbed areas. These weeds are highly aggressive and are contributing to the degradation and loss of native species richness and composition in the plant communities. Weed species on Rock Creek Reserve and the rest of the site and region include diffuse knapweed, musk thistle, dalmation toadflax, Canada thistle, and St. Johnswort. Diffuse knapweed, an aggressive tumbleweed, is currently given highest control priority. Canada thistle is common throughout most of the wetlands, musk thistle is sparse but widespread across mesic grasslands, and dalmation toadflax is common in xeric grasslands and other areas.

The three most abundant noxious weeds on the Site as identified in the 1999 Annual Vegetation Report were dalmatian toadflax, infesting 2,507 acres (Fig. 6), diffuse knapweed infesting 2,295 acres (Fig 7) and musk thistle, infesting 1,353 acres (Fig 8).

3.4.5 Sensitive, Threatened and Endangered Species

In addition to those sensitive plant communities already discussed in this section, a list of plant species and communities and wildlife species found on Rock Creek Reserve defined as “sensitive” by the CNHP,

or listed as threatened or endangered by the State or federal government is found in Appendix 7. CNHP rankings and a definition of those rankings are included. This list shows sensitive species found on the rest of the Site also, since most of these species are found regionally or are highly mobile (faunal species) and migrate across the Site as well as off the Site.

No federally-listed plant species have been documented on Rock Creek Reserve. Several listed species have the *potential* to occur on Rock Creek Reserve (i.e., suitable habitat occurs and the species are found elsewhere in the region), including Ute Ladies' Tresses Orchid and Colorado Butterfly Weed.

3.5 FAUNA

Rock Creek Reserve's significant wildlife diversity is directly related to the habitat diversity in the region. The wildlife species richness list for the Rock Creek drainage (Appendix 5), was derived from compiling a species list from all ecological surveys, including fortuitous sightings, from 1991 through 1999. From all years and all studies, 171 wildlife species have been recorded in Rock Creek. Several of these records may have been only single observations. Broken down by general taxa, there are 28 mammal species, 134 bird species, 6 herptile (reptile and amphibian) species and 3 fish species. The information for this section was collected from the 1999 Rocky Flats Environmental Technology Site Annual Wildlife Survey Report. A list of fauna species found for the entire Site can be found in the 1992 Baseline Characterization of Terrestrial and Aquatic Habitats at Rocky Flats Plant.

No federally-listed, threatened or endangered fish, reptile, amphibian or invertebrate species are known to occur on Rock Creek Reserve, or the rest of the Site.

3.5.1 Mammals

The most abundant and conspicuous large mammals on Rock Creek Reserve include mule deer, several white tail deer, and Rocky Mountain elk. The coyote is the most common predator, with other carnivores including black bear, bobcat, gray fox, long-tailed weasel, mink, mountain lion and raccoon. Many small mammals are recorded (mice, shrews, voles and woodrats), most notably the federally-listed, threatened Preble's meadow jumping mouse. The black-tailed prairie dog does not occur currently on Rock Creek Reserve, but is found in small numbers at three former colony sites elsewhere at Rocky Flats. These populations are rebounding from a plague die-off that affected the populations several years ago. The bushy-tailed woodrat was recorded on the Site, but not on Rock Creek Reserve, for the first time in 1999.

3.5.2 Birds

The species richness list at Appendix 5 documents 134 species of birds from Rock Creek Reserve. The rare and varied habitat associations of Rock Creek Reserve support ground nesting grassland species, such as vesper sparrow, grasshopper sparrow, horned lark and western meadowlark.

Rock Creek Reserve's most common raptors are the red-tailed hawk and great horned owl. Less abundant raptors are attracted by the mosaic of trees for nesting and open habitat for hunting. These include American kestrel, Swainson's and ferruginous hawks (considered declining species by the Colorado Division of Wildlife), and the long-eared owl.

The orange-crowned warbler, great egret, and black vulture were recorded on the Site for the first time in 1999. The orange-crowned warbler was recorded in both Woman creek and Rock Creek.

3.5.3 Fish

Three species of fish are known to occur in Rock Creek and Lindsay Pond. These are the fathead minnow, largemouth bass, and stoneroller. The minnow and stoneroller are native to the area.

3.5.4 Reptiles and Amphibians

As is typical for the region, reptiles and amphibians are not well represented at the Site. Reptiles are found typically in the grasslands. The most abundant amphibian at the Site is the boreal chorus frog. The northern leopard frog is less common and requires perennial water, and can be found in the seeps of the tall upland shrubland, Great Plains riparian, and the ponds.

Six species of amphibians and reptiles are documented in the 1999 Annual Wildlife Survey Report to occur on Rock Creek Reserve. These are:

- Boreal chorus frog
- Northern leopard frog
- Tiger salamander
- Bull snake
- Prairie rattlesnake
- Western painted turtle

3.5.5 Invertebrates

Sampling of arthropods was conducted as part of the 1992 Baseline survey for the Site. Sampling was broken down into plant community sampling units. The following are the results taken from the important plant communities on Rock Creek Reserve. Percentages are expressed as percentage of the total sampled. It is expected, however, that most invertebrates found in any area of Rocky Flats would likely be found to some extent in all the others. The following are quantified as percentages of the total for all arthropods observed or collected.

Xeric tallgrass prairie – Terrestrial arthropod taxa in the xeric mixed grasslands community showed the lowest diversity compared to all communities. This results from the drier environment found in the xeric zone. The numbers of orders and families in the xeric zone were lower than site-wide community averages for arthropods. The most abundant insect families collected were Cicadellidae (leafhoppers, 19 %) and Formicidae (ants, 15 %). These two insect families include species specifically adapted to the drier habitats found in the xeric zone. Leafhoppers are generally plant-specific feeders and, therefore, have specialized relationships with plants found in this community. Arachnida (spiders, 12 %) were also well represented.

Tall upland shrubland – The diversity of arthropod taxa, both orders and families, was average for the tall upland shrubland when compared to all communities. Once again, the leafhopper family was the most abundant (15 %), followed by spiders (10 %). This community has several plant species that are

dependent on the bees, wasps and butterflies for pollination. The fruiting shrubs, such as chokecherry, wild plum and hawthorn, must be pollinated to produce fruit and viable seeds. The reproduction of these species depends on both the pollinators and the species that eat their fruits and scatter seeds.

Rare and imperiled invertebrates as defined by the CNHP have been observed on Rock Creek Reserve. Two species of Lepidoptera have been observed, the Arogos skipper and the Hops blue butterfly. The Hops blue larvae feed on the hops found growing in the tall upland shrubland.

Riparian woodland and shrubland – The riparian woodland had the greatest diversity of arthropod taxa and the largest number of families. This community complex also produced the largest total number of individuals. Once again the most abundant family was the leafhoppers (43 %). Hollows in the rotted heartwood of several old cottonwood trees provided hive sites for honeybee colonies.

The bottomland shrubland is dominated by leadplant with some shrubby willows intermixed. Taxon richness was average for terrestrial arthropods, as was the number of orders. The number of individuals was relatively low indicating a low abundance of arthropods. Leafhoppers led the pack again, accounting for 37 % of all arthropods collected.

Benthic macroinvertebrates were also sampled across the entire Site. Benthic macroinvertebrates, mostly larval stages of insects, are important members of the aquatic community because they have many functional roles. These species have relatively long life cycles (6 months to two years) and are a major food source for fish. Adult stages of aquatic insects are terrestrial. There were 155 taxa of benthic macroinvertebrates collected at the Site, including Rock Creek. The most abundant orders were Diptera (flies, 76 taxa), Trichoptera (caddis flies, 16 taxa), Coleoptera (beetles, 16 taxa) and Ephemeroptera (mayflies, 11 taxa). Several of these taxa are found only in clean water. The presence of so many taxa of caddis flies is a good water quality indicator, and can be used in the future as a baseline for water quality sampling on Rock Creek Reserve.

3.5.6 Sensitive, Threatened and Endangered Species

A list of wildlife species and plant communities found on Rock Creek Reserve defined as “sensitive” by the CNHP, or listed as threatened or endangered by the State or federal government is found in Appendix 7. CNHP rankings and a definition of those rankings are included. This list shows sensitive species found on the rest of the Site also, since most of these species are highly mobile and migrate across the Site as well as off the Site. These include the northern leopard frog, ferruginous hawk, black-crowned night heron, grasshopper sparrow and the loggerhead shrike. Only those listed “threatened or endangered” by the federal government are described in this section.

No federally-listed, threatened or endangered fish, reptile, amphibian, or invertebrate species are known to occur on Rock Creek Reserve, or the rest of the Site.

Preble’s Meadow Jumping Mouse

Rock Creek Reserve, along with all other main drainages that cross Rocky Flats, contains populations of, and habitat for, a resident federal threatened species, *Zapus hudsonius preblei*, the Preble’s meadow jumping mouse (Fig. 9). The mouse was listed as a threatened species on May 13, 1998 (63 FR 26517). No other federally listed mammals have been identified on Rock Creek Reserve. Preble’s meadow

jumping mouse, a member of the jumping mouse family Zapodidae, is a federally-listed, threatened subspecies. This mouse is a small mouse of about 3.5 inches body length with a disproportionately long tail of 5.8 inches. The pelage is dark where the dorsal band runs down the back, olive yellow on the sides and white underneath with no dark dividing band. Approximately 70 individuals have been estimated as living in the Rock Creek drainage. Preble's occurs in habitat adjacent to streams and waterways along the Front Range of Colorado and southeastern Wyoming. According to the documentation accompanying the proposed USFWS 4(d) rule, the subspecies' habitat is the riparian zone, primarily defined by the 100-year floodplain, and adjacent uplands extending out about 100 meters (Environmental Assessment for a Proposed 4(D) Rule on the Prebles's Meadow Jumping Mouse, USFWS). Based on actual habitat and trapping data, however, Site ecologists have established Preble's Mouse Protection Areas according to Site-specific habitat conditions (Preble's Meadow Jumping Mouse Protection Policy for Rocky Flats Environmental Technology Site, DOE, September 2000).

The Site has prepared and implemented the above-mentioned Protection Policy for the Preble's meadow jumping mouse. The Preble's Protection Policy (Appendix 6) and other protection policies, plans, and procedures will be evaluated to determine whether implementation may need to be improved, and whether modifications are needed in light of new information, developments, or related conservation efforts, including off-site studies and identified data gaps.

Bald Eagle

The bald eagle was federally-listed endangered in most states but was reclassified as threatened because of significant increases in the number of breeding pairs (USFWS, 1995). The USFWS has considered de-listing the Bald Eagle, and data are currently being collected to analyze this decision. No breeding pairs of eagles nest on Rock Creek Reserve, although they have been observed traversing the Reserve.

Bald eagles generally nest near water in forest stands that contain a mixture of tall, old, and dead or dying trees. An active nest is located to the east of the Site near Standley Lake. In winter bald eagles may expand their home range in search of food or migrate to areas where food is available. Bald eagles are known to congregate at reservoirs, lakes, or rivers. Availability of roosting habitat is an important component of the eagle winter ecology. Roosting habitat consists of trees that extend above the forest canopy and provide a protected microclimate for resting eagles. Eagles feed primarily on fish and waterbirds but also on small mammals and mammal carcasses. Some eagle populations are migratory, whereas others remain near their breeding areas year-round.

American Peregrine Falcon

In 1995 Peregrine falcons were proposed for removal from the list of endangered and threatened wildlife. Peregrine falcons were subsequently de-listed in 1998. Peregrine falcons have been observed traversing and resting on Rock Creek Reserve.

3.6 CULTURAL RESOURCES

A cultural resource is any locality or object exhibiting evidence of prior human behavior. Cultural resources generally comprise specific locations at which one or more activities occurred in the past, and which were visibly modified in the process (e.g., through the building of structures or other non-portable

features; modifications of the ground surface such as wagon ruts; or abandonment of portable items such as tools or refuse, i.e., artifacts). Cultural resources consist of prehistoric and historic buildings, sites, structures, districts, objects or any other physical evidence of human activity considered important to a culture, subculture, or community for scientific, traditional, religious, or other reasons. Cultural resources may be any age, although generally they must be more than 50 years old to be considered for protection under existing cultural resource laws.

3.6.1 Archeological Resources

Surveys to locate cultural resources have been conducted over the entire acreage of the Site Buffer Zone. Two archeological surveys were conducted, one in 1989 (An Archaeological and Historical Survey of Selected Parcels Within the Department of Energy, Rocky Flats Plant, Northern Jefferson County, Colorado, Burney & Assoc. Inc, 1989) and in 1991 (Cultural Resources Class III Survey of the Department of Energy Rocky Flats Plant, Northern Jefferson and Boulder Counties, Colorado, Dames and Moore, 1991). While the surveys identified points of local interest in the Buffer Zone, such as Lindsay Ranch in the Rock Creek Reserve, no sites or artifacts eligible for listing on the National Register of Historic Places were found in the Buffer Zone. A total of 35 archeological sites and 29 isolated finds (usually one or two artifacts) have been recorded in the Buffer Zone. Identified archeological sites include stone rings and alignments, the remains of ranch buildings, trash dumps, stock ponds, corrals, irrigation ditches, an orchard, and a railroad grade. Isolated finds include chipped and ground stone artifacts, barbed wire, stone cairns, and pieces of farm equipment. Resources found during these surveys were primarily historic Euroamerican resources; Native American resources are rare at the Site. None of the sites or isolated finds in the Buffer Zone have been determined eligible for listing in the National Register of Historic Places. The Colorado State Historic Preservation Office (SHPO) concurred with the findings, and no special management or protective actions are required for these resources.

3.6.2 Historic Resources

A survey of the industrial area was prepared in 1995 and reported in the Cultural Resources Survey Report for the Rocky Flats Environmental Technology Site Industrial Area. The survey report concludes several of the facilities in the industrial area are of historic importance because of the role they played in the Site's contribution to the Cold War. Sixty-four facilities in the industrial area have been included in a historic district on the National Register of Historic Places. A Programmatic Agreement regarding the cleanup and closure activities at the Site between the Advisory Council on Historic Preservation, the SHPO, and DOE governs how Site historic information is being recorded.

3.6.2.1 Lindsay Ranch

The Lindsay Ranch, comprised of an old ranch house, barn, stock pond and fences, was evaluated for eligibility to the Register of National Historic Places and was determined to be ineligible, with SHPO concurrence. Description of the Ranch and results of the evaluation and reasons for ineligibility are documented in the Cultural Resources Class III Survey.

3.7 SOCIOECONOMICS

Prior to the purchase of the land contained within the current Rock Creek Reserve and the proposed Reserve boundary expansion, the primary use of the land was livestock ranching. During the 1800s and the first half of the 1900s the social and economic life of this immediate area depended on the use of this land for grazing. When the U.S. government purchased this land in the 1950s and 1970s it effectively removed the lands within the boundaries of Rocky Flats from agricultural use. In addition, the security and safety aspects of Rocky Flats required termination of incidental use of the land, such as hunting, hiking and horseback riding.

3.7.1 Public Use

Tours of and visits to the Site, including Rock Creek Reserve, are currently arranged and coordinated through the Tours and Visits office in the DOE Office of Communications with significant support from the counterpart contractor organization. Site tours are given on an as needed/as requested basis and often include tours of the Buffer Zone area with its unique natural resources. Types of tours include formal visits by elected officials, DOE officials, and regulatory representatives as well as building or project specific tours for local stakeholders. It is the policy of the Site, in accordance with the DOE Openness Initiative, to accommodate as many requests for Site tours and visits as possible. As DOE continues with cleanup of Rocky Flats, operation of the Tours and Visits function should remain fairly constant. Tours and visits include the Rock Creek Reserve.

3.7.2 Rocky Flats Mission Considerations

The current mission of the Rocky Flats Environmental Technology Site is cleanup and closure. At closure, all nuclear materials and wastes will have been removed from the Site, all buildings will have been demolished, and any remaining contamination will have been remediated per the requirements of RFCAs. Current plans call for this mission to be completed late in 2006.

Completion of the closure mission is not expected to directly affect Rock Creek Reserve. However, the continued presence of nuclear material throughout much of the closure project will necessitate continued limitations on unrestricted public access to the Site, including Rock Creek Reserve. In the unlikely event of a nuclear material accident in a facility that could result in significant release of plutonium, the Site's emergency plan is required to consider protective actions for anyone in the buffer zone. (Approval of Site Safety Analysis Report Annual Update, Golan letter, 2000) This may include evacuation and sheltering in order to reduce potential radiological exposures during the accident. Controlling access is a requirement derived from the safety analysis of potential accidents as required by *DOE Order 5480.23, Nuclear Safety Analysis Reports, 1992*.

4.0 INTEGRATED NATURAL RESOURCES MANAGEMENT

PROPOSED ACTIONS AND ALTERNATIVES

The first step in biodiversity protection is to keep an inventory. An inventory, as used here, is an itemized list or catalogue of components of an ecosystem. This process has been ongoing for many years on Rock Creek Reserve.

Monitoring tracks trends (or absolute numbers if needed) of individual species or higher associations of species, such as vegetation cover types or plant communities. Monitoring is generally performed on a regular basis and often targets species with high economic or human-use values, sensitive species, and/or indicator species of overall ecosystem health.

DOE inventories and monitors soil, water, and priority plant and animal species and habitats. Both inventory and monitoring data are used to evaluate general and site-specific ecosystem integrity.

This chapter discusses the inventory, monitoring and management options identified for use on Rock Creek Reserve for each natural resource category.

The “no action” alternative as described under each separate resource area would be to manage natural resources on Rock Creek Reserve (both 800 acres and under the expanded boundary proposal) as they are managed currently. The preferred action is sometimes the continuance of the current management practice, or “no action” and is designated as such throughout this section under the heading Preferred Action: No Action. See Section 1.3.2 for clarification on the use of these terms.

4.1 SOILS INVENTORY, MONITORING AND MANAGEMENT

Soils monitoring and management is very closely related to the monitoring and management of vegetation. Soils have been inventoried across Rocky Flats, including Rock Creek Reserve, as part of the Site’s existing soil monitoring program. Soils were also mapped by the Natural Resources Conservation Service as part of a soil survey of the Golden, Colorado area (Fig 3).

4.1.1 Soils Inventory and Monitoring

Preferred Action: No Action

Soils have been inventoried, and monitoring will continue as currently accomplished through vegetation management in accordance with the Annual Vegetation Management Plan, the Natural Resource Management Policy, and the Vegetation Management Environmental Assessment.

Options Considered But Not Selected

A range of options from no monitoring of the existing soils to comprehensive, frequent monitoring would be accomplished under this alternative. Soils could be monitored extensively, but is not currently necessary for the purposes of this Plan. This option is not considered feasible at this time. No legal requirement exists for soil monitoring in Rock Creek Reserve, and currently available data are sufficient to support the objectives of this Plan.

4.1.2 Soils Management

Proposed Action

- Implement the enhanced noxious weed control integrated strategies that prevent soil erosion through enhancement of native vegetation as described in Section 4.4.2.
- Continue to implement the Annual Vegetation Management Plan which identifies watershed improvement strategies and best management plans, such as check dams, revegetation, and reseeding actions, to retard erosion across the entire Site.
- Soil erosion that occurs along roads will be diminished through the continued use of water turnouts (shallow trenches) water bars and barriers (e.g. straw bales) to divert the flow from the eroded road edges to the adjacent open areas.
- Cooperate with other agencies for their expertise in erosion control and prevention. Establish cooperative efforts to share expertise through Rock Creek Reserve site visits, evaluation and recommendations.

Options Considered But Not Selected

Construction of erosion control devices, such as earthen berms, or dams, etc. are not considered necessary for Rock Creek and its tributaries. Construction of these devices could also cause negative impacts to the federally-listed threatened Preble's meadow jumping mouse. Impacts could include direct mortality, harassment, and destruction of habitat and mouse hibernation dens.

No Action

No action would consist of the current erosion control methods, without implementing the enhanced weed control strategies, mitigation, and cooperative efforts with other agencies. No action would control soil erosion for an unknown period of time, but would increase soil erosion over the long run through the indirect impacts of severe weed infestations.

4.2 WATER INVENTORY, MONITORING AND MANAGEMENT

4.2.1 Surface Water/ Wetlands Inventory and Monitoring

The 6,266-acre Site has approximately 1,100 wetlands covering approximately 191 acres that were identified and mapped in the 1994 Rocky Flats Plant Wetlands Mapping and Resource Study (Fig. 4). Preliminary data shows no contamination in the Rock Creek Reserve (Section 2.1.7). Sampling has been proposed to ensure that Rock Creek's water resources are not diminished.

Proposed Action

Quantity

- Observe areas where ground water is “daylighting”, i.e. pools or seeps, for changes in water levels not associated with climatic conditions.
- Install additional gauging if field observations indicate the need to do so.
- Determine current in-stream flows supporting riparian communities on Rock Creek.
- Determine the minimum in-stream flows necessary to continue supporting these riparian communities.

Quality

- Determine if any undesirable run-off is entering Rock Creek by sampling for water quality parameters indicative of water quality impacts, such as increased siltation and presence of undesirable chemicals.
- Perform additional benthic macroinvertebrate sampling to compare to the 1991 Baseline Characterization study.

Options Considered But Not Selected

Other options considered include a more comprehensive sampling regime for the waters of Rock Creek. The existing data, however, do not suggest that this is necessary. A complete aquatic insect study (including collection of adults) was considered. However, larval forms are considered adequate for sampling on Rock Creek. Past benthic macroinvertebrate sampling has shown an abundance of larvae that require clean water to complete their life cycles. Sampling for pollutants that are not normally associated with the kinds of activities with potential to impact Rock Creek are not being considered at this time. No known contaminated sites occur in Rock Creek Reserve that would warrant increased monitoring of surface water and runoff.

No Action

No action (no monitoring of water quantity and quality) has the potential for damage to wetlands, riparian areas and aquatic fauna through potential contamination and/or siltation going undetected. Decreased amounts of surface water flows to support the riparian communities could also go undetected if monitoring is not done. The sustained quantity and timing of streamflows in riparian ecosystems is essential to support the riparian plant and animal communities.

4.2.2 Surface Water/Wetlands Management

Rock Creek has been identified as a high-quality wetland complex. The primary management concerns are sustaining species diversity, genetic diversity, cover, productivity of the native plant species, and preservation of the animal populations using these areas. Two main concerns with the potential for impacts to surface water and wetlands on the Rock Creek Reserve have been identified: noxious weed spread and control, and adjacent land activities. These have the potential to affect both the quantity and quality of surface water and wetlands. Noxious weed management is discussed in Section 4.4.2.3.

Wetlands are already protected under many existing laws and policies. Section 404 of the CWA, 10 CFR, Part 1022, Compliance with Floodplain/Wetlands Environmental Review Requirements; Executive Order 11990, Protection of Wetlands; and Executive Order 11988, Floodplain Management. The Site has a Site-Wide Wetland Comprehensive Plan (February 1997) and a Wetlands Identification and Protection Procedure (January 3, 1997) that provides instructions for identifying jurisdictional wetlands at the Site and ensuring the protection of these wetlands.

The Site goal for wetlands mitigation, identified in the Memorandum of Agreement (MOA) for the Administration of a Wetland Bank at the Site between DOE RFFO, EPA, the Corps, and the Service, is to achieve no overall net loss of wetland functions and values [e.g., wildlife habitat, critical habitat for endangered species, flood control, water quality improvement, and groundwater recharge], resulting from Site activities. This MOA describes how the Site will account for wetland impacts for a portion of potentially impacted wetlands using a mitigation bank established and maintained by DOE, Rocky Flats Field Office.

Preferred Action: No Action

- Continue with the current actions for surface water/wetlands protection.

Surface water management options for water quality and quantity are not considered necessary at this time for Rock Creek Reserve. It is not considered necessary based on these assumptions:

- The herbicide applications were conducted in accordance with applicable laws, regulations and label instructions and requirements.
- No known contaminated sites occur on Rock Creek Reserve.
- Surface water quality and quantity are not currently being impacted.

If the implementation of the monitoring actions proposed in Section 4.2.1 show any of the above assumptions to be incorrect, mitigation measures will be formulated and implemented if necessary.

Options Considered But Not Selected

Other options, such as enlarging wetlands and increasing surface water flows, are not feasible at this time for the purposes of this Plan, but may be considered as the future re-use and ownership of the Site is discussed and ultimately determined. Current data do not suggest the necessity for any of those options at this time, and they could directly impact Preble's meadow jumping mouse and/or its habitat adversely through construction of diversion structures, dams, and excavations.

4.2.3 Groundwater Inventory and Monitoring

Groundwater on Rock Creek Reserve is currently monitored for water levels in several locations (Fig 10). Groundwater is extensively monitored on the rest of the Site.

