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Floodplains and Wetlands Survey Results for the Rulison and Rio Blanco Sites, Colorado

December 1993

Environmental Restoration

U.S. Department of Energy
Nevada Operations Office

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List of Acronyms and Abbreviations

C.F.R.	Code of Federal Regulations
DOE	U.S. Department of Energy
DOE/NV	U.S. Department of Energy, Nevada Operations Office
DRI	Desert Research Institute
EL	Environmental Laboratory
EPA	U.S. Environmental Protection Agency
FAC	Facultative Plants
FACU	Facultative Upland Plants
FACW	Facultative Wetland Plants
FICW	Federal Interagency Committee for Wetland Delineation
FIRM	Flood Insurance Rate Map
ft	feet
FWS	U.S. Fish and Wildlife Service
in.	inch
km	kilometer(s)
m	meter(s)
mi	mile(s)
NEPA	National Environmental Policy Act
NWI	National Wetlands Inventory
OBL	Obligate Wetland Plants
RI/FS	Remedial Investigation/Feasibility Study
SCS	Soil Conservation Service
UPL	Obligate Upland Plants
USDA	U.S. Department of Agriculture
USFS	U.S. Forest Service
USGS	U.S. Geological Survey

1.0 Introduction

The Project RULISON and Project RIO BLANCO gas stimulation tests were part of a joint government-industry gas-production stimulation experiment under the Plowshare Program designed to develop peaceful uses of nuclear explosions. Under this program, the economic feasibility of stimulating the flow of natural gas by fracturing rock formations with underground nuclear explosions was studied. On September 10, 1969, Project RULISON commenced by detonating a single underground nuclear explosion. On May 17, 1973, three almost simultaneous nuclear explosions were detonated under Project RIO BLANCO (U.S. Congress, 1989; DRI, 1988). Both tests were conducted in western Colorado (Figure 1-1).

The DOE is currently proposing to conduct a Remedial Investigation/Feasibility Study (R/FS) of the Rulison and Rio Blanco test sites to determine if the soil, groundwater, or surface water is contaminated, and if so, what measures can be taken to reduce risks associated with the sites. Before a R/FS can be initiated, the National Environmental Policy Act (NEPA) of 1969 requires the U.S. Department of Energy (DOE) to evaluate the potential impacts that may occur as a result of performing these activities. DOE Order 5440.1E implementing NEPA require that the presence of environmentally sensitive resources such as cultural resources, sensitive species, wetlands, and floodplains be determined at such sites so that the appropriate level of NEPA documentation can be established. NEPA regulations are specified in 10 Code of Federal Regulations (C.F.R.) Part 1022, "Compliance with Floodplain/Wetlands Environmental Review Requirements". Executive Orders 11988 and 11990 require the DOE to prepare regulations to ensure that floodplains and wetlands, respectively, are considered and protected in all actions undertaken by the agency. In accordance with these requirements, plans to conduct floodplain and wetland surveys at the Rulison and Rio Blanco Sites, as well as five other locations outside of Colorado, were outlined and discussed in the *Survey Plans for DOE/NV Outside of Nevada* (DOE, 1993), hereafter referred to as the "survey plans".

This report presents the results of the Level II floodplain and wetland survey for the Rio Blanco and Rulison test sites, as outlined in the survey plan. The purpose of the Level II survey is to verify the presence of floodplains and wetlands at the site and, if present, delineate their boundaries and collect sufficient data such that adverse impacts potentially resulting from R/FS field activities can be avoided. Existing soils, aerial photographs, and floodplain and topographic mapping information, in conjunction with extensive field surveys, were used to describe and delineate the wetlands at each site. The wetlands on site were delineated using the methods outlined in the U.S. Army Corps of Engineers 1987 Manual.

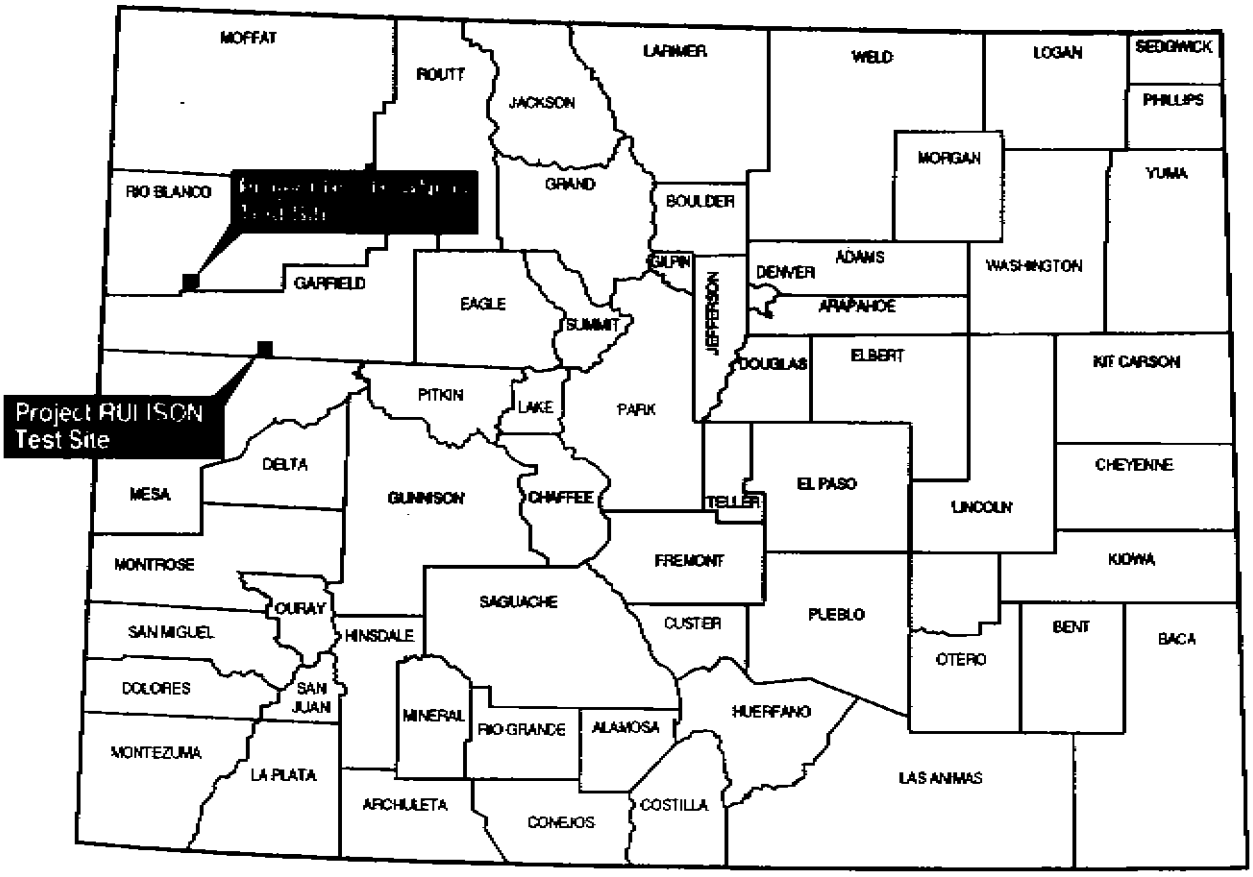


Figure 1-1
Locations of Project RULISON and Project RIO BLANCO Test Sites in Colorado

2.0 Background

2.1 Floodplains and Wetlands Definition/Methodology

"Floodplains" are defined in the 10 C.F.R. Part 1022.4 as:

> *The lowlands adjoining inland and coastal waters and relatively flat areas and floodprone areas of offshore islands including, at a minimum, that area inundated by a 1 percent or greater chance flood in any given year. The base floodplain is defined as the 100 year (1.0 percent) floodplain. The critical action floodplain is defined as the 500 year (0.2 percent) floodplain.*

"Wetlands" are defined in the 10 C.F.R. Part 1022.4 as:

> *Those areas that are inundated by surface or groundwater with a frequency sufficient to support and under normal circumstances does or would support a prevalence of vegetative or aquatic life that requires saturated or seasonally saturated soil conditions for growth and reproduction.*

Wetlands generally include swamps, marshes, bogs, and similar areas. Recognizing the potential for continued or accelerated degradation of the nation's water, including wetlands, the U.S. Congress enacted the Clean Water Act. Section 404 of the Act authorizes the Secretary of the Army, acting through the Chief of Engineers, to regulate the filling of waters of the United States and the disturbance of wetlands. The Environmental Laboratory (EL), Army Corps of Engineers, has prepared the *Corps of Engineers Wetlands Delineation Manual* (EL, 1987). This manual describes technical guidelines and methods using a multiparameter approach to identify and delineate wetlands for purposes of Section 404 of the Clean Water Act. In accordance with this methodology, the following three parameters are diagnostic of wetlands: (1) the vegetation consists predominantly of hydrophytes; (2) the substrate is predominantly undrained, hydric soils; and (3) the substrate is saturated with water or covered by shallow water for a prolonged time during the growing season.

It is required that, under normal circumstances, all three of these conditions be met for an area to be defined as a wetland. "Normal circumstances" refers to the soil and hydrology conditions that are normally present, without regard to whether the vegetation has been removed (EL, 1987).

2.1.1 Vegetation

A "hydrophyte" is any "macrophyte that grows in water or on a substrate that is at least periodically deficient in oxygen as a result of excessive water content" (EL, 1987). Since most plant species can tolerate a range of growing conditions, individual species are not solely restricted to either wetland or upland communities. The U.S. Fish and Wildlife Service (FWS) (Reed, 1988) has developed a classification scheme that assigns species to wetland indicator classes as follows:

Plant Indicator Status Categories

Indicator Category	Indicator Symbol	% Occurrence in Wetlands	Status Categories
Obligate Wetland Plants	OBL	>99	Plants that occur almost always in wetlands under natural conditions, but which may also occur rarely in nonwetlands.
Facultative Wetland Plants	FACW	67-99	Plants that occur usually in wetlands, but also occur (1% to 33%) in nonwetlands.
Facultative Plants	FAC	33-67	Plants with a similar likelihood of occurring in both wetlands and nonwetlands.
Facultative Upland Plants	FACU	33-1	Plants that occur sometimes in wetlands, but occur more often in nonwetlands.
Obligate Upland Plants	UPL	<1	Plants that occur rarely in wetlands, but occur almost always in nonwetlands under natural conditions.

The national list of wetland plants prepared by the FWS (Reed, 1988) is used for hydrophyte determinations. Hydrophytic vegetation is present if greater than 50 percent of the dominant plant species from all strata are OBL, FACW, and/or FAC. When greater than or equal to 50 percent of the dominant species are FACU and/or UPL and hydric soils and wetland hydrology are present, the area is also considered to have hydrophytic vegetation. If hydric soils and wetland hydrology are lacking, and normal circumstances exist, then an area is considered to be upland.

2.1.2 Soils

"Hydric soils" are soils that are saturated, flooded, or ponded long enough during the growing season to develop anaerobic conditions that favor the growth and regeneration of hydrophytic vegetation (USDA, 1983). Soils are considered hydric when they are: (1) somewhat poorly drained and have a seasonal high water table less than 0.5 feet (ft) (0.15 meters [m]) from the surface or (2) poorly drained or very poorly drained and have a seasonal high water table less than 1.0 or 1.5 ft (0.30 or 0.46 m) from the surface. This high water table must be present for a week or more during the growing season (EL, 1987). Soils that are ponded or flooded for long or very long duration during the growing season are also classified as hydric. All organic soils (histosols) or mineral soils with a histic epipedon are considered hydric soils.

