NATIONAL WETLANDS INVENTORY

Map Report of East Central Montana
for the 1:100,000 Map Units of:
Billings NW, NE, SW, SE;
Forsyth NW, NE, SW, SE;
Jordan NW, NE, SW, SE;
Lewistown NW, NE, SW, SE;
Roundup NW, NE, SW, SE;
Hardin NW, NE, SW;
Glasgow NE, SE;
Havre SW, SE.

U.S. Fish and Wildlife Service

Denver, Colorado
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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. Photointerpretation 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 cross-reference 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 East Central Montana study area is located in the Great Plains-Shortgrass Prairie Province and a small portion of the Wyoming Basin Province (Bailey, 1980). Field reconnaissance covered the area of each 1:100,000 quad: Billings SW, SE, NW, NE; Forsyth SW, SE, NW, NE; Jordan SW, SE, NW, NE; Lewistown SW, SE, NW, NE; Roundup SW, SE, NW, NE; Hardin NW, NE, SW; Havre SW, SE; Glasgow NE and SE. (Appendix A).

Field Personnel

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Field Dates 4-20 May 1995

Aerial Photography

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

Forsyth SE: 9/25/80, 6/29/81, 6/30/81, 7/9/81
Forsyth SW: 6/30/81, 7/8/81
Forsyth NE: 9/25/80, 6/29/81, 6/30/81, 7/9/81
Forsyth NW: 6/30/81, 7/8/81
Jordan SE: 7/4/85, 7/19/85, 7/30/85, 7/14/86
Jordan SW: 7/20/85, 7/30/85, 7/14/86
Jordan NE: 7/4/85, 7/19/85, 7/30/85
Jordan NW: 7/20/85, 7/30/85, 7/14/86
Billings SE: 7/15/81, 8/24/81
Billings SW: 8/24/81, 8/25/81, 8/26/81, 9/7/81, 9/10/83
Billings NE: 7/15/81, 8/24/81, 9/7/81
Billings NW: 8/24/81, 8/25/81, 8/26/81, 9/7/81
Lewistown SE: 7/2/86, 7/14/86, 8/14/86, 8/22/86
Lewistown SW: 6/17/86, 6/26/86, 7/6/86, 6/3/87
Lewistown NE: 7/2/86, 7/14/86, 7/17/86, 8/14/86, 8/22/86, 6/3/87
Lewistown NW: 6/17/86, 6/26/86, 7/6/86, 6/3/87
Roundup SE: 7/2/86, 7/6/86, 7/14/86, 7/17/86, 8/14/86, 8/22/86
Roundup SW: 6/17/86, 6/26/86, 7/2/86, 7/6/86
Roundup NE: 7/2/86, 7/6/86, 7/14/86, 7/17/86, 8/14/86, 8/22/86
Roundup NW: 6/17/86, 6/26/86, 7/2/86, 7/6/86, 6/3/87
Hardin SW: 7/21/80, 7/22/80, 7/27/80, 7/28/80, 9/3/80, 9/20/80, 7/8/81, 8/18/81, 9/7/81, 10/1/81
Hardin NE: 7/31/80, 9/5/80, 9/14/80, 7/8/81
Hardin NW: 7/21/80, 7/22/80, 7/27/80, 7/28/80, 7/8/81, 9/7/81
Havre SE: 7/14/86, 7/17/86, 8/14/86, 8/22/86, 6/3/87, 7/14/87
Havre SW: 6/17/86, 6/26/86, 6/3/87, 7/14/87
Glasgow NE: 7/4/85, 7/19/85
Glasgow SE: 7/4/85, 7/19/85, 7/30/85

Percent Coverage: All 832 USGS 7.5' quadrangles were covered with the NHAP photography.

Collateral Data

United States Geological Survey (USGS) Quadrangles
United States Soil Conservation Service (USSCS) Soil Surveys
Bailey's Description of the Ecoregions of the United States (1980)
Water Resource Data, Montana, Water Year 1991
National List of Plant Species That Occur In Wetlands: North Plains (Region 4)
National List of Plant Species That Occur In Wetlands: Northwest (Region IX)
Hydric Soils of the United States
Water Resources Investigative Report, USGS

III. PHYSICAL DESCRIPTION OF PROJECT AREA

Geography

Bailey, Description of the Ecoregions of the United States (1980), describes the East Central Montana project area as the Wheatgrass-Needlegrass and Grama-Needlegrass-Wheatgrass sections of the Great Plains-Shortgrass Prairie Province, and the Wyoming Basin Province.

