

DRAFT

**Fish and Wildlife Coordination Act
Migratory Bird Treaty Act
Endangered Species Act**
COMPLIANCE

**881 HILLSIDE FRENCH DRAIN
(881-HFD) PROJECT**

DRAFT HABITAT MITIGATION PLAN

**DEPARTMENT OF ENERGY
ROCKY FLATS OFFICE
GOLDEN, CO**

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ADMIN RECORD

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1.0 INTRODUCTION

The 881 Hillside French Drain Project (881-HFD) will impact several resources protected under the Fish & Wildlife Coordination Act (FWCA) [16 U.S.C. 661-666, the Migratory Bird Treaty Act (MBTA) [50 CFR Part 12], and potentially the Endangered Species Act (ESA) [50 CFR Part 402]. Interagency consultation between the Department of Energy (DOE,RFO), the U.S. Fish & Wildlife Service (USFWS), and the Colorado Division of Wildlife (CDOW) has been instrumental in identifying areas of concern that will be addressed in this habitat mitigation plan. This plan will be reviewed by the Environmental Protection Agency (EPA), EG&G Surface Water Division, USFWS, and CDOW for identification of impacts to the described resources and to evaluate the effectiveness of proposed mitigation activities.

2.0 PROJECT IMPACTS

2.1 Project

The 881 Hillside French Drain Project involves collecting contaminated alluvial groundwater from three sources within the 881 Hillside Area, pumping this water to a newly constructed treatment facility, where it is processed to treated effluent, then discharged into the South Interceptor Ditch. Collection of groundwater occurs in an approximately 836m (2,625 feet) long french drain system located along an east to west transect across the base of the 881 Hillside, downgradient of the alluvial groundwater contamination plume.

The french drain extends from the soil surface to the bedrock and varies in depth from 3 m (10 feet) to 10 m (33 feet) and from 10 m (33 feet) to 32 m (98 feet) in width. The drain will not remain as an open trench but will be backfilled with soil and brought to the slope grade when complete. Figure 1 shows the location and alignment of the french drain. Construction was initially planned for completion in early spring 1992; however, the completion date has been extended due to unforeseen problems encountered at the west end of the drain.

2.2 Habitat Resource Impacts

The general character of the 881 Hillside is one of man-induced disruption, with highly disturbed primary habitat comprised of typical secondary successional and rehabilitation species. Habitat types immediately adjacent to the project site include wet meadow, short marsh, mesic grassland, rehabilitation, and disturbed types. 881-HFD project construction and remediation activities have affected approximately 2.8 ha (7 acres) of mostly native grasses.

Surveys conducted on the project site prior to construction found a man-made jurisdictional wetland as defined in 33 CFR § 328.3(b) and 40 CFR § 230.3(t). This wetland was classified as man-made because its water source consisted of discharges from Building 881 footer drains and runoff from road surfaces. Since the 881-HFD project is new construction, any associated wetland impacts do not qualify for exclusion under 10 CFR § 1022.5(g) and DOE has begun the required process for public notification of wetlands impacts.

Approximately 1200 m² (12,917 ft²) of tree and wetland habitat on the south-facing slope above Woman Creek drainage near the western end of the french drain alignment were removed. Figure 1 shows the former location of these habitats. These trees and wetlands performed a variety of functions, including provision of wildlife habitat, erosion control, water quality enhancement, food web support, and groundwater recharge/discharge. This area was observed

supporting as many as 14 species of migratory birds both for nesting and foraging. Tree and wetland habitats were composed of the following species:

- Two stands of plains cottonwoods (*Populus sargentii*), covering approximately 400-600 m² (6,456 ft²), in two groupings: one of 10 trees and one with 8 trees. The average diameter at breast height (DBH) for the trees was approximately 30 cm (12 inches).
- An area of approximately 400-600 m² (6,456 ft²) of the following wetland species: willow (*Salix spp.*), broad-leaf cattail (*Typha latifolia*), spike rush (*Eleocharis macrostachya*), and various bulrushes (*Scirpus spp.*).

These tree and wetland habitats were destroyed during excavation of the french drain; construction activities also disrupted migratory bird utilization of this area.

2.3 Endangered Species Impacts

Endangered species and other species of concern (SOC)[listing is provided in Table 1] surveys have been conducted both in the area of the french drain project and throughout the buffer zone¹. Specific surveys for selected SOC species were conducted in the 881 Hillside area during the summer and fall of 1991².

No federal threatened, endangered, or proposed for listing species were documented in or near the 881-HFD Project area, nor did the project area provide, based on what is known of SOC life histories, habitat considered critical to these species. Special surveys were conducted in late September and early October 1991 to determine the presence or absence of either Preble's Meadow Jumping Mouse (*Zapus hudsonius preblei*) or Diluvium Lady's Tresses (*Spiranthes diluvialis*). Unfortunately, these surveys may have been conducted too late in the season to provide a definitive answer as to the presence or absence of either of these two species. A conservative assumption is that either of these two species or their critical habitat may have been impacted by 881-HFD project activities and that some form of mitigation action is required. No other SOC's are expected to occur with any degree of regularity in the 881-HFD project area³.

