MONTANA DEPARTMENT OF TRANSPORTATION WETLAND MITIGATION MONITORING REPORT: YEAR 2001

Cow Coulee
Townsend, Montana

Prepared for:
MONTANA DEPARTMENT OF TRANSPORTATION
2701 Prospect Avenue
Helena, MT 59620-1001

Prepared by:
LAND & WATER CONSULTING, INC.
P.O. Box 8254
Missoula, MT 59807

July 2002

Project No: 130091.013

MONTANA DEPARTMENT OF TRANSPORTATION

WETLAND MITIGATION MONITORING REPORT:

YEAR 2001

Cow Coulee
Townsend, Montana

Prepared for:

MONTANA DEPARTMENT OF TRANSPORTATION
2701 Prospect Ave
Helena, MT 59620-1001

Prepared by:

LAND & WATER CONSULTING, INC.
P.O. Box 8254
Missoula, MT 59807

July 2002

Project No: 130091.013

TABLE OF CONTENTS

TABLES

FIGURES

APPENDICES

1.0 INTRODUCTION

The Cow Coulee wetland mitigation project was constructed in 1997 to provide partial mitigation for existing and projected wetland impacts resulting from Montana Department of Transportation (MDT) projects in Watershed #7 (Missouri-Sun-Smith). At the time of site construction, just over 60 acres of wetland loss were either projected or documented in association with MDT projects within this watershed. Specifically, wetland credits from this project were allocated to offset impacts resulting from the White Sulphur Springs-South project. Constructed in the MDT Butte District, the 9-acre mitigation site is located approximately 1 mile southwest of the Townsend city limits in Broadwater County **(Figure 1)**. The site occurs on private land located west of U.S. Highway 12/287 and just east of the Missouri River.

Design features included minor excavation and placement of a low-level dike to retain surface water. Wetland hydrology is primarily provided by surface water from an irrigation ditch, and is supplemented by groundwater and precipitation. Following construction, the site was seeded with emergent and graminoid seed mixes. Additionally, portions of the site were planted with narrow-leaf cottonwood (*Populus angustifolia*), yellow willow (*Salix lutea*), and a "mesic/upland" shrub mix. The site revegetation plan is included in **Appendix D**.

Approximately 0.07 acre of low-quality wetland occurred at the site prior to project implementation (Robert Peccia & Associates [RPA] and OEA Research [OEA] 1996).

Target wetland communities to be produced at the site included open water/aquatic bed; shallow marsh; shallow marsh/wet meadow; and wet meadow/scrub-shrub (RPA and OEA 1996). Target wetland functions to be provided at the site included habitat diversity, flood control & storage, threatened/endangered species habitat, general wildlife habitat, sediment filtration, nutrient cycling, and uniqueness (RPA and OEA 1996). An estimated 4.5 acres of aquatic habitat was anticipated for this project