The Great Plains-Shortgrass Prairie Province is characterized by rolling plains and tablelands of moderate relief. They are in a broad belt that slopes gradually eastward down from an altitude of 5,500 feet (1,520 m.) near the foot of the Rocky Mountains to 2,500 feet (760 m.) in the central states. The plains are notably flat, but there are occasional valleys, canyons, and buttes.

The Wyoming Basin consists of plains interrupted by isolated hills and low mountains. Altitudes are mostly between 6,000 ft. (1,800 m.) and 8,000 ft. (2,400 m.); the few mountains are 1,000 to 2,000 ft. (300 to 600 m.) higher. Broad intermountain basins and a few isolated small mountain ranges merge into a dissected plateau in the south. Sloping alluvial fans at the edges of the basins merge into flat plains in the center. Badlands are typical of the dissected parts along the outer edges.

Climate

The climate of the Great Plains-Shortgrass Prairie Province is a semiarid continental regime in which maximum rainfall occurs in summer, but the total supply of moisture is low. Ninety-five percent (95%) of basin collected run-off comes from the spring snowmelt. Evaporation usually exceeds runoff. The frost-free season is usually fewer than one-hundred (100) days and the precipitation is approximately ten (10) inches (250 mm). The average annual temperature is 45°F (8°C) throughout most of the region. Winters are cold and dry; the summers warm to hot.

The overall high altitude of the Wyoming Basin gives it a climate characterized by cold winters. Summers are short and hot. Annual temperature averages range from 40° to 52°F. (4° to 11°C.). The average growing season is fewer than 100 days in the south and fewer than 140 days in the north and east. Average annual precipitation ranges from 5 to 14 in. (125 to 350 mm.), fairly evenly distributed throughout the year.

Vegetation

The vegetation of the Great Plains-Shortgrass Prairie Province is characteristic of steppe, sometimes called shortgrass prairie. This is a formation class of short grasses usually bunched and sparsely distributed. Scattered shrubs and trees occasionally appear in the steppe, and exist as all gradations of cover from semidesert to woodland formations. Since ground cover is scarce, much soil is exposed. Many species of grasses and herbs grow in this province.

The chief vegetation of the Wyoming Basin is sagebrush or shadscale, with a mixture of short grasses. Moist alkaline flats support alkali-tolerant greasewood. Along streams in and near the mountains, where the water is good, valley bottoms are lined by willows and sedges, but farther from the mountains this vegetation gives way to greasewood and other alkali-tolerant plants.

Soils

In the semiarid continental climate regime of the Great Plains-Shortgrass Prairie Province, the dominant pedogenic process is calcification; salinization is dominant in poorly drained sites. Soils contain a large excess of precipitated calcium carbonate and are rich in bases. Mollisols are typical. Humus content is small because vegetation is sparse.

The Wyoming Basin Province has extensive alluvial deposits in stream flood plains and in fans at the foot of the mountains. Dry lake beds are numerous, and there are extensive eolian deposits including both dune sand and loess.

Soils in the Wyoming Basin are alkaline aridsoils. Subsoils contain a layer enriched with lime and/or gypsum, which may develop into a caliche hardpan. Because the Wyoming Basin is semiarid and weathering is correspondingly slight, soil texture and composition are dominated by the parent materials.

IV. DESCRIPTION OF WETLAND HABITATS IN PROJECT AREA

Riverine

Water Resource Data, Montana (water year 1991), was used as collateral data to classify some study area rivers. The major river drainages of the Bighorn River, Boulder River, the Clark's Fork of the Yellowstone,

Judith River, Little Bighorn, Lodge Grass Creek, Milk River, Missouri River, Stillwater River, Tongue River, West Rosebud Creek, and the Yellowstone River are classified R2/R3UBH. East Pass Creek, Frenchman River, Pass Creek, Pryor Creek, West Pass Creek, and Willow Creek (Yellowstone Basin) are classified R2/R3UBG. Big Sandy Creek, Boxelder Creek (Milk Basin), Little Peoples Creek, Musselshell River, Owl Creek, and Red Lodge Creek are classified R2/R3UBF. Classification of rivers which are not in the Resource Data are discussed in section VI, subsection Conventions for Linear Wetlands.

Many intermittent streams exist on the study area. Intermittent streams are classified as R4SBA or R4SBC.

Lacustrine

Many of the lakes on the project area are impounded. The classifications are $L1UBH_h$, $L1UBG_h$, $L2ABF_h$, or a combination of these classifications on larger impoundments. Many of these lakes are bordered by persistent emergent vegetation. Natural lakes in non-mountainous areas on the study area are usually shallow basins which are classified L2ABF, L2USC, or L2USA.