3.0 MITIGATION DESIGN

The overall design objective will be redressment of impacts to the habitat and wetland resources which formerly occupied the 881-HFD project area. Four types of specific habitat resources, each with distinct structural features, will eventually be mitigated: grassland, wetland, trees/shrubs, and SOC critical habitat. The mitigation plan design will discuss compensatory mitigation activities appropriate to each habitat type, namely:

- Wetlands: Restoration of wetland habitat at the 881-HFD project site is not

1) U.S. DOE, 1991. Threatened and Endangered Species Evaluation Report, Rocky Flats Plant.

2) U.S. DOE, 1991. Endangered Species Act Compliance, 881 Hillside French Drain Project, Final Biological Survey Report.

3) EG&G Rocky Flats, 1991. Identification and Reporting of Threatened and Endangered and Special Concern Species, Standard Operating Procedure 3-21000-ADM-NEPA.12.

feasible due to uncertainties regarding water availability and the possibility for interference with operation of the french drain system. Wetland habitat will therefore be created in a remote area of the buffer zone where soil and hydrologic conditions are most suitable.

- **Grassland:** Reseeding the disturbed project area, immediately upon completion of the french drain installation, with indigenous grasses and forbs to stabilize the soil surface. This will aid in reducing wind and water erosion and in the reduction of undesirable plant monoculture establishment.
- **Trees:** Restoration of terrestrial habitat for migratory birds and wildlife by planting in-kind xeric and mesic trees by the end of the second year of the mitigation plan at sites elsewhere within the buffer zone.
- **Shrubs:** Restoration of terrestrial habitat for migratory birds and wildlife by planting in-kind xeric and mesic shrubs by the end of the second year of the mitigation plan at the 881-HFD project site and elsewhere within the buffer zone.
- ***Spiranthes* Refuge:** Establishment of a refuge for *Spiranthes diluvialis* in an area of the buffer zone containing its preferred habitat and removed from all anticipated remediation or construction activity impacts. This may involve one large refuge (≈ 0.25 ha) or several smaller (≈ 0.05 ha) scattered refugia. This refuge would be available to accept *Spiranthes* forced into transplantation by either on-site and off-site projects.

Figure 2 shows the approximate locations for proposed or potential mitigation actions for each of the above habitat types. All locations shown, with the exception of the grassland revegetation area, are approximate and subject to change.

3.1 Wetland

The goal of all mitigation activities relating to wetlands will be consistent with the goal of the Clean Water Act, which is "...to restore and maintain the chemical, physical, and biological integrity of our Nation's waters" and to attain functional equivalency.

There are five basic types of wetland compensatory mitigation actions: (a) restoration, (b) creation, (c) enhancement, (d) exchange, and (e) preservation. The mitigation design goal selected for this plan is creation of a wetland habitat. Creation of wetland habitat, rather than in-place restoration, will permit establishment of new wetlands in an area removed from future hydrologic complications resulting from on-going operation of the french drain. Selection of any new wetland site should consider the following design criteria:

- Availability of plant material,
- Genetic compatibility of stock material with the local populations destroyed,
- Similar site-specific environmental conditions, such as water depth, periodicity, slope, soil composition,
- Area topography is a mesic grassland with several low-lying depressions of hydric soil conditions indicated by the vegetation currently present (i.e., cattails and cottonwoods growing in standing water),
- Three man-made drainage infrastructures, from the paved southern most RFP

road, supplies surface water run-off to the chosen area in addition to a subsurface flow.

Restoration of wetland habitat anywhere on the 881-HFD project site is not feasible due to uncertainties regarding water availability and the possibility for interference with operation of the french drain system. Therefore, an area of the buffer zone where soil and hydrologic conditions are most suitable creation of wetland habitat must be selected and developed. Any area must be large enough to provide a 2:1 or better offset for all anticipated wetland habitat losses resulting from all remediation or construction activities. Potential sites exist at the eastern extremes of the Rock Creek, Walnut Creek, Woman Creek, and Smart Ditch drainages.

3.2 Grassland

Immediately following final contour grading, reseeding and long-term stabilization of the 881-HFD project site will be achieved with a mixture of native grasses and forbs. After fertilization, and topsoil distribution, the project area will be drilled with Spring Barley (Otis). This vegetative cover will be of short duration and will provide soil protection through the spring and summer months. Spring Barley should provide standing stubble for soil protection during the native seed mix establishment period, although supplemental mulching may be necessary. The effectiveness of the reseeding activity will be monitored to determine if supplemental mulching is necessary.