In the field, a hand auger is used to sample the soil to examine indicators of hydric soils, such as low chroma colors, mottling, organic accumulation, and high water table. Soils are generally examined to a depth of approximately 20 in. (0.51 m). Hydric conditions for mineral soils with low to moderate organic content were most commonly demonstrated by gleying and mottling. Gleyed soils develop when anaerobic soil conditions result in pronounced chemical reduction of iron, manganese, and other elements, thereby producing gray soil colors. Gleyed soils are manifested by the presence of neutral grey, bluish, or greenish colors through the soil matrix or in mottles (spots or streaks). Mineral soils are compared to a Munsell Soil Chart (Kollmorgen Corp., 1975) to determine soil color. Soil color is characterized by three features: hue, value, and chroma. Hue refers to the spectral color or chromatic composition of light reflected by the soil. Value refers to the amount of light reflected. Chroma refers to the purity or strength of the color. Soils are considered hydric if they are gleyed or if the top of the B horizon has a chroma of 1 or less if mottling is not present or a chroma of 2 or less when mottling is present.

Low chroma colors are an index of the degree of soil reduction as a result of anaerobic conditions. Low chroma colors include black, various shades of gray, and the darker shades of brown and red. These criteria allow most soils to be classified as either hydric or nonhydric. Hydric soils that have been effectively drained may, however, still show low chroma colors, but are no longer considered to be hydric because they lack the hydrology. Low chroma colors may not be used as an indicator of hydric soils in those soils that are sandy, are deeply colored as a result of their parent materials, or have recently been formed

(i.e., alluvial). These soils must be evaluated more carefully under the procedures outlined in the Army Corps of Engineers *Wetlands Delineation Manual* (EL, 1987).

Sandy soils may be considered to be hydric if organic materials have accumulated above or in the surface horizon. Dark vertical streaking of subsurface horizons caused by the downward movement of organic matter also indicates a hydric soil. This streaking may be associated with a spodic horizon located at the average depth of the water table.

The U.S. Department of Agriculture (USDA), Soil Conservation Service (SCS), in cooperation with the National Technical Committee for Hydric Soils, has prepared a national list of hydric soils (USDA, 1987). In addition, the SCS publishes county soil surveys for areas where soil mapping has been completed. Unlisted soils are considered to be nonhydric; however, some phases of unlisted soils may contain hydric inclusions and, thus, may be associated with wetlands. These cases must be individually verified in the field. Field soil characteristics should be given precedence over how a site is mapped on a county soil survey. Alluvial soils may not show hydric characteristics due to their recent formation, but may be considered to be hydric for the purposes of wetland delineation.

2.1.3 Hydrology

Wetland hydrology encompasses the hydrologic characteristics of areas that are inundated or have saturated soils for sufficient duration to support hydrophytic vegetation. Hydrologic indicators are generally used to determine the presence or absence of a wetland. Of the three technical criteria, wetland hydrology is generally the least exact, and indicators of wetland hydrology are sometimes difficult to establish in the field (EL, 1987). An area has wetland hydrology if the soil is saturated to the surface by groundwater or ponded or flooded with surface water for sometime during the growing season. Saturation to the surface can occur when the water table is 0.5 to 1.5 ft (0.15 to 0.46 m) below the surface depending on soil permeability.

Indicators of wetland hydrology may be divided into recorded data and field data. Recorded data may be obtained from aerial photographs, soil surveys, historical data, floodplain delineations, or tide/stream gauges. In the field, wetland hydrology may be evidenced by visual observation of saturation, inundation, or depth to standing water; however, it is not necessary to directly demonstrate the hydrology. Secondary field indicators of wetland

hydrology include drainage patterns, morphological plant adaptations, oxidized root channels, water marks, surface scouring, water-stained leaves, sediment deposits, drift lines, moss lines, and bare areas. Unless an area has been hydrologically modified, the hydrologic parameter may also be inferred from the soil profile.

2.2 Background for the Rulison Site Survey

The Rulison Site is located in northwestern Colorado, approximately 14 miles (mi) (22 kilometers [km]) southwest of Rifle, and 6 mi (10 km) southeast of Grand Valley, Garfield County, Colorado (Figure 2-1). It is a 40-acre site near White River National Forest and the communities of Battlement Mesa and Parachute.

An initial wetlands and floodplains determination for the Rulison Site was made using information from aerial photographs, U.S. Geological Survey (USGS) topographic map (Rulison quadrangle); Rifle Area, Colorado, Soil Survey (1980); and Flood Insurance Rate Maps (FIRM) for Garfield, Colorado. These sources were referenced to determine the possible presence and extent of floodplains/wetlands at the Rulison Site.

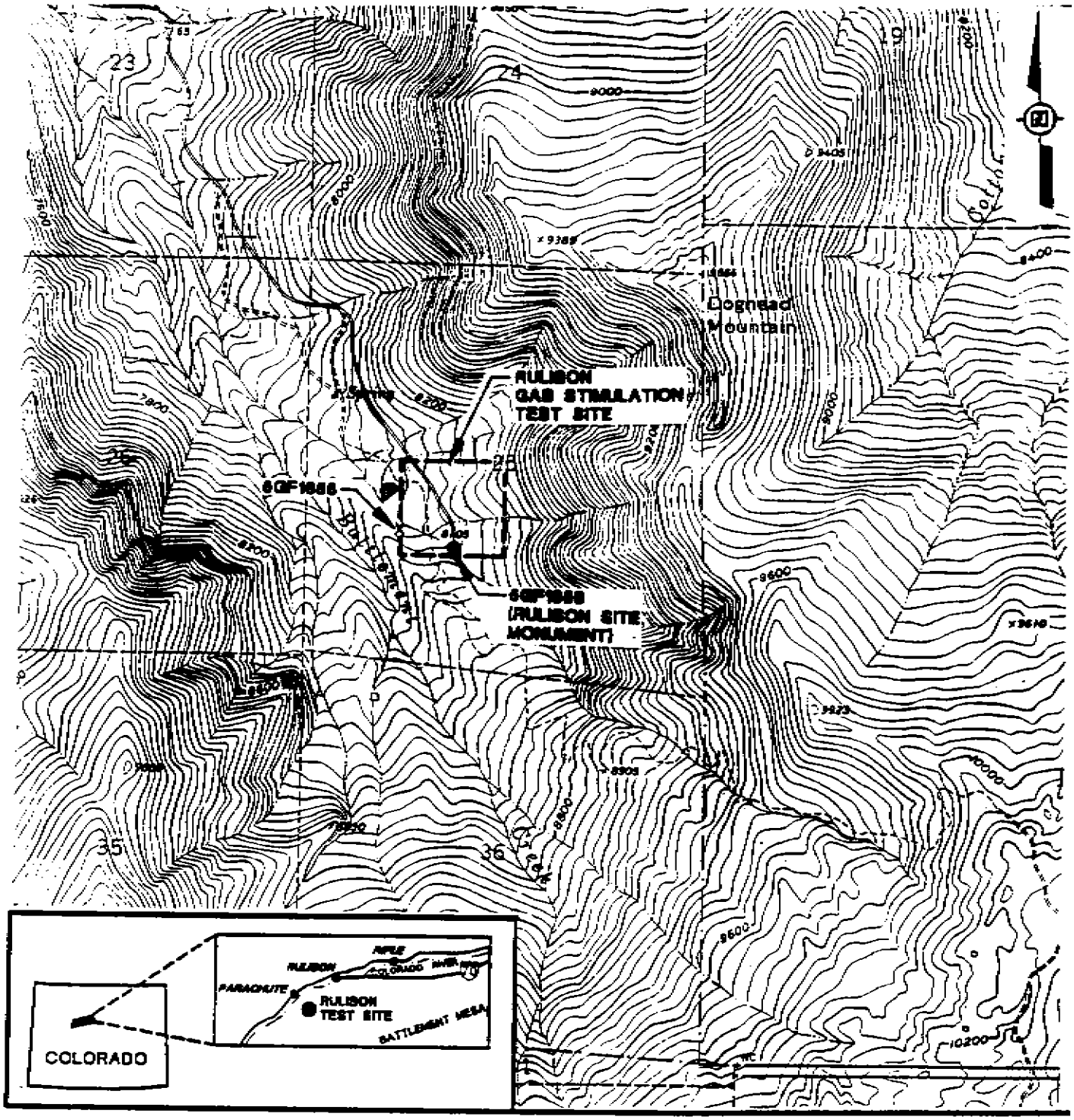
The FIRM Index Map (FEMA, 1986) for Garfield County, Colorado, does not depict floodprone areas around the Rulison Site, although the more detailed panel has never been published.

2.3 Background for the Rio Blanco Site

The Rio Blanco Site is also in northwestern Colorado, approximately 36 mi (58 km) northwest of Rifle, and 52 air miles north of Grand Junction, Rio Blanco County, Colorado (Figure 2-2). It is a 360-acre site located in a very remote area of Colorado.

An initial wetlands and floodplains determination for the Rio Blanco Site was made using information from aerial photographs, U.S. Geological Survey (USGS) topographic maps (Rock School quadrangle); Rio Blanco County Soil Survey (1972); and FIRM for Rio Blanco County, Colorado. These sources were referenced to determine the possible presence and extent of floodplains and wetlands at the Rio Blanco Site.

The FIRM Index Map (FEMA, 1986) for Rio Blanco County, Colorado. The Rio Blanco Site is shown to contain the floodprone area for Fawn Creek (FEMA, 1990). The detailed panel was unavailable, but the deeply incised nature of the Creek should limit the floodplain to within the deeply incised channel.



LEGEND

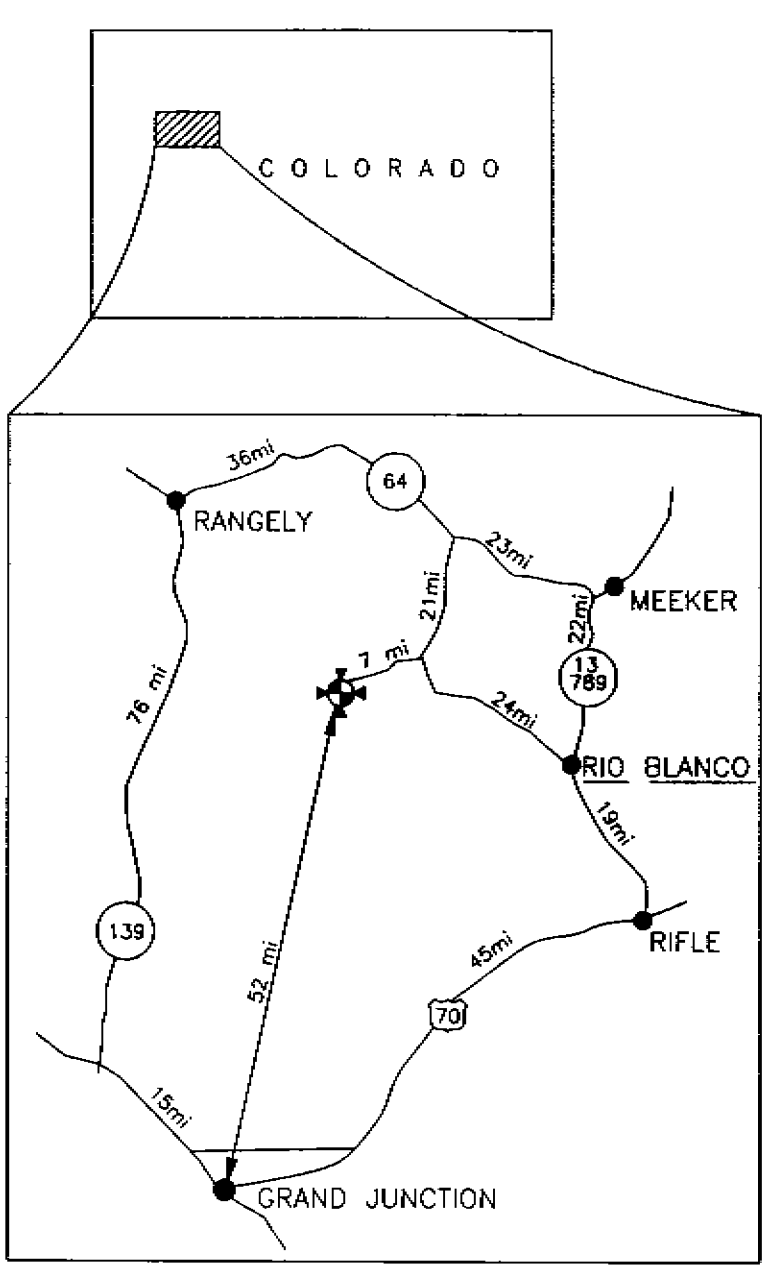
- — — — — PROJECT BOUNDARY
- X ISOLATED FIND
- ● SITE

SCALE

0 2000 4000 FEET

SOURCE: USGS 7.5' RULISON, CO. TOPOGRAPHIC MAP.

