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NATURAL HERITAGE RESOURCES OF THE  
ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE  
AND THEIR CONSERVATION

PHASE II: THE BUFFER ZONE

FINAL REPORT

Prepared by:

K. D. Essington, S. M. Kettler, S. E. Simonson,  
C. A. Pague, J. S. Sanderson, P. M. Pineda, and A. R. Ellingson  
Colorado Natural Heritage Program  
110 Natural Resources Building  
College of Natural Resources  
Colorado State University  
Ft. Collins, CO 80523

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## INTRODUCTION

### Purpose of Study:

In July, 1994, the Colorado Natural Heritage Program (CNHP) was contracted by the U.S. Department of Energy's Rocky Flats Field Office to inventory and rank the natural heritage resources at its Rocky Flats Environmental Technology Site (RFETS) (Purchase Order Number DE-AP34-94RF00900). The project was conducted in two phases: one to study the Rock Creek drainage and the second to study the rest of the facility's open space belt, or Buffer Zone. The project is intended to provide an independent assessment of the ecological values on plant site for consideration in future land-use planning and compliance documents under numerous environmental statutes. Specifically, DOE requested CNHP to aggregate existing biological data into its Conservation Data Center, and apply an established and scientifically methodology to prioritize state-wide and globally significant species, populations and functional ecological communities associated with RFETS.

### Study Area Overview:

The Rocky Flats Environmental Technology Site (RFETS), formerly the Rocky Flats Plant, is located in northern Jefferson County, bordering Boulder County. It is located 25 miles north west of downtown Denver, 14 miles north of Golden, and 8 miles south of Boulder. The suburban communities of Arvada, Westminster, and Broomfield lie 5 miles to the east. RFETS sits high on the Colorado Piedmont, just 2 miles east of the Rocky Mountain foothills, and 15 miles east of the Continental Divide.

The RFETS is part of the U.S. Department of Energy nuclear weapons manufacturing complex, formerly responsible for producing high-grade metallurgical products, plutonium solution, and plutonium "triggers" or "pits" that initiate detonation sequences in the weapons (U.S. Department of Energy 1980). RFETS' current mission is decommissioning, decontamination, environmental restoration, and economic conversion to other, civilian, uses. RFETS is currently regulated under the Comprehensive Environmental Response Compensation and Liability Act, the Resource Conservation and Recovery Act, and others Federal and State of Colorado statutes. The facility employs 4,500 people (U.S. Department of Energy 1994a).

RFETS was part of the Lindsay Ranch livestock operation until the U.S. Government purchased the surface rights to 2,000 acres in 1953. The rest of the current Buffer Zone was transferred to DOE in 1973. Today, RFETS encompasses 6550 acres, although the Industrial Area, not evaluated in this study, totals 300 acres, reducing the effective study area in the Buffer Zone to 6250 acres. Elevation at the facility ranges from approximately 5300' at the eastern boundary at Indiana Street, to over 6120' at the western boundary, three miles distant, near State Highway 93. The topography consists of mesa-like highlands, deeply cut by stream drainages running roughly west to east or northeast, and outwashed, flatter terrain that descends gradually to the east. The three major drainages found at the Site are, from north to south, Rock Creek, Walnut Creek, and Woman Creek.

Flora: The vegetative component of RFETS is representative of the High Plains bioregion, with extensive grasslands bisected by riparian shrublands and occasional wet meadows (Vestal 1919, Mutel and Emerick 1992). However, because of RFETS' unique location in the transition, or

Valley fill colluvium dominates the lower areas. The clay lenses in the colluvium are responsible for frequent slumping and sloughing along terrace sides.

Bedrock geology is dominated by Cretaceous sandstones, the Arapahoe, Laramie, and Fox Hills Formations, in descending order. It is believed that the contact point between the upper alluvium, and the lower, less permeable sandstones is at least partially responsible for the numerous seeps and springs in the study area (U.S. Department of Energy 1992).

**Hydrology:** The hydrographic profile of RFETS is very important in determining the potential natural elements that exist there. Groundwater consists mostly of an upper aquifer in the Rocky Flats Alluvium, and occurs in unconfined conditions. Groundwater flow tends to begin in the west and move towards lower elevations in the east (Hurr 1976). Recharge comes during winter and spring precipitation. While most precipitation occurs during the spring and summer, these events are usually too large and too brief to be properly absorbed by surficial material and contribute instead to surface water flow. Deeper aquifers are confined to bedrock formations, probably recharged from outcropped areas to the west, and do not significantly contribute to RFETS' ecology (EG&G Rocky Flats 1993a).

Most surface water flow is anthropogenically managed for water transfer to downstream users and for facility operations. Only Rock Creek, the northern drainage, maintains a natural flow regime. Walnut and Woman Creeks contain 11 surface water management ponds designed for containment of non-point runoff, wastewater treatment plant effluent, and emergency spill containment. Flows are unnaturally managed, depending on user demands, which may be impacting stream ecological processes. The quality of RFETS surface water is well documented and an unlikely factor in determining RFETS' ecological significance (U.S. Department of Energy 1994d).

## METHODS

Due to previous CNHP projects in Boulder County and Jefferson County, much of the information required for solid conservation planning is already available. This allowed CNHP staff to conduct the RFETS survey on a more discrete level and more efficiently. The methods for this project are outlined below.

### Identify Significant Natural Elements:

The CNHP tracks rare and imperiled natural elements across the state and ranks them based on viability, size, and rarity (Colorado Natural Heritage Program 1995). An element can be a plant, animal, or natural community. The elements that potentially occur in the study area are listed in Table 1. Information explaining the Heritage ranking system is provided in Appendix A. This list of potential elements was derived by consulting local museums, herbaria, literature, technical experts, and the CNHP's Biological Conservation Database.

Some of the highest priority elements CNHP was interested in identifying were the Preble's meadow jumping mouse (*Zapus hudsonius preblei*), Ottoe skipper (*Hesperia ottoe*), regal fritillary (*Speyeria idalia*), Ute's ladies' tresses (*Spiranthes diluvialis*), Colorado butterfly weed (*Gaura neomexicana ssp. coloradensis*), and the natural communities of great plains mixed grass

### Vascular plants

SPIRANTHES DILUVIALIS	UTE LADIES' TRESSES	G2	S1	LT	1
GAURA NEOMEXICANA SSP	COLORADO BUTTERFLY	G5T1	S1	C1	1
COLORADENSIS	WEED				
CAREX OREOCHARIS	MONTANE SEDGE	G3	S1?		
MALAXIS BRACHYPODA	WHITE ADDER'S-MOUTH	G4	S1	C2	2
CAREX TORREYI	TORREY SEDGE	G4	S?	3	
RIBES AMERICANUM	AMERICAN CURRANT	G5	S1	2	
CRATAEGUS CHRYSOCARPA	YELLOW HAWTHORN	G5?	S1S2	2	
VIOLA PEDATIFIDA	PRAIRIE VIOLET	G5	S2	3	
EUSTOMA RUSSELLIANUM	SHOWY PRAIRIE	G5	S3	C2	2
	GENTIAN				
ROOTALA RAMOSIOR	TOOTH CUP	G5	S?	3	
ARISTIDA BASIRAMEA	FORKTIP THREE-AWN	G5	S?	3	