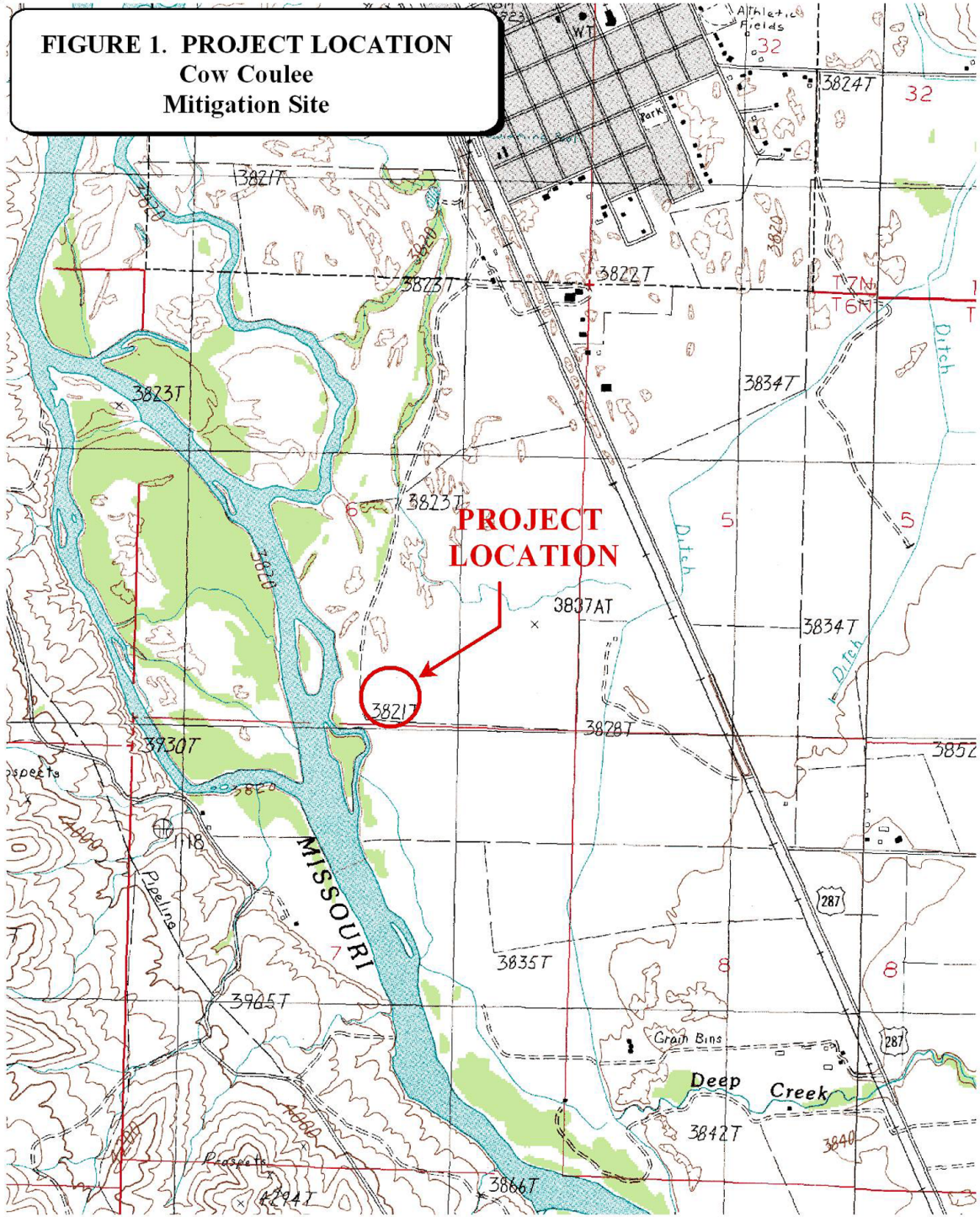
No formal monitoring has been conducted by MDT; however, MDT personnel have visited the site intermittently over the past several years. Photographs taken during these visits have not been incorporated into a report format, but are available in the MDT project files. This site will be monitored three times per year over the 3-year contract period to document wetland and other biological attributes. The area to be monitored is illustrated in **Figure 2 (Appendix A)**.