3.3 Trees

Native trees will be used to reduce degradation of the native ecosystem, reduce chemical (herbicide) use, and conserve water resources⁴. Only in-kind xeric and mesic vegetation will be used for restoration of the terrestrial tree habitat⁵. Temporary fencing will be utilized to prevent unnecessary intrusion and grubbing. Native trees that will be considered include:

- Hybrid Cottonwood (cottonless) trees flourish up to an elevation of 2,134 m (7,000 feet) but need moist soil or supplemental water for initial survival.
- Rocky Mountain Juniper (*Juniperus scopulorum*) is a medium height tree, which grows well on most soils up to an elevation of 2,743 m (9,000 feet). It is drought resistant when established, provides high food and cover values for small non-game birds and small mammals, and is an excellent windbreak species.
- Ponderosa Pine (*Pinus ponderosa*) grows to a height of 14-16 m (45-50 feet) with a spread of 11-13 m (35-40 feet) on most soils except for heavy clay up to an elevation of 2,743 m (9,000 feet). While it must have good drainage, it is a good windbreak species and provides high food and cover values for small non-game birds and small mammals.

Tree habitat restoration will consist of planting from 75 to 150 cottonwood tree seedlings

4) Administrative Order B-302, Use of Native Vegetation in State Parks and Recreation Areas. Colorado Department of Natural Resources Division of Parks and Outdoor Recreation.

5) Mustard, E and Jurgens, L., 1986. Food and Cover Values of Selected Plant Materials for Wildlife. U.S. Department of Agriculture, Colorado Soil Conservation Service, Biology Technical Note No. 4.

("tubes") along the lower (eastern) reaches of Rock, Walnut, and Woman Creeks, near but not in the creek bottoms. Trees could also be planted in the lower reaches of Smart Ditch, near the "D"-series ponds. A limited number (<50) of cottonwood trees will also be planted in existing stands along creeks for habitat augmentation. Some (5 to 10) cottonwoods may be planted near seeps or surface runoff channels on south-facing slopes in the upper (western) reaches of Woman Creek drainage or near flows emanating from Antelope Springs, provided these locations are not subject to impacts from Operable Unit 5 (abandoned landfill) remediation activities.

From 10 to 50 pines and junipers will be planted near or among existing pine populations in the upper, western portions of the buffer zone. None will be planted in or near the industrial area of the plant site.

3.4 Shrubs

A successful program requires evaluation of the interaction of soil type, water drainage, and insolation prior to selection of xeriphyllic shrubs⁶.

Heavy clay soils will provide poor drainage, even on a slope. These same soils on a south- or west-facing slope will dry quickly and therefore require relatively frequent applications of water. Dense, clay soils are low in oxygen and do not lend themselves well to plant growth. Most xeriphyllic shrubs, while tolerating low water, cannot function well in soils low in oxygen and it may be necessary to augment chosen planting locations with a soil amendment. In very heavy soils, where improvements in subsoil drainage are not feasible, it may be necessary to plant xeriphyllic shrubs on berms of well-drained loamy soil. The berms should be a minimum of 60 cm (24 inches) high.

Shade tolerant shrubs will be chosen for placement on north exposures. However, because most xeriphyllic shrubs thrive best in sunny exposures, there are fewer shade tolerant species from which to choose. Shade tolerant species generally require more water than others, although this can be somewhat off-set by using organic mulches such as wood chips.

Relatively frequent watering is needed until shrubs become established. For most woody plants, establishment takes at least two growing seasons. Once established, a gradual reduction in watering frequency can be undertaken. Shallow watering must be avoided, since this tends to encourage shallow, structurally weak root systems.

The following species have proven adaptable to general environmental conditions in Colorado, but may have limited adaptability to soil types and/or environmental conditions at Rocky Flats:

- *Cotoneaster* (*Cotoneaster* sp.) belongs to a highly variable group, most have shiny small leaves, and red or black berries. It grows from 12 cm (6") to 3 m (10 feet) tall on most soils up to an elevation of 2,440 m (8,000 feet), and provides medium to high food and cover value for small non-game birds and small mammals.
- Lilac (*Syringa vulgaris*) is a tall shrub which grows well on most soils up to an elevation of 2,590 m (8,500 feet). It is one of the best shrubs for windbreak purposes

⁶) Feucht, J.R., 1987. Xeriscaping: trees and shrubs for low-water landscapes. Colorado State University Cooperative Extension, Service in Action Bulletin No. 7.229

and provides a high cover but low food value for small non-game birds and small mammals.

- Common Chokecherry (*Prunus virginiana*) is a medium-height shrub which grows well on most soils up to an elevation of 2,743 m (9,000 feet). It provides a high food and cover value for small non-game birds and small mammals.
- Skunkbush Sumac (*Rhus trilobata*) is a medium-height shrub, which grows well on most soils up to an elevation of 2,440 m (8,000 feet). It has glossy dark green leaves, showy red velvety fruit, and is drought resistant. It provides a high food and cover value for small non-game birds and small mammals.
- Hawthorne (*Crataegus erythropoda*) often grows to a 2 m (7 feet) height and provides shelter for deer.