### Natural communities

STIPA COMATA - EAST	GREAT PLAINS MIXED	G2	S2		
	GRASS PRAIRIES				
ANDROPOGON GERARDII-	XERIC TALLGRASS	G2	S2		
SCHIZACHYRIUM SCOPARIUM	PRAIRIES				
ANDROPOGON GERARDII	WET PRAIRIES	G3	S1		
-SORGHASTRUM NUTANS					
CAREX NEBRASCENSIS WETLAND	GREAT PLAINS WET	G4	S?		
	MEADOWS				
POPULUS DELTOIDES-SALIX	GREAT PLAINS	G2	S2		
AMYGDELOIDES/SALIX EXIGUA	RIPARIAN				

#### 1 Abbreviations are as follows:

C2 = Category 2 Candidate  
LE = Listed Endangered

#### 2 Abbreviations are as follows:

1 = federal threatened or endangered that are rare throughout their range  
2 = plant species which are rare in Colorado but relatively common elsewhere within their range  
3 = species which appear to be rare but for which conclusive information is lacking;

### Conduct Field Surveys:

DOE and its prime contractor Kaiser-Hill have ecological surveys and monitoring programs in place that record the presence, absence, and viability of potential natural elements at the RFETS. These include a detailed research program on the Preble's meadow jumping mouse (by Dr. F.A. Harrington) and three years of surveys for the Ute's ladies tresses (by Dr. W. Buckner) (EG&G Rocky Flats, Inc. 1993b). Also, the *Biological Characterization of the Rocky Flats Plant* (U.S. Department of Energy 1992), the Ecological Monitoring Program, and the Natural Resource Protection Program have or continue to catalogue and monitor the Site's biota. This work helped focus CNHP field efforts. CNHP agreed to avoid duplicating ongoing or recent research at RFETS by not pursuing these areas. DOE has provided CNHP with all the pertinent data from said research for integration into this report. The research efforts of EG&G Rocky Flats *cum* Kaiser-Hill and its sub-contractors were critical to an accurate assessment of the conservation priorities of the study area.

CNHP conducted field surveys for potential natural elements during the 1994 and 1995 field seasons. The surveys considered the Rock Creek drainage first, generating the Phase I report on the area (see Appendix C). Phase II field work covered the remainder of RFETS, particularly the Buffer Zone where Heritage Program scientists pursued the confirmation of rare and imperiled butterflies and significant natural communities. This work completed the ecological picture needed to develop accurate conservation priorities.

**BOUNDARY JUSTIFICATION:** The preliminary conservation planning boundary delineated in this report includes all known occurrences of natural heritage resources and the adjacent lands required for their protection.

**PROTECTION AND MANAGEMENT CONSIDERATIONS:** A summary of the major issues and factors that are known or likely to affect the protection and management of the Conservation Site.

## ROCKY FLATS CONSERVATION SITE

**SIZE:** approx. 4000 acres

**BIODIVERSITY RANK:** B2  
**PROTECTION URGENCY:** P1  
**MANAGEMENT URGENCY:** M2

**LOCATION:** Louisville Quadrangle (3910582)  
 Eldorado Springs Quadrangle (3910583)  
 Golden Quadrangle (3910572)  
 Ralston Buttes Quadrangle (3910573)  
 T2S, R70W, Sections 2,3,4,9,10,14,15,16,17,20,21

**GENERAL DESCRIPTION:** The Rocky Flats Conservation Site occurs on the south and west portions of the Rocky Flats alluvial fan and, to some extent, down into the colluvial valleys that dissect it. Most of the Conservation Site is located on the Rocky Flats Environmental Technology Site (RFETS), a former nuclear weapons manufacturing facility overseen by the U.S. Department of Energy. RFETS is listed on the National Priorities List under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). The flora is similar to other alluvial fans in the region, although many of these natural communities are becoming increasingly threatened by urban development. The fauna of the Conservation Site has been more highly impacted by regional extirpations of some high trophic level mammals, but still retains many common animals and some rarer ones.

The Rocky Flats Conservation Site is bounded by Highway 128 on the north, Coal Creek to the west, and the RFETS boundary to the south. The eastern boundary follows a rough line that follows the eastern watershed extent of Rock Creek, curves around to the west of the facility's industrial area, and runs southeast to include the wetland complexes of upper Woman Creek. Much of this Conservation Site includes a previous Site, "Rock Creek," identified in Phase I, but includes new element occurrences identified in Phase II, warranting a revision of the previous Site boundary.

Additionally, this Conservation Site is part of the larger Rocky Flats Macrosite, a landscape level boundary that includes a reach of Coal Creek below Coal Creek Canyon, the Quarter Circle area below Coal Creek Peak, the previous Rock Creek boundary, and the Walnut Creek site. This information is based on previous surveys conducted by CNHP (Pague et al. 1993).

**NATURAL HERITAGE RESOURCE SIGNIFICANCE:** This Conservation Site has retained much of its native character due to the general exclusion of the public that occurred during the Cold War. Although RFETS operations and activities have impacted some of the targeted natural elements, particularly on the facility's eastern half, much of the study area remains in relatively natural condition and only moderately fragmented. These areas are included in the Conservation Site.

As with the Rock Creek Conservation Site, the predominant element occurrences are xeric tallgrass prairie, Great Plains riparian community, the Preble's meadow jumping mouse, and

and-thread grass in parts of section 15. CNHP feels that the species composition in section 15 still warrants its classification as xeric tallgrass prairie, but it may be going through successional changes due to historical impacts unknown to CNHP, or growing in different unknown environmental conditions.

The greatest current impact to this occurrence appears to be fragmentation by roads, utility lines, ditches, and gravel pits. It is unclear what impact this has had on genetic viability of the occurrence, but models exist to examine the possible effects of community fragmentation and should be considered (Usher 1987). Also, the exotic species mentioned above have impacted the margins of the community, particularly in conjunction with fragmentation and disturbance sites.

The Great Plains riparian community occurs in the Conservation Site. It is characterized by a diverse mixture of plains cottonwood, peach-leaved willow, and coyote willow (*Populus deltoides*/*Salix amygdaloides*-*Salix exigua*) with an understory of various low shrubs such as leadplant (*Amorpha fruticosa*) and snowberry (*Symphoricarpos occidentalis*). This community is rare and declining in its native conditions throughout the high plains of Colorado, Nebraska, and Kansas. Threats to this community type are primarily water development, use and management. However, exotic species, such as leafy spurge (*Euphorbia esula*) and purple loosestrife (*Lythrum elata*) are increasing problems. Due to these threats and status, it is ranked G2G3/S2S3, indicating that it exists in only 20-50 sites across its historically large range (Bourgeron and Engelking 1994). It is similarly very rare to rare in Colorado. Although some examples of this community are becoming more common along the South Platte river, this may be due to human induced water management and the elimination of the natural flood cycle than any natural processes (Knopf and Scott 1993).

The only significant occurrence of Great Plains riparian community in the Conservation Site is in the Rock Creek drainage. This is probably due to the relatively natural surface water flow regime in the creek (Knopf et al. 1988). In Walnut Creek, it is unclear how water management affects the plant communities found there, but the flood control systems in this drainage are major human modifications to the natural cycle. Below the Mower Ditch diversion in Woman Creek, for example, the occurrence is severely impacted. This community could be restored simply by returning natural flows to the lower portions of the creek.