Reduction of ground water discharge into surface channels would lead to a significant loss of stream wetlands. Interruption of ground water flow to the seep wetlands by excavation and subsequent filling should be avoided as should activities that could reduce recharge of the aquifer. Lining of water supply

canals, or tighter regulation of flows through the canals, could result in less recharge to shallow aquifers in the Rock Creek drainage.

Proposed Action

Quantity

- Review monitoring data from existing monitoring wells in Rock Creek Reserve to determine water level consistency.
- Measure seep areas to aid in assessing groundwater level changes not associated with climatic conditions.

Quality

- Sample existing groundwater monitoring wells located in Rock Creek Reserve for herbicides and other chemicals.

Options Considered But Not Selected

No contaminated sites have been identified within the boundaries of Rock Creek Reserve that require monitoring. A comprehensive groundwater monitoring program on Rock Creek Reserve would not be justified at this time. Groundwater monitoring options in addition to the proposed action are not considered necessary at this time.

No Action

There is no legal requirement for groundwater monitoring on Rock Creek Reserve. However, the no action alternative could result in negative impacts to groundwater if monitoring is not implemented. Impacts to groundwater would be observed by staff during other field activities, at which time the impacts could already be negatively affecting water quality and/or quantity.

4.2.4 Groundwater Management

Preferred Action: No Action

Groundwater management is not required currently for Rock Creek Reserve. It is not considered necessary based on these assumptions:

- Groundwater quantity is not impaired.
- Groundwater quality is not impaired.
- The herbicide applications were conducted in accordance with applicable laws, regulations and label instructions and requirements.
- No known contaminated sites have been identified on Rock Creek Reserve.

If the implementation of the monitoring actions proposed in Section 4.2.3 show any of the above assumptions to be incorrect, mitigation measures will be formulated and implemented if necessary.

Options Considered But Not Selected

At this time, other groundwater management options, such as pump and treat systems for contaminants, barrier systems, etc., are not considered necessary, and are not justified for Rock Creek Reserve.

4.3 AIR QUALITY INVENTORY, MONITORING AND MANAGEMENT

This section has combined the Inventory, Monitoring and Management subsections for ease of reading and to simplify the organization of the section.

Site air monitoring activities assist in protecting the public and the environment by detecting and tracking any impact of Site operations on air quality at and near the Site. This includes characterizing any airborne materials that may be introduced and the meteorological conditions that influence their transport and dispersion. Data are used to plan, implement, and assess the effects of Site activities, including operations, construction, and decommissioning; to maintain emergency preparedness; and to demonstrate compliance with relevant regulations.

Preferred Action: No Action

- Air quality inventory, monitoring and management on Rock Creek Reserve are done in accordance with existing Site policy. Fugitive dust (PM-10 and TSP, described in Section 3.3.1.4) is not currently a concern on Rock Creek Reserve. Air quality is also monitored through implementation of the Annual Vegetation Management Plan. Proposed actions within this Plan with the potential to impact air quality were analyzed and documented in the 1998 Vegetation Management Environmental Assessment and Finding of No Significant Impact.

Options Considered But Not Selected

Air quality monitoring is currently done as determined by regulation and other agreement. Increased monitoring would be unnecessary as the current level of monitoring is based on statistical requirements for accuracy. At this time, air quality management options are not applicable. Management of fugitive dust such as dust suppressant on roads and prohibiting traffic are not necessary to control dust since traffic is minimal and fugitive dust is not currently a concern on Rock Creek Reserve.

4.4 BIOLOGICAL RESOURCES INVENTORY, MONITORING AND MANAGEMENT

4.4.1 Vegetation Inventory and Monitoring

Preferred Action: No Action

- Continue with the current ecological monitoring program as documented in the Annual Vegetation Reports for the Rocky Flats Environmental Technology Site.
- Continue to update the vegetation inventory (including herbarium mounts) as new species are found during surveys, including site-specific surveys, sensitive plant species surveys, and other projects.
- Continue to maintain the plant species database.

Options Considered But Not Selected

There is no legal requirement to maintain a vegetation inventory. Thus, the option to do no additional work maintaining and expanding this inventory is viable. At the other extreme, DOE could expend a great deal of effort specifically developing a more complete vegetation inventory. The current level of inventory adequately supports the overall need for vegetation inventory and monitoring, as well as the goals of this Plan, making that option unjustifiable and unnecessary.

4.4.1.1 Sensitive, Threatened and Endangered Species Inventory and Monitoring

Sensitive species and plant communities are monitored on an annual basis as part of the ecological monitoring program. Rocky Flats has supported periodic monitoring and surveying for Ute Ladies Tresses Orchid and Colorado Butterfly Weed. Neither of these endangered plants has been found on Site. Intensive surveys were conducted two consecutive years, 1993 and 1994 (Report of Findings, Ute Ladies' -Tresses and Colorado Butterfly Weed Surveys, 1994). Monitoring will continue informally, in conjunction with other, annual surveys.

Proposed Action

There are populations of Ute Ladies Tresses Orchid and Colorado Butterfly Weed in Boulder and Jefferson Counties. Suitable habitat exists on Rock Creek Reserve, especially in the seeps that feed Rock Creek. Noxious weed control efforts may have allowed plants that have gone undetected in the past to have better establishment. Surveys for other species, including candidate species with potential to occur on Rock Creek Reserve, will be conducted as appropriate.

- Conduct formal surveys for Ute Ladies Tresses Orchid and Butterfly Weed in years following enhanced weed control and prescribed burning. Conduct limited burn in wetland areas where thatch has built up in great proportions, inhibiting plant growth. Ute Ladies Tresses Orchid is often discovered after a burn regime.
- Continue informal surveys in subsequent years.
- Prepare annual reports on formal survey results for the Service.
- Continue to monitor areas critical to sensitive plant and animal species.
- Survey for state-listed plant species on Rock Creek Reserve to the degree possible with available funding.

Options Considered But Not Selected

The option to do no additional work surveying for Ute ladies' tresses orchid and Colorado butterfly weed is viable. At the other extreme, DOE could expend a great deal of effort and funds specifically surveying for these plants on a yearly basis. Periodic surveys every few years are considered adequate to detect the species' presence, especially since noxious weed control may take several years. Frequent surveying also has the potential to impact sensitive areas from trampling, disturbing wildlife, etc.

No Action

If additional formal surveys are not conducted, presence of Ute ladies' tresses orchid or Colorado butterfly weed would only be detected by a fortuitous sighting. The potential exists for small populations to go undetected. These populations would not add to the recovery and de-listing efforts for the species (since they would be unknown) and could potentially be harmed in the short term by some weed control activities that would take place in potential habitat (especially herbicide applications).

4.4.1.2 Noxious Weeds Inventory and Monitoring

Noxious weeds have been identified and mapped across the entire site, including Rock Creek Reserve (Figs. 6,7,8). Ten years ago, there was little diffuse knapweed in the Buffer Zone; now, this Colorado-listed noxious weed inhabits approximately 2300 acres of the Buffer Zone. The most recent report, the 1999 Annual Vegetation Report, describes dalmatian toadflax as currently being the most pervasive noxious weed, infesting over 2500 acres of the Buffer Zone.

The 1999 report also describes the impacts of the 1997 herbicide application on the Site, including some areas of Rock Creek Reserve. The results have so far been favorable, and will be used to refine future management techniques.

Preferred Action: No Action

The current inventory and monitoring programs for noxious weeds provide a comprehensive database for Rock Creek Reserve and the entire Site. The Annual Vegetation Reports are complete and contain maps with the most recent identifications and distributions of noxious weed infestations. Weed infestations in the region with the potential to impact Rock Creek Reserve and the Site are identified through coordination with State and County weed experts.

Options Considered But Not Selected

The current inventory and monitoring process provides an excellent source of information on noxious weeds and is currently a very useful tool for land managers. A more intense inventory and monitoring program would not add to the existing program enough to justify the dedication of resources. At this time, other management options are not applicable.

4.4.2 Vegetation Management

The Natural Heritage Program, DOE and USFWS have identified the primary threat to all native plant communities on Rocky Flats, including the Rock Creek Reserve, to be the displacement of the native vegetation by noxious, invasive weeds. The management strategies for all the native plant communities therefore focus on management of noxious weeds. Noxious weed control is discussed more thoroughly in Section 4.4.2.3. Existing vegetation management plans and policies include the 2000 Integrated Weed Control Strategy for the Rocky Flats Environmental Technology Site (Kaiser-Hill), the 1998 Vegetation Management Environmental Assessment (Kaiser-Hill) and the 2000 Annual Vegetation Management Plan for the Rocky Flats Environmental Technology Site (Kaiser-Hill).

4.4.2.1 Plant Communities

Plant communities found on Rock Creek Reserve, the remainder of the Site, and declining across the region, were identified by CNHP as sensitive areas in need of protection. For purposes of this Plan, they are listed here as the xeric tallgrass prairie, tall upland shrubland, and riparian woodland/shrubland.

4.4.2.1.1 Xeric Tallgrass Prairie

Proposed Action

- Increased noxious weed control, especially diffuse knapweed and dalmatian toadflax (see Section 4.4.2.3).
- Continue removal and rehabilitation of unnecessary roads and fences to lessen the genetic and reproductive impacts from fragmentation of the grasslands. Determine if any fences should remain as catchment devices for diffuse knapweed (a tumble weed).
- Implement approved prescribed burning, including vegetation monitoring consistent with the Vegetation Management Environmental Assessment and Section 4.6.2.. The monitoring of fire effects is necessary to evaluate community response and quantify vegetation trends over time. Pre- and post-fire monitoring, particularly in the xeric tallgrass prairie areas, is needed to assess impacts from fire to that plant community. The use of fire in tandem with weed control methods to reduce the distribution of the exotic weeds is another benefit that may be realized from pre- and post-fire research on Rock Creek Reserve.
- Continue to participate in regional approaches to tallgrass prairie conservation.

Options Considered But Not Selected

Considerable resources could be dedicated to a wide range of options. Examples include attempting to eradicate (completely remove) all noxious weeds, closing all roads through the area or seeding and watering on a large scale. The benefits compared to cost of these options are questionable, and probably impossible to achieve in the case of weed eradication, since these weeds occur across the region. Negative environmental impacts could also arise from a weed eradication process, which would probably require large amounts of herbicides. Increased use of herbicides affects non-target plant species and could impact water resources.

No Action

The no action alternative would consist of the current management, including prescribed burning, for the xeric tallgrass prairie, as outlined in the existing management plans (listed in Section 4.4.2). Although this would adequately manage the prairie in the short term, the benefit from the increased noxious weed control of the proposed action would not be realized, and the grasslands could suffer in the long run.

4.4.2.1.2 Tall Upland Shrubland

Proposed Action

Management of the tall upland shrubland includes:

- Increased noxious weed management (see Section 4.4.2.3).
- Evaluate impacts to the groundwater seeps that are important for the survival of this plant community.
- Remove dead knapweed through use of prescribed fire, described in Section 4.6.3. Build up of brush from dead knapweed was identified by Site ecologists and the CHNP as one cause for damage to the tall upland shrubland. High winds once blew a great amount of dead knapweed into the tall upland shrubland, and consequent shading damaged some of the plant community. This has already been abated through the current weed control practices. Perform thinning, if necessary, for wildland fuel hazard reduction and also to improve wildlife habitat.
- Implement approved prescribed burning, including vegetation monitoring. The monitoring of fire effects is necessary to evaluate community response and quantify vegetation trends over time. Data collection and analyses will provide an understanding of ways to protect and/or enhance natural ecosystems. Past occurrences of fire in the tall upland shrubland have shown beneficial effects to the plant community. The use of fire to help reduce the distribution of noxious weeds is another beneficial action that may be realized from pre- and post-fire research on Rock Creek Reserve.

Options Considered But Not Selected

Considerable resources could be dedicated to a wide range of options. Examples include attempting to eradicate (completely remove) all noxious weeds that impact the tall upland shrubland, or increasing availability of groundwater upon which the seeps depend through unnatural means. The benefits compared to cost of these options are questionable, and probably impossible to achieve in the case of weed eradication. Negative environmental impacts could also arise from a weed eradication process, which would probably require large amounts of herbicides. Increased use of herbicides affects non-target plant species and could impact water resources.

No Action

The no action alternative would consist of the current management for the tall upland shrubland, as outlined in the existing vegetation management plans (see Section 4.4.2). Although this would probably adequately manage this rare plant community in the short term, the benefit from the increased noxious weed control efforts outlined in the proposed action would not be realized, and the tall upland shrubland could suffer in the long run.

4.4.2.1.3 Riparian Woodland and Shrubland

Noxious weeds are considered the primary threat also to the riparian plant communities. The riparian woodland had only 73 percent native species as reported in the Terrestrial Vegetation Survey (1993-1995) for the Rocky Flats Environmental Technology Site (Kaiser-Hill). This plant community accounted for the highest number of species (species richness) of the plant communities. This community provides important habitat for the federally-listed, threatened Preble's meadow jumping mouse.

Proposed Action

- Increased noxious weed control efforts, especially Canada thistle.
- Evaluate planting cottonwoods or other native vegetation in strategic areas to enhance the benefits the trees provide to the riparian area, including the negative effect that shading would have on diffuse knapweed.
- Evaluate impacts to the surface water flows that are important for the survival of this plant community.

Options Considered But Not Selected

Considerable resources could be dedicated to a wide range of options. Examples include attempting to eradicate (completely remove) all noxious weeds affecting this plant community, or enlarging the riparian corridor through increasing in-stream flows. The benefits compared to cost of these options are questionable, and probably impossible to achieve in the case of weed eradication, and the lack of available water to increase the in-stream flows. Negative environmental impacts could also arise from the eradication process, which would probably require large amounts of herbicides in an aquatic system. Enlarging the existing riparian corridor could have negative impacts on the established vegetation and small mammal communities currently residing there, including the federally-listed, threatened Preble's meadow jumping mouse.

No Action

The no action alternative would consist of the current management for the riparian plant communities, as outlined in the existing vegetation management plans (see Section 4.4.2). Although this would probably adequately manage these communities, the benefit from the increased noxious weed control of the proposed action would not be realized, and the diversity of the riparian plant communities could suffer.

4.4.2.2 Sensitive, Threatened and Endangered Species

No threatened or endangered plant species as defined by the Endangered Species Act have been identified in surveys conducted on Rock Creek Reserve. Two federally-listed plants that are found in the region and have potential habitat on Rock Creek Reserve, but were not found in surveys are the Ute Ladies Tresses Orchid and the Colorado Butterfly Weed. If these plants are found in future surveys, management strategies will be formulated at that time. The introduction of these threatened or endangered plant species on Rock Creek Reserve will be considered in the development of recovery plans for these species. A draft recovery plan for Ute Ladies' Tresses Orchid is currently under review by the Service. Recovery plans are developed with public participation, and public concerns are addressed in the process. Sensitive plant communities and species will be managed according to the discussions above.

4.4.2.3 Noxious Weeds

An Integrated Weed Control Strategy is currently applied at the Site including biological controls, mechanical controls, chemical controls, use of weed-free seed and mulch, and prompt revegetation of disturbed sites. The Site also has an Annual Vegetation Management Plan that addresses weed control methods, target species, and treatment areas to direct weed control efforts each year. Additionally, the Site has worked cooperatively with Jefferson County weed control personnel, and surrounding landowners to participate in regional weed control strategies and implement integrated weed control.

The Natural Resource Management Policy was analyzed in an Environmental Assessment in accordance with the National Environmental Policy Act. Vegetation management options and alternatives were analyzed, and the public was actively educated and involved. DOE and USFWS will continue to evaluate a range of options, including prescribed burning and herbicide spraying, and it may be necessary to use an array of techniques for long-term habitat maintenance. DOE and USFWS understand that there are some community concerns regarding controlled burns and herbicide use and will continue to address these in development and implementation of this Plan.

Prescribed burning, described in Section 4.6.2, can help control some weed species while promoting other weed species, depending upon specific conditions in each case that prescribed burning is applied. Prescribed burning, which has recently been approved, will be integrated with other weed control measures as part of an integrated weed control plan. Since Rock Creek Reserve is relatively unimpacted by radionuclide contamination (see Section 2.1.7), limited burns for native vegetation enhancement should be made available as a management option. Prescribed burning will also have a beneficial effect in reducing wildfire potential. A controlled test burn was implemented in May 2000. Data from that burn is being collected and analyzed to help make informed decisions for future burns.

The Site now controls noxious weeds in the Buffer Zone, including Rock Creek Reserve, through aerial and ground application of herbicides as part of an integrated weed management strategy. Data from 1997 herbicide plot applications are showing promising results, with the species richness of the affected plots returning to pre-application numbers by the end of 1999.

Proposed Action

The following management options will be available to land managers of Rock Creek Reserve as part of an overall integrated management strategy for noxious weeds. All options will comply with applicable laws and regulations, especially those that govern use of herbicides, prescribed burning and releases of biological control agents. If any option has the potential to impact any federally-listed threatened or endangered species, consultation on a project-specific basis with USFWS will be done in accordance with Section 7 of the Endangered Species Act.

- As part of the Annual Vegetation Management Plan, develop objectives for control of each noxious weed species with additional emphasis on non-chemical control methods.

- Use guidance in the most current Annual Vegetation Management Plan to maintain consistency and integrate with weed control efforts across the rest of the Site.
- Continue herbicide applications when necessary and subsequent revegetation to reduce weed densities incorporating strategies outlined in the most recent Bureau of Land Management (BLM) Integrated Pest Management and Pesticide Application Certification Course.
- Continue use of prescribed burns to stimulate native plant growth and reduce litter. If necessary, reseed the burned areas found on steeper slopes with the native plant mix (if applicable) currently used for revegetation at Rocky Flats.
- Use mechanical means and cultural practices as described in the Annual Vegetation Management Plan. This may include additional options based on research currently conducted by Colorado State University at Fort Carson, Colorado for integrated control of cheatgrass and knapweeds.
- Continue to increase the biological control efforts against Canada thistle, musk thistle, diffuse knapweed and dalmatian toadflax using strategies proven to increase the chances for establishment and control found in the most current Annual Report for Biocontrol at Fort Carson, Colorado, (Texas Agricultural Experiment Station [TAES]). Obtain as many species as possible from the lists within the Report of insect species approved for release by United States Department of Agriculture's Animal & Plant Health Inspection Service and the Colorado Department of Agriculture.
- Introduce the field bindweed mite for control of field bindweed. The bindweed mite is approved for release by the USDA and CDA, and is proven successful to help with bindweed control in Texas.
- Enter into cooperative agreements with other agencies to redistribute approved biological control agents established on other federal lands in the region.

Options Considered But Not Selected

Other management options include the reliance on any one of the above control measures, without an integrated approach. In the case of mechanical and chemical controls, the benefits compared to costs are questionable since these are generally short term control measures that must be used in conjunction with other measures to provide long term control. Negative environmental impacts could result from some of them, especially overuse of herbicides. Prescribed burning indirectly controls noxious weeds by promoting native plant vigor and must also be used in conjunction with other control measures. Too much use of prescribed burning can have negative impacts to plants and soil. Grazing/ browsing with goats is an option that has been analyzed and discarded because of the damage goats can do if not intensely managed. The potential exists for goats to transport noxious weeds by seeds and plant parts to uninfested areas. At this time, it is felt the potential negatives to the Site's sensitive plant communities outweigh the potential benefits, especially in the riparian and seep areas.

No Action

The no action alternative would keep the noxious weed management exactly as it exists currently. Although this would provide some noxious weed control, the enhanced efforts of the proposed action would not be implemented, and noxious weeds could increase in the long run. The sensitive and unique plant communities of Rock Creek Reserve would be impacted, thereby impacting all the other elements of the ecosystem that depend on them.

4.4.3 Faunal Inventory and Monitoring

4.4.3.1 Species Resident or Transient on Site (including mammals, birds, fish, reptiles, amphibians and invertebrates)

Preferred Action: No Action

- Monitoring and inventorying faunal species will continue in accordance with current management plans, including the Ecological Monitoring Program, as documented in the Annual Wildlife Survey Reports. Existing monitoring and inventory meet, and exceed in many cases, the level necessary to make informed management decisions.
- Continue to add to the faunal baseline inventory using observations and data from other field projects.

Options Considered But Not Selected

A higher level of monitoring and inventory is not considered necessary, and would be a costly alternative. Current monitoring programs adequately support the goals of this Plan. Depending on the methods used, there would be the potential for actual harm to a sensitive ecosystem such as that found in Rock Creek. Increased frequency of monitoring would cause trampling in sensitive plant communities and the potential to spread noxious weeds. Harassment of birds during nesting season causing nest abandonment could occur.

4.4.3.2 Sensitive, Threatened and Endangered Species

The Site, due to its geographic position between the Great Plains and the Front Range of the Rocky Mountains, includes a great diversity of terrain and provides a wide variety of wildlife habitats. The wide range of habitats provides year-round and seasonal habitat for a large number of wildlife species, including threatened, endangered, and other special-concern species. To facilitate monitoring the status of sensitive species, DOE maintains a list of such species that have the potential to occur at the Site. The Ecological Resource Management Plan, 1998 NRMP, and current Preble's Protection Policy (Appendix 6) for the Site identify Site management concerns, monitoring approach, and management strategies for threatened and endangered species. Monitoring data are reported in the Annual Wildlife Survey Report for the Site. Sensitive species will be managed according to the discussions above. Only federally-listed threatened or endangered species will be discussed here.

Preferred Action: No Action

Monitoring and inventorying threatened and endangered species, currently only the Preble's meadow jumping mouse, will continue in accordance with current management plans, including the Ecological Monitoring Program and Preble's Protection Policy. Existing monitoring and inventory meet, and exceed in many cases, the level necessary to make informed management decisions.

Options Considered But Not Selected

A higher level of monitoring and inventory is not considered necessary, and would be a costly alternative. Depending on the methods used, there would be the potential for harassment and harm to threatened and endangered species, currently only Preble's meadow jumping mouse, found in Rock Creek riparian habitat. Increased trapping and handling of mice could increase mortality. Indirect impacts through

trampling of habitat and spreading noxious weeds could occur.

4.4.4 Faunal Management

Much of the faunal species management on Rocky Flats is directed towards listed species, primarily due to compliance requirements. Fortunately, measures for listed species also benefit many other species of plants and wildlife on the Site.

Fauna is managed mainly through habitat management. This is accomplished through wetlands management, plant community management, wildland fire management, erosion control, and noxious weed control. Those and other related activities are described in their corresponding sections of the plan.

4.4.4.1 Large Mammals

Large mammals present on the Site, including Rock Creek Reserve, are resident populations of mule deer, white-tailed deer, and occasionally mountain lion, bear and elk. These mammals out-migrate to some extent, and known individuals have often been observed off the Site. The only large predator that is resident is the coyote. Management strategy for deer and elk is a habitat-based approach depending on management of the plant communities these animals depend on. Studies show that coyote use of mule deer for food at Rocky Flats appears to be low during the summer and probably limited to fawns. This low utilization may be the result of availability of other coyote food such as voles (Ribic, 1978). Inventory and monitoring projects for mammals are described in Section 4.4.3.1. Protection and management of threatened and endangered species are important to the management and protection of mammals in general on Rock Creek Reserve.

Preferred Action: No Action

- Use measures established for federally-listed species to also provide protection for other mammals that occur on Rock Creek Reserve.
- Continue policy of coordination with Colorado DOW to control populations of large mammals if necessary.

Options Considered But Not Selected

Rocky Flats is not legally required to specifically manage non-federally-listed species. Thus, programs for mammals in general are not required to be implemented. However, most of Rock Creek Reserve and Site management programs and policies have positive effects for non-federally-listed species, including large mammals. Other management options include intensive management for large mammals through methods such as hunting, trapping, predator control, relocation, and species-level management. Hunting and trapping are not applicable at this time for previously discussed mission and security reasons. There is no indication that large mammals require, or will require in the foreseeable future, any kind of intensive management, such as culling.

4.4.4.2 Small Mammals

Proposed Action

- Install bat houses in strategic locations to provide increased roosting areas and shelter for bats.

Options Considered But Not Selected

Intensive management for small mammals through methods such as predator control, trapping and relocation, planting additional food sources, supplying an artificial food source such as cracked corn, and species-level management were considered. These options all have the potential for ecosystem harm and negative impacts on biodiversity through management strategies that fail to consider the ecosystem as a whole. Predator/prey relationships could be upset. Feeding and planting additional food sources have the potential to cause population fluctuations and create imbalances in the native plant communities. Another option for small mammal management that has been suggested is the use of Rocky Flats, including Rock Creek Reserve, as a refuge for displaced, relocated black-tailed prairie dogs. Rocky Flats will continue its policy of not accepting relocated prairie dogs. Both the Service and DOE are concerned about the potential for damage to sensitive grasslands and the introduction of the plague to prairie dogs that currently populate the Site. Prairie dogs do not currently populate Rock Creek Reserve, but the potential exists for them to move into the Reserve naturally. Prairie dogs that naturally migrate to Rock Creek Reserve are not expected to require population control, as these measures have never been necessary in the past, due to a healthy predator/prey balance. A large, sudden influx of prairie dogs through relocations could disrupt the natural predator/prey relationship which exists on Rock Creek Reserve.

