NATIONAL WETLANDS INVENTORY

MAP REPORT FOR NORTHERN COLORADO

FOR THE 1:100,000 MAP UNITS OF

VERNAL NE, VERNAL SE

CRAIG NW, CRAIG SW, CRAIG NE, CRAIG SE

U.S. Fish and Wildlife Service
Denver, Colorado
January, 1994

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I. INTRODUCTION

The United States Fish and Wildlife Service's National Wetlands Inventory (NWI) is producing maps showing the location and classification of wetlands and deepwater habitats of the United States. Classification of Wetlands and Deepwater Habitats of the United States by Cowardin et al. (1979) is the document used by the NWI to define and classify wetlands. Photo interpretation conventions, hydric soils lists and wetland plant lists are also used to implement the Cowardin classification system.

The purpose of this map report is to: (1) provide information on the production of NWI maps, including narrative on imagery and interpretation; (2) provide a descriptive crosswalk from NWI wetland codes on the map to common terminology and to representative plant species found on specific wetland sites; and (3) describe local geography, climate, and wetland communities.

II. FIELD RECONNAISSANCE

Field reconnaissance is a necessary procedure in order to accurately interpret aerial photography. Photographic signatures are correlated to the wetland habitat in the field. Collateral information including vegetative communities, soil types and topographic setting are further evaluated to aid in the photointerpretation process. This information is evaluated for seasonality and conditions existing at the time of photography and at ground truthing.

Project Area

The Northern Colorado study area is located in the Rocky Mountain Forest Province and the Wyoming Basin Province. Field reconnaissance covered the area of Vernal NE, Vernal SE, Craig NW, Craig SW, Craig NE and Craig SE. (See Appendix A)

Field Personnel

Chuck Elliott	-	U.S. Fish and Wildlife Service
Elaine Blok	-	U.S. Fish and Wildlife Service
Chuck Attardo	-	Geonex, Inc.
Rick Brovey	-	Geonex, Inc.
Heather Ritz	-	Geonex, Inc.

Field Dates

July 17 - 28, 1993

Aerial Photography

Primary Source Data (100%)
Type: NHAP Color Infra-Red High Altitude
Scale: 1:58,000

Vernal NE; 9/1/82, 9/2/82, 10/4/82, 9/10/83, 9/11/83, 8/30/84

Vernal SE; 9/1/82, 9/2/82, 10/4/82, 10/6/82, 9/10/83, 9/11/83, 8/30/84

Craig NW; 6/27/82, 7/31/82, 9/10/83, 9/12/83

Craig SW; 6/27/82, 7/31/82, 9/10/83, 9/12/83, 9/5/84

Craig NE; 9/10/83, 9/13/83, 9/16/83, 9/21/83, 9/5/84

Craig SE; 9/10/83, 9/13/83, 9/16/83, 9/21/83

Percentage Coverage: All 192 USGS quadrangles were covered with the NHAP photography.

Collateral Data

United States Geological Survey (USGS) Quadrangles
Soil Conservation Service Soil Surveys (Rio Blanco and Jackson Counties)
Bailey's Description of the Ecoregions of the United States
Water Resources Data Colorado
Hydric Soils of the State of Colorado
Wetland Plants of the State of Colorado

III. PHYSICAL DESCRIPTION OF PROJECT AREA

According to Bailey's Description of the Ecoregions of the United States (1980), the Northern Colorado study area is part of the Rocky Mountain Forest Province as well as the Wyoming Basin Province. Within the rocky Mountain Forest Province lies Routt National Forest, Arapaho National forest, Dinosaur National Monument and White River National Forest. Glaciated mountains within this province range in elevation from 8,000 to 13,000 feet. There are some plateaus composed of horizontally layered rock. A smaller portion of the study area is within the Wyoming Basin Province. This province is characterized by plains interrupted by low mountains and hills. Elevation ranges from 6,000 - 9,000 feet. Few mountains are 1,000 - 2,000 feet higher than the plains.

Although irrigated hayed fields are found throughout the study area within major river basins, most are located within and north of the Arapaho National Wildlife Refuge in Craig NE. There are also numerous saturated areas in the mountains as well as many active beaver ponds.

Climate

The Rocky Mountain Forest Province is characterized by winter precipitation which falls mainly in the form of snow in high altitudes. Precipitation is moderate on the plains, receiving only 10 - 20 inches. However, in the mountains, rainfall may increase to as much as 40 inches. Average annual temperatures for this province ranges from 35° to 45°F.