Most of the riparian community in Walnut Creek has been fragmented by roads and is often dominated in the understory by exotic species (U.S. Department of Energy 1995). Also, Phase II surveys of Rock Creek riparian vegetation indicate that the intrusion of exotics witnessed during Phase I has not quantitatively declined. Primary invaders in both drainages are Canada thistle (*Cirsium arvense*), musk thistle (*Carduus nutans*), smooth brome (*Bromopsis inermis*), and Kentucky bluegrass (*Poa pratensis*).

Despite the generally xeric nature of the Conservation Site, several wetlands occur on the site, mostly in the upper Woman Creek drainage, but also on north aspect slopes in Rock Creek. The most prominent wetland plant communities present in these wetlands are narrow-leaved cattail (*Typha latifolia*) plant association, Baltic rush (*Juncus balticus*) plant association, and Nebraska sedge (*Carex nebrascensis*) plant association (U.S. Army Corps of Engineers 1994). These communities are all ranked G5/S4 by CNHP. A watercress (*Nasturtium officinale*) community, a



rank by CNHP. It has been recorded in only three other locations in the state, in Teller, Gilpin, and Conejos counties. CNHP believes that its occurrence in the Conservation Site is further indication of the rare and sensitive nature of undisturbed areas. Also, most occurrences of this species have been on granitic soil, so it is of additional interest that this occurrence is found on Cretaceous derived material. Further study of this species' distribution and ecology in the Conservation Site is critical to a better understanding of its status in Colorado.

The Preble's meadow jumping mouse (*Zapus hudsonius preblei*) is well documented in the Conservation Site (EG&G Rocky Flats 1992, Compton and Hugie 1993, U.S. Department of Energy 1993, U.S. Department of Energy 1994a, U.S. Department of Interior 1994, U.S. Department of Energy 1995a). It was previously ranked extremely rare by CNHP, or G5T1/S1 because of its relatively unstudied nature and the perception that it occurred in less than 5 populations, globally. However CNHP has re-ranked the sub-species as G5T2/S2 based on field surveys conducted range-wide during 1995 that indicate that it is now found in over 5 populations along the Colorado Piedmont.

The Rock Creek population was previously thought to be the only known site containing sufficient numbers and in adequate habitat to be considered a viable population (Kettler et al. 1994). But additional surveys, particularly in City of Boulder of Open Space and at the U.S. Air Force Academy, have identified other viable populations (Miller pers. comm. 1995, Corn et al. 1995). Because of the natural flow regime and relatively unfragmented habitat, the Preble's meadow jumping mouse occurrence in Rock Creek is still considered very good by CNHP. It is noteworthy that the Rock Creek population may represent an extreme habitat in the range of variability exhibited by the subspecies.

The Woman Creek occurrence is considered average to poor due to its smaller population, fragmentation by roads and weeds, and hydrologic manipulation. Also, recent presence/absence surveys conducted during 1995 failed to capture a single specimen, indicating that the population may be seriously depleted, if not extirpated. A major flood event that occurred in the spring of 1995 may be responsible (Wegrzyn pers. comm. 1995).

Although CNHP did not conduct live trapping for small mammals, Merriam's shrew (*Sorex merriami*) is recorded from previous RFETS studies (U.S. Department of Energy 1992). This insectivore prefers sandy, shaly, broken cover particularly in uplands. Its habitat is often typified by rabbitbrush (*Chrysothamnus nauseosus*) and sagebrush (*Artemisia tridentata*) (Fitzgerald et al. 1995). It is considered rare in Colorado, justifying a G5/S3 rank by CNHP. Information provided to CNHP claims that the capture of Merriam's shrew occurred within the Rocky Flats Conservation Site (Harrington pers. comm. 1995).

Avian species within the Rocky Flats Conservation Site are mainly typical of the high plains biome with a large number of migratory occurrences. Most breeding birds within the Conservation Site, such as song sparrow (*Melospiza melodia*) and red winged blackbird (*Agelaius phoeniceus*) are generally common and not tracked by the CNHP ranking system. Exceptions to this are loggerhead shrike (*Lanius ludovicianus*), grasshopper sparrow (*Ammodramus savannarum*), and black-crowned night heron (*Nycticorax nycticorax*).

**Table 2: Known Natural Elements in the Rocky Flats Conservation Site**

ELEMENT	COMMON NAME	OCCUR RANK	GLOBAL RANK	STATE RANK	FEDERAL STATUS	STATE STATUS
ZAPUS HUDSONIUS PREBLEI	PREBLE'S MEADOW JUMPING MOUSE	B	G5T2	S2	C2	
SOREX MERRIAMI	MERRIAM'S SHREW		G5	S3		
LANIUS LUDOVICIANUS	LOGGERHEAD SHRIKE		G4	S3B	C2	
NYCTICORAX NYCTICORAX	BLACK CROWNED NIGHT HERON		G4	S3B		
AMMODRAMMUS SAVANNARUM	GRASSHOPPER SPARROW		G5	S3B/S 4B		
CELESTRINA SP.1	HOPS BLUE	C	G2Q	S2		
ATRYTONE AROGOS	AROGOS SKIPPER	C	G4	S2		
CAREX OREOCHARIS	MONTANE SEDGE	?	G3	S1		
ANDROPOGON GERARDII-SCHIZACHYRIUM SCOPARJUM	XERIC TALLGRASS PRAIRIE	BC	G2	S2		
POPULUS DELTOIDES-SALIX AMYGDELOIDES/ SALIX EXIGUA	PLAINS COTTONWOOD RIPARIAN WOODLAND	C	G2G3	S2S3		
AMORPHA FRUTICOSA	RIPARIAN SHRUBLAND	?	GU	SU		
CRATAEGUS ERYTHROPODA -PRUNUS VIRGINIANA-SYMPHORICARPOS OCCIDENTALIS	SEEP SHRUBLAND	?	GU	SU		

**OTHER BIODIVERSITY VALUES:** The Colorado Bird Observatory (CBO), in conjunction with Partners in Flight, has developed a bird prioritization system that considers status on wintering grounds as well as breeding grounds. Emphasis is also placed on trend data (Colorado Bird Observatory 1995). The CBO ranking scheme recognizes several high priority species that use the Conservation Site. These species include lark bunting (*Calamospiza melanocorys*), ferruginous hawk (*Buteo regalis*), MacGillivray's warbler (*Opornis tolmiei*), Brewer's sparrow (*Spizella brewerii*), and several others (U.S. Department of Energy 1995a). Although many of observations of these species at the Conservation Site appear to be casual, it should not be overlooked that the area could provide essential migratory stopover habitat for these and more common species.

Furthermore, as part of a larger, landscape-level, open space contingent, it is likely that the Conservation Site is an important contributor to healthy predator-prey relationships. The size, current isolation, and relatively high quality of the area supports potentially viable population of numerous species that are typical of the natural communities at RFETS. This supports biodiversity at the landscape level by preventing biogeographic (or island) effects prevalent in many natural areas (Macarthur and Wilson 1967). This is likely to be important to some common species, but particularly so for more motile and rare species.

**SITE BOUNDARY JUSTIFICATION:** The Conservation Site boundaries for the Rocky Flats Conservation Site include the documented boundaries of xeric tallgrass prairie, the Great Plains riparian community in Rock Creek, the Preble's meadow jumping mouse occurrences in Rock Creek and upper Woman Creek, and the invertebrate occurrences.