No Action

Not installing bat houses would not allow for increased roosting areas and shelter for these sensitive species that occur on Rock Creek Reserve, such as the small-footed myotis.

4.4.4.3 Birds

Proposed Action

- Place nesting boxes for blue birds in strategic areas of Rock Creek Reserve. Nesting boxes require regular maintenance, and will not be placed if it is determined that current staffing cannot support this. Boxes would only be placed in areas where they would not cause territorial impacts to other birds.

Options Considered But Not Selected

Rocky Flats is not legally required to specifically manage non-federally-listed species. Thus, programs for birds in general are not required to be implemented. Rocky Flats could establish intensive and extensive management strategies for birds, such as planting areas of specific food crops like sunflowers, predator control, constructing ponds for waterfowl, and other species-level management options. These options all have the potential for ecosystem harm and negative impacts on biodiversity through management strategies that fail to consider the native ecosystem as a whole. Rock Creek is not historic waterfowl habitat, and construction of habitat would be an artificial measure that would require increased surface water management to control. Installation of raptor perch poles was considered but not selected due to potential impacts of increased predation on sensitive species, either current resident species or any that

may be introduced in the future. Electrocutions from power lines is not an issue at the Site. Raptor perch poles promote the presence of those species of hawks and owls that did not evolve in the prairie ecosystem, but that have increased in numbers with the presence of manmade structures for nesting and resting.

No Action

No action would not allow for nesting areas for blue birds.

4.4.4.4 Reptiles and Amphibians

Preferred Action: No Action

- Continue the monitoring and management practices already in place for protection of wetlands and grasslands. Implementation of proposed actions for noxious weeds, groundwater and surface water monitoring and management as outlined in their respective sections in this Plan will afford added protection to amphibians and reptiles.

Options Considered But Not Selected

Rocky Flats is not legally required to specifically manage non-federally-listed species. Thus, programs for reptiles and amphibians in general are not required to be implemented. Rocky Flats could establish intensive and extensive management programs for reptile and amphibian species and their habitats through methods such as predator control, enlargement of wetland areas and species-level management. These options all have the potential for ecosystem harm and negative impacts on biodiversity through management strategies that fail to consider the ecosystem as a whole. Rock Creek has not historically had large areas of wetland habitat, and construction of wetland habitat would be an artificial measure that would require increased surface water management to control. Reptiles already benefit from the grassland and other plant community management, and increased management is not necessary.

4.4.4.5 Invertebrates

Preferred Action: No Action

- Continue the monitoring and management practices already in place for protection of plant communities. Implementation of proposed actions for noxious weeds, and sensitive plant community management as outlined in their respective sections in this Plan will afford added protection to invertebrates, and contribute to the maintenance of riparian communities, providing habitat for the hops blue butterfly, Arogos skipper and other sensitive invertebrates.

Options Considered But Not Selected

Rocky Flats is not legally required to specifically manage non-federally-listed species. Thus, programs for invertebrates in general are not required to be implemented. Planting specific host plants for sensitive species such as the hops blue butterfly was considered, or planting flowers preferred by adult lepidoptera in general and host plants for larvae. These measures could impact the sensitive plant communities and would require intense management for noxious weed invasions. Planting flowers and placement of hives

to attract bees was considered, but discarded due to intense management requirements and possible negative impacts to sensitive native plant communities.

4.4.4.6 Sensitive, Threatened and Endangered Faunal Species

Threatened and Endangered Species

Management of federally-listed, threatened and endangered species is required by the Endangered Species Act. Rock Creek Reserve currently has one resident federally-listed, threatened species, the Preble's meadow jumping mouse. The Site manages this species in accordance with the 1999 Memorandum of Agreement For Coordination Of Endangered Species Act Compliance With Activities At Rocky Flats Environmental Technology Site Between Department Of Interior Fish and Wildlife Service, Department of Energy, Environmental Protection Agency, Colorado Department of Health and Environment, and Colorado Department of Natural Resources (Appendix 8). The Preble's Meadow Jumping Mouse Protection Policy now in effect is a requirement of this agreement (Appendix 6). The Preble's Protection Policy addresses a range of programs and projects, and all aspects of remedial activities at Rocky Flats.

Preferred Action: No Action

- Continue to implement the existing Protection Policy prepared by the Site for the Preble's meadow jumping mouse, which is listed as a threatened species under the Endangered Species Act. The Preble's Protection Policy (Appendix 6) and other protection policies, plans and procedures are currently being evaluated to determine whether implementation may need to be improved, and whether modifications are needed in light of new information, developments, and related conservation efforts, including off-site studies and identified data gaps.
- Monitor off site research on federally-listed, threatened, endangered, and proposed species and their habitats that occur on the Site and use results of these research projects to improve management programs on Rock Creek Reserve.
- The proposed action listed in Section 4.2.1 to establish minimum in-stream flows for Rock Creek to support riparian habitat will benefit the continued survival of the mouse through the availability of that data as a habitat management tool.
- The proposed actions listed in Section 4.2.2 and 4.2.3 for groundwater and surface water monitoring in Rock Creek will benefit the continued survival of the mouse through the availability of that data as a habitat management tool.

Options Considered But Not Selected

Other management options would include implementing Preble's mouse habitat enhancement projects. Since the existing habitat adequately supports a viable mouse population (1999 Annual Wildlife Report, Appendix B, Preble's Meadow Jumping Mouse Study), these options are not considered necessary at this time for the Rock Creek Reserve. Projects such as enlarging riparian areas through digging, and extensive vegetation plantings could have negative short-term impacts. Trapping and moving mice from one area to another to produce new populations is an option that could have negative impacts on the individuals being relocated. Habitat enhancement projects could be proposed in the future in accordance with an approved recovery plan for the species. Those projects would be reviewed and coordinated as necessary at that

time. Recovery plans are subject to NEPA analysis and undergo public review.

Sensitive Species

Sensitive species are defined as federal or State-listed species and those documented as sensitive by the CNHP. These species along with their CNHP ranking and definitions are listed in Appendix 7. Some sensitive species are proposed within this Plan for introduction to Rock Creek Reserve. Except for federally-listed species (described in Section 4.4.4.6), these species will be managed using the same approach as used for the general vegetation and faunal management.

Proposed Action

- Coordinate with the Colorado DOW to reintroduce the Plains sharp-tailed grouse and implement monitoring. The grouse is State-listed as endangered in Colorado, but is considered abundant in other states, and is not being considered for federal listing.
- Coordinate with the DOW to introduce native, sensitive species of fish, including Iowa darter, northern redbelly dace (State listed endangered) and common shiner (State listed threatened). Implement monitoring. The purpose of this action is to establish a fishery representative of this area in its original condition, and to provide a source of these species for reintroductions elsewhere. These species are not federally-listed, nor are they being considered for proposal for federal listing.
- Remove the exotic species of fish, such as bass, using established methods currently employed by the Service, from Rock Creek wetlands such as Lindsay Pond.

Options Considered But Not Selected

Rocky Flats is not legally required to specifically manage non-federally-listed species. Thus, programs for sensitive species are not required to be implemented. Most of Rocky Flats' management programs have positive effects for non-federally-listed species due to their emphasis on habitat protection. Rocky Flats could establish intensive and extensive management programs for species of special concern and their habitats. This would however, require species-level management which could conflict with the overall goal of enhancing biodiversity on Rock Creek Reserve. Specific projects for management of introduced species are not being considered that are not already part of the goals of ecosystem level and habitat management as set forth in this Plan.

No Action

The No Action alternative would not support the biodiversity with emphasis on native species goals set forth in Section 1.2 of this Plan. Non-native fish would continue to be the predominate species, and native species would not be introduced, and would not contribute to the native biodiversity goals of Rock Creek Reserve management.

4.5 CULTURAL RESOURCES INVENTORY, MONITORING AND MANAGEMENT

This section has combined the Inventory, Monitoring and Management subsections for ease of reading and to simplify the organization of the section.

4.5.1 Archaeological Resources Inventory, Monitoring and Management

All known cultural resources at the Site have been evaluated for National Register eligibility. None were determined eligible. The Colorado SHPO has concurred with the findings. No additional evaluation is required, unless previously undiscovered resources are identified, or objects of potential scientific importance are identified. Even though all undisturbed areas within the Site, including Rock Creek Reserve, have been surveyed for cultural resources, the vegetation in some locations precludes a determination that there are absolutely no undiscovered resources.

The Site will monitor surface disturbing activities in the Buffer Zone for occurrences of undiscovered cultural resources. If any suspected cultural resources are discovered, the work will be stopped or rerouted to avoid the area. The suspected cultural resources will be evaluated for significance and managed according to Section 4.10.6 of the Rocky Flats Environmental Site Cultural Resource Management Plan (CRMP). The CRMP incorporates the information from both the archeological and industrial area surveys. The CRMP establishes guidelines regarding how to manage Site cultural resources.

Preferred Action: No Action

- Ground disturbing activities, removal of vegetation in certain areas and new erosion courses have the potential to uncover undiscovered buried deposits. Areas where any of these activities take place will continue to be monitored for cultural resources.
- Federal law prohibits commencement of federal undertakings that could impact cultural resources without undergoing the consultation process as outlined in Section 106 of the National Historic Preservation Act. The no action alternative, which is current policy, would still protect cultural resources as required by law. If any cultural remains are suspected, all activity will cease until the remains have been assessed for cultural significance.

Options Considered But Not Selected

Another option for monitoring and inventorying would be to conduct more in depth surveys than required by law, e.g., subsurface testing (testing below the surface for cultural resources before a project is implemented). This option is not necessary since the CRMP identifies the Buffer Zone as a low-density (low probability) area for cultural resources. These options could actually do harm to subsurface cultural deposits that otherwise may have been left unharmed.

No significant archaeological resources have been identified on Rock Creek Reserve. Therefore, other options for current management do not apply. If significant cultural resources are discovered in the

future, mitigation measures may range from simple avoidance of the site, to complete excavation and documentation. Avoidance and protection of sites via barriers, etc. would be the most probable management options.

4.5.2 Historic Resources Inventory, Monitoring and Management

The Lindsay Ranch is considered the only historically relevant structure on Rock Creek Reserve. While it is not listed as eligible for the Register of National Historic Places according to the National Historic Preservation Act, there is community interest in preserving the Lindsay Ranch. Suggestions have been made to reconstruct Lindsay Ranch for use as a visitors' center for Rock Creek Reserve. Since unrestricted public access to Rock Creek Reserve will not be allowed until the completion of the closure mission, the ultimate use of the ranch property cannot be determined until that time. The use of Lindsay Ranch, and public access in general, will need to be consistent with maintaining the ecological resources of Rock Creek Reserve. These issues will also be addressed in the Access and Recreation Study that is one of the proposed actions elsewhere in this Plan (Section 4.7.1). The following is proposed for the interim as other issues regarding public access and the Lindsay Ranch are being resolved.

Proposed Action

- DOE will work with interested stakeholders to determine what stabilization may be needed to prevent further degradation of Lindsay Ranch prior to closure. An assessment of the work needed to stabilize the structures and the hazards and impacts involved will be conducted first. Stabilization techniques may include replacing rotted wooden support features, protective temporary covering for the roof and windows, repairs to cracked cement foundations, removing and saving original features (doors, windows, etc.) for future use, pesticide treatments for wood destroying insects, etc. Such stabilization may be performed if funding can be made available from public and private sources. Stabilization may have short-term impacts resulting from noise and increased traffic. Care will be taken to prevent erosion and sedimentation into the Lindsay Pond. Consultation with the Service will be conducted if any planned activities have the potential to affect Preble's meadow jumping mouse habitat.

Options Considered But Not Selected

Complete restoration of the Ranch in the near term to its original condition was considered, but not selected because of the expense of such an option, and because the ultimate use of this property has not been determined at this time.

No Action

No action could negatively impact the property, especially the ranch house, allowing it to fall into such disrepair that no future rehabilitation would be possible.

4.6 LAND AND INFRASTRUCTURE MAINTENANCE

Rocky Flats has its own underground and aboveground utilities systems and supporting facilities. Except for unpaved access roads, fences and some utility lines, Rock Creek Reserve infrastructure is largely undeveloped. A landfill that was constructed and never put into use lies within the southern boundary of

the Rock Creek Reserve. Existing easements are described in Section 2.1.5.

4.6.1 Fence and Road Maintenance

There are several miles of unpaved roads on Rock Creek Reserve. Rocky Flats maintains unpaved roads in the Buffer Zone both as vehicle access and fire breaks. The Site has closed some roads to travel in order to increase prairie habitat. Also, the Site has reduced the width of road grading to 40 feet and driving vehicles off the road network is controlled to protect prairie habitat.

Proposed Action

- Initiate an Access and Recreation Study to be used as a management tool when recommending public access (roads, trails, etc.) options in the future. This study will include not only Rock Creek Reserve, but the entire Site.
- Continue to implement the existing policy that roads not necessary for access will be removed and rehabilitated through reseeding with the native vegetation found in the immediate area; these areas will be priority areas for noxious weed control.
- Roads, fences and signs that are considered necessary will continue to be maintained. Those considered not necessary will be removed.
- The Site will continue road-grading activities in Rock Creek Reserve to maintain roads and continue control of noxious weeds. The Site will minimize the width of road grading to protect prairie habitat while balancing fire control needs.
- The Site will continue to control off-road vehicle traffic.

Options Considered But Not Selected

All, or most, of the roads and fences could be removed. This would create a lack of access for those doing land rehabilitation measures, monitoring and research, causing severe negative impacts. Another option is that no roads and fences would be removed and rehabilitated, resulting in continued fragmentation of the prairie, and avenues for noxious weeds to invade and spread.

4.6.2 Fire Management Including Prescribed Fire

Wildfires at the Site, including Rock Creek Reserve, have been suppressed for many years. As a result, plant litter (dead plant material) has built up in most areas of the grasslands. This plant litter causes a number of management problems. Plant litter shades and stifles prairie plants when the accumulation builds too high, affecting the viability of such dominant species as big bluestem, little bluestem, mountain muhley, and others. This affects the viability of the xeric tallgrass prairie, mesic grasslands, and even wetlands. The thatch buildup also provides a heavy fuel load that can carry a prairie wildfire at a dangerous rate across open lands.

Grasslands at the Site evolved under conditions where fires periodically swept across the prairie every five to ten years on average. Fire is an important tool in prairie management and maintenance through removal of thatch and recycling of nutrients. Fires stimulate the growth and vigor of prairie species by releasing nutrients into the soil making them available to plants.

Prescribed Burning

The Proposed Prescribed Burn Annual Rotation Plan for RFETS (Kaiser-Hill) has been developed and submitted to CDPHE (June 30, 2000). It is based on the Vegetation Management Environmental Assessment and Annual Vegetation Management Plan and will be implemented across the Site, including Rock Creek Reserve. The U.S. Forest Service is a cooperating agency implementing prescribed burns, and specific burn plans are developed for each prescribed burn in accordance with U.S. Forest Service requirements.

Prescribed burning (fires set intentionally as part of a fire plan, a specific set of requirements and prescribed weather conditions) can be used to rejuvenate overgrown habitats, reduce fuel loads, and reduce the chance of an uncontrolled wildfire. The greater the fuel load, the hotter the fire, and (1) the greater the potential of environmental damage and (2) the more rapid spread of a wildfire to either the industrial area or neighboring lands.

Neighboring local governments, including Jefferson County and Boulder County, routinely use prescribed burning. Site environmental documents note prescribed burning is recommended for a number of highly beneficial, previously described, purposes. However, many area residents are concerned about the possibility that fires in the Buffer Zone, including Rock Creek Reserve, could spread contamination.

DOE has a limited number of rangeland fire-fighting vehicles, and the current policy is to aggressively suppress unplanned fires using the Rocky Flats Fire Department, and if necessary, support services from local fire districts, under mutual aid agreements. Mutual aid agreements with local fire districts are designed to specifically support the Site during emergencies, not prescribed burns. However, depending on the availability of local departments, these departments may be able to support the Site in conducting prescribed burning. In general, fire suppression equipment would be provided by the agency contracted to conduct the prescribed burn, in accordance with the approved burn plan. The Vegetation Management Environmental Assessment describes the planned use of fire and other management tools. It also describes the alternatives in more detail and the impacts from each alternative.

Preferred Action: No Action

- Wildfires on Rock Creek Reserve will continue to be suppressed in accordance with existing policy and mutual aid agreements.
- Prescribed burning will be used on Rock Creek Reserve, in accordance with the approved Annual Vegetation Management Plan and Vegetation Management Environmental Assessment.
- Data from the 2000 prescribed test burn on the southwestern portion of Rocky Flats will be used to determine potential impacts to human health, identify potential erosion problems, and to identify benefits to the Site plant communities.
- All prescribed burning that could affect Preble's meadow jumping mouse will be done after consultation with the Service.
- All prescribed burns will include public notification, as well as, application and receipt of a burn permit from CDPHE. The Site will conduct pre-burn environmental sampling and air monitoring during the burns as appropriate to the areas involved.

Options Considered But Not Selected

Options to introduce wild or domestic grazers such as cattle, sheep, bison were considered in an effort to effectively manage prairie plant and weed species. This alternative to prescribed fire would require intensive management including herding, fences, drift fences, electric fences, stock water sources and salt licks. Without this intensive management, damage to riparian areas and Preble's mouse habitat is likely to occur. Without intensive management, these grazers would use and damage riparian vegetation. Rocky Flats is not staff equipped or funded to implement this option. The proposed future uses of Rock Creek Reserve are not compatible with this option.

An option to use goats to control undesirable vegetation and to reduce litter was considered. For example, goats will eat noxious weeds if confined to small areas of noxious weed monocultures, but they will not selectively choose most of these weeds over more desirable native forbs. Goat browsing, like the grazing option described above, requires intensive management, such as herding and fencing. The pervasive weed and litter problem in Rock Creek Reserve is extensive, and not isolated to certain areas. To control undesirable vegetation in Rock Creek Reserve many goats would be required. This option is not consistent with the intended use of the Rock Creek Reserve for native species. Rocky Flats is not staffed, equipped or funded to implement this alternative. The potential for damage to riparian and other sensitive plant communities exists with this option.

4.7 SOCIOECONOMICS

There are no known socioeconomic issues associated with Rock Creek Reserve management for the duration of this Plan. This section describes the public use parameters that will be in effect for the duration of this Plan. Expansion of the Rock Creek Reserve, public use studies, and contaminants studies are presented as proposed actions here based on their relationship to public use. Although this Plan does not contain figures for monetary value for preserving natural resources associated with Rock Creek Reserve, there are studies that attempt to establish those values. There are both tangible and intangible values to surrounding communities for having adjacent, or nearby, open space lands.

4.7.1 Public Use

Notwithstanding necessary restrictions during active closure, it is DOE's desire that as many areas of the site ultimately be made available for public use and public education as possible, consistent with maintaining the ecological resources. DOE has asked that the Service evaluate the amount and type of public access that the land and resources will bear as part of the Service's ongoing cooperative management of Rock Creek Reserve. All reasonable alternatives for public use will be discussed with the local communities and community preferences for public use will be sought prior to opening the Site for public access. Rocky Flats Mission Considerations in relation to public access is discussed in Section 3.7.2.

Proposed Action

- Continue with the existing management policy for public tours and visits for the life of this Plan.
- Analyze public visitation options for post-closure through an Access and Recreation Study. This

study will analyze the impacts of recreation and become the basis for recommendations on public access compatible with the future use of the land.

- Conduct contaminants sampling and analysis to support a potential National Wildlife Refuge designation. This will help comply with Service requirements through incorporation of a Service Level III contaminants study to identify potential contamination in Rock Creek Reserve. This will be prepared in cooperation with the Service's Environmental Contaminants Division. The Service's Level III portion of the study will be accomplished by the Service.
- Expand Rock Creek Reserve to 1700 acres (Fig. 2).

Options Considered But Not Selected

For the intended life of this Plan, there are no other options that are applicable. Continued need for a safety and security buffer zone by Rocky Flats requires continued limitation of public access until nuclear material is removed. In addition, the existence of a federally-listed, threatened species will continue to require protection of the habitat. If conditions warrant, or Congress mandates it, the area could become part of the USFWS Refuge System. If refuge designation occurs, management direction may change to meet the needs of the Refuge System. These options cannot be analyzed at this time since the future use of the Site has not been decided, and current restrictions are in place. Public comments have mainly focused on hiking and horse trails through the site. These will be analyzed in the Access and Recreation Study to be initiated under the Proposed Action.

No Action

No action would not allow for the study and planning of future public access to the Site and contaminants studies. This would not be conducive to good public access management decisions. Not expanding the boundaries of Rock Creek Reserve would not allow for good watershed management techniques since only part of the watershed would be included in the Rock Creek Reserve (see Section 1.3.2 for a more detailed analysis).

5.0 ENVIRONMENTAL CONSEQUENCES

This Section expands on some of the environmental impacts briefly analyzed in the alternatives discussion throughout the Plan. The Plan incorporates by reference the Rocky Flats Environmental Technology Site Vegetation Management Environmental Assessment. Impacts from vegetation management practices are analyzed within that document, and it provides the impact analyses for many of the actions described within this Plan. Nothing in this Plan is to be interpreted as a diminishment of the policies, programs and projects as outlined in that EA.

As discussed in Section 1.3.2 of this document, three alternatives are considered:

- The “**proposed actions**” with implementation of the Plan.
- The “**options considered but not selected**” alternative, which discusses management strategies considered but not selected for inclusion within the Plan.
- The “**no action**” alternative. No action is the continuation of existing management practices.

The preferred (proposed) action is sometimes not a new proposal, but may be the continuance of a current management practice, or “no action” and is designated as such throughout the Plan under the heading ***Preferred Action: No Action***. For example, in much of the inventory and monitoring section the no action alternative (current monitoring program) is the preferred action.

The proposed action alternatives would not have long-term negative environmental consequences compared to existing conditions. The “options considered but not selected” alternatives could have a wide range of environmental consequences, ranging from positive to negative on various components of the Rock Creek Reserve environment. In some cases, the alternatives differ significantly in their ability to proactively manage natural resources, support the Rocky Flats mission, and comply with environmental laws.

The “options considered but not selected” discussion in this section also includes the “no action” alternative in cases where “no action” is not the preferred alternative. This is done for brevity and to simplify the discussions.

The Plan provides guidelines for managing natural resources, and describes actions designed to maintain and improve Rock Creek Reserve’s native, natural resources. The Plan describes preferred options that allow flexibility in management that will be exercised as more information becomes available.

5.1 ROCK CREEK RESERVE BOUNDARY EXPANSION

Proposed Action

One of the actions proposed in this Plan is the expansion of the boundaries of Rock Creek Reserve to include most of the Rock Creek watershed. The watershed encompasses approximately 1500 acres, most of which occur on the Site. The proposed boundary expansion would bring the total acreage of Rock Creek Reserve from 800 acres to 1700 acres (Fig. 2). The Service supports this proposed action. The other proposed management options in this Plan will not change with the implementation of the boundary

expansion. This Plan is not a watershed management plan. The intent is to protect, restore and conserve native species. Changing the boundary of the Rock Creek Reserve helps to do this by making a more definable land unit by incorporating natural and manmade boundary lines such as drainage features, topographical features and roads. The proposed boundary expansion does not include any known contaminated areas or eligible archaeological or historic sites. The proposed boundary expansion includes additional easements and structures, to include a never-used landfill with pond and support facility.

Options Considered But Not Selected

The Rock Creek Reserve proposed boundary expansion could have encompassed a wide range of acres and different boundary configurations. Contaminated areas were not considered for inclusion in Rock Creek Reserve. Range managers and wildlife biologists selected the best option based on the potential for contamination, and on an ecological approach. A general watershed approach was desired, and inclusion of as much of the tall grass prairie as practicable. Applying management practices to a better-defined land management unit allows a more unified approach, rather than managing fragments of habitat with no discernible boundaries. The No Action alternative would provide a more fragmented approach, since accessible areas of the watershed and adjoining sections of tall grass prairie would not be included in Rock Creek Reserve.