Shrub habitat restoration will consist of planting from 10 to 50 1-gallon size plants of a variety of the above shrubs in an area above the french drain and below Building 881, near where the tree and wetland habitats were removed. This is an area with a higher than average soil moisture content due to discharges from Building 881 footer drains and road surface runoff. A limited number of shrubs will also be planted in existing stands of trees along creeks to increase habitat complexity and values. Some (<50) shrubs may be planted near seeps or surface runoff channels on south-facing slopes in the upper (western) reaches of Woman Creek drainage or near flows emanating from Antelope Springs, provided these locations are not subject to impacts from Operable Unit 5 (abandoned landfill) remediation activities.

3.5 *Spiranthes* Refuge

Diluvium Lady's Tresses (*Spiranthes diluvialis*) is a terrestrial orchid listed as a federal threatened plant species which grows in or near wetlands in the states of Utah, Nevada, and Colorado. It is considered extremely rare in Colorado, and is known only from three populations along the front range. Populations of the orchid are known from parts of the Clear Creek drainage in Prospect Park and near the west edge of Golden in Jefferson County. Another population is located on South Boulder Creek near U.S. Highway 36 in Boulder County. The Rocky Flats Plant is located between the known Jefferson County and Boulder County populations⁷.

No individuals of *Spiranthes* have been found in areas of RFP surveyed to date⁸. Because only ~9.3 ha (23 acres) of the ~43.3 ha (107 acres) of wetland habitat on the RFP site have been surveyed, no definitive conclusions as to the presence or absence of this species can be made on a sitewide basis.

Appropriate habitat for *Spiranthes* includes moist swales dominated by grasses or open gravel areas near the edge of wetlands dominated by sedges, rushes and cattails. It cannot compete in the marsh habitat. The plant produces a flowering stalk of ~30-36cm (12-14 inches) in height.

⁷) Colorado Natural Areas Program, 1990. Colorado Natural Areas Inventory Element Occurrence Records. Database search for sensitive plant species.

⁸) EG&G, 1990. Wetlands Assessment - Rocky Flats Site. pp. 31.

arising from a basal rosette of leaves⁹. Numerous small white flowers arranged in a helix occur near the upper end of the stalk; the flowers are arranged in a spiral staircase.

Establishment of a *Spiranthes* refuge in the buffer zone will involve identifying areas containing its preferred habitat and removed from all anticipated remediation or construction activities. One large refuge (≈ 0.25 ha) or several smaller (≈ 0.05 ha) scattered refugia may be identified as appropriate, but should be large enough to allow for future population growth. The area will be clearly demarcated with refuge signs and exclusion fencing. This refuge would be available to accept *Spiranthes* forced into transplantation by either on-site and off-site projects.

Should any *Spiranthes* individuals be identified at RFP, their location will be evaluated relative to potential impacts arising from future remediation activities, with relocation to the refuge for protection as an alternative. Any on-site refuge would also be available for relocation of *Spiranthes* threatened by off-site activities.

Potential *Spiranthes* refuge areas may exist near Antelope Springs, along Rock Creek, near certain seeps above Rock Creek drainage, or along Smart Ditch near the "D"-series ponds.

4.0 MITIGATION IMPLEMENTATION

Intended use, cost, ecological requirements, commercial availability of native seed or stock and local conditions will determine appropriate use of native vegetation. Locally propagated stock or local seed sources are preferred for use where available, as such material will assist preservation of native species genetic integrity. In the case of grassland habitats, revegetation will have to proceed quickly to limit colonization of the project site by other species. Potential colonization mechanisms include windblown seeds, seeds lying dormant in the soil, water borne seeds from upstream or surface water run-off, and seeds distributed by wildlife.

4.1 Wetland

A detailed discussion of the process of wetland creation is beyond the scope of this document. Due to the complexities involved, extensive involvement of engineering, facilities, biology, and NEPA personnel will be required to meet the biologic, engineering, and administrative requirements of the task. As it may be 1-3 years before actual wetland creation groundbreaking can occur, any such activity must be triggered by, but ultimately independent of, mitigation activities at the 881-HFD project site.

It is anticipated that planning and implementation of wetland creation activities will be performed in consultation with independent consultants such as Dr. Erik Olgeirson, an applied ecologist in private practice and a specialist in wetland restoration. In addition, Mr. James Von Loh, administrator of the Colorado Natural Areas Program, has expressed interest in reviewing management plans for development of native wetland and other habitats within Rocky Flats Plant boundaries.

Cost and schedule estimates for wetland creation are beyond the scope of this document. It is highly probable that a distinct "Wetland Habitat Creation Program" document will have to be developed to describe, in detail, costs and schedules associated with plant (seed & stock) selection, surface run-off drainage, labor, performance monitoring requirements, temporary

⁹) Colorado Native Plant Society, 1989. Rare plants of Colorado. pp. 73.

fencing, etc. It is anticipated that the consultants listed above will be instrumental in this effort.