Palustrine:

The majority of wetlands on the study area are palustrine. Palustrine wetlands are located in basins, river floodplains, and many drainages. Some wetlands have been drained or tilled for agricultural purposes, but most wetlands are located on untilled prairie or in mountainous areas.

Emergents (PEMA, PEMC, PEMF) and aquatic bed (PABF) are the dominant cover types with smaller areas of scrub-shrub (PSSA, PSSC) and forested (PFOA, PFOC). Saturated wetlands were observed on isolated portions of the study area (PEMB, PSSB, PFOB). Field checksites were documented where problem areas existed due to inconsistent wetland photosignatures. Vegetation observed in these wetland habitats was grouped according to class and water regime. Plant species listed in Tables 1 and 2 were identified on check sites or field sites and represent only a fraction of all wetland plant species occurring on the project area. Table 3 describes the Cowardin et. al. system and common plants within each classification.

Table 1. Plant Species Observed in Project Area

Palustrine Temporary Emergents: PEMA

Agropyron smithii, western wheatgrass
Aster spp., aster
Deschampsia spp., hairgrass
Distichlis spp., salt grass
Eleocharis spp., spikerush
Equisetum spp., horsetail
Helianthus spp., sunflower
Hordeum jubatum, foxtail barley
Mimulus guttatus, common yellow monkey-flower
Muhlenbergia spp., muhly
Panicum capillare, witchgrass
Phleum pratense, Timothy
Phragmites australis, giant reedgrass
Polygonum spp., smartweed
Rumex, spp., dock
Salicornia rubra, saltwort
Sium suave, water parsnip
Sonchus arvensis, sow thistle
Spartina pectinata, prairie cord grass
Sporobolus airoides, alkali sacaton

Palustrine Seasonal Emergents: PEMC

Alisma spp., water plaintain
Beckmania syzigachne, American sloughgrass
Carex spp., sedge
Eleocharis spp., spikerush
Hippuris vulgaris, mare's-tail
Juncus spp., rush
Mentha spp., mint
Phalaris arundinacea, reed canary grass
Polygonum, smartweed
Potentilla rivalis, brook cinquefoil
Rumex spp., dock
Sagittaria spp., arrowhead
Scirpus spp., bulrush
Scirpus pungens, threesquare
Scolochloa festucacea, whitetop
Sium suave, water parsnip
Spartina pectinata, prairie cord grass
Triglochin spp., arrowgrass
Typha spp., cattail

Palustrine Semi-permanent Emergents: PEMF

Alisma spp., water plantain
Scirpus spp., bulrush
Typha spp., cattail

Palustrine Semi-permanent Aquatic Bed: PABF

Callitriche spp., water starwort
Ceratophyllum spp., coontail
Lemna spp., duckweed
Potamogeton spp., pondweed

Palustrine Saturated Emergent: PEMB

Carex spp., sedge
Epilobium ciliatum, willow herb
Typha spp., cattail

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

Palustrine Temporary Scrub-shrub: PSSA

Cornus stolonifera, red osier dogwood
Populus spp., cottonwood
Salix spp., willow

Palustrine Seasonal Scrub-shrub: PSSC

Cornus stolonifera, red osier dogwood
Populus spp., cottonwood
Salix spp., willow

Palustrine Temporary Forested: PFOA

Acer negundo, boxelder
Fraxinus spp., ash
Salix spp., willow
Populus spp., cottonwood

Table 2. OBSERVED WETLAND VEGETATION

A. EMERGENT	
Angropyron smithii	western wheatgrass
Alisma spp.	water plantain
Aster spp.	aster
Beckmania spp.	sloughgrass
Carex spp.	sedge
Deschampsia spp.	hairgrass
Distichlis spp.	salt grass
Eleocharis spp.	spikerush
Epilobium ciliatum	willow herb
Equisetum spp.	horsetail
Helianthus spp.	sunflower
Hippuris vulgaris	mare's-tail
Hordeum jubatum	foxtail barley
Juncus spp.	rush
Kochia spp.	fireweed
Mentha spp.	mint
Mimulus guttatus	common yellow monkey-flower
Phalaris arundinacea	reed canary grass
Phleum pratense	Timothy
Phragmites australis	giant reedgrass
Polygonum spp.	smartweed
Potentilla rivalis	brook cinquefoil
Ranunculus spp.	buttercup
Rumex spp.	dock
Sagittaria spp.	arrowhead
Scirpus spp.	bulrush
Scolochloa festicacea	whitetop
Sium suave	water parsnip
Solidago spp.	goldenrod
Sonchos arvensis	sow thistle
Spartina pectinata	prairie cord grass
Triglochin spp.	arrowgrass
Typha spp.	cattail
B. AQUATIC BED	
Callitriche spp.	water starwort
Ceratophyllum spp.	coontail
Lemna spp.	duckweed
Potamogeton spp.	pondweed
C. SCRUB-SHRUB	
Populus spp.	cottonwood
Salix spp.	willow
Cornus stolonifera	red osier dogwood
D. FORESTED	
Acer negundo	boxelder
Fraxinus spp.	ash
Populus spp.	cottonwood