5.2 TOPOGRAPHY, PHYSIOGRAPHY, GEOLOGY AND SOILS

Proposed Action

The proposed action includes an existing integrated program for the planning of land maintenance and protection of soils through the management of vegetation. Brief periods of increased erosion could occur during land maintenance and rehabilitation activities (such as prescribed burning), but these would be insignificant compared to the erosion control benefits of enhancing native vegetation. There may be slight increases in erosion during bare ground aspects of rehabilitation of roads and other projects which disturb the soil, but the plan includes provisions to minimize erosion during and following these actions such as soil stabilization using structures and vegetation. The proposed action has evolved over years of active and successful management at Rocky Flats.

Options Considered But Not Selected

Other options could range from intensive erosion control programs that would provide relatively good soils protection to virtually no erosion control or damage prevention. Erosion, however, is not a major issue at this time on Rock Creek Reserve. Options in the Proposed Action will control limited areas of erosion that were identified in the tall upland shrubland areas. Most are aimed more at prevention than erosion repair. Construction of erosion control dams could have a greater impact than the current erosion. This would also impact a federal threatened species, the Preble's meadow jumping mouse found in Rock Creek riparian areas. Negative effects on Rock Creek Reserve's soils (and associated vegetation) would be greater using other options than under the proposed action.

5.3 WATER RESOURCES

Proposed Action

Implementing the monitoring described in the Plan will not have a negative impact on the environment. It could have a very positive impact if potential problems are identified and subsequently mitigated. Monitoring water quantity and quality is not a legal requirement on Rock Creek Reserve, as it is within the other two watersheds that occur on the Site. Exploring the feasibility of obtaining water rights gives land managers a wider array of options for management of water quantity in the future, an option which could become necessary for protection of a federal-listed, threatened species, such as the Preble's meadow jumping mouse.

Options Considered But Not Selected

Other options range from doing nothing to intensive monitoring and testing of the groundwater and surface water of Rock Creek. The No Action alternative could result in negative impacts, going undetected, therefore causing harm to the Preble's meadow jumping mouse, and other native animal and plant species.

5.4 AIR QUALITY

Preferred Action: No Action

No negative long-term impacts would occur from implementation of the proposed actions. Air quality monitoring and management are currently done as determined by law and specific agreements between Rocky Flats and the regulatory agencies. Monitoring less than the existing level would result in noncompliance with State and federal law. Increased monitoring would be unnecessary as the current level of monitoring is based on statistical requirements for accuracy. Continued reclamation of roads and bare areas will further reduce the likelihood of PM-10 and TSP generation as fugitive dust.

Options Considered But Not Selected

Negative environmental impacts would not result from enhanced air quality projects, such as using dust suppressants (that have been assessed for impacts to vegetation and water) on roads, prohibiting traffic or no implementation of occasional prescribed burns. Prohibiting all traffic is not a viable alternative. Access is necessary for environmental programs and maintenance activities. Traffic is already kept to a minimum and is strictly controlled in the Buffer Zone, including Rock Creek Reserve.

5.5 BIOLOGICAL RESOURCES/ VEGETATION AND FAUNA

Proposed Action

The proposed action would provide management of faunal and vegetation resources on Rock Creek Reserve on an integrated basis. The Plan uses an ecosystem management strategy to achieve biological

diversity conservation. It emphasizes the use of native species and the monitoring and control of invasive species, as emphasized in the Presidential memorandum to the heads of federal agencies (Office of the President, 1994) and Executive Order 13112, Invasive Species. The Plan incorporates biodiversity principles and analyzes impacts to biodiversity as outlined in the Council on Environmental Quality's 1993 report entitled Incorporating Biodiversity Considerations Into Environmental Impact Analysis Under the National Environmental Policy Act. Implementation of this Plan will have positive effects on the biodiversity of Rock Creek Reserve.

The plan includes specific actions to inventory, monitor, and manage the watershed and semi-arid ecosystem of Rock Creek Reserve, including wildlife habitat, native species introductions, protection of increasingly rare native plant communities, and an integrated approach to noxious weed management. These programs include monitoring a variety of plants and animals, wetlands protection, prairie ecosystem management to maintain and improve wildlife habitat, and means to detect and reduce impacts to surface waters.

This Plan incorporates by reference the Rocky Flats Environmental Technology Site Vegetation Management Environmental Assessment. Impacts from vegetation management practices are analyzed within that document, and it provides the impact analysis for many of the actions analyzed within this Plan. Nothing in this Plan is to be interpreted as a diminishment of the policies, programs and projects as outlined in that EA.

Some proposed actions with the potential for short-term negative impacts, or public concern are analyzed further here. These are:

Introduction of native species and removal of non-natives- Public concern for the potential for protected species to migrate off federal lands on to private lands has been raised. Introducing the Plains sharp-tailed grouse would not require Endangered Species Act coordination since the species is not federally-listed or being considered for listing. Establishment of these sensitive species, especially on lands that will remain open space in perpetuity, helps to avoid future federal listing by increasing their numbers and survival rates. The species is State listed as endangered, but is considered abundant in other states. The introduction would only occur after successful habitat restoration (decreasing the noxious weeds to an acceptable level) and enhancement of the native prairie. The DOW would be the lead agency in the introduction and would most likely use Rock Creek Reserve as one part of a region wide effort to establish the grouse. Although Rock Creek Reserve alone (or even the entire Site) would not afford enough habitat to establish viable populations, the connected acreage devoted to open space in this area may make the project more feasible. Introductions will be discussed and studied (availability of lek sites, predation, weed control, etc.), and the option to do so if an introduction plan is developed was desirable for this Plan.

Introduction of sensitive, native fish species- None of the native fish species proposed for introduction into the Rock Creek Reserve are being considered for federal listing. Establishing these species in more areas could help preclude listing in the future, and make more individuals available for transplant to other areas. Although the habitat in Rock Creek Reserve is considered marginal by Site ecologists and on the edge of the species' range, the loss of the core habitat areas in Colorado is one of the factors that have pushed the species to State listing. Because of the loss of core habitat area, habitat on the periphery if the species range usually holds the remaining populations, and are usually the potential sites for early

restoration work. Both species proposed for introduction into Lindsay Pond are listed by the State of Colorado.

The long-term survival of bass and other aquatic species within the Lindsay Pond indicates that the site is capable of supporting fish populations. The presence of aquatic vegetation in Lindsay Pond also indicates that siltation events are usually of limited duration. Since floods and siltation are normal for foothill streams, most native fish are better adapted to flood and siltation events than the largemouth bass population. Larger sites than Lindsay Pond are desired, but as long as a species is sensitive and not a game fish, there is reluctance to allow the introduction of protected species due to regulatory concerns. Although the site is small, it is one of the few sites identified to date for possible restoration of native non-game fish species. This site has several benefits, such as isolation from non-native fish populations that could repopulate the area, and a lack of pressure to maintain a sport fishery at the site.

Predation from pelicans and cormorants could have a short-term impact until the fish population is well-established. Native Colorado fish are adapted to bird predation, but they are not adapted to predation from largemouth bass. The proposed action to remove the non-native largemouth bass and introduce native fish species will also benefit native bird species, as well as other native species over the long-term. The existing vegetation around the edge and throughout the bottom of the pond provides sufficient cover to maintain small fish species such as darters and dace.

Methods of non-native fish removal and impacts on non-target species- The purpose of the proposed action is to remove non-native largemouth bass. The bass have a long-term negative impact upon all native fish, amphibians, invertebrates and possibly some bird species. There are two EPA approved chemicals for the removal of fish within the United States. These two compounds are rotenone (powdered and liquid formulations) and antimycin (Fintrol). Rotenone is derived from the root of a South American plant, and is most often used for large fish restoration projects, with an application rate of 0.5 to 3.0 ppm. Antimycin is an antibiotic, and is effective in waters of low pH. Due to the expense of antimycin, it is most often used for smaller alpine trout restoration projects and the removal of sunfish from commercial catfish ponds at the rate of 2 to 10 ppb. An approved Fish Restoration Plan, and a Fish Control Permit must be obtained from the DOW prior to start of the project. The restoration plan would address the existing water quality, chemical best suited for the site, species salvage, time of application, duration of chemical contact, neutralization and restocking. At the legal application rate, impacts to mammals are highly unlikely. A 150 lb. person would have to ingest from 5 to 70 lbs. of Rotenone dust for mortality to occur. Due to the low application rates of antimycin, and low toxicity of antibiotics to mammals, there would be little impact to mammals from application up to 10 ppb. However, both fish control compounds and potassium permanganate (a neutralizer used in conjunction with control chemicals) can have short-term impacts to amphibians and invertebrates, within the legal application rates. To offset this impact, sensitive species are collected and set aside in a refugium during the fish control project and returned to the area after the chemical has been neutralized with potassium permanganate. Impacts to non-target species are also controlled by treating at times of the year when there are the fewest numbers of sensitive aquatic-dependent forms, and limiting the concentration and contact time of the chemical. The short-term impacts from the rotenone/antimycin projects are off-set by the long-term benefits to native species from the removal of non-native species.

Introduction of federally-listed plant species- Two species considered in the Plan for introduction to Rock Creek Reserve are the Ute Ladies' Tresses Orchid and the Colorado Butterfly Plant. These plants would

only be introduced after a successful noxious weed control effort that would provide healthy and stable habitat for these plants. Plants will not be considered for introduction if weed control measures are ongoing in suitable (without weeds) areas. Introductions would only be accomplished as part of an approved USFWS Recovery Plan for the species. The purpose of Recovery Plans is to increase a federally-listed species' numbers within populations and/or number of populations to a point where they can be de-listed. Introduction of the species would benefit the species in the long-term and provide for a greater diversity of native species in Rock Creek Reserve. Input from the public goes into the development of Recovery Plans.

Increased biological control of noxious weeds- Although it may seem contradictory to import exotic species into an area when so much emphasis is on removal of non-native species, in the case of biological control it is considered necessary. When exotic plants enter the United States, their natural enemies are usually left behind. This lack of natural suppression allows the exotics to out-compete our native plants resulting in expansive monocultures of the invaders. When these invaders are aggressive, hard to control, pose a health risk to humans or livestock, or are considered to cause economic injury, they are listed as "noxious weeds" by federal and state agencies. Current laws mandate control of these weeds on both public and private lands. Biological control is one weapon used to fight noxious weeds. Unlike other control methods, biological control is self-sustaining, does not introduce toxic chemicals into the environment, is less labor intensive and less costly in the long-term. A well-planned program consists of releases into protective cages and/or open field releases, monitoring of baseline conditions, redistribution of established colonies, monitoring for results and feasibility studies. Although there are generally no short-term impacts from biological control, issues have been raised as to potential negative long-term impacts on non-target species. To date, data does not show significant negative impacts to native plants from any insect species released intentionally for weed biological control. The insects released as part of the proposed action in the Plan have all been released elsewhere in Colorado, have shown success in establishment and control, and have all been approved for release by USDA/APHIS and the Colorado Department of Agriculture. Each species undergoes a rigorous host screening process under starvation parameters before it is allowed for release in the United States. Only species that are shown to be specific for the target plant under study conditions are chosen for releases. Sometimes the insect will feed on plants within the genus of the target plant only when the target plant is not available. An example is *Rhinocyllus conicus*, a small weevil that was released in the 1960's and 1970's for control of musk thistle. That beetle has been observed on sensitive native thistles. Significant negative impacts to native thistles have not been quantified to date. *R. conicus* was known, however, to be a generalist (feeding on several plant species) when it was approved for release on musk thistle. Since then many environmental laws have been passed (NEPA, ESA) that make the approval for release of generalist species with a wide host range in the United States highly unlikely. Some beneficial species have been accidentally introduced into the United States along with their weed host species. The benefits of biological control of a given weed species must be considered to outweigh the risks of the insect species feeding on sensitive native plants. If this risk is considered acceptable, the insect species will be used in the program. Displacement of sensitive native species by noxious weeds, and the potential for common plants to become increasingly rarer because of noxious weeds is considered to be a greater risk than impacts from approved biological control agents.

Options Considered But Not Selected

Management options selected within the Plan are the result of years of on-the-ground research, monitoring and management of biological resources in the Rocky Flats Buffer Zone as well as consultations with local, regional, and federal natural resources management professionals. The Plan package represents the best recommendations of Rocky Flats natural resources personnel as well as those of cooperating partner agencies.

The other options, as a total package, would likely produce a lesser degree of ecosystem-wide benefits or be detrimental to some biological resources. Below are a few examples of “options considered but not selected” and their likely effects:

- Rock Creek Reserve could be managed with no monitoring of natural resources, which has the potential for ecological harm to the Rock Creek Reserve by allowing potential impacts to go undetected. This would not meet stewardship goals, support biological diversity, or satisfy requirements of threatened and endangered species management.
- Rock Creek Reserve could be managed for production of game species. This could reduce biological diversity, especially those species that require unique habitats.
- Rock Creek Reserve’s fish species could be managed for the existing, non-native species which occur there now, with no removal of exotics or introductions of species native to the area. This would not support biodiversity, a primary goal of this Plan.
- Land managers could manage exotic invasive species on Rock Creek Reserve without the benefit of enhanced integrated pest management strategies. This has the potential to reduce biological diversity in the long run and would be detrimental to native species of vegetation through continued reliance on chemical control.
- Expansion of the Rock Creek Reserve boundary could be configured differently, or not changed at all. This would not provide for the ecosystem management unit approach, and would promote management of fragmented habitats.

The “options considered but not selected” alternative would likely produce a less-balanced effect on biological resources than the proposed action. However, the degree of effect would be dependent upon objectives of natural resources management and the degree of implementation applied.

This alternative sometimes would emphasize reaction to problems rather than a proactive approach to natural resources management. This approach would emphasize site-specific responses to environmental compliance. Additional studies, surveys and monitoring of natural resources, and long term programs, would be lower priority. A reaction-to-problems approach would probably achieve compliance with laws and agreements, but it would not provide as many benefits to biological resources. Species level management would promote management of one or a few species, and could cause harm, or neglect of others. Examples include predator control, plantings of specific host plants, and habitat enhancement efforts targeting only limited areas. This could have a negative impact on predator/prey relationships, distribution of native plants and communities and create artificial habitats that would require intensive management to maintain.

The “no action” alternative is preferred in some cases. Where it is not, no action could result in lack of information for good decision making, such as no monitoring for water quantity or quality, or data to help formulate access and recreation plans. No action could lessen biodiversity goals if the reintroduction of native wildlife species is not accomplished. No action would not allow for the enhancement of the biological control of certain noxious weeds, and continue or increase the reliance on herbicide use.

5.6 CULTURAL RESOURCES

Preferred Action: No Action

The proposed implementation of the Plan is consistent with existing cultural resources protection policy as documented in the CRMP, and as required by law. The Plan includes steps to protect cultural resources that may be discovered on Rock Creek Reserve during implementation of this plan. Ground-disturbing natural resources projects have the potential to uncover sites even in surveyed areas. The review of potential eligible sites by an archaeologist and the NEPA process are used to ensure protection of known and potential cultural resources while implementing the Plan. Study and possible stabilization of all or part of the Lindsay Ranch will not affect cultural or other resources and could preserve a locally recognized point of interest. Activities undertaken in Preble’s meadow jumping mouse habitat will undergo review by the Service, and all other management policies protecting natural resources will be complied with.

Options Considered But Not Selected

DOE must comply with laws and policies related to protection of cultural resources. Other options for monitoring and inventorying would be to conduct more in depth surveys than required by law, e.g., subsurface testing (testing below the surface for buried cultural deposits before a project is implemented). This option is not necessary since the CRMP identifies the Buffer Zone as a low-density (low probability) area for cultural resources. These options could negatively impact subsurface cultural deposits that otherwise may have been left unharmed. Other options would not apply in this case since Rocky Flats has undergone archaeological surveys and historic assessments for the entire Site.

5.7 LAND AND INFRASTRUCTURE MAINTENANCE

Preferred Action: No Action

Implementation of the proposed actions would have no long-term negative environmental impacts, and some short-term negative impacts (dust, erosion) could result. Positive impacts would result from the control of noxious weeds, removal of fences and rehabilitation of roads and trails. Working with off-site land managers to cooperate in land maintenance activities would continue to be beneficial. As part of the Annual Vegetation Management Plan, prescribed burning and use of herbicides have been environmentally assessed in accordance with NEPA and a Finding of No Significant Impact was published.

Options Considered But Not Selected

Other options such as too widespread or too frequent use of fire, and no use of fire have the potential for negative environmental impacts in both the short term and long term. Cultural sites could be damaged. Special status and other sensitive species could be at risk and erosion could increase from the large areas impacted and/or the frequency of the burning. Increased herbicide use could cause ecological damage through the cumulative effects on non-target species. No use of fire would remove a very important tool proven to benefit prairie species from the land manager's available options.

5.8 SOCIOECONOMICS

Proposed Action

Based on the reception of primarily positive comments regarding the formation and expansion of Rock Creek Reserve, it is anticipated that the existence and management of Rock Creek Reserve is socially and economically acceptable to the surrounding communities. Rock Creek Reserve was created as a natural protected area to preserve valuable plant communities and wildlife, and although it is not open to unlimited public access, it serves many of the functions similar to surrounding open space areas, such as: viewshed values, buffer between developed areas and protection of environmental features. It has been shown through many public comments on proposed land developments, allocation of taxes for land purchases, and general uses of the open space land for recreation, that the general public places great value on preserving large tracts of land for those purposes.

No negative impacts to the socioeconomics of the area result from this Plan. Public access above the current level is not applicable for Rock Creek Reserve for the life of this Plan. Positive impacts will result from the initiation of an Access and Recreation Study and contaminants studies to ensure the future use of the land and public access will be integrated with environmental goals and consider public health. The Access and Recreation Study will be a compilation of data that will help make decisions in the future for the kinds of public access, frequency, best areas, etc. to better plan public access with ecological goals in mind. Access could range from none to full access depending on the location and use of the land at that time. Easement holders will not be affected by this Plan. Impacts from easements will not change since easement holders are required to adhere to DOE procedures and follow the limitations specified in each individual easement. It is the responsibility of the easement holder to comply with applicable federal, State and local laws.

Expansion of the boundary of Rock Creek Reserve will result in positive impacts as discussed in Section 5.1.

Options Considered But Not Selected

For the intended life of this Plan, there are no other options that are applicable. Continued need for a safety buffer zone by Rocky Flats requires continued limitation of public access until nuclear material is removed. In addition, the existence of a federally-listed, threatened species will continue to require protection of the habitat. If conditions warrant, or Congress mandates it, the area could become part of the

USFWS Refuge System. If refuge designation occurs, management direction may change to meet the needs of the Refuge program. These options cannot be analyzed at this time since the future use of the Site has not been decided, and current restrictions are in place. Public comments have mainly focused on hiking and horse trails through the site. These will be analyzed in the study to be initiated under the Proposed Action. “No action” would not allow for the study and planning of future public access to the Site and contaminants studies. This would not be conducive to good public access management decisions. Not expanding the boundaries of Rock Creek Reserve would not allow for good watershed management techniques since only part of the watershed would be included in the Rock Creek Reserve as described in Sections 1.3.2 and 5.1.

5.9 ENVIRONMENTAL JUSTICE

Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low Income Populations, directs federal agencies to identify and address, as appropriate, disproportionately high and adverse human health or environmental impacts of their program, policies, and activities on minority or low-income populations in the surrounding community. This assessment has not identified any adverse or beneficial effects unique to minority or low-income populations in the affected area.

5.10 IRREVERSIBLE, IRRETRIEVABLE COMMITMENT OF RESOURCES

No irreversible or irretrievable commitment of resources is part of this Plan. The intent of this Plan is to conserve and protect natural resources to the fullest extent possible given Site mission considerations and funding levels.

5.11 CUMULATIVE IMPACTS

A cumulative impact is defined in 40 CFR Section 1508.7 as “the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions.” The location of the Rock Creek Reserve is discussed in detail in Section 2.1.1.

Surrounding land for the Reserve includes open space, highways, private mining activities, the National Wind Technology Center, Rocky Flats buffer zone, and the Rocky Flats industrial area. There are a variety of activities occurring on those lands with associated impacts to the environment. Implementation of this management plan is not expected to result in incremental impacts to these surrounding lands, or the Rock Creek Reserve; therefore the negative cumulative impacts will not be increased from the level currently existing.

Past practices both on-site and off-site have contributed to noxious weed invasions and introductions of non-native fish species. Positive cumulative impacts should result over time from implementation of the Plan. Noxious weed control efforts using increased biological and other non-chemical means should help control weeds with less dependence on herbicides. The spread of increased numbers and species of biological control agents will benefit the entire region. Introductions of native species will help restore the

biodiversity of those ecosystems. Preble’s meadow jumping mouse continued conservation and habitat protection could have positive cumulative impacts by contributing to the recovery efforts that could lead to possible de-listing of the mouse in the future.

The management of Rock Creek Reserve’s natural resources now will help ensure the future quality of these lands, and cumulatively maintaining the availability of high quality natural resources for the Front Range. This management will produce a positive cumulative impact.

SUMMARY OF IMPACTS

Figure: 11

Section	Negative Impacts	Positive Impacts
Boundary Expansion	None	<ul style="list-style-type: none"> • Provide a more definable unit (watershed) for an ecosystem management approach.
Topography, Physiographic, Geology, and Soils	<ul style="list-style-type: none"> • Minimal short-term erosion from road maintenance activities. 	<ul style="list-style-type: none"> • Use of water bars, etc. to control water flows on, or across, roads will reduce associated soil erosion. • Re-seeding with native grass species along roads where maintenance has exposed bare soils will reduce soil erosion. • Implementation of vegetation management (fire, herbicides) as analyzed in the Vegetation Management Environmental Assessment will provide long-term

		benefits.
Water Resources	<ul style="list-style-type: none"> • Short-term impacts may occur from vehicle access to monitoring well sites if soil erosion occurs or gasoline spills occur and enter the stream channels. 	<ul style="list-style-type: none"> • Selected increased monitoring of surface and groundwater will assist in earlier detection of impacts from adjacent activities. • Monitoring of seep and spring flows will assist in early detection of flow reduction which could impact vegetation and fauna species. • Determination of minimum flows necessary to support the habitat will provide positive affects on habitat management planning activities.
Air Quality	<ul style="list-style-type: none"> • Soils bared by road maintenance activities could produce short-term impacts from wind erosion until reclamation is completed. • Short-term impacts could occur from prescribed burning activities, however these have been analyzed in the Vegetation Management Environmental Assessment which would apply to the Rock Creek Reserve. 	<ul style="list-style-type: none"> • Reclamation of bare soil areas and implementation of activities analyzed in the Vegetation Management Environmental Assessment (prescribed burning, herbicide application) will provide long-term benefits through maintenance of a robust native vegetation cover.
Biological Resources	<ul style="list-style-type: none"> • Short-term impacts 	<ul style="list-style-type: none"> • Long-term positive

	<p>would occur with the removal of bass from Lindsay Pond, however introduction of native species such as the northern Redbelly Dace will be a positive long-term benefit to the ecosystem.</p>	<p>effects occur from maintaining a current Vegetation inventory and library so species composition changes can be noted as a reflection of the ecosystem health.</p> <ul style="list-style-type: none"> • Continuation of periodic specific surveys for Ute Ladies Tresses Orchid and Butterfly Weed will provide a benefit of early detection if they do naturally occur. • Long-term benefits, as analyzed in the Vegetation Management Environmental Assessment, for the native vegetation & fauna arise from aggressive noxious weed control. • Long and short-term benefits occur from selective use of prescribed burning on the vigor of native plant communities and uncontrolled fire hazard situations. • Removal of unnecessary roads and fences will be a long-term benefit as it lessens the fragmentation of the grasslands. It
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		<p>reduces the amount of bare soils where erosion can occur and noxious weeds become established.</p> <ul style="list-style-type: none"> • Increased use of approved biological controls on selected weed species in conjunction with other, more short-term control efforts, will have a long-term positive effect on the plant communities. • Installation of bat houses will be a benefit to assist in establishing a stable regional population of bats. • Installation of nesting boxes for blue birds will benefit the region-wide stabilization of those bird populations. • Monitoring and maintenance of water and vegetation resources will provide long-term protection for the federally listed Preble's Meadow Jumping Mouse. • Coordination with the Colorado DOW for introduction of species such as the Plains Sharp-tailed grouse could broaden the existing range of
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		these species and provide greater population stability.
Cultural Resources	<ul style="list-style-type: none"> • Short-term impacts may occur from stabilization processes involving the Lindsay Ranch (vehicle and foot traffic, construction material storage, etc.) 	<ul style="list-style-type: none"> • A long-term benefit may result from possible stabilization of Lindsay Ranch structures through coordination with interested stakeholders.
Lands & Infrastructure Maintenance	None	<ul style="list-style-type: none"> • Noxious weed control, road maintenance, fence and road removal will provide positive benefits to the natural resources.
Socioeconomics	None	<ul style="list-style-type: none"> • Initiation of an Access and Recreation Study, coordinated with local groups and governments, will result in public trail routes and options available on a regional basis to facilitate public use. In addition, it will define access needs for easement holders such as, water ditches and power lines.
Environmental Justice	None	None

6.0 CONCLUSIONS

The Department of Energy and the U.S. Fish and Wildlife Service should implement an Integrated Natural Resource Management Plan for Rock Creek Reserve located in the Buffer Zone at the Rocky Flats Environmental Technology Site for the period 2001-2006 (or until closure) to manage natural resources, as well as to support the Rocky Flats cleanup and closure mission, and compliance with various environmental laws. Full implementation of the plan will also ensure the continued quality of Rock Creek Reserve's natural resources for the ultimate re-use and land ownership decisions yet to be made.