Figure 2-1
Site Location Map Project Rulison



NOT TO SCALE

SOURCE: DRI, 1988

Figure 2-2
Site Location Map Project Rio Blanco

3.0 Procedure

Field surveys of vegetation, soils, and hydrologic conditions were performed from June 25 to 30, 1993, to identify and delineate the wetlands at the Rulison and Rio Blanco Sites. The field investigations were completed by a team of two qualified wetland specialists.

The FWS National Wetlands Inventory (NWI) maps, which help identify wetland habitats in the United States, were not available for either project site. In addition, previous wetland surveys had not been conducted for the Rulison and Rio Blanco Sites.

Field methodology followed procedures established in the *Corps of Engineers Wetlands Delineation Manual* (EL, 1987) for routine on-site determination of wetlands (Section D). The presence of hydrophytes, hydric soils, and indicators of prolonged flooding or soil saturation were used to identify the wetlands. The FWS wetlands classification system (Cowardin et. al., 1979) was used to classify the wetlands at the sites. A Munsell Soil Chart (Kollmorgen Corp., 1975) was used to determine soil color. Soils were described using standard USDA nomenclature as outlined in the revised *Soil Survey Manual.* Grays Manual of Botany (Fernald, 1950) was used to identify the vegetation.

Both the Rulison and Rio Blanco Sites were inspected in order to identify the plant community types present. Representative areas within each wetland and upland community were then chosen and described. The species within these plant communities were ranked for dominance, and a wetland indicator status was listed for each dominant species (see Appendices A and B). A list of dominant plant species is also included in Table 1. Soil borings were then taken in the representative wetland and upland communities to a depth of approximately 20 in. (0.51 m). Hydric soil indicators were noted when observed (see Appendices A and B of this report). Indicators of wetland hydrology, when present, were also noted in the representative wetland and upland communities (see Appendices A and B). The wetland/upland boundary was then flagged where hydrophytic vegetation and wetland hydrology gave way to nonhydrophytic vegetation and soils lacking hydric or hydrologic characteristics.

Additional observations of soils, vegetation, and hydrology were taken throughout the two sites. A discussion of these observations is included in Section 5.0 of this report. The field delineation results describe the wetlands on site starting with the 40-acre Rulison Site,

followed by the 360-acre Rio Blanco Site. The results include a discussion of the types of wetlands and vegetation communities, the SCS soils mapped, and the hydrological associations found at each project site. Photographs were also taken of the two properties and are included in Appendices C and D.

The wetland/upland boundaries of the site were flagged with pink day-glo® surveyor's tape. Flags were affixed to either trees or shrubs and given a sequential alphabetic and numeric coding in the field. The flagging will be used to demark the wetlands so that these areas may be avoided during RI/FS activities. The flagging may also be utilized by a surveyor to accurately map the wetlands boundary. Based on the survey, the initial base maps would be corrected to more precisely depict the location of wetlands in relation to each site's boundaries and areas of RI/FS operations.

4.0 Results

4.1 Results of the Rulison Site Survey

Vegetation

Vegetation on the site was characterized by visual assessment with special attention addressed to the data point areas. A list of dominant plant species found in upland and wetland communities at the Rulison Site is presented in Table 4-1. The vegetation communities at the Rulison Site ranged from upland woodlot to grazed pasture to scrub/shrub and forested wetlands.

The wetlands on site are either associated with Battlement Creek or its tributary, which transects the site. Battlement Creek flows within a narrow, well-defined path. The high flow rate of Battlement Creek has scoured the channel leaving a very rocky substraight supporting limited, if any, vegetation within the channel. However, the wooded slopes adjacent to the Creek contain a dense canopy of blue and Englemann spruce intermixed with quaking aspen. The understory contained individuals of mountain maple, water birch, and mountain alder.

The tributary to Battlement Creek, which transects the site, has a similar wetland community associated with it. These wetlands are due to adjacent springs feeding the tributary, and beaver disturbance in the center of the site. The two most common species in this area are the quaking aspen and mountain maple in the canopy, with serviceberry and grasses in the understory and ground cover. The aspen often forms pure stands. In the center of the site, beaver have removed the canopy layer and formed numerous ponds on several terraces. Associated with the terraces are saplings of quaking aspen with adult spruces intermixed. Sandbar willow is also common recolonizing the wetter areas and common choke cherry sprouting in the drier areas. Numerous emergent species, such as grasses and sedges, were also observed colonizing the disturbed areas and on the beaver dams.

The center of the site also contains a man-made effluent pond. This pond was created during the original testing activity on site and is contained within an earthen berm that has little hydrophytic and no aquatic vegetation.

TABLE 4-1
List of Dominant Plant Species - Wetland Survey
Rulison and Rio Blanco Test Sites
June 25 - 30, 1993
(Page 1 of 2)

Scientific Name[1]	Common Name	Indicator Status[2]		Location	
		Regional	National	Rulison	Rio Blanco
Osmundaceae					
Osmunda cinnamomea	cinnamon fern	NL	FACW	X	
Gramineae					
Gramineae spp.	grasses	NIS		X	X
Salicaceae					
Salix exigua	sandbar willow	OBL	FACW, OBL	X	X
Populus tremuloides	quaking aspen	FAC	FACU, FAC	X	
Betulaceae					
Betula occidentalis	water birch	FACW	FAC, FACW	X	
Alnus tenuifolia	mountain alder	FACW	FAC, FACW	X	
Cyperaceae					
Carex spp.	sedge	NIS	FACW,OBL	X	X
Juncaceae					
Juncus effusus	soft rush	OBL	FACW, OBL	X	X
Fagaceae					
Quercus gambelii	gamble oak	NL	UPL	X	
Rosaceae					
Prunus virginiana	common chokecherry	FACU	FACU, FAC	X	
Amelanchier alnifolia	western serviceberry	FACU	UPL, FAC	X	
Cowania mexicana	cliffrose	UPL	UPL		X
Purshia tridentata	antelope brush	UPL	UPL		X
Aceraceae					
Acer glabrum	rocky mountain maple	FAC	FACU, FAC	X	
Cornaceae					
Cornus stolonifera	red-osier dogwood	FACW	FAC, FACW	X	
Pinaceae					
Picea engelmannii	engelmann spruce	FACU	FAC, FACU	X	
Picea pungens	blue spruce	FAC	FAC	X	
Pinus edulis	Colorado pinyon	UPL	UPL		X

TABLE 4-1
List of Dominant Plant Species - Wetland Survey
Rulison and Rio Blanco Test Sites
June 25 - 30, 1993
(Page 2 of 2)

Scientific Name[1]	Common Name	Indicator Status[2]		Location	
		Regional	National	Rulison	Rio Blanco
Cupressaceae					
Juniperus monosperma	oneseed juniper	UPL	UPL		X
Scrophulariaceae					
Verbascum thapsus	common mullein	UPL	UPL		X
Castilleja miniata	paintbrush	FAC	FACW,FACU		X
Convolvulaceae					
Convolvulus arvensis	field bindweed morning-glory	UPL	UPL		X
Cactaceae					
Opuntia phaeacantha	prickly-pear cactus	UPL	UPL		X
Malvaceae					
Sphaeralcea grossulariaefolia	globemallow	UPL	UPL		X
Typhaceae					
Typha latifolia	broad-leaf cattail	OBL	OBL	X	X
Compositae					
Artemisia tridentata	big sagebrush	UPL	UPL		X
Chrysothamnus nauseosus	rabbitbrush	UPL	UPL		X
Balsaminaceae					
Impatiens capensis	jewelweed	FACW	FACW	X	
Urticaceae					
Urtica dioica	stinging nettle	FAC	FACU,FACW	X	

[1] Nomenclature conforms to that of Grays Manual of Botany (Fernald, 1950).
[2] Indicator status derived from the U.S. Fish and Wildlife Service's National List of Plant Species that occur in Wetlands: 1988 National Summary (Reed, 1988).
OBL = obligate wetland plants that occur almost always in wetlands (>99%)
FACW = facultative wetland plants that usually occur in wetlands (67 - 99%)
FAC = facultative plants that are equally likely to occur in wetlands or nonwetlands (34 - 66%)
FACU = facultative upland plants that usually occur in nonwetlands (1-33%)
UPL = obligate upland plants that occur almost always in nonwetlands (>99%)
NL = species not listed.
NIS = not identified to species.

Soils

The SCS publishes county soil surveys for areas where soil mapping is completed. The soils are mapped as series, complexes, and/or associations with the boundaries drawn on aerial photos and field verified.

The Rifle Area, Colorado, Soil Survey (1980) maps two soil types within the 40-acre site (Figure 4-1). These include Bucklon-Inchau loams, 25 to 50 percent slopes (12) and Cochetopa loam, 9 to 50 percent slopes (17). Neither of these soil types is classified as hydric according to *Hydric Soils of the United States* (SCS, 1987). Immediately northeast of the site there are three soils mapped. These include Badland (9); Torriorthents - Camborthids Rock Outcrop Complex, steep (66); and Torriorthents - Rock Outcrop Complex, steep (67).

Numerous soil borings were taken and field analyzed during the wetlands delineation (representative soil boring logs are presented in Appendix A). Field observations of on-site soils indicate the presence of hydric soils in areas identified as wetlands. These results correspond with the SCS soils mapping of the Rifle Area, Colorado Bucklon-Inchau loams, 25 to 30 percent slopes (12), consists of moderately sloping to very steep soils on ridges and mountainsides. Elevation ranges from 7,000 to 9,500 ft (2,134 to 2,896 m). These soils are formed in sandstone and shale residuum.

- Bucklon soils make up 55 percent of the map unit and is on the more steep, convex parts of the landscape. It is a shallow and well-drained soil. Permeability of the Bucklon soil is slow above bedrock. The available water capacity is very low. Effective rooting depth is about 10 to 20 in. (0.25 to 0.51 m). Surface runoff is medium, and the erosion hazard is severe.