Table 3. 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,G,H)	Riverine, upper perennial unconsolidated bottom	Mountain streams, major drainage areas	Unconsolidated bottom
R4SB (A,C)	Riverine, intermittent, streambed	Small streams, creeks, or irrigation ditches	Streambed
L1UB (G,H)	Lacustrine, limnetic unconsolidated bottom	Deep lake marshes	Unconsolidated bottom
L2AB (F,G)	Lacustrine, littoral aquatic bed	Shallow lake marshes	Hippuris vulgaris (marestail) Lemna spp. (duckweed)
L2US (A,C)	Lacustrine, littoral, unconsolidated shore	Dry alkaline lake beds	Unconsolidated shore
PUB (F,G,H)	Palustrine, unconsolidated bottom	Open water	Unconsolidated bottom
PAB (F,G,K)	Palustrine, aquatic bed	Deep basins, impoundments, excavated tanks, or sewage treatment settling ponds	Hippuris vulgaris (marestail) Lemna spp.

Table 3. NWI WETLAND CLASSIFICATION CODES, COWARDIN DESCRIPTION AND COMMON TERMINOLOGY

NWI CODE WATER REGIME	COWARDIN DESCRIPTION	COMMON DESCRIPTION	VEGETATION
PEM (A,B,C,F)	Palustrine, emergent	Basins, depressions, marshes, meadows, springs, seeps, or drainage areas	Agropyron smithii (western wheat) Beckmania syzigachne (American sloughgrass) Carex spp. (sedges) Distichlis spicata (inland saltgrass) Eleocharis spp. (spikerush) Equisetum spp. (horsetail) Hordeum jubatum (foxtail barley) Juncus spp. (rush) Phalaris arundinacea (reed canary grass) Phleum pratense (timothy) Poa pratensis (Kentucky bluegrass) Polygonum spp. (smartweed) Rumex spp. (dock) Sagittaria spp. (arrowhead) Spartina pectinata (prairie cord grass) Nasturtium officinale (water cress)

Table 3. NWI WETLAND CLASSIFICATION CODES, COWARDIN DESCRIPTION AND COMMON TERMINOLOGY

NWI CODE WATER REGIME	COWARDIN DESCRIPTION	COMMON DESCRIPTION	VEGETATION
PEM (continued) (A,B,C,F)			Scirpus americanus (common threesquare) Scirpus validus (softstem bulrush) Typha spp. (cattail)
PSS (A,B,C)	Palustrine, scrub-shrub	Willow thicket, river banks or drainage areas	Salix spp. (willow) Rosa spp. (rose) Ribes spp. (currant)
PFO (A,B,C)	Palustrine, forested	Cottonwood, river banks, floodplains, or drainage areas	Populus deltoides (eastern cottonwood) Salix spp. (willow) Fraxinus spp. (ash) Acer negundo (boxelder)
PUS (A,C)	Palustrine, unconsolidated shore	Salt flats	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.

VI. IMAGERY

Most of the NHAP Color Infra-Red Emulsion is good quality. The exceptions are the 22 July 1980, 8 July 1981, and 14 July 1986 imagery. The 22 July 1980 imagery has light emulsion on one roll of film and dark emulsion on another roll. On the 8 July 1981 and 14 July 1986 imagery there are some washed out emulsions. Photo dates with poor emulsion require extended photointerpretation times to accurately delineate and classify wetland areas. The photo dates are July & September 1980, June through October 1981, September 1983, July 1985, June through August 1986 and June & July 1987. The 1980, 1981, 1983, and 1985 photography shows normal water conditions. The 1986 photography shows wetter than normal water conditions on all dates of June and July photography. The 3 June 1987 imagery also shows very wet conditions. Except for farmed basins, most wetland basins on all dates of photography contain typical vegetation growth for the season.

Field reconnaissance provided the following mapping conventions for all the imagery based on seasonal and climatic conditions. These conventions will cover general conventions, wetland basins, riverine and vegetated linears, oxbows, impoundments, and miscellaneous signatures.