Implementing the Rock Creek Reserve Integrated Natural Resources Management Plan would not result in detrimental impacts. Minor adverse impacts on wildlife habitat will be mitigated by full implementation of restorative and proactive wildlife management provisions in the Plan. Implementing the Plan would provide beneficial impacts to soil, water, and biological resources, including federally-listed, threatened and endangered species. Implementation would allow the DOE and USFWS to manage the natural resources of Rock Creek Reserve in an effective manner to meet current and future conservation needs.

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LIST OF APPENDICES

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- 11 Biological Opinion for Rock Creek INRMP

FAMILY	SCINAME96
ACERACEAE	<i>Acer glabrum</i> Torr.
ACERACEAE	<i>Acer negundo</i> L. var. <i>interius</i> (Britt.) Sarg.
AGAVACEAE	<i>Yucca glauca</i> Nutt.
ALISMATACEAE	<i>Alisma trivale</i> Pursh
ALISMATACEAE	<i>Sagittaria latifolia</i> Willd.
AMARANTHACEAE	<i>Amaranthus albus</i> L.
AMARANTHACEAE	<i>Amaranthus retroflexus</i> L.
ANACARDIACEAE	<i>Rhus aromatica</i> Ait. var. <i>trilobata</i> (Nutt.) A. Gray
ANACARDIACEAE	<i>Toxicodendron rydbergii</i> (Small) Greene
APIACEAE	<i>Berula erecta</i> (Huds.) Cov. var. <i>incisum</i>
APIACEAE	<i>Cicuta maculata</i> L. var. <i>angustifolia</i> Hook.
APIACEAE	<i>Conium maculatum</i> L.
APIACEAE	<i>Daucus carota</i> L.
APIACEAE	<i>Harbouria trachypleura</i> (Gray) C. & R.
APIACEAE	<i>Heracleum sphondylium</i> L. ssp. <i>montanum</i> (Schleich.) Briq.
APIACEAE	<i>Ligusticum porteri</i> C. & R.
APIACEAE	<i>Lomatium orientale</i> Coult. & Rose
APIACEAE	<i>Musineon divaricatum</i> (Pursh.) Nutt. var. <i>hookeri</i> T. & G.
APIACEAE	<i>Osmorhiza chiliensis</i> H. & A.
APIACEAE	<i>Osmorhiza longistylis</i> (Torr.) DC var. <i>longistylis</i>
APOCYNACEAE	<i>Apocynum androsaemifolium</i> L.
APOCYNACEAE	<i>Apocynum cannabinum</i> L.
ASCLEPIADACEAE	<i>Asclepias incarnata</i> L.
ASCLEPIADACEAE	<i>Asclepias pumila</i> (Gray) Vail
ASCLEPIADACEAE	<i>Asclepias speciosa</i> Torr.
ASCLEPIADACEAE	<i>Asclepias stenophylla</i> A. Gray
ASCLEPIADACEAE	<i>Asclepias viridiflora</i> Raf.
ASTERACEAE	<i>Achillea millefolium</i> L. ssp. <i>lanulosa</i> (Nutt.) Piper
ASTERACEAE	<i>Agoseris glauca</i> (Pursh.) Dietr.
ASTERACEAE	<i>Ambrosia artemisiifolia</i> L.
ASTERACEAE	<i>Ambrosia psilostachya</i> DC.
ASTERACEAE	<i>Ambrosia trifida</i> L.
ASTERACEAE	<i>Antennaria microphylla</i> Rydb.
ASTERACEAE	<i>Antennaria parvifolia</i> Nutt.
ASTERACEAE	<i>Anthemis cotula</i> L.
ASTERACEAE	<i>Arctium minus</i> Bernh.
ASTERACEAE	<i>Arnica fulgens</i> Pursh.
ASTERACEAE	<i>Artemisia campestris</i> L. ssp. <i>caudata</i> (Michx.) Hall & Clem.
ASTERACEAE	<i>Artemisia dracunculus</i> L.
ASTERACEAE	<i>Artemisia frigida</i> Willd.
ASTERACEAE	<i>Artemisia ludoviciana</i> Nutt. var. <i>ludoviciana</i>
ASTERACEAE	<i>Aster falcatus</i> Lindl.
ASTERACEAE	<i>Aster fendleri</i> A. Gray
ASTERACEAE	<i>Aster hesperius</i> A. Gray var. <i>hesperius</i>
ASTERACEAE	<i>Aster laevis</i> L. var. <i>geyeri</i> A. Gray
ASTERACEAE	<i>Aster porteri</i> Gray
ASTERACEAE	<i>Bidens cernua</i> L.
ASTERACEAE	<i>Bidens frondosa</i> L.
ASTERACEAE	<i>Carduus nutans</i> L. ssp. <i>macrolepis</i> (Peters.) Kazmi
ASTERACEAE	<i>Centaurea diffusa</i> Lam.
ASTERACEAE	<i>Centaurea repens</i> L.

ASTERACEAE *Chrysanthemum leucanthemum* L.
 ASTERACEAE *Chrysopsis fulcrata* Greene
 ASTERACEAE *Chrysopsis villosa* Pursh.
 ASTERACEAE *Chrysothamnus nauseosus* (Pall.) Britt. ssp. *graveolens* (Nutt.) Piper
 ASTERACEAE *Chrysothamnus nauseosus* (Pall.) Britt. ssp. *nauseosus*
 ASTERACEAE *Cichorium intybus* L.
 ASTERACEAE *Cirsium arvense* (L.) Scop.
 ASTERACEAE *Cirsium flodmanni* (Rydb.) Arthur
 ASTERACEAE *Cirsium ochrocentrum* A. Gray
 ASTERACEAE *Cirsium undulatum* (Nutt.) Spreng.
 ASTERACEAE *Cirsium vulgare* (Savi) Ten.
 ASTERACEAE *Conyza canadensis* (L.) Cronq.
 ASTERACEAE *Crepis occidentalis* Nutt.
 ASTERACEAE *Crepis runcinata* (James) T. & G.
 ASTERACEAE *Dyssodia papposa* (Vent) Hitchc.
 ASTERACEAE *Erigeron canus* A. Gray
 ASTERACEAE *Erigeron compositus* Pursh var. *dicoideus* A. Gray
 ASTERACEAE *Erigeron divergens* T. & G.
 ASTERACEAE *Erigeron flagellaris* A. Gray
 ASTERACEAE *Erigeron pumilus* Nutt.
 ASTERACEAE *Erigeron speciosa* (Lindl.) DC. var. *macranthus* (Nutt.) Cronq.
 ASTERACEAE *Erigeron strigosus* Muhl. ex Willd.
 ASTERACEAE *Erigeron vetensis* Rydb.
 ASTERACEAE *Gaillardia aristata* Pursh.
 ASTERACEAE *Gnaphalium chilense* Spreng.
 ASTERACEAE *Grindelia squarrosa* (Pursh.) Dun.
 ASTERACEAE *Gutierrezia sarothrae* (Pursh.) Britt. & Rusby
 ASTERACEAE *Happlopappus spinulosus* (Pursh) DC.
 ASTERACEAE *Helianthus annuus* L.
 ASTERACEAE *Helianthus ciliaris* DC.
 ASTERACEAE *Helianthus maximiliani* Schrad.
 ASTERACEAE *Helianthus nuttallii* T. & G.
 ASTERACEAE *Helianthus petiolaris* Nutt.
 ASTERACEAE *Helianthus pumilus* Nutt.
 ASTERACEAE *Helianthus rigidus* (Cass.) Desf. ssp. *subrhomboideus* (Rydb.) Heiser
 ASTERACEAE *Heliomeris multiflora* Nuttall
 ASTERACEAE *Hymenopappus filifolius* Hook. var. *cinereus* (Rydb.) I. M. Johnst.
 ASTERACEAE *Iva axillaris* Pursh.
 ASTERACEAE *Iva xanthifolia* Nutt.
 ASTERACEAE *Kuhnia chlorolepis* Woot. & Standl.
 ASTERACEAE *Kuhnia eupatorioides* L.
 ASTERACEAE *Lactuca oblongifolia* Nutt.
 ASTERACEAE *Lactuca serriola* L.
 ASTERACEAE *Leucelene ericoides* (Torr.) Greene
 ASTERACEAE *Liatris punctata* Hook.
 ASTERACEAE *Machaeranthera bigelovii* (Gray) Greene
 ASTERACEAE *Machaeranthera canescens* (Pursh) A. Gray
 ASTERACEAE *Microseris cuspidata* (Pursh.) Sch. Bip.
 ASTERACEAE *Onopordum acanthium* L.
 ASTERACEAE *Picradeniopsis oppositifolia* (Nutt.) Rydb.
 ASTERACEAE *Ratibida columnifera* (Nutt.) Woot. & Standl.
 ASTERACEAE *Rudbeckia ampla* Nelson

ASTERACEAE	<i>Scorzonera laciniata</i> L.
ASTERACEAE	<i>Senecio fendleri</i> Gray
ASTERACEAE	<i>Senecio integerrimus</i> Nutt.
ASTERACEAE	<i>Senecio plattensis</i> Nutt.
ASTERACEAE	<i>Senecio spartioides</i> T. & G.
ASTERACEAE	<i>Senecio tridenticulatus</i> Rydb.
ASTERACEAE	<i>Solidago canadensis</i> L.
ASTERACEAE	<i>Solidago gigantea</i> Ait.
ASTERACEAE	<i>Solidago missouriensis</i> Nutt.
ASTERACEAE	<i>Solidago mollis</i> Bart.
ASTERACEAE	<i>Solidago nana</i> Nutt.
ASTERACEAE	<i>Solidago rigida</i> L.
ASTERACEAE	<i>Sonchus arvensis</i> L. ssp. <i>uglinosus</i> (Bieb.) Nyman
ASTERACEAE	<i>Sonchus asper</i> (L.) Hill
ASTERACEAE	<i>Stephanomeria pauciflora</i> (Torr.) A. Nels.
ASTERACEAE	<i>Taraxacum laevigatum</i> (Willd.) DC.
ASTERACEAE	<i>Taraxacum officinale</i> Weber
ASTERACEAE	<i>Thelesperma megapotanicum</i> (Spreng.) O. Ktze.
ASTERACEAE	<i>Townsendia grandiflora</i> (Nutt.)
ASTERACEAE	<i>Townsendia hookeri</i> Beaman
ASTERACEAE	<i>Tragopogon dubius</i> Scop.
ASTERACEAE	<i>Tragopogon porrifolius</i> L.
ASTERACEAE	<i>Xanthium strumarium</i> L.
BERBERIDACEAE	<i>Berberis repens</i> Lindl.
BETULACEAE	<i>Alnus incana</i> (L.) Moench ssp. <i>tenuifolia</i> (Nuttall) Breitung
BETULACEAE	<i>Betula occidentalis</i> Hook.
BORAGINACEAE	<i>Asperugo procumbens</i> L.
BORAGINACEAE	<i>Cryptantha virgata</i> (Porter) Payson
BORAGINACEAE	<i>Cynoglossum officinale</i> L.
BORAGINACEAE	<i>Hackelia floribunda</i> (Lehm.) I. M. Johnst.
BORAGINACEAE	<i>Lappula redowskii</i> (Hornem.) Greene
BORAGINACEAE	<i>Lithospermum incisum</i> Lehm.
BORAGINACEAE	<i>Lithospermum multiflorum</i> Torr.
BORAGINACEAE	<i>Mertensia lanceolata</i> (Pursh.) A. DC.
BORAGINACEAE	<i>Onosmodium molle</i> Michx. var. <i>occidentale</i> (Mack.) Johnst.
BORAGINACEAE	<i>Plagiobothrys scouleri</i> (H. & A.) I. M. Johnst.
BRASSICACEAE	<i>Alyssum alyssoides</i> (L.) L.
BRASSICACEAE	<i>Alyssum minus</i> (L.) Rothmaler var. <i>micranthus</i> (C. A. Mey.) Dudley
BRASSICACEAE	<i>Arabis fendleri</i> (S. Wats.) Greene var. <i>fendleri</i>
BRASSICACEAE	<i>Arabis glabra</i> (L.) Bernh.
BRASSICACEAE	<i>Arabis hirsuta</i> (L.) Scop. var. <i>pynocarpa</i> (Hopkins) Rollins
BRASSICACEAE	<i>Barbarea vulgaris</i> R. Br.
BRASSICACEAE	<i>Camelina microcarpa</i> Andrzej. ex DC.
BRASSICACEAE	<i>Capsella bursa-pastoris</i> (L.) Medic.
BRASSICACEAE	<i>Cardaria chalepensis</i> (L.) Hand-Mazz
BRASSICACEAE	<i>Cardaria draba</i> (L.) Desv.
BRASSICACEAE	<i>Chorispora tenella</i> (Pall.) DC.
BRASSICACEAE	<i>Conringia orientalis</i> (L.) Dum.
BRASSICACEAE	<i>Descurainia pinnata</i> (Walt.) Britt.
BRASSICACEAE	<i>Descurainia richardsonii</i> (Sweet) Schultz
BRASSICACEAE	<i>Descurainia sophia</i> (L.) Webb ex Prantl.
BRASSICACEAE	<i>Draba nemorosa</i> L.

BRASSICACEAE	<i>Draba reptans</i> (Lam.) Fern.
BRASSICACEAE	<i>Erysimum capitatum</i> (Nutt.) DC.
BRASSICACEAE	<i>Erysimum repandum</i> L.
BRASSICACEAE	<i>Hesperis matronalis</i> L.
BRASSICACEAE	<i>Lepidium campestre</i> (L.) R. Br.
BRASSICACEAE	<i>Lepidium densiflorum</i> Schrad.
BRASSICACEAE	<i>Lesquerella montana</i> (A. Gray) Wats.
BRASSICACEAE	<i>Nasturtium officinale</i> R. Br.
BRASSICACEAE	<i>Physaria vitulifera</i> Rydb.
BRASSICACEAE	<i>Rorippa palustris</i> (L.) Bess. ssp. <i>hispida</i> (Desv.) Jonsell
BRASSICACEAE	<i>Sisymbrium altissimum</i> L.
BRASSICACEAE	<i>Thlaspi arvense</i> L.
CACTACEAE	<i>Coryphantha missouriensis</i> (Sweet) Britt. & Rose
CACTACEAE	<i>Echinocereus viridiflorus</i> Engelm.
CACTACEAE	<i>Opuntia fragilis</i> (Nutt.) Haw.
CACTACEAE	<i>Opuntia macrorhiza</i> Engelm.
CACTACEAE	<i>Opuntia polyacantha</i> Haw.
CACTACEAE	<i>Pediocactus simpsonii</i> (Engelm.) Britt. & Rose
CALLITRICHACEAE	<i>Callitriche verna</i> L.
CAMPANULACEAE	<i>Campanula rotundifolia</i> L.
CAMPANULACEAE	<i>Lobelia siphilitica</i> L. var. <i>ludoviciana</i> A. DC.
CAMPANULACEAE	<i>Triodanis leptocarpa</i> (Nutt.) Nieuw.
CANNABACEAE	<i>Humulus lupulus</i> L. var. <i>lupuloides</i> E. Small
CAPPERACEAE	<i>Polansia dodecandra</i> (L.) DC. ssp. <i>trachysperma</i> (T. & G.) Iltis
CAPRIFOLIACEAE	<i>Symphoricarpos occidentalis</i> Hook.
CAPRIFOLIACEAE	<i>Symphoricarpos oreophilus</i> Gray
CAPRIFOLIACEAE	<i>Viburnum opulus</i> L. var. <i>americanum</i> Ait
CARYOPHYLLACEAE	<i>Arenaria fendleri</i> A. Gray
CARYOPHYLLACEAE	<i>Cerastium arvense</i> L.
CARYOPHYLLACEAE	<i>Cerastium brachypodum</i> (Engelm. ex A. Gray) Robins.
CARYOPHYLLACEAE	<i>Cerastium vulgatum</i> L.
CARYOPHYLLACEAE	<i>Conosilene conica</i> (L.) Fourreau ssp. <i>conoidea</i> (L.) Love & Kjellqvist
CARYOPHYLLACEAE	<i>Paronychia jamesii</i> T. & G.
CARYOPHYLLACEAE	<i>Saponaria officinalis</i> L.
CARYOPHYLLACEAE	<i>Silene antirrhina</i> L.
CARYOPHYLLACEAE	<i>Silene drummondii</i> Hook.
CARYOPHYLLACEAE	<i>Silene pratensis</i> (Raf.) Godr. & Gren
CARYOPHYLLACEAE	<i>Spergularia rubra</i> (L.) K. Presl.
CARYOPHYLLACEAE	<i>Stellaria longifolia</i> Muhl. ex Willd.
CARYOPHYLLACEAE	<i>Vaccaria pyramidata</i> Medic.
CERATOPHYLLACEAE	<i>Ceratophyllum demersum</i> L.
CHENOPODIACEAE	<i>Atriplex canescens</i> (Pursh.) Nutt.
CHENOPODIACEAE	<i>Chenopodium album</i> L.
CHENOPODIACEAE	<i>Chenopodium atrovirens</i> Nutt.
CHENOPODIACEAE	<i>Chenopodium berlandieri</i> Moq.
CHENOPODIACEAE	<i>Chenopodium botrys</i> L.
CHENOPODIACEAE	<i>Chenopodium denticatum</i> A. Nels.
CHENOPODIACEAE	<i>Chenopodium fremontii</i> S. Wats.
CHENOPODIACEAE	<i>Chenopodium leptophyllum</i> Nutt. ex Moq.
CHENOPODIACEAE	<i>Chenopodium overi</i> Aellen
CHENOPODIACEAE	<i>Kochia scoparia</i> (L.) Schrad.
CHENOPODIACEAE	<i>Salsola iberica</i> Senn. & Pau.

CLUSIACEAE	<i>Hypericum majus</i> (A. Gray) Britt.
CLUSIACEAE	<i>Hypericum perforatum</i> L.
COMMELINACEAE	<i>Tradescantia occidentalis</i> (Britt.) Smyth
CONVOLVULACEAE	<i>Calystegia macouni</i> (Greene) Brummitt
CONVOLVULACEAE	<i>Calystegia sepium</i> (L.) R. Br. ssp. <i>angulata</i> Brummitt
CONVOLVULACEAE	<i>Convolvulus arvensis</i> L.
CONVOLVULACEAE	<i>Evolvulus nuttallianus</i> R. & S.
CRASSULACEAE	<i>Sedum lanceolatum</i> Torr.
CUPRESSACEAE	<i>Juniperus communis</i> L.
CUPRESSACEAE	<i>Juniperus scopulorum</i> Sarg.
CUSCUTACEAE	<i>Cuscuta approximata</i> Bab.
CYPERACEAE	<i>Carex athrostachya</i> Olney
CYPERACEAE	<i>Carex aurea</i> Nutt.
CYPERACEAE	<i>Carex bebbii</i> (Bailey) Fern
CYPERACEAE	<i>Carex brevior</i> (Dew.) Mack. ex Lunell.
CYPERACEAE	<i>Carex douglasii</i> F. Boott.
CYPERACEAE	<i>Carex eleocharis</i> Bailey
CYPERACEAE	<i>Carex emoryi</i> Dew.
CYPERACEAE	<i>Carex filifolia</i> Nutt.
CYPERACEAE	<i>Carex heliophila</i> Mack.
CYPERACEAE	<i>Carex hystericina</i> Muhl. ex Willd.
CYPERACEAE	<i>Carex interior</i> Bailey
CYPERACEAE	<i>Carex lanuginosa</i> Michx.
CYPERACEAE	<i>Carex nebrascensis</i> Dew.
CYPERACEAE	<i>Carex oreocharis</i> Holm.
CYPERACEAE	<i>Carex praegracilis</i> W. Boott.
CYPERACEAE	<i>Carex rostrata</i> Stokes ex Willd.
CYPERACEAE	<i>Carex scoparia</i> Schkuhr. ex Willd.
CYPERACEAE	<i>Carex simulata</i> Mack.
CYPERACEAE	<i>Carex stipata</i> Muhl.
CYPERACEAE	<i>Carex vulpinoidea</i> Michx.
CYPERACEAE	<i>Eleocharis acicularis</i> (L.) R. & S.
CYPERACEAE	<i>Eleocharis compressa</i> Sulliv.
CYPERACEAE	<i>Eleocharis macrostachya</i> Britt.
CYPERACEAE	<i>Eleocharis parvula</i> Link ex Boff. & Fingerbr. var. <i>anachaeta</i> (Torr.) Svens.
CYPERACEAE	<i>Scirpus acutus</i> Muhl.
CYPERACEAE	<i>Scirpus pallidus</i> (Britt.) Fern
CYPERACEAE	<i>Scirpus pungens</i> Vahl
CYPERACEAE	<i>Scirpus validus</i> Vahl.
ELAEAGNACEAE	<i>Elaeagnus angustifolia</i> L.
EQUISETACEAE	<i>Equisetum arvense</i> L.
EQUISETACEAE	<i>Equisetum laevigatum</i> A. Br.
EQUISETACEAE	<i>Equisetum variegatum</i> Schleich.
EUPHORBIACEAE	<i>Euphorbia dentata</i> Michx.
EUPHORBIACEAE	<i>Euphorbia fendleri</i> T. & G.
EUPHORBIACEAE	<i>Euphorbia marginata</i> Pursh.
EUPHORBIACEAE	<i>Euphorbia robusta</i> (Engelm.) Small
EUPHORBIACEAE	<i>Euphorbia serpyllifolia</i> Pers.
EUPHORBIACEAE	<i>Euphorbia spathulata</i> Lam.
EUPHORBIACEAE	<i>Tragia ramosa</i> Nutt.
FABACEAE	<i>Amorpha fruticosa</i> L.
FABACEAE	<i>Amorpha nana</i> Nutt.