- Inchau soils make up about 35 percent of the map unit and occur on the slightly concave parts of the landscape. It is a moderately deep and well drained soil. Permeability of the Inchau soil is moderate above bedrock, and available water capacity is moderate. Effective rooting depth is 20 to 40 in. (0.51 to 1.0 m). Surface runoff is medium, and the erosion hazard is severe.

Cochetopa loam, 9 to 50 percent slopes (17), is a deep, well drained, rolling to steep soil on mountainsides and alluvial fans. Elevation ranges from 7,000 to 9,500 ft (2,134 to 2,896 m). This soil formed in basaltic alluvium. Permeability is slow, and available water capacity is high. Effective rooting depth is 60 in. (1.5 m) or more. Surface runoff is slow, and the erosion hazard is severe.

SOURCE:
1980 RIFLE AREA COLORADO SOILS MAP, SHEET NO. 14.

LEGEND:

9 - BADLAND

12 - BUCKLON-NOHAU LOAMS, 25 TO 50 PERCENT SLOPES

17 - COCHETOPA LOAM, 9 TO 50 PERCENT SLOPES

66 - TORRIORTHENTS-CAMBORTHIDS-ROCK OUTCROP COMPLEX, STEEP

67 - TORRIORTHENTS-ROCK OUTCROP COMPLEX, STEEP

1000 0 1000 2000

SCALE OF FEET

REV. NO.	DATE	DESCRIPTION OF REVISION	REV. BY	DWN	CHKD BY	APPRVD BY
0	7/27/93	DEVELOPED DRAWING	N.S.M.			

PROJECT MANAGER: RON PRANN | DRAWN BY: M.S. WABACH, SR. | DATE: 7/27/93

Figure 4-1
USDA/SCS SOILS MAP
RIFLE AREA, COLORADO
RULISON PROJECT

Prepared For:

DOE/NV
LAS VEGAS, NEVADA

PROJECT NO.	FILE NO.	DRAWN	DRAWING NUMBER	REV. NO.
301935	A3		301935-A3	

/dwgfiles/notdwgs/dwgs/301935/301935a3 07/28/93 1:18pm M.S.M.

Hydrology

The hydrology of the wetlands at the Rulison Site is driven by Battlement Creek and its tributary. Battlement Creek originates from a series of ponds located on top of the Battlement Mesa. The Creek flows in a southern direction, downslope, eventually draining into the Colorado River. The sloping topography of the site creates a quickly moving creek versus a slower creek, which would tend to have a broader floodplain.

northern

A tributary to Battlement Creek also transects the site. This smaller creek is spring originated south of the site, with additional on-site springs feeding it. In the center of the site, this tributary is diverted by a series of beaver dams. These dams create a terrace effect, dramatically slowing the flow; however, toward the northern portion of the site, the tributary returns to its channel, therefore, increasing flow and traveling downslope off the site.

The effluent pond is also present in the center of the site. This isolated pond is fed by groundwater with an overflow drain in the western berm. A small spring also feeds the pond through an inlet in the northern berm.

Because of the sloping topography of the site, the wetlands are naturally confined to the channels and banks of the streams; however, since there is a natural disturbance (beaver), the wetlands have expanded in the center of the site. This wetland boundary has the potential to be very dynamic since the beaver are influencing the hydrology.

4.2 Results of the Rio Blanco Site Survey

Vegetation

Vegetation on the site was characterized by visual assessment with special attention addressed to the data point areas. A list of dominant plant species found in upland and wetland communities at the site is presented in Table 4-1. The Rio Blanco Site is characterized by three distinct communities. The first is the pinyon-juniper woodlands associated with the steep slopes and higher elevated plateaus; the second is the sagebrush shrub community in the flat terrace between the higher elevations and Fawn Creek, and the third is the floodplain community within the eroded channel of Fawn Creek.

The higher plateaus and slopes support a pinyon-juniper woodland. The cover in this community is very thin, with one seed juniper and pinyon dominating. The thin soils support very little understory or groundcover vegetation; however, serviceberry and cliffrose appear scattered throughout this community.

The sagebrush community dominates the site. This area also doubles as pasture for cattle. Big sagebrush forms dense thickets with cattle paths leading to open grass areas in this flat terraced community. Antelope brush and rabbit bush are also very common in this area. Ground cover is heavily grazed, but wildflowers, such as globemallow, morning glory, paintbrush, and common mullein are present.

The well defined channel of Fawn Creek is also used by cattle. This area changes annually due to its high spring and low summer flows. The sediment deposits along the channel support common wetland species, such as cattail, rush, sedge, and sandbar willow with big sagebrush encroaching down the slopes.

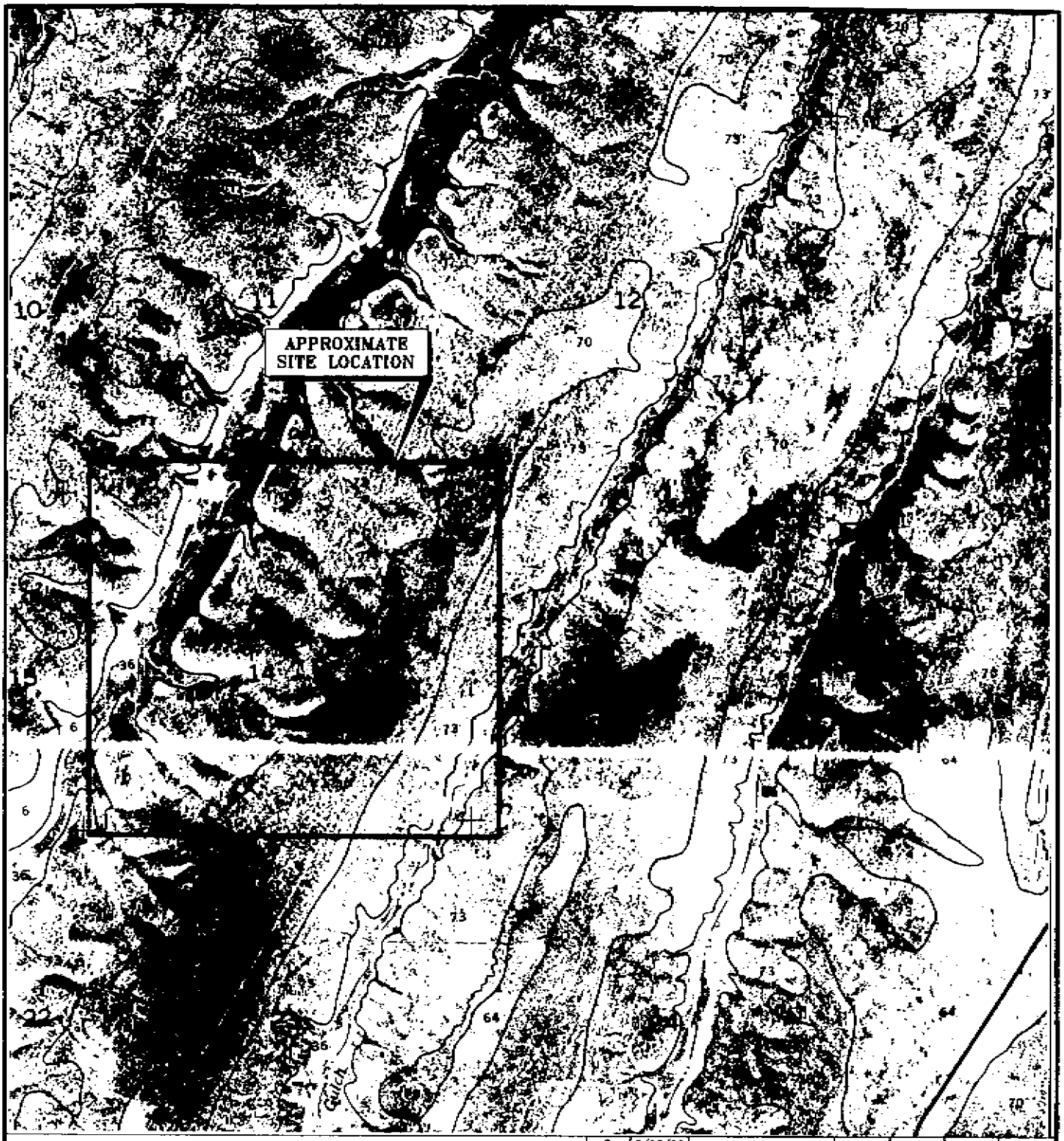
Soils

The SCS publishes county soil surveys for areas where soil mapping is completed. The soils are mapped as series, complexes, and/or associations with the boundaries drawn on aerial photos and field verified.

The Rio Blanco County Soil Survey (1972) maps four soil types within the 360-acre site (Figure 4-2). These include: Barcus channery loamy sand, 2 to 8 percent slopes (6); Glendive fine sandy loam (36); Redcreek-Rentsac complex, 5 to 30 percent slopes (70); and Rentsac channery loam, 5 to 50 percent slopes (73). None of these soil types are classified as hydric according to *Hydric Soils of the United States* (SCS, 1987).

Numerous soil borings were taken and field analyzed during the wetlands delineation (representative soil boring logs are presented in Appendix B). Field observations of on-site soils indicate the presence of hydric soils in areas identified as wetlands. These results correspond with the SCS soils mapping of Rio Blanco County, Colorado.

Barcus channery loam sand, 2 to 8 percent slopes (6), is a deep, somewhat excessively drained soil on alluvial fans and in narrow valleys. It formed in alluvium derived from



SOURCE:
1972 RIO BLANCO COUNTY SOIL SURVEY.

LEGEND:

6 – BARCUS CHANNERY LOAMY SAND, 2 TO 8 PERCENT SLOPES

36 – GLENDIVE FINE SANDY LOAM

70 – REDCREEK RENTSAC COMPLEX, 5 TO 30 PERCENT SLOPES

73 – RENTSAC CHANNERY LOAM, 5 TO 50 PERCENT SLOPES

1000 0 1000 2000

SCALE OF FEET

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PROJECT MANAGER: RON PRANN | DRAWN BY: M.S. MAIBACH, SR. | DATE: 7/27/93

Figure 4-2
USDA/SCS SOILS MAP
RIO BLANCO COUNTY, COLORADO
RIO BLANCO PROJECT

Prepared For:
DOE/NV
LAS VEGAS, NEVADA

PROJECT NO.	FILE NO.	CHKD:	DRAWING NUMBER	REV. NO.
301935	A4	ENG. ENG. APPVD.	301935-A4	

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calcareous sandstone and shale The native vegetation is mainly low shrubs and grasses. Elevation to 5,800 to 6,800 ft (1,768 to 2,073 m). Permeability of the Barcus soil is rapid. Available water capacity is low. Effective rooting depth is 60 in. (1.5 m) or more. Runoff is slow, and the hazard of water erosion is moderate.

Glendive fine sandy loam (36) is a deep, well drained soil along drainageways on alluvial valley floors. It is formed in alluvium. Slope is 2 to 4 percent and elevation is 5,800 to 7,200 ft (1,768 to 2,195 m). Permeability of this Glendive soil is moderately rapid. Available water capacity is moderate. Effective rooting depth is 60 in. (1.5 m) or more. Runoff is slow, and the hazard of water erosion is slight. The soil is subject to rare periods of flooding. Depth to seasonal high water table is >6.0 ft (1.8 m).

Redcreek-Rentsac complex, 5 to 30 percent slopes (70), is on mountainsides and ridges. The native vegetation is mainly pinyon pine and juniper trees with an understory of shrubs and grasses. Elevation is 6,000 to 7,400 ft (1,829 to 2,255 m). This unit is 60 percent Redcreek sandy loam and 30 percent Rentsac channery loam.