The potential extent of xeric tallgrass prairie is documented by Western Aggregates, Inc. (1995) and, while fragmented by roads and gravel pits, is considered one occurrence by CNHP. It stretches from the northwest corner of the Conservation Site south through section 16 and west for an uncertain distance across Highway 93. Although it is unclear what size of prairie constitutes a viable community, CNHP feels that the boundary, particularly to the west, accurately captures the known area of the occurrence.

The boundary is also considered a "buffer area" for the rare invertebrates recorded in the study area. It is difficult to monitor the range of these animals but this "buffer area" should sufficiently protect their perceived needs by including adequate habitat size.

It should be noted that the Rock Creek and Woman Creek watersheds are joined into one Conservation Site. This is an atypical boundary determination by CNHP and is due to two factors. First, the xeric tallgrass prairie occurrence, equally covers both watersheds. Second, is the understanding that hydrologic inputs to Woman Creek are probably from shallow groundwater recharge in the pediments of sections 16 and 15, east of the sandstone hogback that runs north-south through the area (U.S. Department of Energy 1992, U.S. Department of Energy 1994d). Although the Woman Creek channel has been historically used for water conveyance to downstream users, and thereby contributing to flow patterns and possibly augmenting Preble's meadow jumping mouse habitat, this practice will not continue due to the construction of the Kinnear Pipeline (Hill pers. comm. 1995). It is critical that, in order to ensure natural surface water flow and continued viability of the Preble's meadow jumping mouse occurrence in Woman Creek, the groundwater recharge area be included and recognized within the Conservation Site.

**PROTECTION RECOMMENDATIONS:** The Conservation Site, as noted earlier, is afforded no level of protection, aside from exclusion of the general public. Due to the Conservation Site's ecological significance, and the numerous threats to its viability, CNHP has reissued its Rock Creek Protection Urgency Rank of P1 to this larger, Rocky Flats Conservation Site (Kettler et al. 1994). This indicates that management agency(ies) involved should take steps to ensure its protection within one year or risk losing this valuable natural heritage. This will involve coordination between the U.S. Department of Energy, U.S. Department of Interior, U.S. Environmental Protection Agency, Colorado Department of Natural Resources, Colorado Department of Health and the Environment, Jefferson County, and private landowners, including surface rights owners, mineral rights owners, and water rights holders. Private land trust organizations might be helpful in securing the protection of some or all of this Conservation Site.

Designating RFETS (and subsequently the Conservation Site) as a NERP should be a primary protection objective for the Department of Energy. When compared to other NERPs around the country, such as those at the Savannah River Site and the Hanford Site, the Rocky Flats Conservation Site surely ranks as an area of equal ecological interest, especially considering its

threats. These tools include not only traditional methods, such as herbicide application and mowing, but also the use of fire.

Fires are an integral part of the evolution of grassland community evolution and it is believed that, under natural conditions, wild grassland fires occurred every 10-15 years (Brewer 1992). Fire has been well documented to not only help control the spread of exotic species, but also increase overall species diversity (both floral and faunal) within the burned area, especially if conducted in conjunction with a managed grazing regime (Anderson 1982, Collins 1985, Hatch 1990, Hosten 1992). CNHP urges the Department of Energy to conduct a controlled fire feasibility study immediately and to research the effects of fire on exotic vegetation.

**Preble's Meadow Jumping Mouse Recommendations:** Because this Conservation Site contains one of the best known occurrences of the Preble's meadow jumping mouse, management for its continued population health is highly critical for the subspecies' range-wide success.

The Rock Creek occurrence is somewhat fragmented and also may be threatened by the intrusion of exotic vegetation, particularly in the understory. This suggests that, per the *Watershed Management Plan*, closing roads that cross the creek channel should be a high priority at RFETS (U.S. Department of Energy 1993).

Should further study indicate the Preble's meadow jumping mouse is averse to exotic vegetation, weed control should be accelerated in the riparian zone. This will require labor intensive efforts (such as hand pulling and cutting), as herbicide application is not recommended for riparian areas.

CNHP would like to commend Dr. F.A. Harrington's approach to Preble's meadow jumping mouse study. By prohibiting targeted sampling in the healthiest population area (Rock Creek), and focusing instead on more anthropogenically impacted areas (Walnut and Woman Creek), RFETS is maintaining an important baseline/reference area. This will encourage the continued high occurrence rank of the subspecies in Rock Creek and the Conservation Site. Further inventory and study efforts should continue to avoid this sensitive area.

**Great Plains Riparian Community Recommendations:** In places, exotic species heavily dominate the understory in the mosaic of plant associations that make up this community and, in places, have degraded the occurrence in Rock Creek. It is suspected that heavy dominance of exotic species in the understory can result in drastic reduction in diversity of some animal groups (Bock and Bock 1988). As mentioned earlier, the most common and problematic species include Canada thistle, Kentucky bluegrass, and smooth brome. Early season grazing, burning or mowing may be effective management tools to control these exotic plants. Biological control already implemented in the Buffer Zone appears to be only somewhat effective in controlling Canada thistle but quantitative data is lacking. Total elimination of exotic species is impossible but reducing the vigor and dominance of these species may allow native species to increase.

CNHP encourages RFETS to simulate a more natural surface water flow regime in upper Woman Creek. This may help restore the vegetation in the area to more closely resemble a native community. Although CNHP understands that there are several factors determining water management in the watershed, including downstream demands and CERCLA related activities,

## WALNUT CREEK CONSERVATION SITE

**SIZE:** approx. 500 acres

**BIODIVERSITY RANK: B4**  
**PROTECTION URGENCY: P4**  
**MANAGEMENT URGENCY: M3**

**LOCATION:** Louisville Quadrangle (3910582)  
 T2S, R70W, Sects: 1,2,11,12

**GENERAL DESCRIPTION:** The Walnut Creek Conservation Site lies on the eastern side of the U.S. Department of Energy's Rocky Flats Environmental Technology Site (RFETS). The topography slopes from west to east, with moderately steep drainages cut into Quaternary formed alluvial mesas. The Conservation Site ranges in elevation from 5300' to 5900'. The upland flora has been degraded by impacts from routine RFETS operations. Some native riparian vegetation remains. Most of the native fauna have been extirpated from the area except for small mammals, generalist avian species, and some native ungulates.

The Walnut Creek Site is bounded by the RFETS Industrial Area to the west, the mesa tops to the north and south, and Indiana Street to the east. Numerous roads, surface water management ponds, ditches, utility poles, fences, and borrow pits are in or adjacent to the Conservation Site. Much of the Conservation Site is regulated by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA).

**NATURAL HERITAGE RESOURCE SIGNIFICANCE:** The Conservation Site contains a sizable population of Preble's meadow jumping mouse (*Zapus hudsonius preblei*) (U.S. Department of Energy 1994d, Harrington pers. comm. 1995). A Pleistocene relict animal, its historical range extended along the Colorado piedmont from roughly El Paso county into central Wyoming (Whittaker 1972). The genus generally prefers mesic to hydric environments typical of riparian systems (Quimby 1951, Krutzsch 1954). Although the subspecies has probably never been common, it has been severely restricted throughout its historical range due to water development, livestock grazing, and urban development (Compton and Hugie 1993). Because there are less than 20 populations of this small mammal and its habitat is highly threatened CNHP ranks it G5T2/S2.