The climate of the Wyoming Basin Province is characterized by cold winters and a growing season which is less than 100 days. Summers are generally short and hot. In this province average annual temperature ranges from 40° to 52°F and average rainfall is 5 - 14 inches. Unlike the Rocky Mountain Forest Province, precipitation in the Wyoming Basin Province is distributed evenly throughout the year.

Vegetation

Wyoming Basin Province - The predominant vegetation is sagebrush with a mixture of short grasses. Willows and sedges are found along streams in and near the mountains where water is of good quality. Greasewood and other alkali tolerant plants dominate as you more from the mountains to moist alkaline flats. Predominant wetland plant species identified in this area included Salix (willow), Typha (cattail), Agropyron Smithii (western wheatgrass), Juncus (rush), Scirpus americanus (American three square), Hordium jurbatum (foxtail barley) and Polygonum pericaria (smartweed).

Rocky Mountain Forest Province - Clearly defined vegetational zones are characteristic of this area. The combination of altitude, latitude, prevailing wind direction and slope exposure is the driving force behind these distinct zones. These zones, beginning with the highest elevation and working down are characterized as follows.

Alpine: Alpine tundra and absence of trees.

Sub-Alpine: Englemann spruce and sub-alpine fir are dominant in most places.

Montane: Douglas fir is dominant on the higher, moister and more sheltered slopes while Ponderosa pine dominates on the lower, drier and more exposed slopes. Grasses and sagebrush will often cover the ground under open Ponderosa pine forests.

Foothill (Woodland): Scrub oak and mountain mahogany are often found in these dry rocky slopes. Predominant wetland plant species identified in the province included Populus (cottonwood), Salix (willow), Typha (cattail), Juncus (rush), Carex (sedge), Rumex (dock) and Sphagnum (moss).

Soils

Wyoming Basin Province - Weathering of soil is slight because of the semiarid conditions. This has allowed parent material to dictate soil texture and composition. This province also has extensive alluvial deposits in stream floodplains and in fans at the foot of mountains. There are many dry lake beds and extensive eolian deposits including dune sand and loess. Alkaline aridisols are the dominant soil type. Sub soils contain a layer enriched with lime and/or gypsum which may develop into a caliche hardpan.

Rocky Mountain Forest Province - Soils occur in zones corresponding to vegetation zones. These range form mollisols and alfisols in the montane zone to aridisol in the foothill zone. Inceptisols are also found because of steep slopes and recent glaciation.

IV. DESCRIPTION OF WETLAND HABITATS

Riverine

Permanent mountain rivers in the study area will be classified as R3UBH. Photo signature will be open water. Some examples of this classification are the Yampa, White and Green Rivers. Small streams in the mountains may be camouflaged by tree canopy. We will use the topo as a guide to determine where these streams are located. These will be classified as R3UBG.

Smaller stream channels in lower elevations with an open water signature will be classified as R3UBF. Intermittent streams with little or no water present in channel will be labeled R4SBC and R4SBA.

A R2UBH classification will be used on rivers with an open water signature located in lower elevations with little slope. A typical R2UBH will have a well developed floodplain with many meander scars. It is likely that water is being diverted from the main channel for agricultural purposes.

R2UBG and R2UBF will be applied to rivers with a smaller channel than a R2UBH. These rivers will have little velocity and a developed floodplain. Water resource data is crucial when classifying a river either R2UBG or R2UBF.

Sand and mud flats along R2/R3UBH rivers will be classified as R2/R3USC and R2/R3USA. Signature will vary from white to blue-gray.

Lacustrine

High mountain lakes, regardless of size, with any part of the visible shoreline as bedrock will be classified as L1UBH.

Shallow high mountain lakes, regardless of size, with any part of the visible shoreline as bedrock will be classified as L1UBF. This label will be used sparingly.

Reservoirs twenty acres or greater in size will be classified L1UBHh, regardless of their elevation.

High mountain lakes twenty acres or greater in size will be classified L1UBH.

Lakes below timberline that are twenty acres or greater in size will be classified L2ABG,F. Water Resource Collateral Data will be implemented when available.

Flats associated with reservoirs twenty acres or greater in size will be classified as L2USCh and L2USAh. Signatures will vary from a bluish gray in the case of a seasonally flooded flat to white in a temporarily flooded flat.

Large mining pits with an open water signature will be classified as L1UBGx.