- Redcreek soil is shallow and well drained. It formed in residual and eolian material derived dominantly from sandstone. Permeability is moderately rapid, and available water capacity is very low. Effective rooting depth is 10 to 20 in. (0.25 to 0.51 m). Runoff is medium, and the hazard of water erosion is moderate to high.

- Rentsac is a shallow and well drained soil. It formed in residuum derived dominantly from sandstone. Permeability is moderately rapid and available water capacity is low. Effective rooting depth is 10 to 20 in. (0.25 to 0.51 m). Runoff is medium, and the hazard of water erosion is moderate to high.

Rentsac channery loam, 5 to 50 percent slopes (73), is a shallow, well-drained soil on ridges, foothills, and side slopes. It formed in residuum, derived dominantly from calcareous sandstone. The native vegetation is mainly pinyon pine, juniper, brush, and grasses. Elevation is 6,000 to 7,600 ft (1,829 to 2,315 m). Permeability is moderately rapid. Available water capacity is very low. Effective rooting depth is 10 to 20 in. (0.25 to 0.51 m) Runoff is rapid, and the hazard of water erosion is moderate to very high.

Hydrology

The wetland hydrology at the Rio Blanco is driven by Fawn Creek. Fawn Creek is a tributary to Black Sulphur Creek, which in turn drains into the Piceance Creek. Fawn Creek is well carved into the landscape with banks exceeding 20 ft (6.1 m) in height. Sediment deposits that settle in backwaters and in bends support hydrophytic vegetation. The numerous gulches that are associated with the creek are dry and support upland vegetation.

5.0 Discussion

Field investigations were conducted at the Rulison Site and the Rio Blanco Site from June 25 to 30, 1993. These field investigations of vegetation, soils, and hydrology followed guidelines established in the *Corps of Engineers Wetlands Delineation Manual* (EL, 1987). The field surveys resulted in the delineation of broad-leaved deciduous forest, scrub/shrub, and emergent wetlands within the 40-acre Rulison Site and a riverine system with emergent vegetation within the 360-acre Rio Blanco Site.

The presence and type of wetlands delineated were based on information obtained from aerial photographs, USGS topographic map, Rulison and Rock School quadrangles, FIRM of Garfield County and Rio Blanco County Colorado, and actual field investigation/verification. NWI maps do not exist for these areas.

The Rifle Area, Colorado, soil survey mapped two soil types throughout the Rulison Site. The Rio Blanco Soil Survey mapped four soil types throughout the project site. In general, the field observations of the on-site soils correspond with the SCS mapping.

The wetland field investigation resulted in the physical delineation (flagging in the field) of the wetland/upland boundary at the Rulison and Rio Blanco Sites. This preliminary activity will ensure that the RI/FS activities will not encroach upon these environmentally sensitive resources.

6.0 Conclusions

Based on the results and findings of the preliminary floodplains/wetlands survey, it is recommended that activities currently scheduled to occur as part of the detailed site characterization be initiated.

Further, the purpose of the floodplain/wetland delineation was to describe and delineate the floodplains and wetlands at the project sites, so that these areas would not be encroached upon by the intrusive RI/FS activities. Compliance with floodplain/wetland environmental review requirements are listed in 10 C.F.R. Part 1022. The floodplains/wetlands assessment outlined in 10 C.F.R. Part 1022.12 applies to any proposed floodplain/wetland action(s). The rationale for not performing any further investigation or assessment is that no DOE/NV planned activity (i.e., actions) will take place in a floodplain or wetland area. Thus, the DOE NEPA guidelines and conditions for a categorical exclusion would be met.

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APPENDIX A
RULISON PROJECT DATA FORMS

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Rulison Applicant/Owner: DOE Investigator: RPY JK	Date: 6-28-93 County: Garfield State: Colorado
Do Normal Circumstances exist on the site? Yes No Is the site significantly disturbed (Atypical Situation)? Yes No Is the area a potential Problem Area? Yes No (If needed, explain on reverse.)	Community ID: PFO1 Transect ID: T1 Plot ID: P1

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1. Populus tremuloides	C	FAC	9.		
2. Acer glabrum	C	FAC	10.		
3. Prunus virginiana	S	FACU	11.		
4. Cornus stolonifera	S	FACW	12.		
5. grazed grasses	G	—	13.		
6.			14.		
7.			15.		
8.			16.		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-). 75%

Remarks: Cattle grazing ground cover, solid aspen canopy

HYDROLOGY

___ Recorded Data (Describe in Remarks):
___ Stream, Lake, or Tide Gauge.
___ Aerial Photographs
___ Other
✓ No Recorded Data Available

Field Observations:

Depth of Surface Water: 0 (in.)

Depth to Free Water in Pit: 0 (in.)

Depth to Saturated Soil: 10 (in.)

Wetland Hydrology Indicators:
Primary Indicators:
___ Inundated
✓ Saturated in Upper 12 Inches
___ Water Marks
___ Drift Lines
___ Sediment Deposits
___ Drainage Patterns in Wetlands
Secondary Indicators (2 or more required):
___ Oxidized Root Channels in Upper 12 Inches
___ Water-Stained Leaves
___ Local Soil Survey Data
✓ FAC-Neutral Test
___ Other (Explain in Remarks)

Remarks: Surface roots observed

SOILS

Map Unit Name (Series and Phase): Cochetopa

Drainage Class: WD

Field Observations Confirm Mapped Type? Yes (No)

Taxonomy (Subgroup): —

Profile Description:

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-8	A	10YR 3/2	—	—	L, weak medium
8-26	B	10YR 4/2	—	—	L, moderate medium

Hydric Soil Indicators: —

- ___ Histosol
- ___ Histic Epipedon
- ___ Sulfidic Odor
- ✓ Aquic Moisture Regime
- ✓ Reducing Conditions
- ___ Gleyed or Low-Chroma Colors
- ___ Concretions
- ___ High Organic Content in Surface Layer in Sandy Soils
- ___ Organic Streaking in Sandy Soils
- ___ Listed on Local Hydric Soils List
- ___ Listed on National Hydric Soils List
- ___ Other (Explain in Remarks)

Remarks: Floodplain of tributary

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	(Yes)	No	(Circle)
Wetland Hydrology Present?	(Yes)	No	
Hydric Soils Present?	(Yes)	No	

(Circle)

Is this Sampling Point Within a Wetland? (Yes) No

Remarks: All three criteria met

Approved by HQUSACE 2/92

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Rulison Applicant/Owner: DOE Investigator: RP & JK	Date: 6-28-93 County: Garfield State: Colorado
Do Normal Circumstances exist on the site? (Yes) No Is the site significantly disturbed (Atypical Situation)? Yes (No) Is the area a potential Problem Area? (Yes) No (If needed, explain on reverse.)	Community ID: Upland Transect ID: T1 Plot ID: P2

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1. Grasses (grazed)	G	—	9.		
2.			10.		
3.			11.		
4.			12.		
5.			13.		
6.			14.		
7.			15.		
8.			16.		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-). —

Remarks: Grazed pasture, surrounded by stand of aspen

HYDROLOGY

___ Recorded Data (Describe in Remarks):
- ___ Stream, Lake, or Tide Gauge
- ___ Aerial Photographs
- ___ Other

✓ No Recorded Data Available

Field Observations:

Depth of Surface Water: NE (in.)

Depth to Free Water in Pit: NE (in.)

Depth to Saturated Soil: NE (in.)

Wetland Hydrology Indicators:

Primary Indicators:
- ___ Inundated
- ___ Saturated in Upper 12 Inches
- ___ Water Marks
- ___ Drift Lines
- ___ Sediment Deposits
- ___ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):
- ___ Oxidized Root Channels in Upper 12 Inches
- ___ Water-Stained Leaves
- ___ Local Soil Survey Data
- ___ FAC-Neutral Test
- ___ Other (Explain in Remarks)

Remarks: NE- not encountered
no wetland hydrology indicators

SOILS

Map Unit Name (Series and Phase): Cochetopa

Drainage Class: WD

Field Observations Confirm Mapped Type? (Yes) No

Taxonomy (Subgroup): —

Profile Description:

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-18	A	10YR4/3	—	—	L, weak fine
18-33	B	10YR5/4	—	—	L, weak medium

Hydric Soil Indicators: —

- ___ Histosol
- ___ Histic Epipedon
- ___ Sulfidic Odor
- ___ Aquic Moisture Regime
- ___ Reducing Conditions
- ___ Gleyed or Low-Chroma Colors
- ___ Concretions
- ___ High Organic Content in Surface Layer in Sandy Soils
- ___ Organic Streaking in Sandy Soils
- ___ Listed on Local Hydric Soils List
- ___ Listed on National Hydric Soils List
- ___ Other (Explain in Remarks)

Remarks: no hydric soil indicators

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	Yes (No) (Circle)		(Circle)
Wetland Hydrology Present?	Yes (No)	Is this Sampling Point Within a Wetland?	Yes (No)
Hydric Soils Present?	Yes (No)		

Remarks: Problem area due to grazing, however soils indicate dry area with no evidence of flooding or soil saturation

Approved by HQUSACE 2/92

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Rulison Applicant/Owner: DOE Investigator: EP & JK	Date: 6-28-93 County: Garfield State: Colorado
Do Normal Circumstances exist on the site? Yes No Is the site significantly disturbed (Atypical Situation)? Yes No Is the area a potential Problem Area? Yes No (If needed, explain on reverse.)	Community ID: Upland Transect ID: T2 Plot ID: P1

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1. Quercus gambelii	S	UPL	9.		
2. Prunus virginiana	S	FACU	10.		
3. Purshia tridentata	S	UPL	11.		
4. Picea engelmannii	S	FACU	12.		
5.			13.		
6.			14.		
7.			15.		
8.			16.		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-). 0%

Remarks: Dry, side slope, no hydrophytic vegetation present

HYDROLOGY

___ Recorded Data (Describe in Remarks):
- ___ Stream, Lake, or Tide Gauge
- ___ Aerial Photographs
- ___ Other

✓ No Recorded Data Available

Field Observations:

Depth of Surface Water: NE (in.)

Depth to Free Water in Pit: NE (in.)

Depth to Saturated Soil: NE (in.)