FABACEAE	<i>Astragalus adsurgens</i> Pall. var. <i>robustior</i> Hook.
FABACEAE	<i>Astragalus agrestis</i> Dougl. ex G. Don
FABACEAE	<i>Astragalus bisulcatus</i> (Hook.) A. Gray
FABACEAE	<i>Astragalus canadensis</i> L.
FABACEAE	<i>Astragalus crassicaulus</i> Nutt.
FABACEAE	<i>Astragalus drummondii</i> Dougl. ex Hook.
FABACEAE	<i>Astragalus flexuosus</i> (Hook.) G. Don
FABACEAE	<i>Astragalus lotiflorus</i> Hook.
FABACEAE	<i>Astragalus shortianus</i> Nutt. ex T.&G.
FABACEAE	<i>Astragalus spathulatus</i> Sheld.
FABACEAE	<i>Astragalus tridactylus</i> Gray
FABACEAE	<i>Coronilla varia</i> L.
FABACEAE	<i>Dalea candida</i> Michx. ex Willd. var. <i>oligophylla</i> (Torr.) Shinners.
FABACEAE	<i>Dalea purpurea</i> Vent
FABACEAE	<i>Glycyrrhiza lepidota</i> Pursh.
FABACEAE	<i>Lathyrus eucosmus</i> Butters and St. John
FABACEAE	<i>Lotus corniculatus</i> L.
FABACEAE	<i>Lupinus argenteus</i> Pursh ssp. <i>ingratus</i> (Greene) Harmon
FABACEAE	<i>Lupinus argenteus</i> Pursh var. <i>argenteus</i>
FABACEAE	<i>Medicago lupulina</i> L.
FABACEAE	<i>Medicago sativa</i> L. ssp. <i>sativa</i>
FABACEAE	<i>Melilotus alba</i> Medic.
FABACEAE	<i>Melilotus officinalis</i> (L.) Pall.
FABACEAE	<i>Oxytropis lambertii</i> Pursh.
FABACEAE	<i>Psoralea tenuiflora</i> Pursh.
FABACEAE	<i>Robinia pseudo-acacia</i> L.
FABACEAE	<i>Thermopsis rhombifolia</i> var. <i>divaricarpa</i> (Nels.) Isely
FABACEAE	<i>Trifolium hybridum</i> L.
FABACEAE	<i>Trifolium pratense</i> L.
FABACEAE	<i>Trifolium repens</i> L.
FABACEAE	<i>Vicia americana</i> Muhl. ex Willd.
FUMARIACEAE	<i>Fumaria vaillantii</i> Lois
GENTIANACEAE	<i>Gentiana affinis</i> Griseb.
GENTIANACEAE	<i>Swertia radiata</i> (Kell.) O. Ktze.
GERANIACEAE	<i>Erodium cicutarium</i> (L.) L'Her.
GERANIACEAE	<i>Geranium caespitosum</i> James ssp. <i>caespitosum</i>
GROSSULARIACEAE	<i>Ribes aureum</i> Pursh
GROSSULARIACEAE	<i>Ribes cereum</i> Dougl.
GROSSULARIACEAE	<i>Ribes inerme</i> Rydb.
HALORAGACEAE	<i>Myriophyllum exalbescens</i> Fern.
HYDROPHYLLACEAE	<i>Hydrophyllum fendleri</i> (Gray) Heller
HYDROPHYLLACEAE	<i>Phacelia heterophylla</i> Pursh.
IRIDACEAE	<i>Iris missouriensis</i> Nutt.
IRIDACEAE	<i>Sisyrinchium montanum</i> Greene
JUNCACEAE	<i>Juncus articulatus</i> L.
JUNCACEAE	<i>Juncus balticus</i> Willd.
JUNCACEAE	<i>Juncus bufonius</i> L.
JUNCACEAE	<i>Juncus dudleyi</i> Wieg.
JUNCACEAE	<i>Juncus ensifolius</i> Wikst. var. <i>montanus</i> (Englm.) C. L. Hitchc.
JUNCACEAE	<i>Juncus interior</i> Wieg.
JUNCACEAE	<i>Juncus longistylis</i> Torr.
JUNCACEAE	<i>Juncus nodosus</i> L.

JUNCACEAE	<i>Juncus torreyi</i> Cov.
JUNCACEAE	<i>Juncus tracyi</i> Rydb.
LAMIACEAE	<i>Dracocephalum parviflorum</i> Nutt.
LAMIACEAE	<i>Hedeoma hispidum</i> Pursh.
LAMIACEAE	<i>Lycopus americanus</i> Muhl. ex Barton
LAMIACEAE	<i>Lycopus asper</i> Greene
LAMIACEAE	<i>Marrubium vulgare</i> L.
LAMIACEAE	<i>Mentha arvensis</i> L.
LAMIACEAE	<i>Monarda fistulosa</i> L. var. <i>mentifolia</i> (Grah.) Fern.
LAMIACEAE	<i>Monarda pectinata</i> Nutt.
LAMIACEAE	<i>Nepeta cataria</i> L.
LAMIACEAE	<i>Prunella vulgaris</i> L.
LAMIACEAE	<i>Salvia reflexa</i> Hornem.
LAMIACEAE	<i>Scutellaria brittonii</i> Porter
LAMIACEAE	<i>Stachys palustris</i> L. ssp. <i>pilosa</i> (Nutt.) Epling
LEMNACEAE	<i>Lemna minor</i> L.
LILIACEAE	<i>Allium cernuum</i> Roth
LILIACEAE	<i>Allium geyeri</i> S. Wats.
LILIACEAE	<i>Allium textile</i> A. Nels. & Macbr.
LILIACEAE	<i>Asparagus officinalis</i> L.
LILIACEAE	<i>Calochortus gunnisonii</i> S. Wats.
LILIACEAE	<i>Leucocrinum montanum</i> Nutt.
LILIACEAE	<i>Smilacina stellata</i> (L.) Desf.
LILIACEAE	<i>Zigadenus venenosus</i> Wats. var. <i>gramineus</i> (Rydb.) Walsh ex Peck
LINACEAE	<i>Linum perenne</i> L. var. <i>lewisii</i> (Pursh.) Eat. & Wright
LINACEAE	<i>Linum pratense</i> (Nort.) Small
LYTHRACEAE	<i>Ammania robusta</i> Herr & Regel.
LYTHRACEAE	<i>Lythrum alatum</i> Pursh.
MALVACEAE	<i>Malva neglecta</i> Wallr.
MALVACEAE	<i>Sidalcea candida</i> Gray
MALVACEAE	<i>Sidalcea neomexicana</i> Gray
MALVACEAE	<i>Sphaeralcea coccinea</i> (Pursh.) Rydb.
NYCTAGINACEAE	<i>Mirabilis hirsuta</i> (Pursh.) MacM.
NYCTAGINACEAE	<i>Mirabilis linearis</i> (Pursh.) Heimerl
NYCTAGINACEAE	<i>Mirabilis nyctaginea</i> (Michx.) MacM.
ONAGRACEAE	<i>Calylophus serrulatus</i> (Nutt.) Raven
ONAGRACEAE	<i>Epilobium ciliatum</i> Raf. ssp. <i>glandulosum</i> (Lehm.) Hock & Raven
ONAGRACEAE	<i>Epilobium paniculatum</i> Nutt.
ONAGRACEAE	<i>Gaura coccinea</i> Pursh.
ONAGRACEAE	<i>Gaura parviflora</i> Dougl.
ONAGRACEAE	<i>Oenothera flava</i> (A. Nels.) Garrett
ONAGRACEAE	<i>Oenothera howardii</i> (A. Nels.) W. L. Wagner
ONAGRACEAE	<i>Oenothera villosa</i> Thunb. ssp. <i>strigosa</i> (Rydb.) Dietrich & Raven
ORCHIDACEAE	<i>Habenaria hyperborea</i> (L.) R. Br.
OROBANCHACEAE	<i>Orobanche fasciculata</i> Nutt.
OXALIDACEAE	<i>Oxalis dillenii</i> Jacq.
PAPAVERACEAE	<i>Argemone polyanthemus</i> (Fedde) G. Ownbey
PINACEAE	<i>Picea pungens</i> Engelm.
PINACEAE	<i>Pinus ponderosa</i> Laws
PINACEAE	<i>Pseudotsuga menziesii</i> (Mirb.) Franco
PLANTAGINACE	<i>Plantago lanceolata</i> L.
PLANTAGINACE	<i>Plantago major</i> L.

PLANTAGINACE	<i>Plantago patagonica</i> Jacq.
POACEAE	<i>Aegilops cylindrica</i> Host
POACEAE	<i>Agropyron caninum</i> (L.) Beauv. ssp. <i>majus</i> (Vasey) C. L. Hitchc.
POACEAE	<i>Agropyron cristatum</i> (L.) Gaertn.
POACEAE	<i>Agropyron dasystachyum</i> (Hook.) Scribn.
POACEAE	<i>Agropyron desertorum</i> (Fisch.) Schult.
POACEAE	<i>Agropyron elongatum</i> (Host) Beauv.
POACEAE	<i>Agropyron griffithsii</i> Scribn. & Smith
POACEAE	<i>Agropyron intermedium</i> (Host) Beauv.
POACEAE	<i>Agropyron repens</i> (L.) Beauv.
POACEAE	<i>Agropyron smithii</i> Rydb.
POACEAE	<i>Agropyron spicatum</i> (Pursh) Scribn. and Sm.
POACEAE	<i>Agrostis scabra</i> Willd.
POACEAE	<i>Agrostis stolonifera</i> L.
POACEAE	<i>Alopecurus geniculatus</i> L.
POACEAE	<i>Andropogon gerardii</i> Vitman
POACEAE	<i>Andropogon scoparius</i> Michx.
POACEAE	<i>Apera interrupta</i> (L.) Beauvois
POACEAE	<i>Aristida basiramea</i> Engelm. ex Vasey var. <i>basiramea</i>
POACEAE	<i>Aristida purpurea</i> Nutt. var. <i>longiseta</i> (Steud.) Vasey
POACEAE	<i>Aristida purpurea</i> Nutt. var. <i>robusta</i> (Merrill) A. Holmgren & N. Holmgr
POACEAE	<i>Avena fatua</i> var. <i>sativa</i> (L.) Hausskn.
POACEAE	<i>Bouteloua curtipendula</i> (Michx.) Torr.
POACEAE	<i>Bouteloua gracilis</i> (H. B. K.) Lag ex Griffiths
POACEAE	<i>Bouteloua hirsuta</i> Lag
POACEAE	<i>Bromus briziformis</i> F. & M.
POACEAE	<i>Bromus inermis</i> Leyss. ssp. <i>inermis</i>
POACEAE	<i>Bromus japonicus</i> Thunb. ex Murr.
POACEAE	<i>Bromus tectorum</i> L.
POACEAE	<i>Buchloe dactyloides</i> (Nutt.) Engelm.
POACEAE	<i>Calamagrostis stricta</i> (Timm.) Koel
POACEAE	<i>Cenchrus longispinus</i> (Hack.) Fern
POACEAE	<i>Ceratochloa marginata</i> (Nees ex Stued.) Jackson
POACEAE	<i>Dactylis glomerata</i> L.
POACEAE	<i>Danthonia spicata</i> (L.) Beauv. ex R. & S.
POACEAE	<i>Dichanthelium linearifolium</i> (Scribn.) Gould
POACEAE	<i>Dichanthelium oligosanthos</i> (Schultz) Gould var. <i>scribnerianum</i> (Nash) G
POACEAE	<i>Digitaria sanguinalis</i> (L.) Scop.
POACEAE	<i>Echinochloa crusgallii</i> (L.) Beauv.
POACEAE	<i>Elymus canadensis</i> L.
POACEAE	<i>Elymus juncea</i> Fisch.
POACEAE	<i>Eragrostis cilianensis</i> (All.) E. Mosher
POACEAE	<i>Eragrostis curvula</i> (Schrad.) Nees
POACEAE	<i>Eragrostis pilosa</i> (L.) Beauv.
POACEAE	<i>Festuca octoflora</i> Walt.
POACEAE	<i>Festuca ovina</i> L. var. <i>rydbergii</i> St. Yves
POACEAE	<i>Festuca pratensis</i> Huds.
POACEAE	<i>Glyceria grandis</i> S. Wats. ex A. Gray
POACEAE	<i>Glyceria striata</i> (Lam.) Hitchc.
POACEAE	<i>Hordeum brachyantherum</i> Nevski
POACEAE	<i>Hordeum jubatum</i> L.
POACEAE	<i>Koeleria pyramidata</i> (Lam.) Beauv.

POACEAE	<i>Leersia oryzoides</i> (L.) Sw.
POACEAE	<i>Lolium perenne</i> L. var. <i>aristatum</i> Willd.
POACEAE	<i>Lolium perenne</i> L. var. <i>perenne</i>
POACEAE	<i>Muhlenbergia asperifolia</i> (Nees. & Mey.) Parodi
POACEAE	<i>Muhlenbergia filiformis</i> (Thurb.) Rydb.
POACEAE	<i>Muhlenbergia montana</i> (Nutt.) Hitchc.
POACEAE	<i>Muhlenbergia racemosa</i> (Michx.) B. S. P.
POACEAE	<i>Muhlenbergia wrightii</i> Vasey
POACEAE	<i>Oryzopsis hymenoides</i> (R. & S.) Ricker
POACEAE	<i>Panicum capillare</i> L.
POACEAE	<i>Panicum virgatum</i> L.
POACEAE	<i>Phalaris arundinacea</i> L.
POACEAE	<i>Phleum pratense</i> L.
POACEAE	<i>Phragmites australis</i> (Cav.) Trin. ex Steud.
POACEAE	<i>Poa bulbosa</i> L.
POACEAE	<i>Poa canbyi</i> (Scribn.) Piper
POACEAE	<i>Poa compressa</i> L.
POACEAE	<i>Poa fendleriana</i> (Steud.) Vasey
POACEAE	<i>Poa juncifolia</i> Scribn.
POACEAE	<i>Poa palustris</i> L.
POACEAE	<i>Poa pratensis</i> L.
POACEAE	<i>Polypogon monspeliensis</i> (L.) Desf.
POACEAE	<i>Schedonnardus paniculatus</i> (Nutt.) Trel.
POACEAE	<i>Secale cereale</i> L.
POACEAE	<i>Setaria viridis</i> (L.) Beauv.
POACEAE	<i>Sitanion hystrix</i> (Nutt.) Sm. var. <i>brevifolium</i> (Sm.) Hitchc.
POACEAE	<i>Sorghastrum nutans</i> (L.) Nash
POACEAE	<i>Spartina pectinata</i> Link
POACEAE	<i>Sphenopholis obtusata</i> (Michx.) Scribn.
POACEAE	<i>Sporobolus asper</i> (Michx.) Kunth
POACEAE	<i>Sporobolus cryptandrus</i> (Torr.) A. Gray
POACEAE	<i>Sporobolus heterolepis</i> (A. Gray) A. Gray
POACEAE	<i>Sporobolus neglectus</i> Nash
POACEAE	<i>Stipa comata</i> Trin. & Rupr.
POACEAE	<i>Stipa neomexicana</i> (Thur.) Scribn.
POACEAE	<i>Stipa spartea</i> Trinius
POACEAE	<i>Stipa viridula</i> Trin.
POACEAE	<i>Triticum aestivum</i> L.
POACEAE	X <i>Agrohordeum macounii</i> (Vasey) Lepage
POLEMONIACEAE	<i>Collomia linearis</i> Nutt.
POLEMONIACEAE	<i>Gilia ophthalmoides</i> Brand. ssp. <i>clokeyi</i> (Mason) A. & V. Grant
POLEMONIACEAE	<i>Ipomopsis spicata</i> (Nutt.) V. Grant ssp. <i>spicata</i>
POLEMONIACEAE	<i>Microsteris gracilis</i> (Hook.) Greene
POLEMONIACEAE	<i>Navarretia minima</i> Nutt.
POLYGONACEAE	<i>Eriogonum alatum</i> Torr.
POLYGONACEAE	<i>Eriogonum effusum</i> Nutt.
POLYGONACEAE	<i>Eriogonum jamesii</i> Benth.
POLYGONACEAE	<i>Eriogonum umbellatum</i> Torr.
POLYGONACEAE	<i>Polygonum arenastrum</i> Jord. ex Bor.
POLYGONACEAE	<i>Polygonum convolvulus</i> L.
POLYGONACEAE	<i>Polygonum douglasii</i> Greene
POLYGONACEAE	<i>Polygonum hydropiper</i> L.

POLYGONACEAE	<i>Polygonum lapathifolium</i> L.
POLYGONACEAE	<i>Polygonum pensylvanicum</i> L.
POLYGONACEAE	<i>Polygonum persicaria</i> L.
POLYGONACEAE	<i>Polygonum ramosissimum</i> Michx.
POLYGONACEAE	<i>Polygonum sawatchense</i> Small
POLYGONACEAE	<i>Rumex acetosella</i> L.
POLYGONACEAE	<i>Rumex crispus</i> L.
POLYGONACEAE	<i>Rumex maritimus</i> L.
POLYGONACEAE	<i>Rumex obtusifolius</i> L.
POLYGONACEAE	<i>Rumex salicifolius</i> Weinm. ssp. <i>triangulivalvis</i> Danser
POLYPODIACEAE	<i>Cystopteris fragilis</i> (L.) Bernh.
PORTULACACEAE	<i>Claytonia rosea</i> Rydb.
PORTULACACEAE	<i>Portulaca oleracea</i> L.
PORTULACACEAE	<i>Talinum parviflorum</i> Nutt.
POTAMOGETONACEAE	<i>Potamogeton foliosus</i> Raf.
POTAMOGETONACEAE	<i>Potamogeton natans</i> L.
PRIMULACEAE	<i>Androsace occidentalis</i> Pursh.
PRIMULACEAE	<i>Dodecatheon pulchellum</i> (Raf.) Merrill
PRIMULACEAE	<i>Lysimachia ciliata</i> L.
RANUNCULACEAE	<i>Anemone cylindrica</i> A. Gray
RANUNCULACEAE	<i>Anemone patens</i> L.
RANUNCULACEAE	<i>Clematis hirsutissima</i> Pursh
RANUNCULACEAE	<i>Clematis ligusticifolia</i> Nutt.
RANUNCULACEAE	<i>Delphinium nuttalianum</i> Pritz. ex Walpers
RANUNCULACEAE	<i>Delphinium virescens</i> Nutt. ssp. <i>penardii</i> (Huth) Ewan
RANUNCULACEAE	<i>Myosurus minimus</i> L.
RANUNCULACEAE	<i>Ranunculus macounii</i> Britt.
RANUNCULACEAE	<i>Ranunculus scleratus</i> L.
RANUNCULACEAE	<i>Ranunculus trichophyllus</i> Chaix
RANUNCULACEAE	<i>Thalictrum dasycarpum</i> Fisch. & Ave-Lall
RHAMNACEAE	<i>Ceanothus fendleri</i> A. Gray
RHAMNACEAE	<i>Ceanothus herbaceus</i> Raf. var. <i>pubescens</i> (T. & G.)
ROSACEAE	<i>Agrimonia striata</i> Michx.
ROSACEAE	<i>Amelanchier alnifolia</i> Nutt.
ROSACEAE	<i>Crataegus erythropoda</i> Ashe
ROSACEAE	<i>Crataegus succulenta</i> Link var. <i>occidentalis</i> (Britton) E. J. Palm.
ROSACEAE	<i>Geum aleppicum</i> Jacq.
ROSACEAE	<i>Geum macrophyllum</i> Willd.
ROSACEAE	<i>Physocarpus monogynus</i> (Torr.) Coult.
ROSACEAE	<i>Physocarpus opulifolius</i> (L.) Raf.
ROSACEAE	<i>Potentilla arguta</i> Pursh
ROSACEAE	<i>Potentilla fissa</i> Nutt.
ROSACEAE	<i>Potentilla gracilis</i> Dougl. ex Hook. var. <i>glabrata</i> (Lehm.) C. L. Hitchc.
ROSACEAE	<i>Potentilla hippiana</i> Lehm.
ROSACEAE	<i>Potentilla norvegica</i> L.
ROSACEAE	<i>Potentilla paradoxa</i> Nutt.
ROSACEAE	<i>Potentilla pensylvanica</i> L.
ROSACEAE	<i>Potentilla pulcherrima</i> x <i>hippiana</i>
ROSACEAE	<i>Potentilla rivalis</i> Nutt.
ROSACEAE	<i>Prunus americana</i> Marsh.
ROSACEAE	<i>Prunus pumila</i> L. var. <i>besseyi</i> (Bailey) Gl.
ROSACEAE	<i>Prunus virginiana</i> L. var. <i>melanocarpa</i> (A. Nels.) Sarg.

ROSACEAE	<i>Pyrus malus</i> L.
ROSACEAE	<i>Rosa acicularis</i> Lindl.
ROSACEAE	<i>Rosa arkansana</i> Porter
ROSACEAE	<i>Rosa woodsii</i> Lindl.
ROSACEAE	<i>Rubus deliciosus</i> Torr.
ROSACEAE	<i>Rubus idaeus</i> L. ssp. <i>sachalinensis</i> (Levl.) Focke var. <i>sachalinensis</i>
ROSACEAE	<i>Sanguisorba minor</i> Scop.
ROSACEAE	<i>Sorbus scopulina</i> Greene
RUBIACEAE	<i>Galium aparine</i> L.
RUBIACEAE	<i>Galium septentrionale</i> Roemer & Schultes
SALICACEAE	<i>Populus alba</i> L.
SALICACEAE	<i>Populus angustifolia</i> James
SALICACEAE	<i>Populus deltoides</i> Marsh. ssp. <i>monilifera</i> (Ait.) Eckenw.
SALICACEAE	<i>Populus x acuminata</i> Rydb.
SALICACEAE	<i>Salix amygdaloides</i> Anderss.
SALICACEAE	<i>Salix exigua</i> Nutt. ssp. <i>exigua</i>
SALICACEAE	<i>Salix exigua</i> Nutt. ssp. <i>interior</i> (Rowlee) Cronq.
SALICACEAE	<i>Salix fragilis</i> L.
SALICACEAE	<i>Salix irrorata</i> Andersson
SALICACEAE	<i>Salix lutea</i> Nutt.
SANTALACEAE	<i>Comandra umbellata</i> (L.) Nutt.
SAXIFRAGACEAE	<i>Heuchera parvifolia</i> Nutt. ex T. & G.
SAXIFRAGACEAE	<i>Saxifraga rhomoidea</i> Greene
SCROPHULARIACEAE	<i>Castilleja integra</i> A. Gray
SCROPHULARIACEAE	<i>Castilleja sessiliflora</i> Pursh.
SCROPHULARIACEAE	<i>Collinsia parviflora</i> Dougl. ex Lindl.
SCROPHULARIACEAE	<i>Gratiola neglecta</i> Torr.
SCROPHULARIACEAE	<i>Linaria dalmatica</i> (L.) Mill.
SCROPHULARIACEAE	<i>Linaria vulgaris</i> Hill
SCROPHULARIACEAE	<i>Mimulus floribundus</i> Dougl. ex Lindl.
SCROPHULARIACEAE	<i>Mimulus glabratus</i> H. B. K. var. <i>fremontii</i> (Benth.) A. L. Grant
SCROPHULARIACEAE	<i>Penstemon albidus</i> Nutt.
SCROPHULARIACEAE	<i>Penstemon secundiflorus</i> Benth.
SCROPHULARIACEAE	<i>Penstemon strictus</i> Benth. in De Candolle
SCROPHULARIACEAE	<i>Penstemon virens</i> Penn.
SCROPHULARIACEAE	<i>Penstemon virgatus</i> Gray ssp. <i>asa-grayi</i> Crosswhite
SCROPHULARIACEAE	<i>Scrophularia lanceolata</i> Pursh.
SCROPHULARIACEAE	<i>Verbascum blattaria</i> L.
SCROPHULARIACEAE	<i>Verbascum thapsus</i> L.
SCROPHULARIACEAE	<i>Veronica americana</i> (Raf.) Schwein. ex Benth.
SCROPHULARIACEAE	<i>Veronica anagallis-aquatica</i> L.
SCROPHULARIACEAE	<i>Veronica catentata</i> Penn.
SCROPHULARIACEAE	<i>Veronica peregrina</i> L. var. <i>xalapensis</i> (H. B. K.) St. John & Warren
SELAGINELLACEAE	<i>Selaginella densa</i> Rydb.
SMILACACEAE	<i>Smilax herbacea</i> L. var. <i>lasioneura</i> (Small) Rydb..
SOLANACEAE	<i>Physalis heterophylla</i> Nees
SOLANACEAE	<i>Physalis virginiana</i> P. Mill.
SOLANACEAE	<i>Quincula lobata</i> (Torr.) Raf.
SOLANACEAE	<i>Solanum rostratum</i> Dun.
SOLANACEAE	<i>Solanum triflorum</i> Nutt.
TAMARICACEAE	<i>Tamarix ramosissima</i> Ledeb.
TYPHACEAE	<i>Typha angustifolia</i> L.

TYPHACEAE	<i>Typha latifolia</i> L.
ULMACEAE	<i>Ulmus pumila</i> L.
URTICACEAE	<i>Parietaria pensylvanica</i> Muhl. ex Willd.
URTICACEAE	<i>Urtica dioica</i> L. ssp. <i>gracilis</i> (Ait.) Seland.
VERBENACEAE	<i>Lippia cuneifolia</i> (Torr.) Steud.
VERBENACEAE	<i>Verbena bracteata</i> Lag. & Rodr.
VERBENACEAE	<i>Verbena hastata</i> L.
VIOLACEAE	<i>Hybanthus verticillatus</i> (Ort.) Baill.
VIOLACEAE	<i>Viola nuttallii</i> Pursh.
VIOLACEAE	<i>Viola rydbergii</i> Greene
VIOLACEAE	<i>Viola scopulorum</i> (Gray) Greene
VIOLACEAE	<i>Viola sororia</i> Willd.
VITACEAE	<i>Vitis riparia</i> Michx.
ZYGOPHYLLACEAE	<i>Tribulus terrestris</i> L.