4.2 Grassland

Long term soil stabilization can best be achieved by maintaining a productive, diversified plant cover. Soil disturbances that destroy the existing plant cover will followed by an effective, aggressive revegetation plan to quickly reestablish plant cover. During the vegetative reestablishment period, surface soils must be protected to prevent further project site degradation and limit resuspension of potential soil contaminants. The Rocky Flats revegetation plan¹⁰ will establish a long lasting perennial shrubs, grasses, and forbs while preventing the resuspension of disturbed surface soils. Revegetation activities will commence immediately following final grading of the 881-HFD project site.

Prior to distribution of topsoil, the area of disturbance will be fertilized with 60 pounds per acre of both nitrogen and phosphorous to provide nutrients to the plant root zone. Following fertilization, all topsoil stripped and stockpiled prior to construction will be uniformly distributed over the area of disturbance.

Recommended seed mixes for revegetation are listed in Table 2. Immediately following final contour grading, fertilization, and topsoil distribution, but not earlier than April 15th, the project area will be drilled with Spring Barley (Otis) at 50 pounds per acre. This vegetative cover will be of a short duration and will provide soil protection through the spring and summer months. A second seeding with a native perennial seed mix will follow in late fall, after November 1, 1992. The seed will be drilled with a no-till seeder at a rate of 18 pounds per acre in a pattern that follows the land contour where possible.

Spring Barley growth should provide standing stubble for soil protection during the native seed mix establishment period, although supplemental mulching may be necessary. The effectiveness of the reseeding activity will be monitored to determine if supplemental mulching is necessary. Should such mulching be required, the area will be covered with a native grass hay mulch at two tons per acre, held in place with plastic erosion control netting.

Cost and schedule estimates for the 881-HFD project site grassland revegetation activities are available from the Operable Unit 1 Program Manager.

4.3 Trees

A detailed planting plan, along with cost and schedule estimates, will be developed upon approval of the mitigation plan. The planting plan will describe proper planting location, appropriate species for the site, spacings, and number of trees needed. The plan will also list proper site preparation, optimal planting methods, maintenance needs for initial survival, and directions for assuring a vigorous growing condition. Tree planting field work can be initiated upon approval of this mitigation plan and preparation of the planting plan.

4.4 Shrubs

¹⁰ The grassland revegetation plan (including Table 2) described here was developed by Mr. Michael Guillame and Dr. Lawrence Woods of the EG&G Environmental Management Department, Remediation Programs Division.

A detailed planting plan, along with cost and schedule estimates, will be developed upon approval of the mitigation plan. The planting plan will describe proper planting location, appropriate species for the site, spacings, and number of trees needed. The plan will also list proper site preparation, optimal planting methods, maintenance needs for initial survival, and directions for assuring a vigorous growing condition. Shrub planting field work can be initiated upon approval of this mitigation plan and preparation of the planting plan.

4.5 *Spiranthes* Refuge

Establishment of a *Spiranthes* refuge or refuge may begin upon approval of the mitigation plan. Dr. David Buckner of ESCO Associates, Inc., an expert in the life history and habitat requirements of *Spiranthes*, will be contracted to select an optimal refuge site. This activity will be coordinated with the *Spiranthes* survey planned for late July-August 1992, so that any plants discovered in threatened areas may be moved to the refuge immediately.