Wetland Hydrology Indicators:

Primary Indicators:
- ___ Inundated
- ___ Saturated in Upper 12 Inches
- ___ Water Marks
- ___ Drift Lines
- ___ Sediment Deposits
- ___ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):
- ___ Oxidized Root Channels in Upper 12 Inches
- ___ Water-Stained Leaves
- ___ Local Soil Survey Data
- ___ FAC-Neutral Test
- ___ Other (Explain in Remarks)

Remarks: NE - not encountered
no wetland hydrology indicators present

SOILS

Map Unit Name (Series and Phase): Torriorthents - Camborthids

Drainage Class: EWD

Field Observations Confirm Mapped Type? (Yes) No

Taxonomy (Subgroup): —

Profile Description:

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0 - 10	A	10YR 6/4	—	—	rock fragments
11	R				

Hydric Soil Indicators: —

- ___ Histosol
- ___ Histic Epipedon
- ___ Sulfidic Odor
- ___ Aquic Moisture Regime
- ___ Reducing Conditions
- ___ Gleyed or Low-Chroma Colors
- ___ Concretions
- ___ High Organic Content in Surface Layer in Sandy Soils
- ___ Organic Streaking in Sandy Soils
- ___ Listed on Local Hydric Soils List
- ___ Listed on National Hydric Soils List
- ___ Other (Explain in Remarks)

Remarks: shallow depth to bed rock

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	Yes (No) (Circle)		(Circle)
Wetland Hydrology Present?	Yes (No)	Is this Sampling Point Within a Wetland?	Yes (No)
Hydric Soils Present?	Yes (No)		

Remarks: Side slope, shallow depth to bedrock

Approved by HQUSACE 2/92

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Rulison Applicant/Owner: DOE Investigator: RD / JK	Date: 6-28-93 County: Garfield State: Colorado
Do Normal Circumstances exist on the site? (Yes) No Is the site significantly disturbed (Atypical Situation)? Yes (No) Is the area a potential Problem Area? (Yes) No (If needed, explain on reverse.)	Community ID: PEM Transect ID: T2 Plot ID: P2

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1. Populus tremuloides	S	FAC	9.		
2. Salix exigua	S	OBL	10.		
3. Picea pungens	C	FAC	11.		
4. Osmunda cinnamomea	G	FACW	12.		
5. Grasses	G	—	13.		
6.			14.		
7.			15.		
8.			16.		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-). 100%

Remarks: Beaver have removed canopy, and flooded surrounding area

HYDROLOGY

___ Recorded Data (Describe in Remarks):
- ___ Stream, Lake, or Tide Gauge
- ___ Aerial Photographs
- ___ Other

✓ No Recorded Data Available

Field Observations:

Depth of Surface Water: 0 (in.)

Depth to Free Water in Pit: NE (in.)

Depth to Saturated Soil: 5 (in.)

Wetland Hydrology Indicators:

Primary Indicators:
- ___ Inundated
- ✓ Saturated in Upper 12 Inches
- ✓ Water Marks
- ___ Drift Lines
- ___ Sediment Deposits
- ___ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):
- ___ Oxidized Root Channels in Upper 12 Inches
- ___ Water-Stained Leaves
- ___ Local Soil Survey Data
- ✓ FAC-Neutral Test
- ___ Other (Explain in Remarks)

Remarks: tributary to Battlement Creek, numerous dams in terrace landscape

SOILS

Map Unit Name (Series and Phase): Cochetopa

Drainage Class: WD

Field Observations Confirm Mapped Type? Yes (No)

Taxonomy (Subgroup): —

Profile Description:

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-24	A	10YR2/2	—	—	L, weak medium

Hydric Soil Indicators: —

- ✓ Histosol
- ___ Histic Epipedon
- ___ Sulfidic Odor
- ✓ Aquic Moisture Regime
- ✓ Reducing Conditions
- ___ Gleyed or Low-Chroma Colors
- ___ Concretions
- ___ High Organic Content in Surface Layer in Sandy Soils
- ___ Organic Streaking in Sandy Soils
- ___ Listed on Local Hydric Soils List
- ___ Listed on National Hydric Soils List
- ___ Other (Explain in Remarks)

Remarks: high organic content

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	(Yes) No	(Circle)
Wetland Hydrology Present?	(Yes) No	
Hydric Soils Present?	(Yes) No	

(Circle)

Is this Sampling Point Within a Wetland? (Yes) No

Remarks: All three criteria met

Approved by HQUSACE 2/92

APPENDIX B
RIO BLANCO PROJECT DATA FORMS

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Rio Blanco Applicant/Owner: DOE Investigator: Ronald Prunn (RP) and Joanna Kaslarnakis (JK)	Date: 6-29-93 County: Rio Blanco State: Colorado
Do Normal Circumstances exist on the site? (Yes) No Is the site significantly disturbed (Atypical Situation)? Yes (No) Is the area a potential Problem Area? Yes (No) (If needed, explain on reverse.)	Community ID: Upland Transect ID: T1 Plot ID: P1

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1. Artemisia tridentata	S	UPL	9.		
2. Purshia tridentata	S	UPL	10.		
3. Chrysothamnus nauseosus	S	UPL	11.		
4. ground cover grazed			12.		
5.			13.		
6.			14.		
7.			15.		
8.			16.		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-): 0 %

Remarks: upland vegetation dominates

HYDROLOGY

___ Recorded Data (Describe in Remarks): ___ Stream, Lake, or Tide Gauge ___ Aerial Photographs ___ Other ✓ No Recorded Data Available	Wetland Hydrology Indicators: Primary Indicators: ___ Inundated ___ Saturated in Upper 12 Inches ___ Water Marks ___ Drift Lines ___ Sediment Deposits ___ Drainage Patterns in Wetlands Secondary Indicators (2 or more required): ___ Oxidized Root Channels in Upper 12 Inches ___ Water-Stained Leaves ___ Local Soil Survey Data ___ FAC-Neutral Test ___ Other (Explain in Remarks)
Field Observations: Depth of Surface Water: NE (in.) Depth to Free Water in Pit: NE (in.) Depth to Saturated Soil: NE (in.)	

Remarks: NE - not encountered

SOILS

Map Unit Name (Series and Phase): Glendive fine sandy loam

Drainage Class: WD

Field Observations Confirm Mapped Type? (Yes) No

Taxonomy (Subgroup): Torrifluvents

Profile Description:

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-22	A	10YR4/3	–	–	fsl, weak fine
22-31	B	10YR5/3	–	–	fsl, weak fine

Hydric Soil Indicators:

- ___ Histosol
- ___ Histic Epipedon
- ___ Sulfidic Odor
- ___ Aquic Moisture Regime
- ___ Reducing Conditions
- ___ Gleyed or Low-Chroma Colors
- ___ Concretions
- ___ High Organic Content in Surface Layer in Sandy Soils
- ___ Organic Streaking in Sandy Soils
- ___ Listed on Local Hydric Soils List
- ___ Listed on National Hydric Soils List
- ___ Other (Explain in Remarks)

Remarks: no hydric soil indicators present

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	Yes (No)	(Circle)
Wetland Hydrology Present?	Yes (No)	
Hydric Soils Present?	Yes (No)	

(Circle)

Is this Sampling Point Within a Wetland? Yes (No)

Remarks: very dry, no wetland indicators present

Approved by HQUSACE 2/92

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Rio Blanco Applicant/Owner: DOE Investigator: RP y JK	Date: 6-29-93 County: Rio Blanco State: Colorado
Do Normal Circumstances exist on the site? (Yes) No Is the site significantly disturbed (Atypical Situation)? Yes (No) Is the area a potential Problem Area? Yes (No) (If needed, explain on reverse.)	Community ID: PEM Transect ID: T1 Plot ID: P2

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1. Typha latifolia	G	OBL	9.		
2. Salix exigua	S	OBL	10.		
3. Juncus effusus	G	OBL	11.		
4. grazed sedges	G	–	12.		
5.			13.		
6.			14.		
7.			15.		
8.			16.		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-). 100%

Remarks: vegetation patchy due to sediment deposition and grazing

HYDROLOGY

___ Recorded Data (Describe in Remarks):
- ___ Stream, Lake, or Tide Gauge
- ___ Aerial Photographs
- ___ Other

✓ No Recorded Data Available

Field Observations:

Depth of Surface Water: 0 (in.)

Depth to Free Water in Pit: 10 (in.)

Depth to Saturated Soil: Surface (in.)

Wetland Hydrology Indicators:

Primary Indicators:
- ___ Inundated
- ✓ Saturated in Upper 12 Inches
- ___ Water Marks
- ✓ Drift Lines
- ✓ Sediment Deposits
- ✓ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):
- ___ Oxidized Root Channels in Upper 12 Inches
- ___ Water-Stained Leaves
- ___ Local Soil Survey Data
- ✓ FAC-Neutral Test
- ___ Other (Explain in Remarks)

Remarks: Plot immediately adjacent to channel of Fawn Creek

SOILS

Map Unit Name (Series and Phase): Glendive

Drainage Class: WD

Field Observations Confirm Mapped Type? Yes No

Taxonomy (Subgroup): Torrifluvents

Profile Description:

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-6	A	10YR3/3	-	-	SL, weak blocky
6-24	B	10YR2/1	-	-	SL, weak blocky

Hydric Soil Indicators:

- ✓ Histosol
- ___ Histic Epipedon
- ___ Sulfidic Odor
- ✓ Aquic Moisture Regime
- ✓ Reducing Conditions
- ✓ Gleyed or Low-Chroma Colors
- ___ Concretions
- ___ High Organic Content in Surface Layer in Sandy Soils
- ___ Organic Streaking in Sandy Soils
- ___ Listed on Local Hydric Soils List
- ___ Listed on National Hydric Soils List
- ___ Other (Explain in Remarks)

Remarks: Hydric soils present along creek channel

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	Yes No (Circle)	
Wetland Hydrology Present?	Yes No	
Hydric Soils Present?	Yes No	
Is this Sampling Point Within a Wetland?	Yes No (Circle)	

Remarks: All three criteria met

Approved by HQUSACE 2/92

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Rio Blanco Applicant/Owner: DOE Investigator: RP : JK	Date: 6-29-93 County: Rio Blanco State: Colorado
Do Normal Circumstances exist on the site? (Yes) No Is the site significantly disturbed (Atypical Situation)? Yes (No) Is the area a potential Problem Area? Yes (No) (If needed, explain on reverse.)	Community ID: upland Transect ID: T1 Plot ID: P3

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1. Artemisia tridentata	S	UPL	9.		
2. Chrysothamnus nauseosus	S	UPL	10.		
3. Sphaeralcea grossulariaefolia	G	UPL	11.		
4. grazed grasses	G	–	12.		
5.			13.		
6.			14.		
7.			15.		
8.			16.		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-). 0%

Remarks: upland vegetation

HYDROLOGY

___ Recorded Data (Describe in Remarks):
- ___ Stream, Lake, or Tide Gauge
- ___ Aerial Photographs
- ___ Other

✓ No Recorded Data Available

Field Observations:

Depth of Surface Water: NE (in.)

Depth to Free Water in Pit: NE (in.)

Depth to Saturated Soil: NE (in.)

Wetland Hydrology Indicators:

Primary Indicators:
- ___ Inundated
- ___ Saturated in Upper 12 Inches
- ___ Water Marks
- ___ Drift Lines
- ___ Sediment Deposits
- ___ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):
- ___ Oxidized Root Channels in Upper 12 Inches
- ___ Water-Stained Leaves
- ___ Local Soil Survey Data
- ___ FAC-Neutral Test
- ___ Other (Explain in Remarks)

Remarks: NE - not encountered
- no wetland hydrology indicators

SOILS

Map Unit Name (Series and Phase): Glendive fine sandy loam

Drainage Class: WD

Field Observations Confirm Mapped Type? (Yes) No

Taxonomy (Subgroup): Torrifluvents

Profile Description:

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-33	A	10YR 5/3	-	-	fsl, loose, granular

Hydric Soil Indicators:

- ___ Histosol
- ___ Histic Epipedon
- ___ Sulfidic Odor
- ___ Aquic Moisture Regime
- ___ Reducing Conditions
- ___ Gleyed or Low-Chroma Colors
- ___ Concretions
- ___ High Organic Content in Surface Layer in Sandy Soils
- ___ Organic Streaking in Sandy Soils
- ___ Listed on Local Hydric Soils List
- ___ Listed on National Hydric Soils List
- ___ Other (Explain in Remarks)

Remarks:

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	Yes	No	(Circle)
Wetland Hydrology Present?	Yes	No	
Hydric Soils Present?	Yes	No	

(Circle)

Is this Sampling Point Within a Wetland? Yes No

Remarks:

Approved by HQUSACE 2/92

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Rio Blanco Applicant/Owner: DOE Investigator: RP & JK	Date: 6-29-93 County: Rio Blanco State: Colorado
Do Normal Circumstances exist on the site? Yes No Is the site significantly disturbed (Atypical Situation)? Yes No Is the area a potential Problem Area? Yes No (If needed, explain on reverse.)	Community ID: Upland Transect ID: T2 Plot ID: P1

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1. Artemisia tridentata	S	UPL	9.		
2. Chrysothamnus nauseous	S	UPL	10.		
3. grazed grass	G	–	11.		
4.			12.		
5.			13.		
6.			14.		
7.			15.		
8.			16.		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-): 0%

Remarks: upland vegetation

HYDROLOGY

___ Recorded Data (Describe in Remarks):
- ___ Stream, Lake, or Tide Gauge
- ___ Aerial Photographs
- ___ Other

✓ No Recorded Data Available

Field Observations:

Depth of Surface Water: NE (in.)