In the Conservation Site, the subspecies has been captured throughout the length of the stream reach. It has been trapped in and around the surface water management ponds, specifically by Ponds A-1, A-2, and B-3. It has been found below the terminal pond, A-4, in the stream channel. Coyote willow (*Salix exigua*), plains cottonwood (*Populus deltoides*), and snowberry (*Symphoricarpos occidentalis*) make up most of the vegetative cover in the capture areas, although it has also been found in the grassy margins of these areas. Exotic vegetation is prevalent in much of the capture areas. These are mostly Kentucky bluegrass (*Poa pratensis*), smooth brome (*Bromopsis inermis*), and Canada thistle (*Cirsium arvense*). It is unclear how these exotics impact the subspecies population.

Because it is downgradient of the RFETS Industrial Area, surface water flow in the capture areas is anthropogenically managed and highly complex. Although the quality of the water is probably

Should further studies indicate that Preble's meadow jumping mice have an aversion to exotic vegetation, an accelerated weed control program in the riparian area should be considered. Use of herbicides is discouraged because of the hydric nature of the application zone. An aggressive mechanical campaign, emphasizing manual labor, and a controlled burn program are approaches worthy of consideration.

Returning a natural flow regime to the Conservation Site should be the Department of Energy's first objective in reconsidering water management in the drainage. Management requirements imposed by regulatory agencies and the demands of downstream users dictate how and when water is released from the terminal ponds. Cooperation from all parties will be critical to moving away from the current "batch discharge" system towards a "flow through" system, as recommended in the *Pond Water Management Interim Measures/Interim Remedial Action Decision Document* (U.S. Department of Energy 1994d). This may support a more natural belt of acceptable habitat for the Preble's meadow jumping mouse in the riparian zone.

Further studies on the Preble's meadow jumping mouse, as currently under way in the watershed and throughout RFETS, are critical to understanding the needs of the subspecies and how best to manage for it. CNHP considers these efforts the most critical step in retaining the quality of the occurrence in the Conservation Site.

ranked G5T2/S2 by CNHP. The Rock Creek drainage (in the Rocky Flats Conservation Site), with its natural surface water regime and relatively unfragmented nature, is considered the best occurrence in the Macrosite, and one of the best throughout the subspecies' range.

Rock Creek also contains an occurrence of Great Plains riparian community (*Populus angustifolia*-*Salix amygdaloides*/*Salix exigua*), a declining element throughout its historical range. This community is found in less than twenty places globally and is ranked G2G3/S2S3 by CNHP.

The rare sedge, *Carex oreocharis*, is documented from the Rocky Flats Conservation Site (U.S. Department of Energy 1995a). This species is more typical of montane environments but is found on outwashed areas, explaining its occurrence on the colluvial material below the Rocky Flats Alluvium. Because it has been documented in only three other locations in Colorado, it is ranked G3/S1 by CNHP.

In addition to Preble's meadow jumping mouse, faunal occurrences in the Macrosite include rare invertebrates such as Arogos skipper (*Atrytone arogos*) and hops blue (*Celestrina sp.*) found in the xeric tallgrass prairie community and a seep shrubland community, respectively. The Arogos skipper is somewhat common globally but rare in Colorado, and hops blue is believed to be very rare globally but taxonomic questions remain about the species. They are ranked G3G4/S2 and G2Q/S2, respectively.

Loggerhead shrike is ranked G4/S3B and is probably breeding in ponderosa pines in the Rocky Flats Conservation Site (U.S. Department of Energy 1995a). Merriam's shrew (*Sorex merriami*) is known from both the Rocky Flats Conservation Site and the Walnut Creek Conservation Site and is ranked G4/S3 (U.S. Department of Energy 1992).

**OTHER BIODIVERSITY VALUES:** The area supports a wide array of avian species, particularly during their migration and wintering periods (U.S. Department of Energy 1994a).

**CURRENT STATUS:** There is no protection afforded any parcel of this Macrosite, save for the Coal Creek Conservation Site which is owned and managed by Boulder County Open Space. Grazing is moderate to heavy throughout the western half of the Macrosite. Special use designations are pending for sand and gravel mining in sections 3, 4, and 16 (Jefferson County 1995a, Jefferson County 1995b). Some of the Macrosite, as it occurs on RFETS property, is currently regulated under the Comprehensive Environmental Response, Compensation, and Liability Act.

**BOUNDARY JUSTIFICATION:** The Macrosite boundary was developed to capture the significant natural elements found within the associated Conservation Sites and aggregate them on a landscape level. Buffer zones and migration corridors have been integrated. This Macrosite effectively captures the area's abiotic parameters as well.

**PROTECTION AND MANAGEMENT RECOMMENDATIONS:** Because the Macrosite has not been afforded any protection, and because CNHP believes it may be threatened by

## REPORT RECOMMENDATIONS:

### 1. Establish a Rocky Flats Natural Resource Management Roundtable.

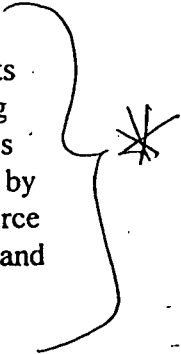
Because of the demands on the future use of the Rocky Flats area and the documented natural heritage values associated with it, CNHP suggests that the U.S. Department of Energy cooperate in developing a roundtable forum to natural resource scientific and management issues. Of paramount import is an understanding of the rarity and restoration potential of the xeric tallgrass prairie. This forum should include noted experts in the field of grassland ecology, weed management, and mine reclamation. Managers affiliated with all pertinent landowners should also be in attendance. CNHP offers its services to convene and chair this forum. Other future issues could include water management or protection strategies.

### 2. Cooperate with Local Landowners Regarding Routine Management Activities.

Per the Secretary of Energy's Ecosystem Management Initiative, CNHP recommends that RFETS work more closely with local landowners in managing its natural resources (U.S. Department of Energy 1995b). Information indicates that a cooperative weed control effort was organized for the 1994 field season. CNHP lauds this approach. Several other landowners in the area, together with RFETS, comprise a larger, landscape-level, system that should be managed in concert. Because RFETS is the largest, most central part of this landscape, it behooves the Department of Energy to coordinate activities such as controlled fire and weed management in order to ensure it achieves its natural resource management objectives.

### 3. Develop an Integrated Natural Resource Management Strategy.

It is critical that U.S. Department of Energy document its goals and objectives regarding its natural resource management responsibilities. CNHP feels that natural resources are being managed at RFETS without any effective internal coordination or common objective. This strategy should integrate the information included in this report, as well as data generated by Kaiser-Hill and its subcontractors. Also, cooperative agreements with other natural resource management agencies and university faculty would help produce a more widely reviewed and effective document.



### 4. Continue to Monitor Ecological Processes and Elements at RFETS.

It is of utmost import that RFETS continue to monitor Site ecology. CNHP is very concerned at the prospect that the Ecological Monitoring Program and the Natural Resources Protection Program might be eliminated in the coming Fiscal Year. These programs are vital to understanding the nature of biological processes along mountain front environments. No other federal facility is a well placed to continue the excellent work started by EG&G Rocky Flats and continued by Kaiser-Hill's ecology staff. CNHP would like to offer its services in any way needed to study ways to retain an effective monitoring program.



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#### Table 4. Definition of Natural Heritage State Rarity Ranks.