GENERAL CONVENTIONS FOR EAST CENTRAL MONTANA WETLANDS

- All open water impoundments are classified ABF_h unless field reconnaissance and/or collateral data justifies an UBG_h classification.

- All open water dugouts, except for waste water treatment facilities, are classified UBF_x and occasionally G_x if they are very large. Excavations exhibiting a AB photosignature are classified as such.

- Intermittent versus perennial riverine classifications were determined by photosignature coupled with other collateral data and in field observations. The perennial or intermittent designations on USGS quads were not strictly followed when classifying streams and river systems.

- Beaver ponds with a open water signature are classified $PABG_b$.

CONVENTIONS FOR BASIN WETLANDS

Temporary Basins

Temporary emergent basins, in non-agricultural areas can be characterized by their indistinct edges. However, these borders are quite distinct within agricultural areas of crops and haying. Depending on the date of photography, temporary photosignatures exhibit a variety of gray, red, brown, tan, and olive tones.

All 10 dates of the 1980 imagery are normal for the season. Temporary basins are grayish-red on the light emulsion 22 July 1980 imagery and dark mottled red on the dark emulsion of that date. Temporary basins

on the rest of the dates are various combinations of gray and red.

The 1981 photography shows normal water conditions. Signatures on the 11 dates of photography include dark brown, brownish-red, olive-red, white with a slight red tint, reddish-grey, and mottled white and light reddish-brown.

The 1983 photography was taken on 10 September and shows normal water conditions. The signature for temporary basins is a faded reddish-pink.

The 1985 imagery shows normal water conditions for July. The signatures for temporary basins on these dates are diverse. Signatures are various shades or combinations of red, brown, olive, gray, green, blue, and orange. In cropland, signatures are bluish-orange and reddish-orange. On the Glasgow SE quad there are areas of drained temporary emergent basins which show grayish-green intermixed with white signatures or sometimes a faded reddish-orange signature.

The 1986 imagery shows wetter than normal water conditions through the month of July. Subsequent dates of photos show normal water conditions. This imagery also has a large variety of signatures for temporary basins. In flood irrigated agricultural fields dark red, reddish-brown, or medium to light gray temporary signatures are found in the middle of bright red or medium red upland areas. In non-ag areas signatures are mixtures of reds, grays, browns, and greens with occasional mottled pink tones. Many temporary basins contain water with visible emergents on the June and July imagery. On the 14 July photos there are upland areas that resemble temporary wetlands which have a dark gray signature. In contrast, the temporary wetlands are darker gray and have reds or browns intermixed.

The 3 June 1987 imagery shows wet field conditions. Temporary basins are darker red signatures, strong red tones visible within dark colored water, and light blue-gray with some red or white to light gray with some red intermixed. Bright red signatures are upland.

Temporary oxbows are common along riverine and palustrine drainages. These areas exhibit gray, tan, light brown, and red signatures and have the characteristic crescent shape.

Unconsolidated shore temporary wetlands are a white basin with well defined edges. These wetland signatures are similar to blowout areas. However, blowout areas have diffuse and convoluted peripheries. topographic maps and soil surveys provide valuable collateral data in these areas.

Seasonal Basins

There are few field sites of seasonal basins on 1980 imagery. Seasonal signatures are either light brown or dark gray with brown areas. Some seasonal oxbows on 31 July imagery have a reddish-gray signature.

The 1981 seasonal basins exhibit a variety of signatures. Included are several versions of brownish-gray tones, some gray or slate grays mixed with red, and reddish-brown tones. On 30 June and 8 July photos some EMC's show a light pink with red tint or pinkish-white signature. The 24 & 25 August photos have water with red emergents in some seasonal basins. There are a lot of seasonal oxbows on the 1981 coverage. On the 8 June photos, signatures include dark gray-blue with reddish-brown colored emergents on the ends of the oxbow, dark reddish-brown, dark reddish-gray, alternating open water & red or gray vegetation, and gray intermixed with red sections.

The 1983 imagery is mostly in the mountains. Seasonal basins are brown and red with some open water.

July 1985 seasonal basins exhibit dark blue, dark orange-blue, olive, reddish-brown, and olive to blue signatures, all with distinct borders. Basins on 30 July are a very light gray bordered by indistinct upland reds.

On all dates of 1986 imagery basins are dark grays, browns, reds, gray-greens, olive greens, and reddish-browns in various combinations. The June dates also include some basins with slate gray signatures, slate gray and silver-gray with mottled red, or mixed red, brown, and pink tones. Seasonal oxbows are dark gray-green on the 14 July imagery. On 14 August some basins have a gray/white signature with distinct edges. The 22 August photos have some basins with bright white-grays with red and dark gray clumps and some basins with a mixture of gray and brown with dark reds and a clumped appearance.