Palustrine

Temporarily flooded emergents PEMA were seen mostly in the lower elevations. Hayed fields in the study area contained the largest area of temporary emergents observed. Signatures varied from bluish mottled to a variety of pink and reddish tones. There were also areas with a mixture of pink and white, light brown and yellow flesh-toned signatures.

Seasonally flooded emergents PEMC were also found more in the lower elevations. These usually were in drainages, swales and pockets. Signatures range from pink, red, brown and dark green and usually consisted of a mixture of two or more of these signatures.

Semipermanently flooded emergents PEMF were found as swales and pockets and in shallow lakes. Signatures vary from dark red/black, reddish purple, dark green/brown, and a textured red. The key for PEMF is the rough texture that the cattail and hardstem bulrush produce which is absent in the seasonally flooded signature.

Saturated emergents PEMB were sometimes difficult to distinguish and have varying signatures depending on the location within the study area. These areas are found as springs on slopes, and in the mountains. While ground truthing we found that the majority of emergent wetlands regardless of slope were saturated in the higher elevations. Signatures varied from a light pink to mottled deeper shades of pink, red, green and brown. Emergents associated with beaver dams will be classified as saturated and will carry the beaver (b) modifier.

The aquatic bed classification is used on a variety of wetlands. Areas of pockets, swales, basins and oxbows will be classified as PABF. Impoundments and man-made ponds will also carry this classification but will have the appropriate special modifiers assigned to their classification. Mountain ponds with a vegetated shoreline will be labeled PABG, beaver ponds will also be labeled PABG but will carry the beaver (b) modifier. Sewage ponds will be classified as PABK and have the excavated modifier (x). Signatures on these wetlands will be open water or an aquatic bed signature, usually a pink return.

Scrub-shrub, temporarily flooded PSSA were found in swales, pockets, stream channels and next to rivers. Signature is a pink/red with a fluffy texture. Seasonally flooded shrubs PSSC were seen more in oxbows and pockets. Signature was deeper red in color and will have an emergent understory. Saturated shrubs PSSB were found on slopes, springs and in the higher elevations. PSSB signature varied from bright red fluffy crowns in the lower elevations to a less textured pale pink/green/brown in the higher elevations.

Wetlands that were classified into the forested class carried water regimes A, B or C. Temporarily flooded forested wetlands will primarily be found near a major river or in a floodplain. Seasonally flooded forested wetlands will be found within a river floodplain, and in addition, a blanket of seasonal emergents or open water signature will be apparent in the understory. Although most of the saturated forested wetlands will be delineated in or near a spring, some saturated trees may be found in seeps or on saturated hillsides in the high mountains. Forested wetland areas were encountered along the Elk River and near Mad Creek.

The unconsolidated shore classification is used in the palustrine system and when there is a well defined border and a scoured white (PUSA) or a grey/blue (PUSC) signature.

OBSERVED WETLAND VEGETATION

TABLE I

Palustrine Temporary Emergents: PEMA
Hordeum jubatum, foxtail barley
Agropyron smithii, western wheat
Juncus spp., rush
Rumex spp., dock
Equisetum spp., horsetail
Eleocharis coloradoensis, dwarf spikerush
Phleum pratense, timothy
Phalaris arundinacea, reed canary grass
Phragmites sp., common reed
Calamagrositis canadensis, bluejoint
Iris missouriensis, Rocky Mountain iris
Xanthium sp., cocklebur
Polygonum persicaria, smartweed

Palustrine Saturated Emergents: PEMB
Eleocharis spp., spikerush
Scirpus americanus, American threesquare
Hordeum jubatum, foxtail barley
Sphagnum sp., moss
Carex spp., sedge
Juncus spp., rush
Veratrum tenuipetalum, corn lilly
Trifolium repens, white sweet clover

Palustrine Seasonal Emergents: PEMC
Beckmania syzigachne, American sloughgrass
Eleocharis spp., spikerush
Calamagrositis canadensis, bluejoint
Carex spp., sedge
Juncus spp., rush
Rumex spp., dock

Palustrine Semi-permanent Emergents: PEMF
Typha spp., cattail
Scirpus validus, softstem bulrush
Scirpus americanus, common threesquare

Palustrine Semi-Permanent Aquatic Bed: PABF
Lemna spp., duckweed

Palustrine Intermittently Exposed Aquatic Bed: PABG
Lemna spp., duckweed

Palustrine Temporary Scrub-shrub: PSSA
Salix spp., willow
Cornus stolonifera, Red-osier dogwood
Tamarix gallica, salt cedar
Sarcobatus vermiculatus, greasewood