SPECIES	SPECCODE	CASCL
Mountain Maple	ACGL1	T
Box-elder	ACNE1	T
Yucca	YUGL1	T
American Water Plantain	ALTR1	T
Common Arrowhead	SALA1	T
Tumbleweed	AMAL2	T
Rough Pigweed	AMRE1	T
Fragrant Sumac	RHAR1	T
Poison Ivy	TORY1	T
Water Parsnip	BEER1	T
Water Hemlock	CIMA1	T
Poison Hemlock	COMA1	T
Wild Carrot	DACA2	T
Whiskbroom Parsley	HATR1	T
Cow Parsnip	HESP1	T
Porter's Lovage	LIPO1	T
Wild Parsley	LOOR1	T
Musineon	MUDI1	T
Sweet Cicely	OSCH1	T
Anise Root	OSLO1	T
Spreading Dogbane	APAN1	T
Hemp Dogbane	APCA1	T
Swamp Milkweed	ASIN1	T
Plains Milkweed	ASPU1	T
Showy Milkweed	ASSP1	T
Narrow-leaved Milkweed	ASST1	T
Green Milkweed	ASVI1	T
Yarrow	ACMI1	T
False Dandelion	AGGL1	T
Common Ragweed	AMAR1	T
Western Ragweed	AMPS1	T
Giant Ragweed	AMTR1	T
Pink Pussytoes	ANMI1	T
Pussytoes	ANPA1	T
Dog Fennel	ANCO1	T
Burdock	ARMI1	T
Arnica	ARFU1	T
Western Sagewort	ARCA1	T
Silky Wormwood	ARDR1	T
Silver Sage	ARFR1	T
White Sage	ARLU1	T
Aster	ASFA1	T
Fendler's Aster	ASFE1	T
Panicled Aster	ASHE1	T
Smooth Blue Aster	ASLA1	T
Aster	ASPO1	T
Nodding Beggarticks	BICE1	T
Beggar-ticks	BIFR1	T
Musk Thistle	CANU1	T
Diffuse Knapweed	CEDI1	T
Russian Knapweed	CERE1	T

Ox-eye Daisy	CHLE1	T
Golden Aster	CHFU1	T
Golden Aster	CHVI1	T
Greenplume Rabbitbrush	CHNA1	T
Rubber Rabbitbrush	CHNA2	T
Common Chicory	CIIN1	T
Canada Thistle	CIAR1	T
Flodman's Thistle	CIFL1	T
Yellow Spine Thistle	CIOC1	T
Wavyleaf Thistle	CIUN1	T
Bull Thistle	CIVU1	T
Horseweed	COCA1	T
Hawksbeard	CROC1	T
Hawksbeard	CRRU1	T
Fetid Marigold	DYPA1	T
Fleabane	ERCA1	T
	ERCO1	T
Fleabane	ERDI1	T
Fleabane	ERFL1	T
Fleabane	ERPU1	T
Oregon Fleabane	ERSP1	T
Daisy Fleabane	ERST1	T
LaVeta Fleabane	ERVE1	T
Blanket Flower	GAAR1	T
Cotton-batting	GNCH1	T
Curly-top Gumweed	GRSQ1	T
Snakeweed	GUSA1	T
Cutleaf Ironplant	HASP1	T
Common Sunflower	HEAN1	T
Texas Blue Weed	HECI1	T
Maximilian Sunflower	HEMA1	T
Nuttall's Sunflower	HENU1	T
Plains Sunflower	HEPE1	T
Sunflower	HEPU1	T
Stiff Sunflower	HERI1	T
Showy Goldeneye	HEMU1	T
Hymenopappus	HYFI1	T
Poverty Weed	IVAX1	T
Marsh Elder	IVXA1	T
False Boneset	KUCH1	T
False Boneset	KUEU1	T
Blue Lettuce	LAOB1	T
Prickly Lettuce	LASE1	T
White Aster	LEER1	T
Blazing Star	LIPU1	T
Bigelovi's Tansy Aster	MABI1	T
Hoary Aster	MACA1	T
False Dandelion	MICU1	T
Scotch Thistle	ONAC1	T
Picradeniopsis	PIOP1	T
Prairie Coneflower	RACO1	T
Goldenglow	RUAM1	T

False Salsify	SCLA1	T
Groundsel	SEFE1	T
Groundsel	SEIN1	T
Prairie Ragwort	SEPL1	T
Groundsel	SESP1	T
Groundsel	SETR1	T
Canada Goldenrod	SOCA1	T
Late Goldenrod	SOG11	T
Prairie Goldenrod	SOM11	T
Soft Goldenrod	SOMO1	T
Low Goldenrod	SONA1	T
Rigid Goldenrod	SORI1	T
Field Sow Thistle	SOAR2	T
Prickly Sow Thistle	SOAS1	T
Wire Lettuce	STPA1	T
Red Seeded Dandelion	TALA1	T
Dandelion	TAOF1	T
Greenthread	THME1	T
Easter Daisy	TOGR1	T
Easter Daisy	TOHO1	T
Goat's Beard	TRDU1	T
Salsify	TRPO1	T
Cocklebur	XAST1	T
Oregon Grape	BERE1	T
Alder	ALIN1	T
Water Birch	BEOC1	T
Madwort	ASPR1	T
Miners Candle	CRV11	T
Hound's Tongue	CYOF1	T
Large-flowered Stickseed	HAFL1	T
Stickseed	LARE1	T
Puccoon	LIIN1	T
	LIMU1	T
Bluebells	MELA1	T
False Gromwell	ONMO1	T
Popcorn Flower	PLSC1	T
Pale Alyssum	ALAL1	T
Alyssum	ALMI1	T
Rock Cress	ARFE3	T
Tower Mustard	ARGL1	T
Rock Cress	ARHI1	T
Yellowrocket Wintercress	BAVU1	T
Small-seeded False Flax	CAMI1	T
Shepherd's Purse	CABU1	T
Lens-padded Hoary Cress	CACH1	T
Hoary Cress	CADR1	T
Blue Mustard	CHTE1	T
Hare's-ear Mustard	COOR1	T
Tansy Mustard	DEPI1	T
Tansy Mustard	DERI1	T
Flixweed	DESO1	T
Yellow Whitlowort	DRNE1	T

White Whitlowort	DRRE1	T
Western Wallflower	ERCA2	T
Bushy Wallflower	ERRE1	T
Dame's Rocket	HEMA2	T
Field Peppergrass	LECA1	T
Peppergrass	LEDE1	T
Bladderpod	LEMO1	T
Watercress	NAOF1	T
Double Bladder-pod	PHVI1	T
Bog Yellow Cress	ROPA1	T
Tumbling Mustard	SIAL1	T
Field Penny Cress	THAR1	T
Nipple Cactus	COMI1	T
Hedgehog Cactus	ECVI1	T
Little Prickly Pear	OPFR1	T
Twistspine Prickly Pear	OPMA1	T
Plains Prickly Pear	OPPO1	T
Nipple Cactus	PESI1	T
Water Starwort	CAVE1	T
Harebell	CARO1	T
Great Lobelia	LOSI1	T
Venus' Looking Glass	TRLE1	T
Common Hops	HULU1	T
Clammy-weed	PODO2	T
Western Snowberry	SYOC1	T
Snowberry	SYOR1	T
Highbush Cranberry	VIOP1	T
Fendler's Sandwort	ARFE2	T
Prairie Chickweed	CEAR1	T
Short-stalked Chickweed	CEBR1	T
Common Mouse-Ear	CEVU1	T
Community Campion	COCO1	T
James' Nailwort	PAJA1	T
Bouncing Bet	SAOF1	T
Sleepy Catchfly	SIAN1	T
Campion	SIDR1	T
White Campion	SIPR1	T
Sand Spurry	SPRU1	T
Long-leaved Stitchwort	STLO1	T
Cow Cockle	VAPY1	T
Coontail	CEDE1	T
Four-winged Saltbush	ATCA1	T
Lamb's Quarters	CHAL1	T
Dark Goosefoot	CHAT1	T
Pitseed Goosefoot	CHBE1	T
Jerusalem Oak	CHBO1	T
Desert goosefoot	CHDE1	T
Fremont Goosefoot	CHFR1	T
Goosefoot	CHLE2	T
Overi's Goosefoot	CHOV1	T
Kochia	KOSC1	T
Russian-Thistle	SAIB1	T

Greater St. John's-wort	HYMA1	T
Common St. John's-wort	HYPE1	T
Spiderwort	TROC1	T
Hedge Bindweed	CAMA1	T
Hedge Bindweed	CASE1	T
Field Bindweed	COAR1	T
Evolvulus	EVNU1	T
Stonecrop	SELA1	T
Common Juniper	JUCO1	T
Rocky Mountain Juniper	JUSC1	T
Dodder	CUAP1	T
Sedge	CAAT1	T
Sedge	CAAU1	T
Sedge	CABE1	T
Sedge	CABR1	T
Sedge	CADO1	T
Sedge	CAEL1	T
Sedge	CAEM1	T
Sedge	CAFI1	T
Sedge	CAHE1	T
Sedge	CAHY1	T
Sedge	CAIN1	T
Sedge	CALA1	T
Sedge	CANE1	T
Sedge	CAOR1	T
Sedge	CAPR1	T
Sedge	CARO2	T
Sedge	CASC1	T
Sedge	CASI1	T
Sedge	CAST1	T
Fox Sedge	CAVU1	T
Spikerush	ELAC1	T
Spikerush	ELCO1	T
Spikerush	ELMA1	T
Spikerush	ELPA1	T
Bulrush	SCAC1	T
Bulrush	SCPA1	T
Pungent Bulrush	SCPU1	T
Bulrush	SCVA1	T
Russian Olive	ELAN1	T
Field Horsetail	EQAR1	T
Smooth Horsetail	EQLA1	T
Variiegated Scouring Rush	EQVA1	T
Toothed Spurge	EUDE1	T
Fendler's Euphorbia	EUFE1	T
Snow-on-the-Mountain	EUMA1	T
Spurge	EURO1	T
Thyme-leaved Spurge	EUSE1	T
Spurge	EUSP1	T
Noseburn	TRRA1	T
False Indigo	AMFR1	T
Dwarf Wild Indigo	AMNA1	T

Standing Milkvetch	ASAD1	T
Field Milkvetch	ASAG1	T
Two-grooved Vetch	ASBI1	T
Canada Milk-vetch	ASCA1	T
Ground-plum	ASCR1	T
Drummond Milkvetch	ASDR1	T
Pliant Milkvetch	ASFL1	T
Lotus Milk-Vetch	ASLO1	T
Short's Milkvetch	ASSH1	T
Draba Milk-Vetch	ASSP2	T
Foothill Milkvetch	ASTR1	T
Crown Vetch	COVA1	T
White Prairie Clover	DACA1	T
Purple Prairie Clover	DAPU1	T
Wild Licorice	GLLE1	T
Purple Peavine	LAEU1	T
Birdfoot Trefoil	LOCO1	T
	LUAR2	T
Silvery Lupine	LUAR1	T
Black Medick	MELU1	T
Alfalfa	MESA1	T
White Sweetclover	MEAL1	T
Yellow Sweetclover	MEOF1	T
Purple Locoweed	OXLA1	T
Wild Alfalfa	PSTE1	T
Black Locust	ROPS1	T
Golden Banner	THRH1	T
Alsike Clover	TRHY1	T
Red Clover	TRPR1	T
White Clover	TRRE1	T
American Vetch	VIAM1	T
Fumitory	FUVA1	T
Northern Gentian	GEAF1	T
Green Gentian	SWRA1	T
Filaria	ERCI1	T
Common Wild Geranium	GECA1	T
Golden Currant	RIAU1	T
Western Red Currant	RICE1	T
Common Gooseberry	RIIN1	T
American Milfoil	MYEX1	T
Waterleaf	HYFE1	T
Scorpionweed	PHHE1	T
Western Blue Flag	IRMI1	T
Blue-eyed Grass	SIMO1	T
Articulate Rush	JUAR1	T
Baltic Rush	JUBA1	T
Toad Rush	JUBU1	T
Dudley Rush	JUDU1	T
Rush	JUEN1	T
Inland Rush	JUIN1	T
Rush	JULO1	T
Knotted Rush	JUNO1	T

Torrey's Rush	JUTO1	T
Tracy Rush	JUTR1	T
Dragonhead	DRPA1	T
Rough False Pennyroyal	HEHI1	T
American Bugleweed	LYAM1	T
Rough Bugleweed	LYAS1	T
Common Horehound	MAVU1	T
Field Mint	MEAR1	T
Wild Bergamot	MOFI1	T
Spotted Bee-Balm	MOPE1	T
Catnip	NECA1	T
Selfheal	PRVU1	T
Lance-leaved Sage	SARE1	T
Britton's Skullcap	SCBR1	T
Hedge Nettle	STPA2	T
Duckweed	LEMI1	T
Wild Onion	ALCE1	T
Geyer's Onion	ALGE1	T
Wild White Onion	ALTE1	T
Asparagus	ASOF1	T
Sego Lily	CAGU1	T
Mountain Lily	LEMO2	T
Spikenard	SMST1	T
Death Camass	ZIVE1	T
Blue Flax	LIPE1	T
Norton's Flax	LIPR1	T
Robust Toothcup	AMRO1	T
Winged Loosestrife	LYAL1	T
Common Mallow	MANE1	T
White Checkermallow	SICA1	T
New Mexico Checkmallow	SINE1	T
Red False Mallow	SPCO1	T
Hairy Four-O'Clock	MIHI1	T
Narrowleaf Four O'Clock	MILI1	T
Wild Four-O'Clock	MINY1	T
Plains Yellow Primrose	CASE2	T
Willow Herb	EPCI1	T
Willow Herb	EPPA1	T
Scarlet Gaura	GACO1	T
Velvety Gaura	GAPA1	T
Evening Primrose	OEFL1	T
Yellow Stemless Evening Pr	OEHO1	T
Common Evening Primrose	OEVI1	T
Northern Green Orchid	HAHY1	T
Broomrape	ORFA1	T
Gray-Green Wood Sorrel	OXDI1	T
Prickly Poppy	ARPO1	T
Blue Spruce	PIPU1	T
Ponderosa Pine	PIPO1	T
Douglas-Fir	PSME1	T
English Plantain	PLLA1	T
Common Plantain	PLMA1	T

Patagonian Plantain	PLPA1	T
Jointed Goatgrass	AECY1	T
Slender Wheatgrass	AGCA1	T
Crested Wheatgrass	AGCR1	T
	AGDA1	T
Crested Wheatgrass	AGDE1	T
Tall Wheatgrass	AGEL1	T
	AGGR1	T
Intermediate Wheatgrass	AGIN1	T
Quackgrass	AGRE1	T
Western Wheatgrass	AGSM1	T
Bluebunch Wheatgrass	AGSP1	T
Ticklegrass	AGSC1	T
Redtop	AGST1	T
Marsh Foxtail	ALGE2	T
Big Bluestem	ANGE1	T
Little Bluestem	ANSC1	T
Italian Windgrass	APIN1	T
Forktip Threeawn	ARBA1	T
Fendler Threeawn	ARFE1	T
Red Threeawn	ARLO1	T
Cultivated Oats	AVFA1	T
Side-oats Grama	BOCU1	T
Blue Grama	BOGR1	T
Hairy Grama	BOHI1	T
Rattlesnake Grass	BRBR1	T
Smooth Brome	BRIN1	T
Japanese Brome	BRJA1	T
Downy Brome	BRTE1	T
Buffalo-grass	BUDA1	T
Northern Reedgrass	CAST2	T
Field Sandbur	CELO1	T
Rescuegrass	CEMA1	T
Orchardgrass	DAGL1	T
Poverty Oatgrass	DASP1	T
Slimleaf Dichanthelium	DILI1	T
Scribner Dichanthelium	DIOL1	T
Hairy Crabgrass	DISA1	T
Barnyard Grass	ECCR1	T
Canada Wild Rye	ELCA1	T
Russian Wild Rye	ELJU1	T
Stinkgrass	ERCI2	T
Weeping Lovegrass	ERCU1	T
India Lovegrass	ERPI1	T
Six-weeks Fescue	FEOC1	T
Sheep's Fescue	FEOV1	T
Meadow Fescue	FEPR1	T
Tall Mannagrass	GLGR1	T
Fowl Mannagrass	GLST1	T
Meadow Barley	HOBR1	T
Foxtail Barley	HOJU1	T
Junegrass	KOPY1	T

Rice Cutgrass	LEOR1	T
Italian Ryegrass	LOPE1	T
Perennial Ryegrass	LOPE2	T
Scratchgrass	MUAS1	T
Muhly	MUFI1	T
Mountain Muhly	MUMO1	T
Marsh Muhly	MURA1	T
Spike Muhly	MUWR1	T
Indian Ricegrass	ORHY1	T
Witchgrass	PACA1	T
Switchgrass	PAVI1	T
Reed Canarygrass	PHAR1	T
Timothy	PHPR1	T
Common Reed	PHAU1	T
Bulbous Bluegrass	POBU1	T
Canby's Bluegrass	POCA1	T
Canada Bluegrass	POCO1	T
Muttongrass	POFE1	T
Alkali Bluegrass	POJU1	T
Fowl Bluegrass	POPA1	T
Kentucky Bluegrass	POPR1	T
Rabbitfoot Grass	POMO1	T
Tumblegrass	SCPA2	T
Rye	SECE1	T
Green Foxtail	SEVI1	T
Squirreltail	SIHY1	T
Indian-grass	SONU1	T
Prairie Cordgrass	SPPE1	T
Prairie Wedgegrass	SPOB1	T
Rough Dropseed	SPAS1	T
Sand Dropseed	SPCR1	T
Prairie Dropseed	SPHE1	T
Poverty Grass	SPNE1	T
Needle-and-thread	STCO1	T
New Mexico Feather Grass	STNE1	T
Porcupine-grass	STSP1	T
Green Needlegrass	STVI1	T
Wheat	TRAE1	T
	AGMA1	T
Collomia	COLI1	T
Gilia	GIOP1	T
Spike Gilia	IPSP1	T
	MIGR1	T
Navarretia	NAMI1	T
Winged Eriogonum	ERAL1	T
Spreading Wild Buckwheat	EREF1	T
James' Wild Buckwheat	ERJA1	T
Sulphur Flower	ERUM1	T
Knotweed	POAR1	T
Wild Buckwheat	POCO2	T
Knotweed	PODO1	T
Water Pepper	POHY1	T

Pale Smartweed	POLA1	T
Pennsylvania Smartweed	POPE1	T
Lady's Thumb	POPE2	T
Knotweed	PORA1	T
Knotweed	POSA1	T
Sheep Sorrel	RUAC1	T
Curly Dock	RUCR1	T
Golden Dock	RUMA1	T
Bitter Dock	RUOB1	T
Willow Dock	RUSA1	T
Fragile Fern	CYFR1	T
Spring Beauty	CLRO1	T
Common Purslane	POOL1	T
Prairie Fameflower	TAPA1	T
Leafy Pondweed	POFO1	T
Floatingleaf Pondweed	PONA1	T
Western Rock Jasmine	ANOC1	T
Shooting Star	DOPU1	T
Fringed Loostrife	LYCI1	T
Candle Anemone	ANCY1	T
Pasque-flower	ANPA2	T
Hairy Clematis	CLHI1	T
Western Clematis	CLLI1	T
Blue Larkspur	DENU1	T
Prairie Larkspur	DEVI1	T
Mousetail	MYMI1	T
Macoun's Buttercup	RAMA1	T
Cursed Crowfoot	RASC1	T
Hairy Leaf Buttercup	RATR1	T
Purple Meadow Rue	THDA1	T
Buckbrush	CEFE1	T
New Jersey Tea	CEHE1	T
Striate Agrimony	AGST2	T
Saskatoon Service-berry	AMAL1	T
Hawthorne	CRER1	T
Hawthorn	CRSU1	T
Yellow Avens	GEAL1	T
Large-leaved Avens	GEMA1	T
Mountain Ninebark	PHMO1	T
Ninebark	PHOP1	T
Tall Cinquefoil	POAR2	T
Cinquefoil	POFI1	T
Cinquefoil	POGR1	T
Wooly Cinquefoil	POHI1	T
Norwegian Cinquefoil	PONO1	T
Bushy Cinquefoil	POPA2	T
Cinquefoil	POPE4	T
Hybrid Cinquefoil	POPU1	T
Cinquefoil	PORI1	T
Wild Plum	PRAM1	T
Sand Cherry	PRPU1	T
Chokecherry	PRVI1	T

Apple	PYMA1	T
Prickly Wild Rose	ROAC1	T
Prairie Wild Rose	ROAR1	T
Western Wild Rose	ROWO1	T
Boulder Raspberry	RUDE1	T
Raspberry	RUID1	T
Burnet	SAMI1	T
Mountain Ash	SOSC1	T
Catchweed Bedstraw	GAAP1	T
Northern Bedstraw	GASE1	T
Silver Poplar	POAL1	T
Narrow-leaved Cottonwood	POAN3	T
Plains Cottonwood	PODE1	T
Lanceleaf Cottonwood	POAC1	T
Peach-leaf Willow	SAAM1	T
Coyote Willow	SAEX2	T
Sandbar Willow	SAEX1	T
Crack Willow	SAFR1	T
	SAIR1	T
Yellow Willow	SALU1	T
Bastard Toadflax	COUM1	T
Alumroot	HEPA1	T
Diamondleaf Saxifrage	SARH1	T
Orange Paintbrush	CAIN2	T
Downy Paintbrush	CASE3	T
Blue Lips	COPA1	T
Hedge Hyssop	GRNE1	T
Toadflax	LIDA1	T
Butter-and-eggs	LIVU1	T
Monkey Flower	MIFL1	T
Roundleaf Monkey-flower	MIGL1	T
White Beardtongue	PEAL1	T
Penstemon	PESE1	T
Rocky Mountain Penstemon	PEST1	T
Slender Penstemon	PEVI1	T
Penstemon	PEVI2	T
Figwort	SCLA2	T
Moth Mullein	VEBL1	T
Common Mullein	VETH1	T
Brooklime Speedwell	VEAM1	T
Water Speedwell	VEAN1	T
Catenate Ironweed	VECA1	T
Purslane Speedwell	VEPE1	T
Spikemoss	SEDE1	T
Carrion Flower	SMHE1	T
Clammy Ground cherry	PHHE2	T
Virginia Ground Cherry	PHVI2	T
Purple Ground Cherry	QULO1	T
Buffalo Bur	SORO1	T
Cut-leaved Nightshade	SOTR1	T
Salt Cedar	TARA1	T
Narrow-leaved Cattail	TYAN1	T

Common Cattail	TYLA1	T
Siberian Elm	ULPU1	T
Pennsylvania Pellitory	PAPE1	T
Stinging Nettle	URDI1	T
Fog-fruit	LICU1	T
Prostrate Vervain	VEBR1	T
Blue Vervain	VEHA1	T
Nodding Green Violet	HYVE1	T
Yellow Prairie Violet	VINU1	T
Rydberg's Violet	VIRY1	T
Colorado Violet	VISC1	T
Northern Bog Violet	VISO1	T
River-bank Grape	VIRI1	T
Puncture Vine	TRTE1	T

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- 7 Distribution of Diffuse Knapweed
- 8 Distribution of Musk Thistle
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- 10 Groundwater Monitoring Well Locations
- 11 Summary of Impacts

Figure 1
Rocky Flats Environmental Technology Site
Vicinity Open Space Map

- EXPLANATION**
- - - County Line
- Land Ownership**
- Jefferson County Openspace
 - City of Boulder Openspace
 - City of Westminster Openspace
 - DOE RFETS
 - DOE NWTC
 - State
- Standard Map Features**
- Buildings and other structures
 - Solar Evaporation Ponds (SEP)
 - Lakes and ponds
 - Streams, ditches, or other drainage features
 - - - Fences and other barriers
 - Contours
 - Heavy duty paved roads
 - Medium duty paved roads
 - Light duty paved roads
 - == Dirt roads
 - - - Railroads

DATA SOURCE BASE FEATURES:
 Buildings, fences, hydrography, roads and other structures from 1954 aerial fly-over data captured by EG&G RSL, Las Vegas. Digitized from the orthophotographs. 1/95

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Scale = 1 : 32940
 1 inch represents 2745 feet



State Plane Coordinate Projection
 Colorado Central Zone
 Datum: NAD27

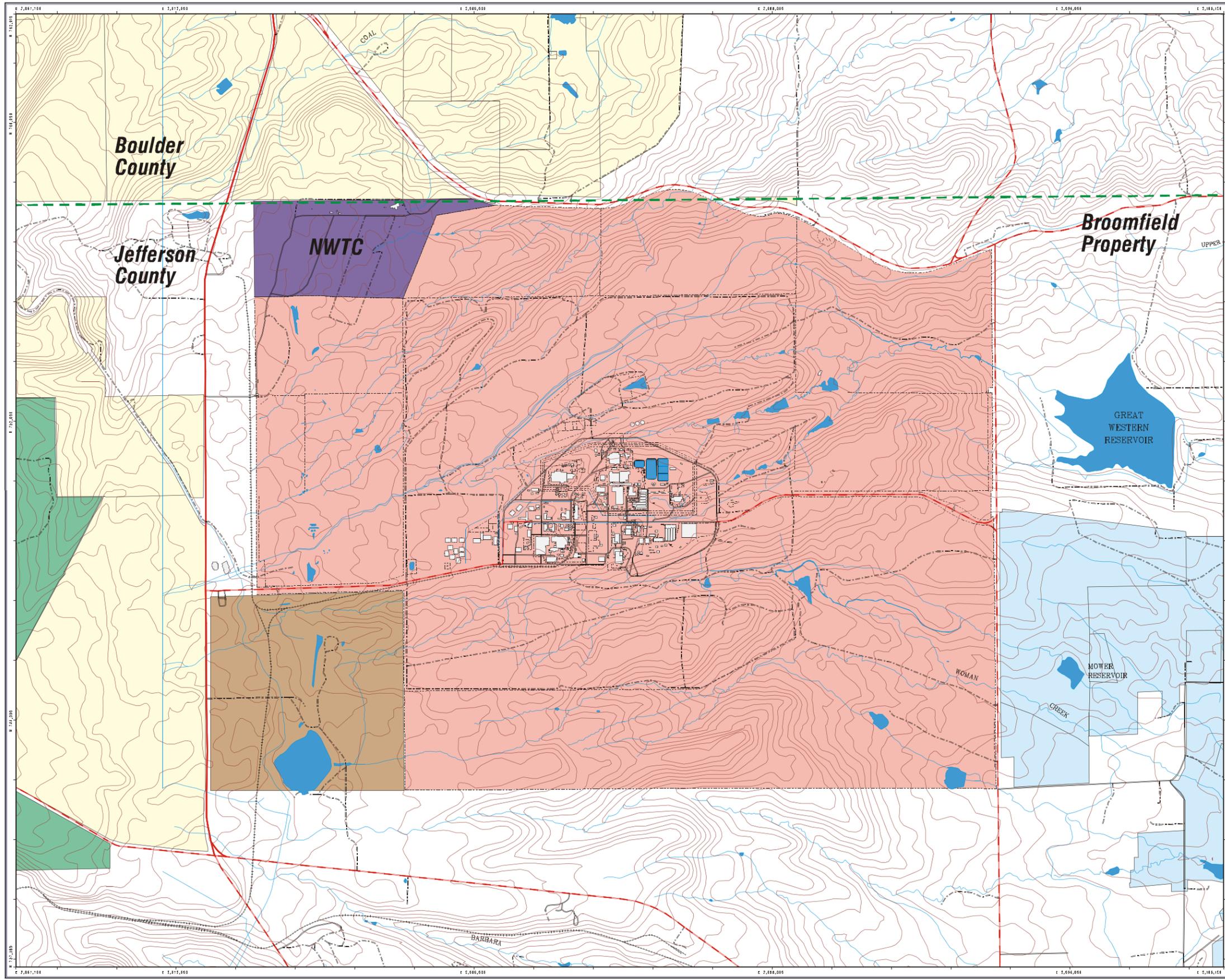
U.S. Department of Energy
 Rocky Flats Environmental Technology Site

GIS Dept. 303-966-7707

DRAFT

MAPID: 01-0306

March 08, 2001



NT_Srv_w:/projects/fly2001/01-0306/openspace-nwtc.aml

The Rock Creek Reserve

Figure 2

MAP LEGEND

-  Existing reserve extent (852 acres)
-  Proposed Rock Creek Reserve boundary (1,793 acres)

Standard Map Features

-  Buildings
-  Ponds
-  Streams & ditches
-  Fences
-  Paved roads
-  Dirt roads
-  Contours (25 ft)

NOTE: The Reserve boundary is an estimate only and does not represent a legal boundary.