June 1987 seasonal basin signatures are dark gray open water, slate-gray, or purple-gray, all with red emergents mixed in. Some have open water with a gray cattail signature in places in the wetland.

Seasonal lacustrine littoral basins, which often show light blue open water on the photography, are classified with the unconsolidated shore class.

Palustrine unconsolidated shore seasonal wetlands have a dark gray photosignature with a distinct light gray to white border.

Semipermanent Water Regimes

Natural semipermanent basins are relatively uncommon in this area. Most natural basins are oxbows along major rivers and streams. The majority of semipermanent wetlands are impounded. Unvegetated semipermanent impoundments are in the aquatic bed class and have black, dark blue, or purple open water signatures. However, the periphery of some impoundments and in some cases the entire impoundment contain semipermanent emergent vegetation. Semipermanent vegetation is predominantly *Typha* sp. and *Scirpus* sp.. The photosignature is the

typical emergent clumping with mottled tones of white/gray to red/gray.

Most natural palustrine emergent semipermanent wetlands exhibit an open water signature with textured clumping emergent within the basin or on the periphery of the basin. Almost all dates of photography have the characteristic clumped vegetation intermixed with open water. The photosignature varies between locations and dates of photos and includes white, green, pink, reddish-tan, reddish-brown, purple and dark gray.

Semipermanent oxbows are associated with major river systems. These oxbows exhibit dark blue open water, a gray/white clumped appearance, purples, dark reds, pink, or dark gray signatures and are classified semipermanent with an aquatic bed and/or emergent class.

CONVENTIONS FOR LINEAR WETLANDS

Linear palustrine wetlands are common. Classifications are determined by open water and/or emergents within the channel. Temporary palustrine linear wetlands with scrub-shrub and/or forested subclasses appear red to light red with a gray understory or brownish-red with a gray understory. Linear wetlands on the study area have a very limited floodplain. Most forested wetlands are confined to the linear channel and do not extend into the surrounding riparian area, except for floodplains associated with major river systems. Temporary emergent linears are red/gray to light red, red and tan, white with faint red tones, lighter browns, grays, or green and have a distinct channel on all dates of photography. Few dates of photography show water in temporary linears except the 1986 and 1987 photo dates. Photos of these two years have darker signatures than are usually associated with temporary linears. Signatures include brownish-reds, olive greens, dark gray to almost black with red emergents, grays, and reds in various combinations. The 3 June 1987 photography is very wet, so many temporary linears are full of water on the work area. Photointerpretation of these areas took into account relative strength of the photosignature coupled with other collateral data such as watershed size and field notes of comparable linears in other areas. Some temporary linears on this date have darker red and gray signatures or a bright pinkish-red interspersed with a smooth light gray.

Palustrine seasonal linear wetlands have a large variety of photosignatures. Seasonal emergent linears have a very distinct channel. Many seasonal emergent linears are various gray tones with red intermixed. Some linears have an open water channel or pools of water connected by red, brownish grays, gray-greens, or purple-red.

Semipermanent palustrine linears are rare in this study area. Photosignatures are aquatic bed or a clumped gray/red mottled signature indicative of cattails. The semipermanent areas are usually polygon size and located within seasonal linear channels. Some large irrigation ditches contain semipermanent vegetation in the excavated channel. On 30 June 1981 imagery natural semipermanent linears show a white cattail signature alternating with open water and on 24 August 1981

photography the signature is a mottled brown color.

Waterways and irrigation runoff areas are distinguished as upland by their pink photosignature and lack of discernable channel. These areas are often associated with agricultural land use.

Linear intermittent riverine systems are classified by signature and watershed size. R4SBC linears generally exhibit an open water, or gray unvegetated, streambed signature. Linears with a white substrate signature are classified R4SBA. Some R4SBA linears have small seasonal pools of water in the channel. Close examination of check sites and field sites aided in determining proper classifications of linear riverine wetlands.

Excavated linear wetlands are located within roadside ditches, particularly along roads which divide basins. These areas are usually classified seasonal, however, some areas have a temporary or semipermanent water regime. Water regime photosignatures for excavated wetlands are the same as previously discussed for linear wetlands.

Many flood irrigation systems are located on the study area near large impoundments or major river systems. The majority are classified $R4SBC_x$ or $PEMC_x$. Some of the smaller ditches are classified $R4SBA_x$ or $PEMA_x$ and a few very large (polygon size) systems are classified $R2UBF_x$.