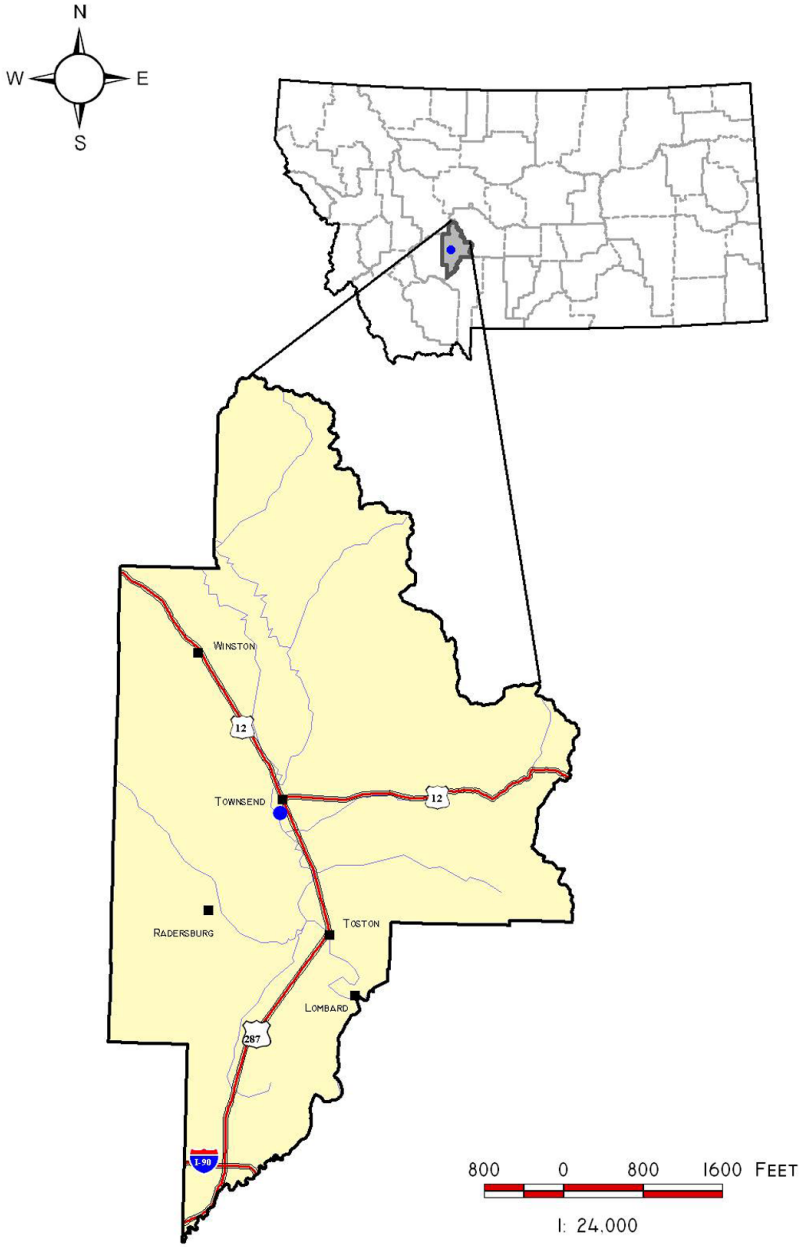
2.0 METHODS

2.1 Monitoring Dates and Activities

The site was visited on April 26 and May 30 (spring) and August 1 (mid-season) 2001. The primary purpose of the spring visits was to become acquainted with the site, conduct a bird/general wildlife reconnaissance, and establish photo point locations and the vegetation transect. The late-May period was selected for the spring visit because monitoring between mid-May and early June is likely to detect migrant as well as early nesting activities for a variety of

FIGURE 1. PROJECT LOCATION
Cow Coulee
Mitigation Site





PROJECT #: 130091.013
DATE: APRIL 2001
LOCATION:
PROJECT MANAGER: B. DUTTON
DRAWN BY: B. NOECKER

LAND & WATER CONSULTING, INC.
1120 CEDAR PO BOX 8254 MISSOULA, MT 59807

avian species (Carlson pers. comm.), as well as maximize the potential for amphibian detection. In Montana, most amphibian larval stages are present by early June (Werner pers. comm.).

The mid-season visit was conducted during early August to document vegetation, soil, and hydrologic conditions used to map jurisdictional wetlands. All information contained on the Wetland Mitigation Site Monitoring Form **(Appendix B)** was collected at this time. Activities and information conducted/collected included: wetland delineation; wetland/open water aquatic habitat boundary mapping; vegetation community mapping; vegetation transect; soils data; hydrology data; bird and general wildlife use; photograph points; macroinvertebrate sampling; GPS data points; functional assessment; and (non-engineering) examination of the dike structure and riprap along Missouri River side channel.