Depth to Free Water in Pit: NE (in.)

Depth to Saturated Soil: NE (in.)

Wetland Hydrology Indicators:

Primary Indicators:
- ___ Inundated
- ___ Saturated in Upper 12 Inches
- ___ Water Marks
- ___ Drift Lines
- ___ Sediment Deposits
- ___ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):
- ___ Oxidized Root Channels in Upper 12 Inches
- ___ Water-Stained Leaves
- ___ Local Soil Survey Data
- ___ FAC-Neutral Test
- ___ Other (Explain in Remarks)

Remarks: NE - Not encountered
· no wetland hydrology indicators

SOILS

Map Unit Name (Series and Phase): Glendive fine sandy loam

Drainage Class: WD

Field Observations Confirm Mapped Type? (Yes) No

Taxonomy (Subgroup): Torrifluvents

Profile Description:

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-6	A	10YR 4/3	–	–	L, weak fine
6-28	B	10YR 3/4	–	–	L, weak medium

Hydric Soil Indicators:

- ___ Histosol
- ___ Histic Epipedon
- ___ Sulfidic Odor
- ___ Aquic Moisture Regime
- ___ Reducing Conditions
- ___ Gleyed or Low-Chroma Colors
- ___ Concretions
- ___ High Organic Content in Surface Layer in Sandy Soils
- ___ Organic Streaking in Sandy Soils
- ___ Listed on Local Hydric Soils List
- ___ Listed on National Hydric Soils List
- ___ Other (Explain in Remarks)

Remarks: no hydric soil indicators

WETLAND DETERMINATION

Hydrophytic Vegetation Present? Yes (No) (Circle)
Wetland Hydrology Present? Yes (No)
Hydric Soils Present? Yes (No)

(Circle)
Is this Sampling Point Within a Wetland? Yes (No)

Remarks: very dry, no wetland indicators

Approved by HQUSACE 2/92

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Rio Blanco Applicant/Owner: DOE Investigator: RD + JK	Date: 6-29-93 County: Rio Blanco State: Colorado
Do Normal Circumstances exist on the site? (Yes) No Is the site significantly disturbed (Atypical Situation)? Yes (No) Is the area a potential Problem Area? Yes (No) (If needed, explain on reverse.)	Community ID: PEM Transect ID: T2 Plot ID: P2

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1. Salix exigua	S	OBL	9.		
2. Typha latifolia	G	OBL	10.		
3. Juncus effusus	G	OBL	11.		
4.			12.		
5.			13.		
6.			14.		
7.			15.		
8.			16.		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-). 100%

Remarks: vegetation very patchy due to recently deposited stream sediments

HYDROLOGY

___ Recorded Data (Describe in Remarks):
- ___ Stream, Lake, or Tide Gauge
- ___ Aerial Photographs
- ___ Other

✓ No Recorded Data Available

Field Observations:

Depth of Surface Water: 0 (in.)

Depth to Free Water in Pit: 12 (in.)

Depth to Saturated Soil: Surface (in.)

Wetland Hydrology Indicators:

Primary Indicators:
- ___ Inundated
- ✓ Saturated in Upper 12 Inches
- ✓ Water Marks
- ✓ Drift Lines
- ✓ Sediment Deposits
- ✓ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):
- ___ Oxidized Root Channels in Upper 12 Inches
- ___ Water-Stained Leaves
- ___ Local Soil Survey Data
- ✓ FAC-Neutral Test
- ___ Other (Explain in Remarks)

Remarks: Floodplain of Fawn Creek

SOILS

Map Unit Name (Series and Phase): Glendive

Drainage Class: WD

Taxonomy (Subgroup): Torrifluvents

Field Observations Confirm Mapped Type? Yes (No)

Profile Description:

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-4	A	10YR3/2	–	–	SL, weak blocky
4-22	BA	10YR2/1	–	–	SL, weak blocky (high organic content)

Hydric Soil Indicators:

- ___ Histosol
- ✓ Histic Epipedon
- ___ Sulfidic Odor
- ✓ Aquic Moisture Regime
- ✓ Reducing Conditions
- ___ Gleyed or Low-Chroma Colors
- ___ Concretions
- ✓ High Organic Content in Surface Layer in Sandy Soils
- ___ Organic Streaking in Sandy Soils
- ___ Listed on Local Hydric Soils List
- ___ Listed on National Hydric Soils List
- ___ Other (Explain in Remarks)

Remarks: Hydric soil present along Creek channel

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	(Yes)	No	(Circle)
Wetland Hydrology Present?	(Yes)	No	
Hydric Soils Present?	(Yes)	No	

(Circle)

Is this Sampling Point Within a Wetland? (Yes) No

Remarks: All three criteria

Approved by HQUSACE 2/92

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Rio Blanco Applicant/Owner: DOE Investigator: RPY JK	Date: 6-29-93 County: Rio Blanco State: Colorado
Do Normal Circumstances exist on the site? **Yes** No Is the site significantly disturbed (Atypical Situation)? Yes **No** Is the area a potential Problem Area? Yes **No** (If needed, explain on reverse.)	Community ID: Upland Transect ID: T3 Plot ID: P1

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1. Artemisia tridentata	S	UPL	9.		
2. Juniperus mexicana	S	UPL	10.		
3. Chrysothamnus nauseosus	G	UPL	11.		
4. Sphaeralcea grossulariaefolia	G	UPL	12.		
5.			13.		
6.			14.		
7.			15.		
8.			16.		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-). 0%

Remarks: very dry, side slope

HYDROLOGY

___ Recorded Data (Describe in Remarks):
- ___ Stream, Lake, or Tide Gauge
- ___ Aerial Photographs
- ___ Other

✓ No Recorded Data Available

Field Observations:

Depth of Surface Water: NE (in.)

Depth to Free Water in Pit: NE (in.)

Depth to Saturated Soil: NE (in.)

Wetland Hydrology Indicators:

Primary Indicators:
- ___ Inundated
- ___ Saturated in Upper 12 Inches
- ___ Water Marks
- ___ Drift Lines
- ___ Sediment Deposits
- ___ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):
- ___ Oxidized Root Channels in Upper 12 Inches
- ___ Water-Stained Leaves
- ___ Local Soil Survey Data
- ___ FAC-Neutral Test
- ___ Other (Explain in Remarks)

Remarks: NE - Not Encountered
no wetland hydrology indicators

SOILS

Map Unit Name (Series and Phase): Glendive

Drainage Class: WD

Field Observations Confirm Mapped Type? (Yes) No

Taxonomy (Subgroup): Torrifluvents

Profile Description:

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-33	A	10YR 5/3	—	—	fsl, weak fine

Hydric Soil Indicators:

- ___ Histosol
- ___ Histic Epipedon
- ___ Sulfidic Odor
- ___ Aquic Moisture Regime
- ___ Reducing Conditions
- ___ Gleyed or Low-Chroma Colors
- ___ Concretions
- ___ High Organic Content in Surface Layer in Sandy Soils
- ___ Organic Streaking in Sandy Soils
- ___ Listed on Local Hydric Soils List
- ___ Listed on National Hydric Soils List
- ___ Other (Explain in Remarks)

Remarks: very dry, no hydric soil indicators

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	Yes (No)	(Circle)
Wetland Hydrology Present?	Yes (No)	
Hydric Soils Present?	Yes (No)	

(Circle)

Is this Sampling Point Within a Wetland? Yes (No)

Remarks: no wetland criteria met

Approved by HQUSACE 2/92

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Rio Blanco Applicant/Owner: DOE Investigator: RP/JK	Date: 6-29-93 County: Rio Blanco State: Colorado
Do Normal Circumstances exist on the site? (Yes) No Is the site significantly disturbed (Atypical Situation)? Yes (No) Is the area a potential Problem Area? (Yes) No (If needed, explain on reverse.)	Community ID: PEM Transect ID: T3 Plot ID: P2

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1. unvegetated			9.		
2.			10.		
3.			11.		
4.			12.		
5.			13.		
6.			14.		
7.			15.		
8.			16.		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-). —

Remarks: newly deposited sediments, uncolonized

HYDROLOGY

___ Recorded Data (Describe in Remarks):
- ___ Stream, Lake, or Tide Gauge
- ___ Aerial Photographs
- ___ Other

✓ No Recorded Data Available

Field Observations:

Depth of Surface Water: 0 (in.)

Depth to Free Water in Pit: 10 (in.)

Depth to Saturated Soil: Surface (in.)

Wetland Hydrology Indicators:

Primary Indicators:
- ___ Inundated
- ✓ Saturated in Upper 12 Inches
- ✓ Water Marks
- ✓ Drift Lines
- ✓ Sediment Deposits
- ✓ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):
- ___ Oxidized Root Channels in Upper 12 Inches
- ___ Water-Stained Leaves
- ___ Local Soil Survey Data
- ___ FAC-Neutral Test
- ___ Other (Explain in Remarks)

Remarks: Floodplain of Fawn Creek

SOILS

Map Unit Name (Series and Phase): Glendive

Drainage Class: WD

Field Observations Confirm Mapped Type? Yes (No)

Taxonomy (Subgroup): Torrifluvents

Profile Description:

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-4	A	10YR 5/3	–	–	fsl, massive
4-26	B	10YR 2/2	–	–	fsl massive (high organic content)

Hydric Soil Indicators: —

- ___ Histosol
- ✓ Histic Epipedon
- ___ Sulfidic Odor
- ✓ Aquic Moisture Regime
- ✓ Reducing Conditions
- ___ Gleyed or Low-Chroma Colors
- ___ Concretions
- ✓ High Organic Content in Surface Layer in Sandy Soils
- ___ Organic Streaking in Sandy Soils
- ___ Listed on Local Hydric Soils List
- ___ Listed on National Hydric Soils List
- ___ Other (Explain in Remarks)

Remarks: Newly deposited sediments on saturated soils mixed with organic matter

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	Yes (No) (Circle)	
Wetland Hydrology Present?	(Yes) No	
Hydric Soils Present?	(Yes) No	
Is this Sampling Point Within a Wetland?	(Yes) No	(Circle)

Remarks: Area is problem area due to lack of vegetation. The area contains newly deposited sediments that have yet to colonize cattail and/or sandbar willow like adjacent areas.

Approved by HQUSACE 2/92

APPENDIX C
RULISON PHOTOGRAPHS

PHOTO #1 View overlooking the Rulison site. Photo shows the man-made effluent pond and Battlement Road.