Perennial rivers are classified lower perennial or upper perennial with water regimes of F, G, or H. Water regimes are determined by photosignature coupled with the USGS Water Resources Data. Riverine sandbars with non-persistent vegetation are classified R2/R3USA and seasonal channels associated with the main river channel are classified R2/R3USC.

The following is a list of guidelines for East Central Montana rivers which are not listed in the Montana Water Resource Data. The main point that needs to be addressed is the differentiation of R4 versus R2 or R3. The R2:R3 determination can be accomplished by definition (i.e. floodplain development, gradient, etc.).

-The total watershed size can be compared to known river classifications

-Type of water source, glacial melt versus lowland runoff

-The number of secondary tributaries associated with the main river

-Continuous water in the channel or on the dry photo dates water pools associated with faint linears

-Oxbow scars along the linear indicating old meander channels

-The extent of shrub or woody vegetation growth associated with the riparian/wetland areas adjacent of the river

-Other collateral data:

Estimates of Monthly Streamflow Characteristics at Selected Sites in the Upper Missouri River Basin, Montana, Base Period Water Years 1937-86. USGS, Water Resources Investigations Report 89-4082.

Instream Flow Requests. Montana Department of Fisheries, Wildlife and Parks.

SATURATED

Saturated areas are usually polygon size and located on slopes. They are common, but not restricted to, below springs or along the sides of irrigation ditches. Signatures are similar to those of temporary or seasonal wetlands and include red, brown, gray, slate gray, and white tones. Most saturated wetlands associated with agricultural irrigation practices have a streaked appearance with indistinct boundaries indicative of seep areas.

On the Havre SW and SE quads EMB's have dark gray or dark red signatures. Other EMB's on these quads are pink with a gray center which is brighter red on the higher portions of the seep. One heavily grazed or hayed area is a white to gray with some pink. During field reconnaissance of the Havre SW quad (photo date 3 June 1987), some seeps have a very weak photo signature. This signature can not consistently be extrapolated to the rest of the imagery. Identification of seeps, on this date of photography, in this area will require a conservative approach with extensive use of collateral data and close attention to field notes.

MISCELLANEOUS

This section addresses photosignatures that are uncommon throughout the work area.

Many vegetated and/or forested linears have red photosignatures similar to temporary wetlands. During field reconnaissance these areas were determined to be upland. Subtle differences in tone, watershed size, gradient of the linear, and in-field data are used to help distinguish these areas as upland.

Some small linear wetlands in the mountain areas are difficult to follow when they are forested or under a tree canopy. Their courses are determined by course data from the USGS quads.

In areas of flood irrigation, large areas of red or bright red are upland. In these fields the wetlands are dark red or brownish red

and will be classified PEMC.

A few areas on different dates of photography have a "splotchy" grey-white or mottled dark greenish-grey signature. These areas are sagebrush growing on saline or alkali soils.

On the eastern portion of the work area there are a lot of upland linears that have reddish-brown or dark grey signatures. These linears do not have distinct channels. There are also upland linears with a distinct channel which can be identified by signature colors that are consistent with the adjoining upland.

VII. MAP PREPARATION

Wetland delineation and classification is in accordance with Cowardin et. al. (1979). Further wetland mapping guidance is provided by NWI photographic and cartographic conventions in concert with National consistency. Delineations are produced through stereoscopic interpretation of 1:58,000 scale color infrared photography. NHAP photography was taken summer and fall of 1980, 1981, 1983, 1985, 1986 and 1987.

Field check sites were evaluated within Billings NW, NE, SW, SE, Roundup NW, NE, SW, SE, Lewistown NW, NE, SW, SE, Jordan NW, NE, SW, SE, Forsyth NW, NE, SW, SE, Hardin NW, NE, SW, Havre SW, SE, Glasgow NE and Glasgow SE project area prior to the actual classification and delineation of wetlands. Field check sites were selected to clarify photosignatures. Wetland photosignatures were identified in the field using vegetation types, soil types, and additional input from field personnel.

Collateral data included USGS topographic maps, SCS soil surveys, USGS water resources data, vegetation, climate, and ecoregional information.

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 was taken during a particular time and season, there may be discrepancies between the maps and current field conditions. Changes in landscape which occurred after the photography was taken would result in such discrepancies.

Aerial photointerpretation and quality control was completed by the South Dakota Cooperative Fish and Wildlife Research Unit, SDSU, Brookings, S.D. with final quality control conducted by the FWS.