2.2 Hydrology

Hydrologic indicators were evaluated at the site during the mid-season visit. Wetland hydrology indicators were recorded using procedures outlined in the Army Corps (COE) 1987 Wetland Delineation Manual (Environmental Laboratory 1987). Hydrology data was recorded on COE Routine Wetland Delineation Data Forms **(Appendix B)**.

All additional hydrologic data was recorded on the mitigation site monitoring form **(Appendix B)**. The boundary between wetlands and open water (no rooted vegetation) aquatic habitats was mapped on an aerial photograph and an estimate of the average water depth at this boundary was recorded.

There are no groundwater monitoring wells at the site. If located within 18 inches of the ground surface (soil pit depth for purposes of delineation), groundwater depths were documented on the routine wetland delineation data form at each data point.

2.3 Vegetation

General dominant species-based vegetation community types (e.g., *Typha latifolia/Scirpus acutus*) were delineated on an aerial photograph during the mid-season visit. Standardized community mapping was not employed as many of these systems are geared towards climax vegetation. Estimated percent cover of the dominant species in each community type was recorded on the site monitoring form **(Appendix B)**.

A single 10-foot wide belt transect was established during the mid-season monitoring event to represent the range of current vegetation conditions. Percent cover was estimated for each vegetative species encountered within the "belt" using the following values: + (<1%); 1 (1-5%); 2 (6-10%); 3 (11-20%); 4 (21-50%); and 5 (>50%). Wetland indicator status was recorded for each species.

The transect location, depicted on **Figure 2** (**Appendix A**), was marked on an aerial photograph and all data recorded on the mitigation site monitoring form. Transect endpoint locations were recorded with a GPS unit. Photos of the transect were taken from both ends during the mid-season visit.

Woody species were planted at this mitigation site. The general location of these plantings, along with a list of planted species, is presented in **Appendix D**. The "planted woody vegetation survival" section of the data form **(Appendix B)** was completed relative to these plantings. For each planted woody species located in the field, an estimated percent survival was recorded along with apparent mortality causes.

2.4 Soils

Soils were evaluated during the mid-season visit according to procedures outlined in the COE 1987 Wetland Delineation Manual. Soil data were recorded for each wetland determination point on the COE Routine Wetland Delineation Data Form (**Appendix B**). The most current NRCS terminology was used to describe hydric soils (USDA 1998).

2.5 Wetland Delineation

Wetland delineation was conducted during the mid-season visit according the 1987 COE Wetland Delineation Manual. Wetland and upland areas within the monitoring area were investigated for the presence of wetland hydrology, hydrophytic vegetation and hydric soils. The indicator status of vegetation was derived from the National List of Plant Species that Occur in Wetlands: Northwest Region 9 (Reed 1988). The information was recorded on COE Routine Wetland Delineation Data Forms (**Appendix B**). The wetland/upland boundary was delineated on the aerial photograph and recorded with a resource grade GPS unit. The wetland/upland boundary in combination with the wetland/open water habitat boundary was used to calculate the wetland area developed on the site.

According to a *Wetland Feasibility Study* completed in July, 1996 (Peccia 1996), 0.07 acres of wetland existed on the site prior to project implementation.

2.6 Mammals, Reptiles, and Amphibians

Mammal, reptile, and amphibian species observations and other positive indicators of use, such as vocalizations, were recorded on the wetland monitoring form during each site visit. Indirect use indicators, including tracks; scat; burrows; eggshells; skins; bones; etc., were also recorded. These observations were recorded as the observer traversed the site while conducting other required activities. Direct sampling methods, such as snap traps, live traps, and pitfall traps, were not implemented. A comprehensive wildlife species list for the entire site was compiled.