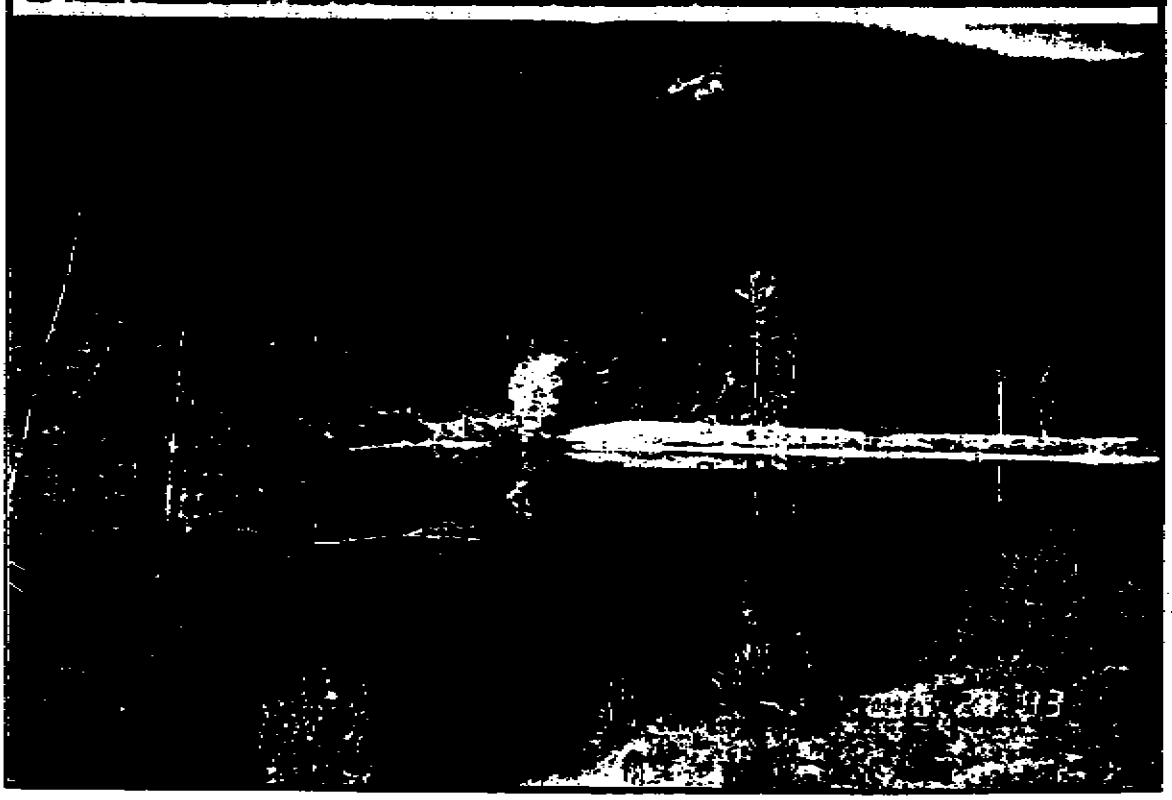

PHOTO #2 Effluent pond located in the center of the site.

INTERNATIONAL TECHNOLOGY CORPORATION

PHOTO #3 Tributary to Battlement Creek which transects the site and has a forested wetland associated with it.

PHOTO #4 A pure stand of quaking aspen on site.

INTERNATIONAL TECHNOLOGY CORPORATION

PHOTO #5 Battlement Creek which originates from a series of reservoirs on the top of Battlement Mesa transects the site.

PHOTO #6 Tributary to Battlement Creek becomes diverted by a series of beaver dams in the center of the site.

INTERNATIONAL TECHNOLOGY CORPORATION

PHOTO #7 Terracing effect of the beaver dams has slowed the flow of the tributary.

PHOTO #8 Pure stand of aspen adjacent to grazed pasture.

APPENDIX D
RIO BLANCO PHOTOGRAPHS

PHOTO #1 View overlooking the Rio Blanco site. Fawn Creek flows between two ridges and is carved into the landscape.

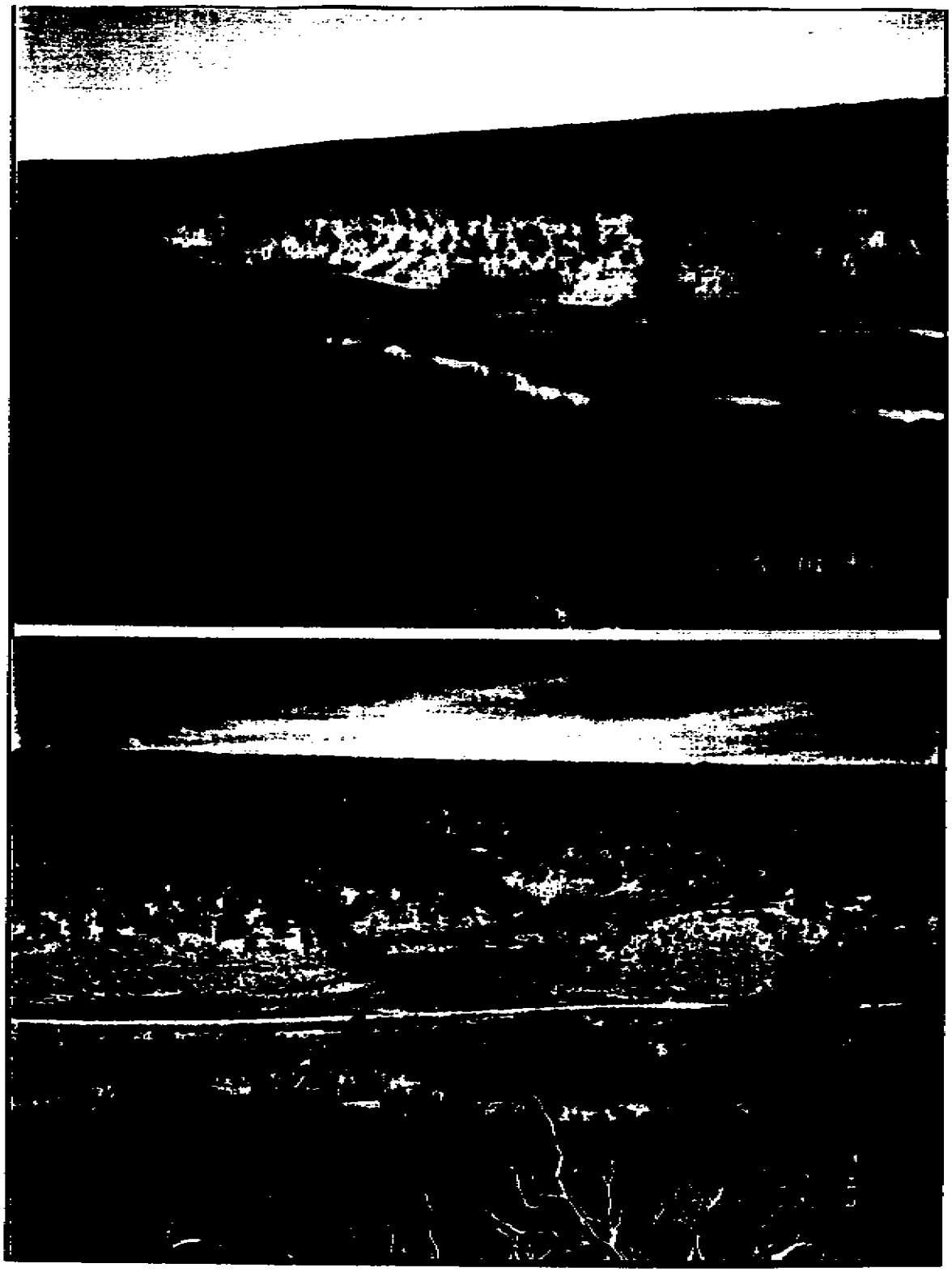

PHOTO #2 View depicting one of the many gulches associated with Fawn Creek.

INTERNATIONAL TECHNOLOGY CORPORATION

PHOTO #3 View of a dry gulch supporting upland vegetation.

PHOTO #4 Open grass areas used as pasture land for cattle.

PHOTO #5 Globemallow (Sphaeralcea grossulariaefolia), one of the many wildflowers on site.

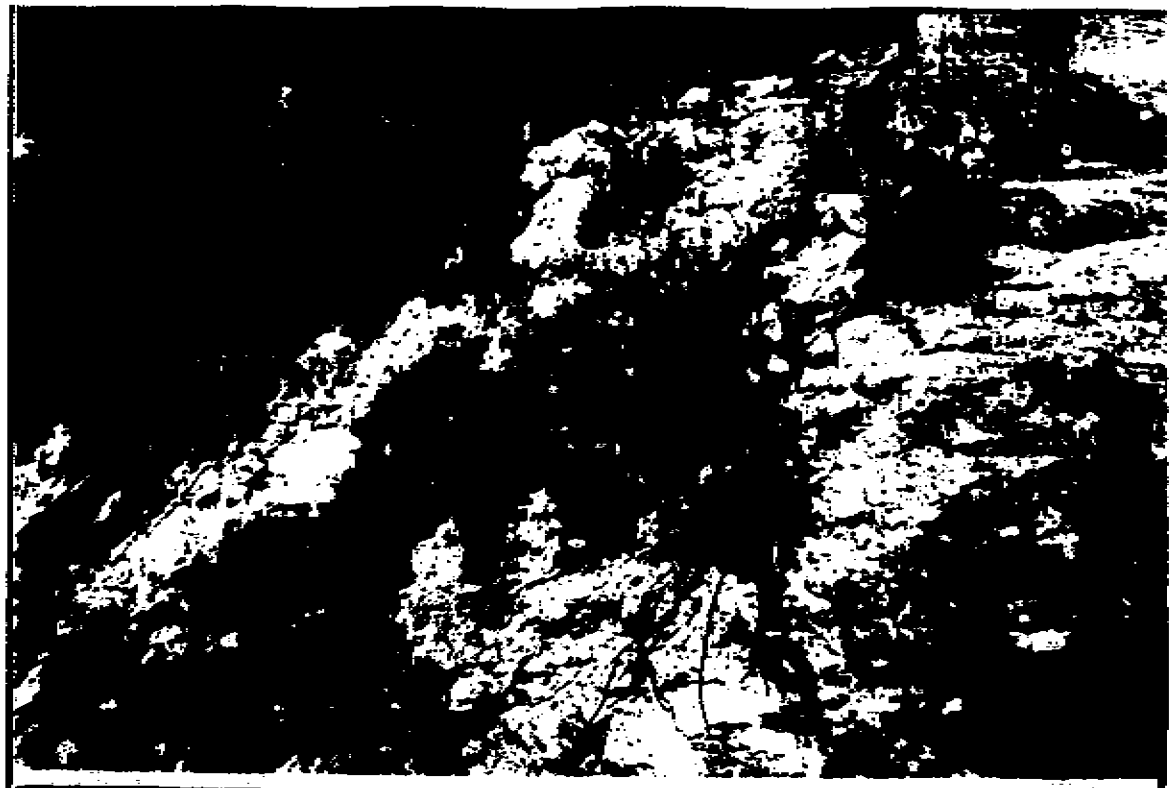

PHOTO #6 Floodplain within the eroded channel of Fawn Creek. Cattle utilize the grass areas for grazing.

PHOTO #7 Fawn Creek with banks exceeding 20 feet in height. Newly deposited sediments settle in bends and support hydrophytic vegetation.

PHOTO #8 Cattail (Typha latifolia), one of the common wetland species found along the channel.

INTERNATIONAL TECHNOLOGY CORPORATION