Global rarity ranks refer to a species' rarity throughout its range. State and Global ranks are denoted, respectively, with an "S" or a "G" followed by a character. These ranks should not be interpreted as legal designations.

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S1	Extremely rare; usually 5 or fewer occurrences in the state; or may be a few remaining individuals; often especially vulnerable to extirpation.
S2	Very rare; usually between 5 and 20 occurrences; or with many individuals in fewer occurrences; often susceptible to becoming endangered.
S3	Rare to uncommon; usually between 20 and 100 occurrences; may have fewer occurrences, but with a large number of individuals in some populations; may be susceptible to large-scale disturbances.
S4	Common; usually > 100 occurrences, but may be fewer with many large populations; may be restricted to only a portion of the state; usually not susceptible to immediate threats.
S5	Very common; demonstrably secure under present conditions.
SA	Accidental in the state.
SH	Historically known from the state, but not verified for an extended period, usually > 15 years; this rank is used primarily when inventory has been attempted recently.
S#B	Same rank as the numbered S-series, but refers to the breeding season rarity of migrants.
S#N	Same rank as the numbered S-series, but refers to the non-breeding season rarity of migrants; where no consistent location can be discerned for migrants or non-breeding populations, a rank of SZN is used.
SU	Status uncertain, often because of low search effort or cryptic nature of the element.
SX	Apparently extirpated from the state.

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The spot on the landscape that supports a particular population of a specific species or a specific stand of a given community type is an **element occurrence**. The Colorado Natural Heritage Program has mapped over 6,000 element occurrences in Colorado. Information on the location and quality of these element occurrences is also entered into the computerized Biological and Conservation Databases (BCD). This computer system, developed by The Nature Conservancy, is utilized by the international network of heritage programs and conservation data centers. All centers utilize the same methodology, allowing a unique, direct comparison of information throughout the area covered.

In addition to ranking each element in terms of rarity, Natural Heritage staff scientists rank each element occurrence so that protection efforts can be aimed not only at the rarest elements, but at the best examples of each. Element occurrences are ranked in terms of the **quality** (size, vigor, etc.) of the population or community, the **condition** or naturalness of the habitat, the long-term **viability** of the population or community, and the **defensibility** (ease or difficulty of protecting) of the occurrence. Given the intimate relationship between a natural community and its environment, community occurrences are largely ranked in terms of their quality and condition.

One of the strongest ways that the Colorado Natural Heritage Program uses these element and element occurrence ranks is to assess the overall significance of a site, which may include one or many element occurrences. Based on these ranks, each site is assigned a **biodiversity** (or B-) **rank**:

identified in this type of study may be considered as core areas for the protection of the full range of biological diversity. Some of these areas are best considered as candidates for special area designations, others as sites within a landscape that should be managed to include the maintenance of the site's integrity.

A basic premise in the landscape management approach starts with the delineation of core protected areas that can be represented by special designations. Where possible, these should be connected through corridors and appropriately buffered. Buffer areas should include the ecological processes supporting the diversity of the core area. Such is the basis of the development of preliminary conservation planning boundaries.

## EXECUTIVE SUMMARY

In 1993, The Colorado Natural Heritage Program (CNHP) was contracted by the Department of Energy to assess the ecological values of the Rock Creek drainage at the Rocky Flats Environmental Technology Site (RFETS). The goal of the project was to accumulate and examine existing biological data from the site, incorporate appropriate portions into the CNHP's Biological Conservation Database, and with appropriate field verification, identify significant natural heritage resources. We were also asked to make recommendations on actions that would be necessary to protect these resources.

The Natural Heritage Inventory was conducted in four steps:

1. Accumulate existing information concerning significant elements of biological diversity from existing data at the Rocky Flats Environmental Technology Site.
2. Perform ground surveys to rank occurrences of elements in terms of quality, condition, viability, and defensibility, and to identify conservation boundaries for each element.
3. Assign natural heritage Biodiversity Ranks (B-ranks) to determine significance of each occurrence.
4. Assess conservation data relative to the conservation priorities of the International Network of Natural Heritage Programs and present in a final report.

The Rock Creek drainage was determined to contain significant natural heritage resources (those species or communities determined by CNHP to be rare, threatened or endangered or of high significance) and was denoted as a "natural heritage conservation site." The Natural Heritage Program developed a preliminary conservation planning boundary for the Rock Creek drainage. In developing this boundary, a number of factors were considered including: habitat for rare species, protection of water quality, buffers from potentially detrimental land uses, and the maintenance of ecological processes necessary for the perpetuation of the significant elements in the area.

The delineation of a conservation planning boundary in this report does not confer any regulatory protection on recommended areas. These boundaries are intended to be used to support wise planning and decision-making for the conservation of these significant areas. The Colorado Natural Heritage Program encourages the Department of Energy (DOE) to take actions that will protect this site, particularly since in the Heritage Program methodology it ranks as a site of

continually updated databases. CNHP is part of an international network of conservation data centers that use the Biological and Conservation Databases (developed by The Nature Conservancy). In addition, CNHP has effective relationships with the Colorado Natural Areas Program, Colorado Department of Natural Resources, the Colorado Division of Wildlife, and the numerous federal agencies. Concentrating on site-specific data for each element of natural diversity, the accurate status of each element becomes known. The data presented here illustrate a site that is important to the conservation of Colorado's, and indeed the nation's natural biological diversity. By using the element ranks and the quality of each occurrence, priorities can be established for the protection of the most sensitive or imperilled sites. It is by having an updated locational database and priority-setting system that CNHP can provide its most effective, proactive land-planning tools.

Information is gathered by CNHP on species, natural communities, and ecosystems. Each of these significant natural features (species and community types) is an element of natural diversity, or simply an element. Each element is assigned a rank that indicates its relative rarity on a five-point scale (1 = extremely rare/imperilled; 5 = abundant/secure; Table 1).

The primary criterion for ranking elements is the number of occurrences, i.e. the number of known distinct localities or populations. Also of great importance is the number of individuals at each locality or, for highly mobile organisms, the total number of individuals. Other considerations include the condition of the occurrences, the number of protected occurrences, population trends, and threats. However, the emphasis remains on the number of occurrences, such that ranks are an index of known biological rarity. These ranks are assigned both in terms of the element's rarity within Colorado (its State or S-rank) and the element's rarity over its entire range (its Global or G-rank). Taken together, these two ranks give an instant picture of the rarity of the element. Although most species protected under state or federal endangered species laws are extremely rare, not all rare species are listed as Endangered or Threatened and Natural Heritage rarity ranks should not be interpreted as legal designations.

The spot on the landscape that supports a particular population of a specific species or a specific stand of a given community type is an element occurrence. The Colorado Natural Heritage Program has mapped over 4,000 element occurrences in Colorado. Information on the location and quality of these element occurrences is also entered into the computerized Biological and Conservation Databases (BCD). This computer system, developed by The Nature Conservancy, is utilized by the international network of heritage programs and conservation data centers. All centers utilize the same methodology, allowing a unique, direct comparison of information throughout the area covered.

In addition to ranking each element in terms of rarity, Natural Heritage staff scientists rank each element occurrence so that protection efforts can be aimed not only at the rarest elements, but at the best examples of each. Element occurrences are ranked in terms of the quality (size, vigor, etc.) of the population or community, the condition or naturalness of the habitat, the long-term viability of the population or community, and the defensibility (ease or difficulty of protecting) of the occurrence. Given the intimate relationship between a natural community and its environment, community occurrences are largely ranked in terms of their quality and condition.