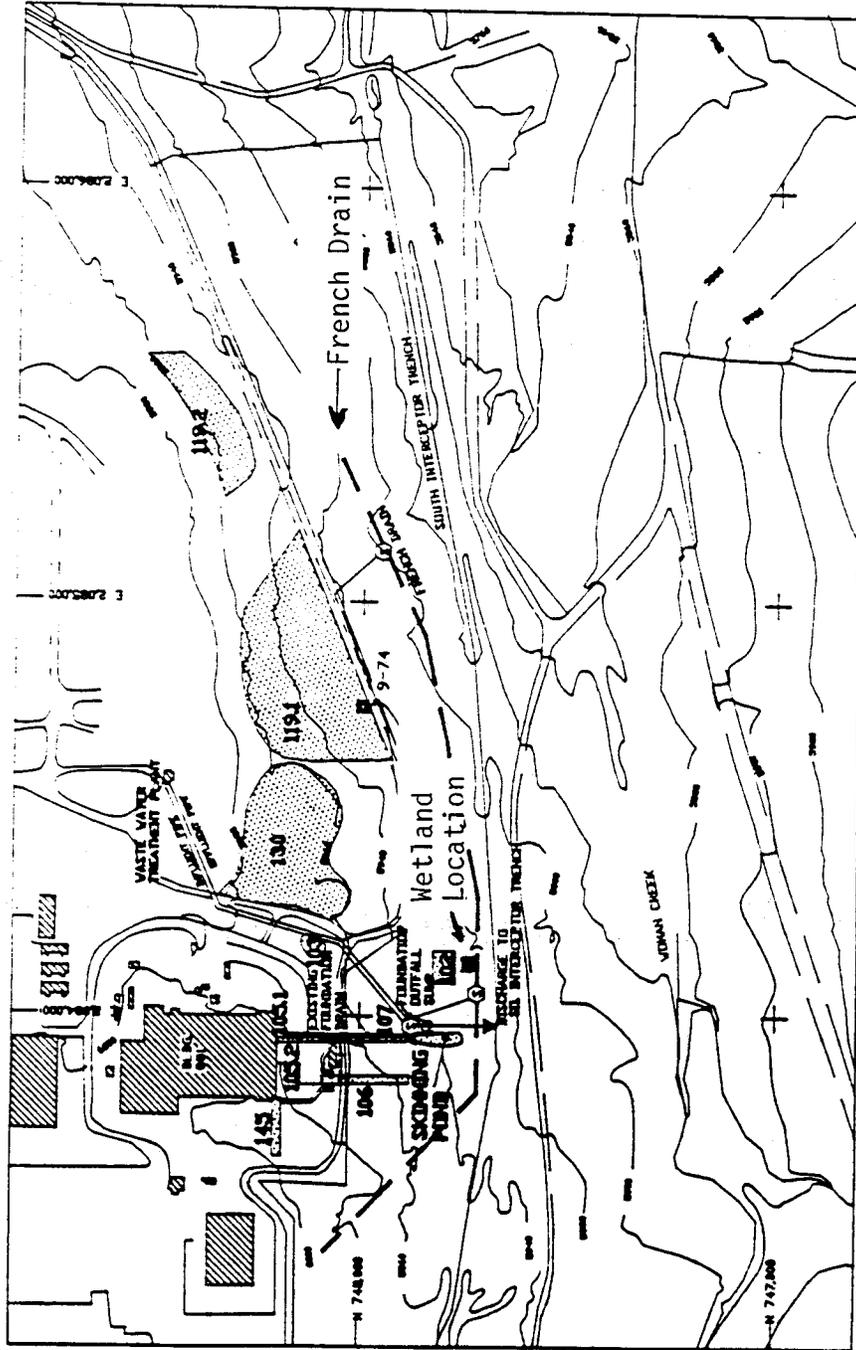
5.0 PERFORMANCE MONITORING

Performance monitoring will be utilized to assess the effectiveness of the mitigation plan. Monitoring activities may include, but not be limited to, some or all of the following tasks:

- Groundwater monitoring wells may be utilized to determine where the groundwater table resides at different times of the year as the level of the table affects wetland development and vice versa.
- Photography and video recording will be performed during the growing season, generally early and late in the season. Plots will be established to track the herbaceous vegetation source (Sod or seed) and provide an ocular estimate of cover.
- Aerial photography will be performed at least twice a year to document the progress of wetland and habitat restoration and augmentation.
- Plant collections will be made to develop a floristic list of species introduced to the wetland area. Foliar cover, species composition, density of species, and wildlife use of the area will be monitored. These determinations will be correlated with spring precipitation and other environmental factors.
- Breeding bird and small mammal populations will be surveyed annually to determine population densities, as well as foraging and nesting activity.
- Soil microbial activity levels and decomposition rates will be monitored in recognition of the role these organisms play in maintaining energy flow through the ecosystem and their sensitivity to chemical changes in the soil.

For a five-year period following creation of wetlands or restoration of trees and shrubs, an annual *881-HFD Project Habitat Mitigation Status Report* will be prepared for DOE,RFO.¹¹

¹¹) This mitigation plan was prepared by Dr. Bruce Hope, Mr. Michael Jones, and Ms. Terri Knudsen, EG&G Environmental Management Department, Ecology & NEPA Division, Environmental Sciences Group.



PROPOSED INTERIM REMEDIAL ACTION
 FRENCH DRAIN COLLECTION
 WITH TREATMENT

FIGURE 1

KEY
 W: potential wetland creation areas
 T: proposed tree restoration areas
 S: proposed shrub restoration areas
 G: grassland revegetation area
 R: potential *Spiranthes* refuge