VIII. SPECIAL MAPPING PROBLEMS

The photosignatures generally correlated well with the wetlands observed. The 22 July and 18 August 1981 imagery have emulsions that are very light on some rolls of film and dark on other rolls of film. On these dates of photos field notes and other collateral data aided in the accurate delineation and classification of wetlands. The 8 July 1981 and

14 July 1986 imagery have some bleached out photos. Soil surveys (when available) and USGS topographic maps were used extensively in all aspects of delineation. Overall, the consistency of tones and breaks in the imagery promote accurate photographic interpretation.

XI. 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.

X. LITERATURE CITED

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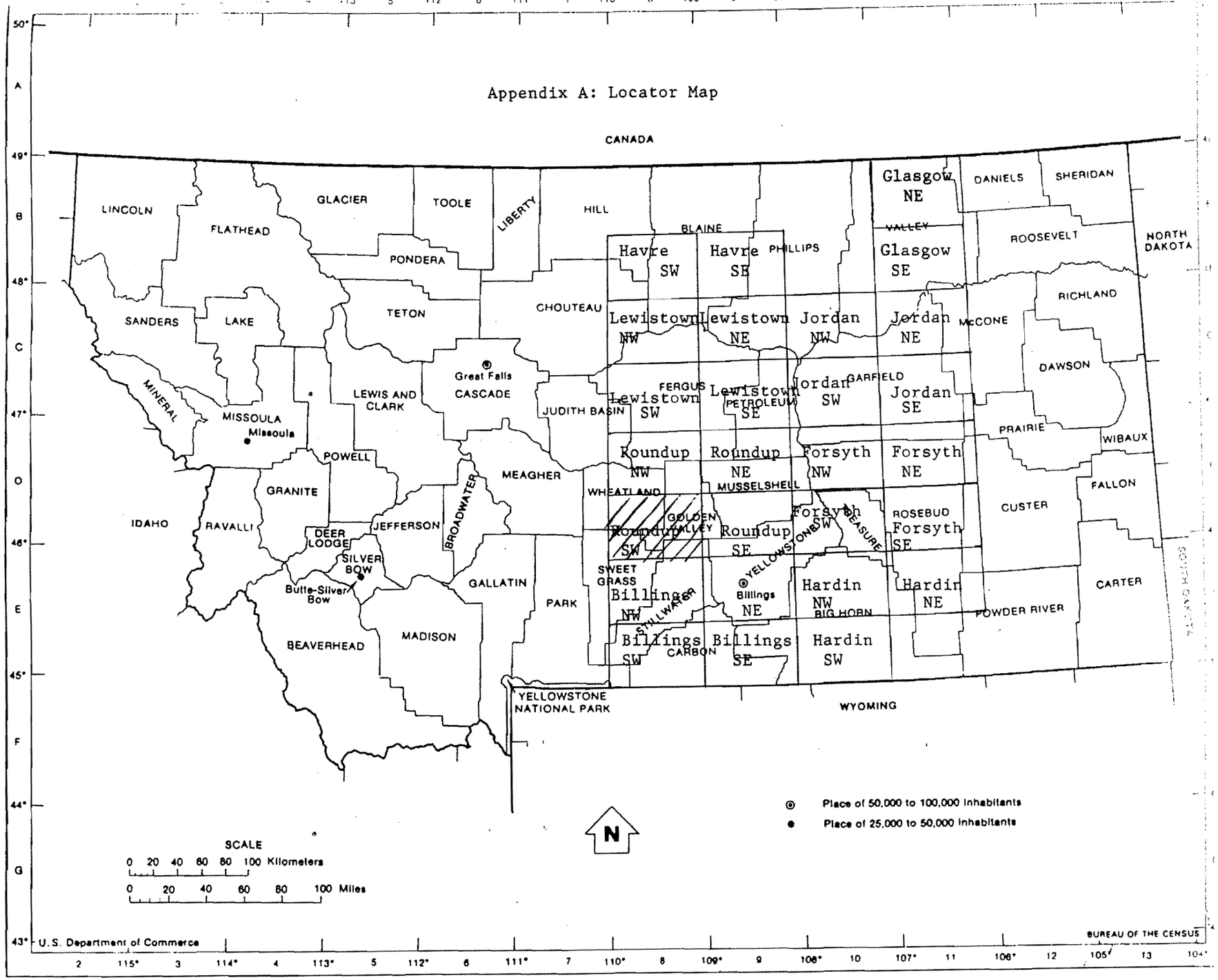
7.5 Minute, 7.5 X 15 Minute, and 1:250,000 USGS Topographic Maps.

Appendix A: Locator Map