One of the strongest ways that the Colorado Natural Heritage Program uses these element and element occurrence ranks is to assess the overall significance of a site, which may include one or many element occurrences. Based on these ranks, each site is assigned a biodiversity (or B-) rank:

- B1 Outstanding Significance: only site known for an element or an excellent occurrence of a G1 species.
- B2 Very High Significance: one of the best examples of a community type, good occurrence of a G1 species, or excellent occurrence of a G2 or G3 species.
- B3 High Significance: excellent example of any community type, good occurrence of a G3 species, or a large concentration of good occurrences of state rare species.
- B4 Moderate Significance: good example of a community type, excellent or good occurrence of state-rare species.
- B5 General Biodiversity Significance: good or marginal occurrence of a community type, S1, or S2 species.

## What is Biological Diversity?

Biological diversity has recently become an important management issue for many natural resource professionals. Biological diversity at its most basic level



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as core areas for the protection of the full range of biological diversity. Some of these areas are best considered as candidates for special area designations, others as sites within a landscape that should be managed to include the maintenance of the site's integrity.

A basic premise in the landscape management approach starts with the delineation of core protected areas that can be represented by special designations. Where possible, these should be connected through corridors and appropriately buffered. Buffer areas should include the ecological processes supporting the diversity of the core area. Such is the basis of the development of preliminary conservation planning boundaries.

## METHODS

The Natural Heritage staff conducted a natural heritage inventory in four stages:

1. Gather existing information. Information was accumulated from a variety of sources at the Rocky Flats Environmental Technology Site and through previously published and unpublished information. This included the gathering of maps, reviewing the BCD and manual Natural Heritage data (see table 2), and consulting experts including Rocky Flats personnel. The high quality research results of EG&G and their subcontractors were critical to being able to accurately assess the conservation priorities of the area.
2. Perform field verification and determine preliminary conservation boundaries. Ground surveys were conducted to rank occurrences of elements in terms of quality, condition, viability, and defensibility to put into perspective the state and range wide significance of the element. Preliminary conservation boundaries were identified for each natural heritage resource.
3. Assign Biodiversity Ranks (B-ranks). The site is assigned a B-rank based on the rarity, occurrence rank, and management and protection urgency of each element as it relates to the protection of biological diversity.
4. Compile the results and prepare a final report. As work was completed, Natural Heritage staff scientists reviewed the information gathered. Based on a review of all natural heritage resources present, the staff prioritized the elements in terms of their significance and the threats facing them, developed and mapped preliminary conservation planning boundaries, and drafted protection and management recommendations.

Vascular plants

SPIRANTHES DILUVIALIS	UTE LADIES' TRESSES	G2	S1	LT	1
GAURA NEOMEXICANA SSP COLORADENSIS	COLORADO BUTTERFLY WEED	G5T1	S1	C1	1
MALAXIS BRACHYPODA	WHITE ADDER'S-MOUTH	G4	S1	C2	2
CAREX TORREYI	TORREY SEDGE	G4	S?		3
RIBES AMERICANUM	AMERICAN CURRANT	G5	S1		2
CRATAEGUS CHRYSOCARPA	YELLOW HAWTHORN	G5?	S1S2		2
VIOLA PEDATIFIDA	PRAIRIE VIOLET	G5	S2		3
EUSTOMA RUSSELLIANUM	SHOWY PRAIRIE GENTIAN	G5	S3	C2	2
RODALA RAMOSIOR	TOOTH CUP	G5	S?		3
ARISTIDA BASIRAMEA	FORKTIP THREE-AWN	G5	S?		3

Natural communities

STIPA COMATA - EAST	GREAT PLAINS MIXED GRASS PRAIRIES	G2	S2		
ANDROPOGON	XERIC TALLGRASS PRAIRIES	G2	S2		
GERARDII-SCHIZACHYRIUM SCOPARIUM					
ANDROPOGON	WET PRAIRIES	G3	S1		
GERARDII-SORGHASTRUM NUTANS CAREX NEBRASCENSIS WETLAND	GREAT PLAINS WET MEADOWS	G4	S?		

- 1 Abbreviations are as follows:  
C2 = Category 2 Candidate  
LE = Listed Endangered

- 2 Abbreviations are as follows:  
1 = federal threatened or endangered that are rare throughout their range  
2 = plant species which are rare in Colorado but relatively common elsewhere within their range  
3 = species which appear to be rare but for which conclusive information is lacking;

- Occurrences for bird species are only those with probable or confirmed breeding status, or significant concentration areas (wintering or migrating).

**NATURAL HERITAGE RESOURCE SIGNIFICANCE:** A synopsis of the rare species and significant natural communities that occur on the conservation site.

**OTHER BIODIVERSITY VALUES:** Other items of general biodiversity interest or concern.

**CURRENT STATUS:** A summary of the ownership, degree of protection currently afforded the conservation site, and threats to the site or natural heritage resources as determined to date.

**BOUNDARY JUSTIFICATION:** The preliminary conservation planning boundary delineated in this report includes all known occurrences of natural heritage resources and the adjacent lands required for their protection. A discussion of the major factors that were considered is on pages 10-11.

**PROTECTION AND MANAGEMENT CONSIDERATIONS:** A summary of the major issues and factors that are known or likely to affect the protection and management of the conservation site.

common graminoids include a sedge (Carex eleocharis), Canada bluegrass (Poa compressa), and mountain muhly (Muhlenbergia montana) (U. S. Dept. of Energy 1994a). This plant association is ranked G2/S2 by the Natural Heritage Program network. The rank G2 indicates that good examples of this community are very rare, occurring in fewer than about 20 places worldwide. In Colorado, we rank this plant association as S2, reflecting its very rare nature. We believe this community to be imperilled in Colorado and rare globally. Xeric tallgrass prairies have become extremely rare, due to building, mining, and grazing (Howe 1994). These types of grasslands once occupied expansive areas on the Great Plains but have been reduced to tiny remnants. The Rock Creek xeric tallgrass prairie occupies a large area and is in good condition in places. Exotic plant species are common in patches throughout the community especially along roads or areas of disturbance. We recommend that it be included in a conservation site due to its size, fairly good condition and rarity.

The xeric tallgrass prairie ecosystem is now fractured into remnants. The placement of several to many remnants such that genetic exchange of the associated organisms is facilitated can aid in the long term persistence of the community. This may happen even though all of the individual components are insufficient. In this light, the setting aside of the Rocky Flats Site would fill a major gap between the City of Boulder Open Space prairies (the nearest at the junction of Hwy 128 and 93) and the smaller patches near White Ranch in Jefferson County. The next closest patches are in the vicinity of Ken Caryl Ranch in southern Jefferson County. The true significance of this site is best viewed from the perspective of the remaining patches of this and associated grasslands in Jefferson County and southern Boulder County. Portions of this landscape are reported in Pague et al. (1993). Associated occurrences of the grassland communities are known from the adjacent areas. It should be considered that these fragments are by themselves insufficient conservation units; however, perhaps with restored linkages, we believe that they could provide community persistence.

The Great Plains riparian community is characterized by a diverse mixture of trees, shrubs, graminoids, and forbs. Common species include plains cottonwood (Populus deltoides), coyote willow (Salix exigua), leadplant (Amorpha fruticosa), baltic rush (Juncus balticus), and various sedges (Carex species) and grasses.