DATA SOURCE:
Rock Creek Reserve boundary provided by Exponent, 1999.
Buildings, fences, hydrography, roads and other structures from 1994 aerial fly-over data captured by EG&G RSL, Las Vegas. Digitized from the orthophotographs, 1/95
Hypsography derived from digital elevation model (DEM) data by Morrison Knudsen (MK) using ESRI Arc TIN and LATTICE to process the DEM data to create 5-foot contours.
The DEM data was captured by the Remote Sensing Lab, Las Vegas, NV, 1994 Aerial Flyover at ~10 meter resolution.
The DEM post-processing performed by MK, Winter 1997.



1:22473

1000 0 1000 2000 Feet

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD27

U.S. Department of Energy
Rocky Flats Environmental Technology Site

Prepared by:

For:

Exponent

 Kaiser-Hill
Company, LLC

RFETS Soils Map

Figure 3

EXPLANATION

-  Denver clay loam, 2 - 5%
-  Denver clay loam, 5 - 9%
-  Denver-Kutch clay loam, 5 - 9%
-  Denver-Kutch clay loam, 9 - 15%
-  Denver-Kutch-Midway clay loam, 9 - 25%
-  Englewood clay loam, 0 - 2%
-  Englewood clay loam, 2 - 5%
-  Flatirons cobbly sandy loam, 0 - 3%
-  Flatirons stoney sandy loam, 0 - 5%
-  Haverson loam, 0 - 3%
-  Leyden-Primen-Standley cobbly clay loams, 15 - 50%
-  McClave clay loam, 0 - 3%
-  Midway clay loam, 9 - 30%
-  Nederland very cobbly sandy loam, 15 - 50%
-  Nunn clay loam, 0 - 2%
-  Nunn clay loam, 2 - 5%
-  Pits, gravel
-  Rock outcrop, Sedimentary
-  Standley-Nunn gravelly clay loam, 0 - 5%
-  Valmont clay loam, 0 - 3%
-  Valmont-Nederland very cobbly sandy loam, 0 - 3%
-  Willowman-Leyden cobbly loam, 9 - 30%
-  Yoder Farlant-Midway complex, 15 - 60%

Standard Map Features

-  Buildings and other structures
-  Solar Evaporation Ponds (SEP)
-  Lakes and ponds
-  Streams, ditches, or other drainage features
-  Fences and other barriers
-  Paved roads
-  Dirt roads

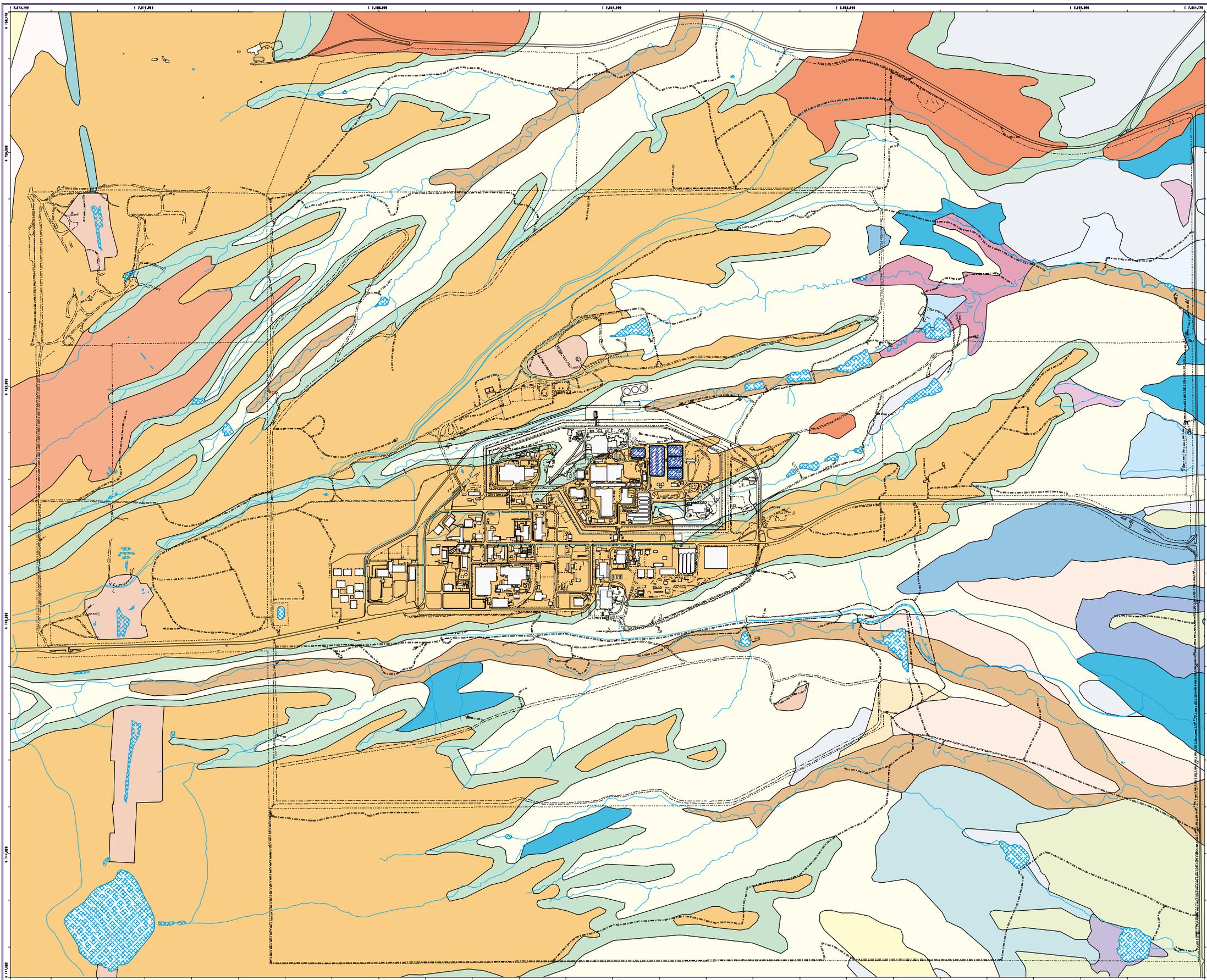
DATA SOURCE BASE FEATURES:
 Soil data from the US Soil Conservation Service, Unclassified Golden Area Soil Survey, 1980.
 Buildings, fences, hydrography, roads and other structures from 1984 aerial flyover data captured by ES&S GIS, Las Vegas.
 Digitized from the orthophotograph, 1/95


 Scale = 1 : 21800
 1 inch represents 1800 feet

 State Plane Coordinate Projection
 Colorado Central Zone
 Datum: NAD 27

U.S. Department of Energy
 Rocky Flats Environmental Technology Site
 GIS Dept. 303-366-7707
 Prepared by:


 MAP ID: 98-0011 October 25, 2000
Original map contents are preserved. Logo and date have changed.



NT_Svr_w:\projects\fy98\98-0011\am\scils-map2.aml

Wetlands

Figure 4

MAP LEGEND

Wetlands (Combined Wet Meadow/Marsh, Short Marsh, and Tall Marsh Habitat Types)

Standard Map Features

- New Landfill
- Buildings
- Lakes & Ponds
- Streams & ditches
- Fences
- Paved roads
- Dirt roads

DATA SOURCE:
Management Unit and wetland boundaries provided by Exponent.
Buildings, fences, hydrography, roads and other structures from 1994 aerial fly-over data captured by EG&G RSL, Las Vegas.
Digitized from the orthophotographs, 1/95
Hypsography derived from digital elevation model (DEM) data by Morrison Knudsen (MK) using ESRI Arc TIN and LATTICE to process the DEM data to create 5-foot contours.
The DEM data was captured by the Remote Sensing Lab, Las Vegas, NV, 1994 Aerial Flyover at ~10 meter resolution. The DEM post-processing performed by MK, Winter 1997.

Note:
These locations approximate the boundaries of the Management Units. The boundaries are not exact and should not be treated as such.



1:23552

1000 0 1000 2000 Feet

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD27

U.S. Department of Energy
Rocky Flats Environmental Technology Site

Prepared by:

Exponent

For:

Kaiser-Hill Company, LLC

\\gisrv\GIS\ECO-projects\projects\2k-0158\management units.aprx\Wetland Management Unit view

1999 Dalmatian Toadflax (*Linaria dalmatica*) Distribution

Figure 6

MAP LEGEND

- High Density Areas
- Medium Density Areas
- Low Density Areas
- Scattered Density Areas

Standard Map Features

- Buildings
- Lakes & Ponds
- Streams & ditches
- Fences
- Paved roads
- Dirt roads
- Contours (20 ft)

DATA SOURCE:
1999 weed distributions provided by Exponent. Buildings, fences, hydrography, roads and other structures from 1994 aerial fly-over data captured by EG&G RSL, Las Vegas. Digitized from the orthophotographs, 1/95. Hypsography derived from digital elevation model (DEM) data by Morrison Knudsen (MK) using ESRI Arc TIN and LATTICE to process the DEM data to create 5-foot contours. The DEM data was captured by the Remote Sensing Lab, Las Vegas, NV, 1994 Aerial Flyover at ~10 meter resolution. The DEM post-processing performed by MK, Winter 1997.

Note:

These locations approximate the boundaries of infestation areas. The boundaries are not exact and should not be treated as such. These areas may not represent all populations on Site.



1:23552

1000 0 1000 2000 Feet

State Plane Coordinate Projection
Colorado Central Zone
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For:



1999 Diffuse Knapweed (*Centaurea diffusa*) Distribution

Distribution

Figure 7

MAP LEGEND

- High Density Areas
- Medium Density Areas
- Low Density Areas
- Scattered Density Areas

Standard Map Features

- Buildings
- Lakes & Ponds
- Streams & ditches
- Fences
- Paved roads
- Dirt roads
- Contours (20 ft)

DATA SOURCE:
 1999 weed distributions provided by Exponent.
 Buildings, fences, hydrography, roads and other structures from 1994 aerial fly-over data captured by EG&G RSL, Las Vegas.
 Digitized from the orthophotographs, 1/95
 Hypsography derived from digital elevation model (DEM) data by Morrison Knudsen (MK) using ESRI Arc TIN and LATTICE to process the DEM data to create 5-foot contours. The DEM data was captured by the Remote Sensing Lab, Las Vegas, NV, 1994 Aerial Flyover at ~10 meter resolution. The DEM post-processing performed by MK, Winter 1997.

Note:

These locations approximate the boundaries of infestation areas. The boundaries are not exact and should not be treated as such. These areas may not represent all populations on Site.



1:23552

1000 0 1000 2000 Feet

State Plane Coordinate Projection
 Colorado Central Zone
 Datum: NAD27

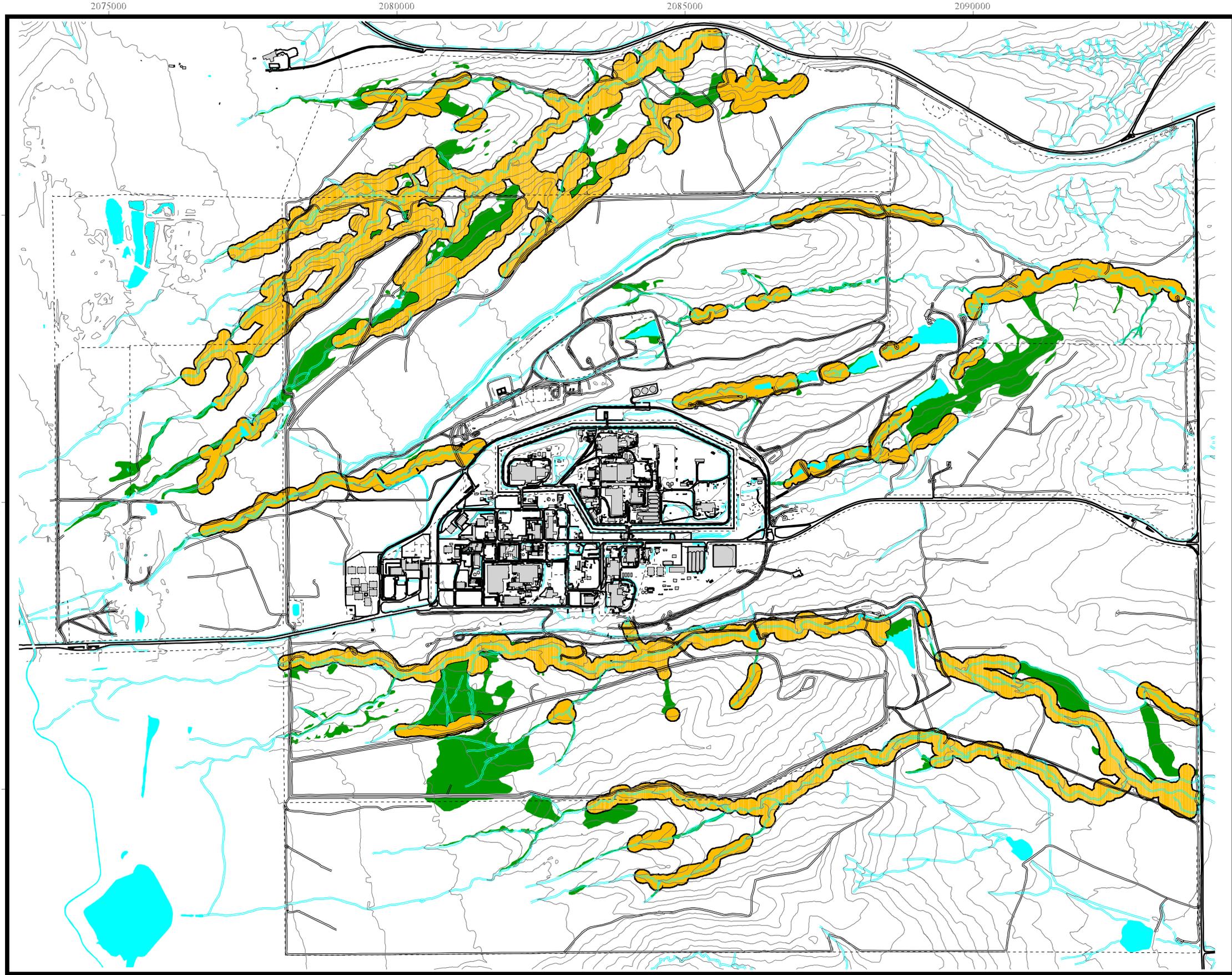
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Prepared by:



For:





Preble's mouse protection area map
August, 2000.

Figure 9

LEGEND

- Protection Areas
- Contiguous Wetlands

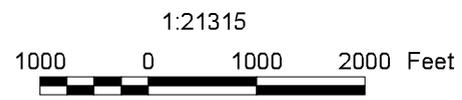
Standard Features

- Buildings
- Lakes & ponds
- Streams & ditches
- Fences
- Paved roads
- Dirt roads
- Contours (25 ft)

DATA SOURCE FOR STANDARD FEATURES:
Buildings, fences, hydrography, roads and other structures from 1994 aerial fly-over data captured by EG&G RSL, Las Vegas. Digitized from the orthophotographs, 1/95
Hypsography derived from digital elevation model (DEM) data by Morrison Knudsen (MK) using ESRI Arc TIN and LATTICE to process the DEM data to create 5-foot contours. The DEM data was captured by the Remote Sensing Lab, Las Vegas, NV, 1994 Aerial Flyover at ~10 meter resolution. The DEM post-processing performed by MK, Winter 1997.

Data Source -
Protection Areas and Contiguous Wetlands provided by Exponent, 2000.
POC Karan North, KH x9876.

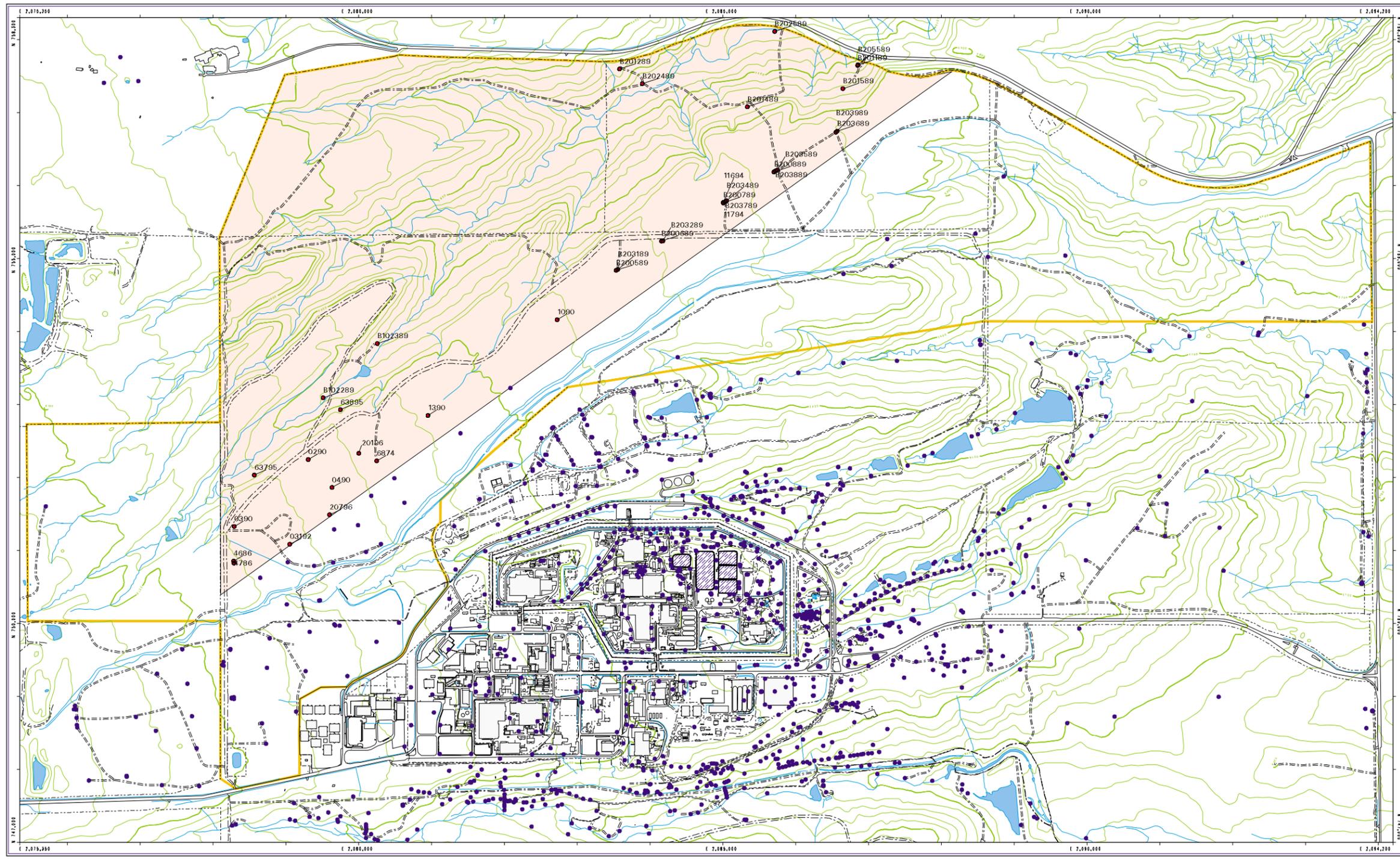
Note:
This map is based on best current knowledge as of August, 2000, and supersedes all previous versions of this map.
As research on the species continues, this map will undergo further revision. Be sure to use the most current map for planning.



State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD27

U.S. Department of Energy
Rocky Flats Environmental Technology Site

Prepared by: **Exponent™** For: Kaiser-Hill Company, LLC



***** DRAFT *****

**Rock Creek Reserve and Ground Water Wells
Figure 10**

EXPLANATION

- Groundwater Wells outside of Rock Creek Reserve
- Groundwater Wells inside of Rock Creek Reserve
- Rock Creek Reserve
- Proposed Rock Creek Reserve Boundary

Standard Map Features

- Buildings and other structures
- Solar Evaporation Ponds (SEP)
- Lakes and ponds
- Streams, ditches, or other drainage features
- Fences and other barriers
- Contour (20-Foot)
- Paved roads
- Dirt roads

DATA SOURCE BASE FEATURES:
Buildings, fences, hydrology, roads and other structures from 1984 aerial photos data captured by EOB RSL, Las Vegas. Digitized from the orthophotograph. USGS Topology (contours) were derived from digital elevation model (DEM) data by Western Geomatics, Inc. using ESRI Arc/Info and LANTICE to process the DEM data to create spot contours. The DEM data was captured by the Remote Sensing Lab, Las Vegas, NV. 1984 Aerial Ortho - 10 meter resolution. DEM postprocessing performed by: NIK, Winter 1997.



Scale = 1:18000
1 inch represents approximately 1508 feet



State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD27

U.S. Department of Energy
Rocky Flats Environmental Technology Site

Prepared by:
DynCorp
THE ART OF TECHNOLOGY

Prepared by:
KH KAISER-HILL
CONSULTANTS

MAP ID: 2K-0385

October 25, 2000

Original map contents are preserved. Logo and date have changed.

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