Palustrine Saturated Scrub-shrub: PSSB
Salix spp., willow

Palustrine Seasonal Scrub-shrub: PSSC
Salix spp., willow
Populus deltoides, eastern cottonwood

Palustrine Temporary Forested: PFOA
Populus deltoides, eastern cottonwood

Palustrine Temporary Unconsolidated Shore: PUSA
Salacornia rubra, Rocky Mountain glasswort
Sarcobatus vermiculatus, greasewood

Palustrine Seasonal Unconsolidated Shore: PUSC
Salacornia rubra, Rocky Mountain glasswort

Salt flats were also noted in the study area. These were sparsely vegetated (less than 30%) with Rocky Mountain glasswort (Salacornia rubra). The wetland typing of these largely unconsolidated shore areas will be PUSA and PUSC.

Table II. NWI WETLAND CLASSIFICATION CODES, COWARDIN DESCRIPTION AND COMMON TERMINOLOGY

NWI CODE WATER REGIME	COWARDIN DESCRIPTION	COMMON DESCRIPTION	VEGETATION
R2UB (F,G,H)	Riverine, lower perennial, unconsolidated bottom	Meandering rivers, low gradient	Unconsolidated bottom
R2US (A,C)	Riverine, lower perennial, unconsolidated shore	Mud, sand or gravel bars	Unconsolidated shore
R3UB (F,H)	Riverine, upper perennial, unconsolidated bottom	Mountain streams, major drainage areas	Unconsolidated bottom
R3US (A,C)	Riverine, upper perennial, unconsolidated shore	Mud, sand or gravel bars	Unconsolidated shore
R4SB (A,C)	Riverine, intermittent, streambed	Small streams, creeks or irrigation ditches	Streambed
L2AB (G)	Lacustrine, littoral, aquatic bed	Shallow lakes	Aquatic bed
L2US (A,C)	Lacustrine, littoral, unconsolidated shore	Dry alkaline lake beds	Unconsolidated shore

Table II. NWI WETLAND CLASSIFICATION CODES, COWARDIN DESCRIPTION AND COMMON TERMINOLOGY

NWI CODE WATER REGIME	COWARDIN DESCRIPTION	COMMON DESCRIPTION	VEGETATION
PUB (F)	Palustrine, unconsolidated bottom	Open water, settling ponds	Unconsolidated bottom
PAB (F,G,K)	Palustrine, aquatic bed	Deep basins, impoundments, sewage treatment	Aquatic bed
PEM (A,B,C,F)	Palustrine, emergent	Basins, depressions, marshes, meadows, springs, seeps, oxbows, or drainage areas	Agropyron smithii (western wheat) Beckmania syzigachne (American sloughgrass) Eleocharis palustris (spikerush) Equisetum hyemal (horsetail) Hordeum jubatum (foxtail barley) Juncus spp. (rush) Phleum pratense (timothy) Rumex spp. (dock) Salicornia rubra (glasswort)

Table II. NWI WETLAND CLASSIFICATION CODES, COWARDIN DESCRIPTION AND COMMON TERMINOLOGY

NWI CODE WATER REGIME	COWARDIN DESCRIPTION	COMMON DESCRIPTION	VEGETATION
PEM (continued)			Scirpus acutus (hardstem bulrush) Scirpus americanus (American threesquare) Scirpus validus (softstem bulrush) Typha sp. (cattail) Phalaris arundinacea (canary grass) Phragmites australis (common reed) Calamagrositis canadensis (bluejoint) Iris missouriensis (Rocky Mountain iris) Xanthium sp. (cocklebur) Polygonum persicaria (smartweed) Trifolium repens (white sweet clover) Carex spp. (sedge)

Table II. NWI WETLAND CLASSIFICATION CODES, COWARDIN DESCRIPTION AND COMMON TERMINOLOGY

NWI CODE WATER REGIME	COWARDIN DESCRIPTION	COMMON DESCRIPTION	VEGETATION
PSS (A,C)	Palustrine, scrub-shrub	Willow thicket, river banks, oxbows, or drainage areas	Tamarix gallica (salt cedar) Salix spp. (willow) Populus deltoides (Eastern cottonwood) Populus augustofolia (narrow leaf greasewood) Sarcobatus vermiculatus (greasewood)
PFO (A,B)	Palustrine, forested	Cottonwood, river banks, oxbows, floodplains, drainage areas or associated with seeps on a slope	Populus deltoides (eastern cottonwood) Populus augustofolia (narrow leaf greasewood)
PUS (A,C)	Palustrine, unconsolidated shore	Salt flats, along high mountain pond shores and in dried up or breached impoundments	Unconsolidated shore

V. WATER REGIME DESCRIPTION

(A) Temporarily Flooded - Surface water present for brief periods during growing season, but water table usually lies well below soil surface. Plants that grow both in uplands and wetlands are characteristic of this water regime.