The vegetation along Rock Creek is dominated by a mosaic of several plant associations: Two of which are the Populus deltoides-Salix amygdaloides/S. exigua (Plains cottonwood riparian woodland) and the Amorpha fruticosa shrubland. The first is considered of global significance by the Natural Heritage Network, G2G3/S2S3 (Globally very rare to rare and the same status in Colorado). This plant association is range-restricted and heavily impacted. The occurrence in the Rock Creek drainage is impacted, but potentially restorable. The Amorpha fruticosa shrubland is ranked GU/SU by the Natural Heritage Network, indicating its poorly known status. The GU/SU rank indicates that ranking has not been attempted for this plant association and more information is needed to document its status. Taking a conservative

The status of extant populations of Preble's meadow jumping mouse is poorly known in Colorado, and unknown in Wyoming. Extant populations are known from the Rocky Flats Environmental Site, the Fort St. Vrain Nuclear Generating Station, the City of Boulder Open Space (Tracy Collins parcel and the Van Vleet parcel) (Compton and Hugie 1993). An intriguing report of the species comes from near Woodburn, El Paso County, Colorado (Jones and Jones 1985), as cited in Compton and Hugie (1993). The exact location of Woodburn is unknown at this time (personal communication with David Armstrong 1994), and no recent live trapping effort has been conducted in this area (Compton and Hugie 1993).

The first Preble's meadow jumping mouse recorded at the Rocky Flats Environmental Technology Site was captured in 1991 (Ebasco Biologists 1992, U. S. Department of Energy 1994c). Intensive trapping efforts have been conducted since 1992 (U. S. Department of Energy 1994c, 1994a, personal communication with Kevin Essington 1994; EG&G 1993a, 1992). The population at RFETS has been under study for several years and is the best known population in the state (and in the world) (Fred Harrington - personal communication; David Armstrong - personal communication). The Rock Creek population (or subpopulation) is the only known site containing sufficient numbers and habitat to be considered potentially viable. For this reason, the Rock Creek Site is considered by CNHP to be of high biodiversity significance.

The Natural Heritage Network ranks this subspecies as G5T1?/S1? indicating that the species (Zapus hudsonius) is globally common. The subspecies, noted by the T1? rank, is extremely rare and imperilled globally. Finally, Preble's meadow jumping mouse is extremely rare in Colorado, indicated by the rank of S1?. The "?" after the ranks indicate a certain level of uncertainty due to insufficient surveys over the potential range. In any case, it is the consensus of experts that this subspecies, even if more widespread, will always be considered rare (David Armstrong - personal communication).

Other mammals known from the Rock Creek site are not considered rare, threatened or endangered. The rare Merriam's shrew (Sorex merriami) is known from the Woman Creek drainage, but has not been verified from the Rock Creek drainage.

Although several special concern bird species have been observed at the Rocky Flats Environmental Technology Site, most cannot be considered occurrences of conservation significance. Tracked occurrences for bird species are only those with probable or confirmed breeding status, as per Colorado Bird Atlas guidelines (Kingery 1990), or significant concentration areas (migrating or wintering). Based on existing information, birds of special concern that probably breed within the Rock Creek Site include the loggerhead shrike (Lanius ludovicianus) and the black-crowned night-heron (Nycticorax nycticorax).

Colorado Natural Heritage Program is highly concerned about the small size of native prairie remnants and considers it of importance to retain (and potentially restore) the existing remnants.

**PROTECTION RECOMMENDATIONS:** The significance of the site warrants that the Department of Energy immediately designate the Rock Creek Site as a priority ecological site. The Protection Urgency Rank of P1 indicates that the Site may be threatened by forces that could result in the loss of the element(s) within one year. Such a designation should be formal and be included in any site management plans. This protective status should also be such that it continues in effect with any transfer of the pertinent lands to other ownership or management (unless other more current biological information suggests otherwise). We also recommend that this protection status include no additional road development or other means of fragmentation of the existing site. Proposals to conduct mineral excavation should incorporate these same principles. We note that the ecological integrity of much of this site is dependent on a protected hydrological regime. Finally, since this conservation site extends beyond Rocky Flats Environmental Site boundaries, CNHP recommends that the Department of Energy work in partnership with pertinent federal, state, and local agencies as well as private conservation organizations that could assist in the protection and management of the entire conservation site.

**MANAGEMENT RECOMMENDATIONS:**

**Preble's meadow jumping mouse management recommendations:** This site contains the largest known and best studied population of Preble's meadow jumping mouse (Fred Harrington - personal communication, U. S. Department of Energy 1994c). Captures at this site have been reported from a variety of habitat types in and adjacent to the riparian zone of Rock Creek. Long term protection will require the maintenance of these habitats in natural condition (natural ecological functions). This includes the maintenance of supportive ecological processes. Fragmentation of the area by roads, and possibly trails, should be avoided. Road closures should be considered (perhaps through re-routing). We do not consider the existing research to be other than a positive management practice. The information thus far gained from EG&G's excellent research program is the best available for the subspecies.

CNHP is greatly concerned about the extent of weedy invasion in the Rock Creek drainage. The effects of many of these species on the Preble's meadow jumping mouse are not precisely known. Ecological theory and observation of CNHP staff suggest that serious degradation of the mouse habitat quality will occur with additional expansion of weeds, particularly knapweed species. Exotic plants that threaten to change the structure of the habitats of the Rock Creek Site should be kept in check.

Off-site land use may pose the greatest threat to this occurrence. Habitat destruction and alteration of the surrounding land may isolate this population, decreasing its

numbers reflect the diverse vegetation types and topography occurring in these counties, more than 54 species can be expected from the vicinity of RFETS.

Targeted searches for rare butterflies and moths using life history information should be conducted. At least one globally rare butterfly (Hesperia ottoe, G3?/S2) is known to occur very near the Site on habitat very similar to the Xeric tallgrass communities identified above. Two state rare butterflies, Atrytone arogos and Polites origenes, use Xeric tallgrass prairie species as larval host plants.

Other invertebrates possibly occurring at the Rocky Flats Environmental Technology Site, including aquatic species, may also be significant. Many terrestrial and aquatic invertebrates were collected and analyzed for the 1992 Baseline Biological Characterization Report. However, most have not been identified to the species level. Species level information is necessary in assessing conservation priorities.

Several special concern bird species have been recorded at the Rocky Flats Environmental Technology Site, although most cannot be considered occurrences of conservation significance. Field surveys designed to evaluate breeding status of special concern species at RFETS may reveal new occurrences which will guide conservation and management decisions. Significant foraging grounds for peregrine falcons and bald eagles, and migratory concentration areas are also of interest.

Further surveys for natural heritage elements identified elsewhere on the plant site should be conducted to determine the extent and quality of these occurrences. Natural heritage element occurrences reported from the Rocky Flats Environmental Technology Site, but not known from Rock Creek, include Merriam's shrew (Sorex merriami, G5/S3) and Fork-tipped three-awn (Aristida basiramea, G5/S?).

7. **Continue monitoring and life history investigation of Preble's meadow jumping mouse.**

Information from the studies being conducted at Rocky Flats Environmental Technology Site will be very valuable in determining proper conservation actions to protect this species. It is critical that this information is shared with other organizations and agencies so that they may fine tune their inventory efforts.



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