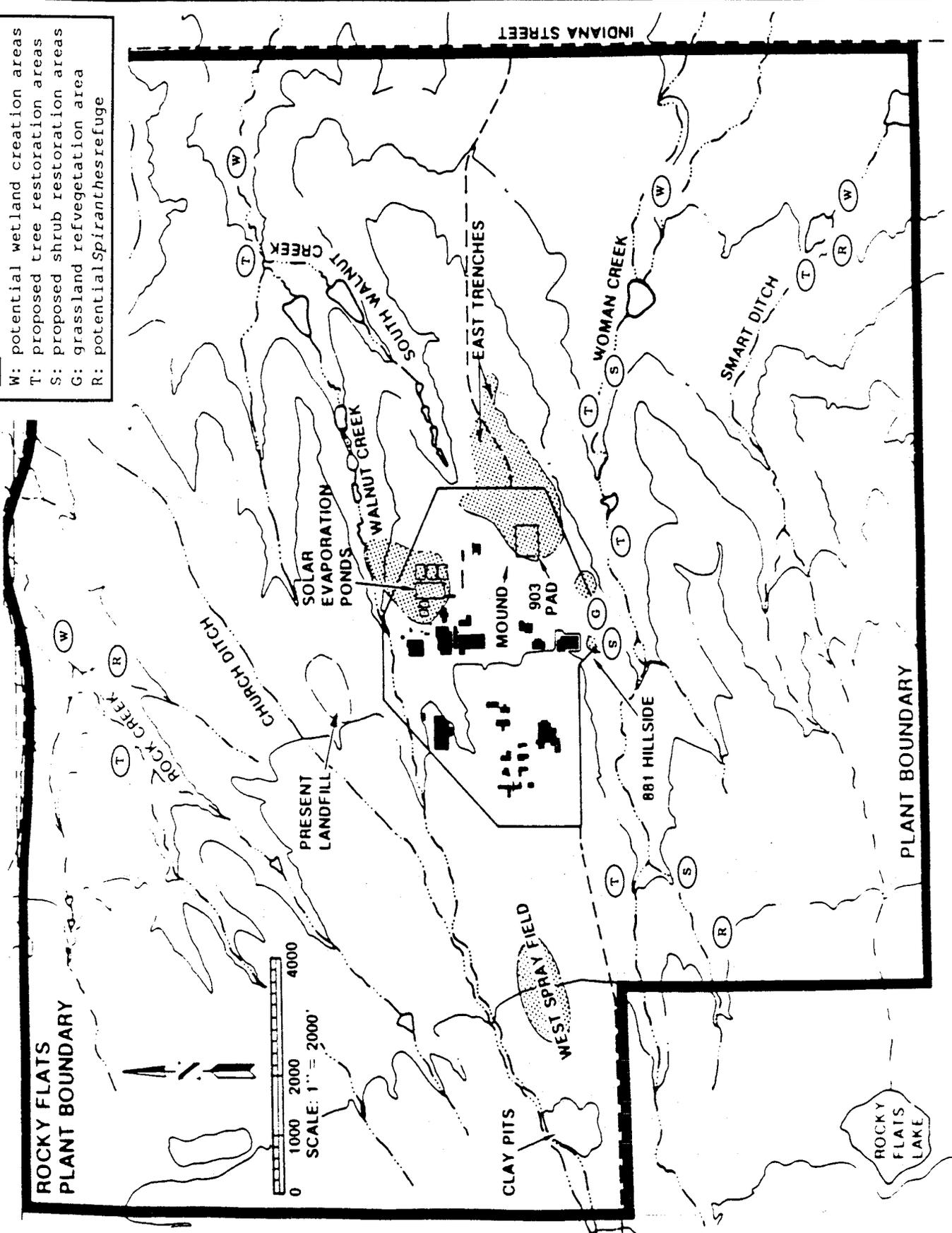


FIGURE 2

TABLE 1 SOC SPECIES COMPLIANCE LIST & HABITAT PREFERENCE (881-HFD)							
GROUP	COMMON NAME	SCIENTIFIC NAME	STATUS	RFP	SITE	HABITAT	TIME
PLANTS	Forktip Threawn	<i>Aristida basiramea</i>	cs	Y	N	xeric uplands with sandy soils and open barrens	year-round blooms ?
	Colorado Butterfly Plant	<i>Gaura neomexicana var. coloradensis</i>	C2,cs			transition between wetland bottoms and drier uplands above wet meadows	year-round blooms Jul-Sep
	Toothcup	<i>Rotala ramosior</i>	cs			obligate wetland species	year-round blooms?
	Diluvium Lady's Tresses	<i>Spiranthes diluvialis</i>	P,cs			moist swales dominated by grasses, wetlands dominated by sedges, rushes, and cattails	year-round blooms late Jul - early Oct
AMPHIBIANS & REPTILES	Northern Leopard Frog	<i>Rana pipens spp.</i>	C2,cu	Y?	N	breeds in marshes and intermittent ponds, forages in riparian and mountain meadows	year-round breeds Mar-Jun
	Texas Horned Lizard	<i>Phrynosoma cornutum</i>	C2,ng			arid and semiarid open country, xeric uplands	year-round forage in sm
FISH	Plains Topminnow	<i>Fundulus sciadicus</i>	C2			streams, lakes	year-round spawn sp & esm
	Common Shiner	<i>Notropis cornutus</i>	cs			streams, lakes	year-round spawn sp & esm
BIRDS	Peregrine Falcon	<i>Falco peregrinus</i>	E,e	Y	Y	nest in cliffs, forage in upland and wetland areas	year-round sp & fl
	Bald Eagle	<i>Haliaeetus leucocephalus</i>	E,e	Y	Y	perch trees near body of water, riparian areas, or wetlands	year-round sp & fl
	White-faced Ibis	<i>Plegadis chichi</i>	C2,ng			near streams, meadows, ponds, and agricultural fields	migrant sp, esm, fl
	Ferruginous Hawk	<i>Buteo regalis</i>	C2,ng,cs	Y		breeds in shortgrass prairie, croplands, mtn meadows, parks	year-round
	Whooping Crane	<i>Grus americana</i>	E,e			forages in marshes, cropland (grain fields), and sagebrush	migrant sp & fl
	Harlequin Duck	<i>Histrionicus histrionicus</i>	C2			open water	migrant sp & fl
	Western Snowy Plover	<i>Charadrius alexandrius nivosus</i>	C2,ng,cs			prefers lakes & reservoirs	migrant sp & fl
	Mountain Plover	<i>Charadrius montanus</i>	C2,ng,cs			xeric upland, shortgrass prairie	breeds esp-fl
	Piping Plover	<i>Charadrius melodus</i>	T,t			forages on open water or wet open ground	migrant sp & fl
	Long-billed Curlew	<i>Numenius americanus</i>	C2,ng,cs			grassland, lakes, reservoirs or marshes	migrant sp & fl
	Least Tern	<i>Sterna antillarum</i>	E,e			forages on open water or wet open ground	migrant sp & fl
	Black Tern	<i>Chlidonias niger</i>	C2,ng			breeds in marshes, uses marshes and open water for migration	breeds esp-sm migrates sp & fl
	Swainson's Hawk	<i>Buteo swainsonii</i>	C3C,ng	Y	Y	nests in trees/shrubs, forages in grassland, ag land, riparian areas, and greasewood	year-round breeds lwn-sp
	Yellow-billed Cuckoo	<i>Coccyzus americanus</i>	C3B,cu,ng			riparian lowland, transition areas	breeds sp migrates sp & fl
	MAMMALS	Swift Fox	<i>Vulpes velox</i>	C2,cu			shortgrass prairie, arid areas with loose soils
Black-footed Ferret		<i>Mustela nigripes</i>	E,e			prairie dog colonies	year-round
Prairie Meadow Jumping Mouse		<i>Zapus hudsonius preblei</i>	C2,cs	Y	Y?	moist fields, brush, brushy field, marsh, thick veg woods	breeds lap-esm forage sp & sm
Fringed Myotis		<i>Myotis thysanodes</i>	C2,ng			old buildings	breeds sp forage sm