(B) Saturated - The substrate is saturated to the surface for extended periods during the growing season, but surface water is seldom present.

(C) Seasonally Flooded - Surface water is present for extended periods especially early in the growing season, but is absent by the end of the growing season in most years. The water table after flooding ceases is extremely variable, extending from saturated to a water table well below ground surface.

(F) Semipermanently Flooded - Surface water persists throughout the growing season in most years. When surface water is absent, the water table is usually at or very near the land's surface.

(G) Intermittently Exposed - Surface water is present throughout the year except in years of extreme drought.

(H) Permanently Flooded - Water covers the land surface throughout the year in all years.

(K) Artificially Flooded - Substrate manipulated by man using natural or synthetic materials. Water level is not constant. Depending on needs, the water is pumped in or out of the reservoir.

VI. IMAGERY

Most of the NHAP Color Infra-Red photography is of high quality with exception of rolls 43 and 65. These rolls have considerably dark emulsion which made it difficult to distinguish the upland-wetland boundary. Ground truthing revealed field conditions similar to those portrayed on imagery.

VII. MAP PREPARATION

The classification and delineation of wetlands is in accordance with Cowardin et al (1979). National Wetlands Inventory photographic and cartographic conventions can provide more information about the mapping process. Delineations are produced through stereoscopic interpretation of 1:58,000 scale color infrared photography. The dates of photography ranged from 1982 through 1984. The months the mission was flown were June through October.

Field checks were conducted in each of the eight 1:100,000 maps in the study area prior to the delineation of wetlands. The check sites were selected to clarify wetland/upland breaks and coinciding signatures to the various vegetative covers.

USGS topographic maps, SCS soil surveys, USGS water resource data book for 1990 water year, vegetation, climate, and ecoregional information are all used as collateral data for wetland delineation.

The user of the map is cautioned that, due to the limitation of mapping primarily through aerial photointerpretation, a small percentage of wetlands may be unidentified. Since the photography depicts only one specific moment in time there may be discrepancies between the maps and current field conditions. Changes in landscape which occurred after the date of photograph would result in such discrepancies.

Aerial photointerpretation and drafting were completed by Geonex, Inc., St. Petersburg, Florida with quality assurance conducted by the United States Fish and Wildlife Service.

VIII. SPECIAL MAPPING PROBLEMS

Many of Colorado's pristine wetlands are found in the alpine and sub-alpine regions of the mountains. Due to snow cover at the time of field reconnaissance, these areas were inaccessible by road. Consequently, many high mountain wetlands eluded field checking. Conventions set up by USFWS personnel in region six were provided to the photointerpreters to help with these areas.

The major mapping problem encountered was the issued of hayed and irrigated fields. A temporary or seasonal wetland signature in a non-hayed field can be totolly different than one in a hayed field. The fact that irrigation practices by northwest Colorado farmers are widespread makes this issue an even more difficult one to map accurately. The confidence in the accuracy of these wetlands is high since it was understood before the project started that this would be a problem area. With this in mind, hayed and irrigated fields were heavily field checked. Although a wide range of tones and textures for seasonal and temporary wetlands were encountered, one mapping procedure seems to hold true. The upland vegetation, whether it be brome or alfalfa, seems to emit a monotone smooth red signature in all cases field checked.

A third, but relatively minor problem, was the presence of shadows created by steep cliffs along rivers. Shadows created by trees in the high mountains also proved to be a problem when locating beaver ponds. Because of shadows, it has become difficult for the photointerpreter to locate all wetlands in these areas.

IX. MAP ACQUISITION

To discuss any questions concerning these maps, please contact:

Regional Wetland Coordinator
U.S. Fish and Wildlife Service - Region 6
Denver Federal Center
P. O. Box 25486
Denver, CO 80225

To order maps call 1-800-USA-MAPS.

Maps are identified by the name of the corresponding USGS 1:24,000 scale topographic quadrangle name. Topographic map indices are available from the USGS.

co-no.rpt
CA/drs.nwi

X. LITERATURE CITED

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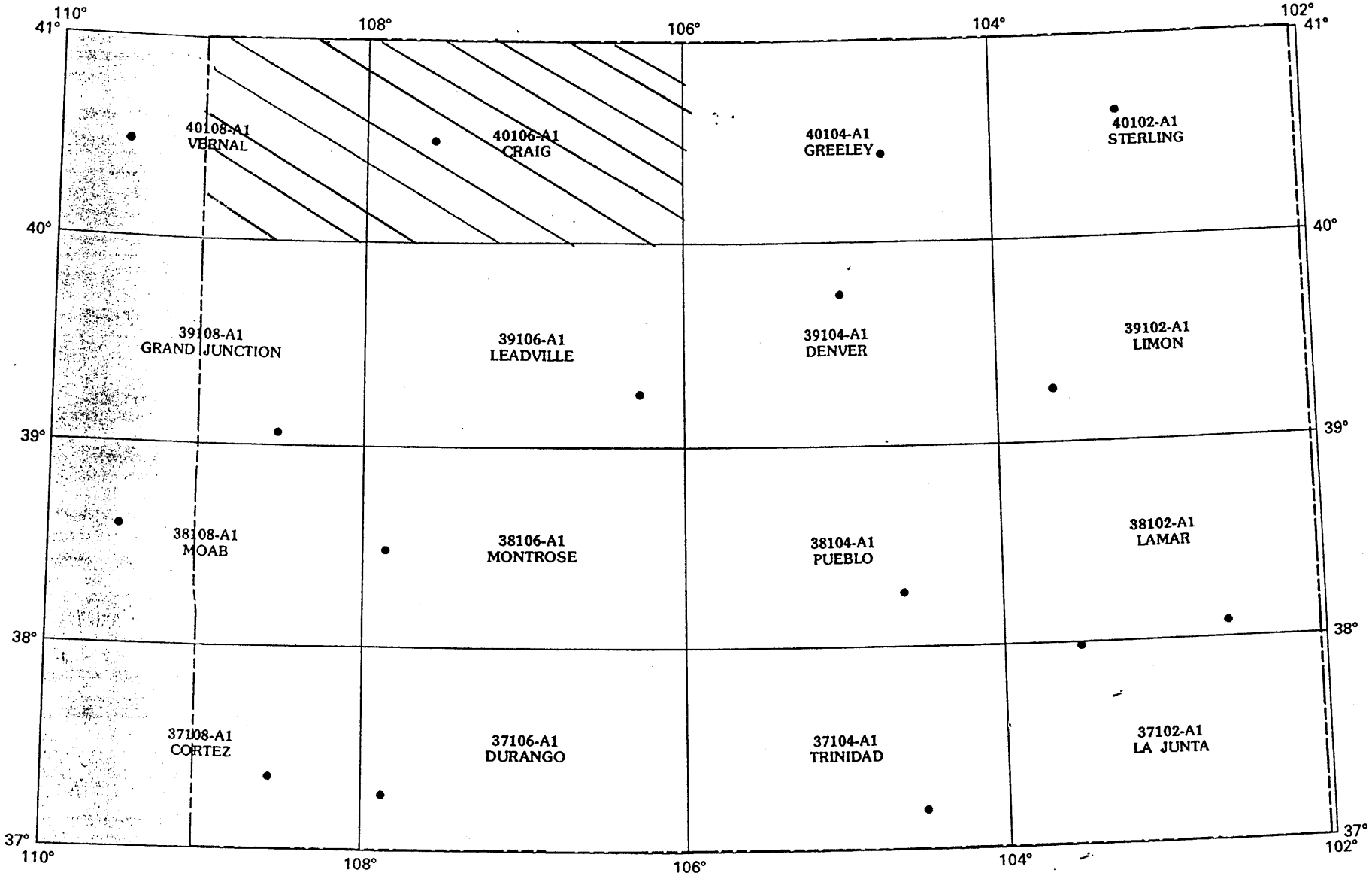
Soil Survey of Rio Blanco County Area, Colorado, 1981. United States Department of Agriculture, Soil Conservation Service.

APPENDIX A
LOCATOR MAP

NORTHERN COLORADO PROJECT AREA

1 X 2 DEGREE SERIES
1:250,000 SCALE