STATUS:	(E)	endangered species (federal)	(C1)	Federal Category 1 (propose to list)	(ng)	Colorado State nongame species
	(T)	threatened species (federal)	(C2)	Federal Category 2 (appropriate to list but no data)	(cs)	Colorado State species of concern
	(P)	proposed to list (federal)	(C3)	Federal Category 3 (formerly proposed)	(cu)	Colorado State undetermined species
	(e)	endangered species (state)	(t)	threatened species (state)		

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TABLE 2 - GRASSLAND REVEGETATION SEED MIXES

Species	Common Name {Variety}	Seeding Rate*
COBBLY FOOTHILL AREAS (lower slopes and drainages)		
Grasses:		
<i>Agropyron smithii</i>	Western wheatgrass {Arriba}	8.0
<i>Bouteloua gracilis</i>	Blue gamma {Lovington}	6.0
<i>Bouteloua curtipendula</i>	Sideoats gamma {Vaughn}	5.5
<i>Stipa comata</i>	Needle-and-thread {native}	0.5
<i>Andropogon garadii</i>	Big bluestem {native, KAw or Champ}	2.0
<i>Schyzachyrium scoparium</i>	Little bluestem {Blaze, Pastura, Aldous, or Cimmaron}	1.0
<i>Panicum virgatum</i>	Switchgrass {Blackwell or Nebraska 28}	1.0
Shrubs:		
<i>Ceratodes lanata</i>	Winterfat {native or Hatch}	0.3
<i>Chrysothamnus nauseosus</i>	Rabbitbrush {green plume, native}	0.1
<i>Atriplex canescens</i>	Fourwing saltbush {native}	0.5
Forbs:		
<i>Linum lewisii</i>	Blue flax {Appar}	0.2
<i>Penstemon strictus</i>	Rocky Mountain Penstemon {Bandera}	0.2
<i>Dalea purpurea</i>	Purple prairie clover {native or Kaneb}	0.5
CLAYEY FOOTHILL AREAS (upland areas)		
Grasses:		
<i>Agropyron smithii</i>	Western wheatgrass {Arriba}	6.0
<i>Stipa viridula</i>	Green needlegrass {Lodorm}	5.0
<i>Bouteloua gracilis</i>	Blue gamma {Lovington}	5.0
<i>Stipa comata</i>	Needle-and-thread {native}	0.5
<i>Bouteloua curtipendula</i>	Sideoats gamma {Vaughn}	4.0
<i>Oryzopsis hymenoides</i>	Indian rice grass {Nezpar}	1.0
Shrubs:		
<i>Ceratodes lanata</i>	Winterfat {native or Hatch}	0.4
<i>Chrysothamnus nauseosus</i>	Rabbitbrush {green plume, native}	0.2
<i>Atriplex canescens</i>	Fourwing saltbush {native}	0.3
Forbs:		
<i>Penstemon strictus</i>	Rocky Mountain Penstemon {Bandera}	0.1
<i>Dalea purpurea</i>	Purple prairie clover {native or Kaneb}	0.5
<i>Linum lewisii</i>	Blue flax {Appar}	0.3

*: pure live seed in pounds per acre