2.7 Birds

Bird observations were recorded during each visit. No formal census plots, spot mapping, point counts, or strip transects were conducted. During the May visit, observations were recorded in compliance with the bird survey protocol in **Appendix E**. During the mid-season visit, bird observations were recorded incidental to other monitoring activities. During each visit, observations were categorized by species, activity code, and general habitat association (see field and office data forms in **Appendix B**). A comprehensive bird list was compiled using these observations.

2.8 Macroinvertebrates

A single macroinvertebrate sample was collected during the mid-season site visit and data recorded on the wetland mitigation monitoring form. Macroinvertebrate sampling procedures are provided in **Appendix E**. The approximate location of this sample point is shown on **Figure 2 (Appendix A)**. Samples were preserved as outlined in the sampling procedure and sent to a laboratory for analysis.

2.9 Functional Assessment

A functional assessment was completed using the 1999 MDT Montana Wetland Assessment Method. Field data necessary for this assessment were collected during the mid-season site visit. An abbreviated field data sheet for the 1999 MDT Montana Wetland Assessment Method was compiled to facilitate rapid collection of field information (**Appendix B**). The remainder of the functional assessment was completed in the office.

2.10 Photographs

Photographs were taken showing the current land use surrounding the site, the upland buffer, the monitored area, and the vegetation transect. Three photograph points were established and shot during 2001. Each photograph point location was recorded with a resource grade GPS. The approximate locations of these photo points are shown on **Figure 2** (**Appendix A**). All photographs were taken using a 50 mm lens. A description and compass direction for each photograph was recorded on the wetland monitoring form.

2.11 GPS Data

During the 2001 monitoring season, survey points were collected with a resource grade GPS unit at the vegetation transect beginning and ending locations, macroinvertebrate sampling locations, bird box locations, and all photograph locations. The wetland boundary was also surveyed with a resource grade GPS unit.

2.12 Maintenance Needs

The dike structure was examined during the 2001 site visit for obvious signs of breaching, damage, or other problems. This did not constitute an engineering-level structural inspection, but rather a cursory examination. Similarly, the riprapped east bank of the Missouri River side channel immediately south of the site was examined for signs of erosion and channel migration. Current or future potential problems were documented.

3.0 RESULTS

3.1 Hydrology

According to the Western Regional Climate Center, Townsend yearly precipitation totals for 2000 (7.93 inches) and 2001 (8.96 inches) were 75 and 85 percent, respectively, of the total annual mean precipitation (10.57 inches) in this area.

The primary source of hydrology for this site is irrigation water, which flows into the mitigation site via a small ditch that enters the monitoring area from the east. A groundwater component contributes to this site, as does precipitation and runoff. The design water level (3,833 ft elevation) contour for the main impoundment is shown on the wetland plan (RPA 1997) in **Appendix D**.

During the April 26, 2001 visit, irrigation water was in the process of being delivered to the site, but had not yet reached the monitoring area and only the deepest portion of the main impoundment was inundated as a result of groundwater interaction. On May 30th, the site was in the process of filling and was approximately 80% full. Additional inundation had occurred at the site between the May and August visits; however, it is unknown if the design water elevation was ever achieved.

Water depth at open water/rooted vegetation interfaces was approximately one foot for the main impoundment. Although, the open water area/rooted vegetation interface east of the small island averaged only 6 inches in depth. Rooted vegetation may establish in this area over time and will be documented during future monitoring efforts. The main impoundment had an average depth of two to three feet and a range of depths from one inch to an estimated four feet. Deepest areas were located near the center of the impoundment, which is as yet unvegetated. Open water areas are shown on **Figure 3** (**Appendix A**).

Water delivery to the site via the existing irrigation ditch is recognized by the landowner and MDT as being a primary source of concern for this site. Water being turned into the ditch from the main Montana Ditch takes a considerable amount of time (weeks) to reach the mitigation site, due primarily to high infiltration and physical barriers such as road crossings and in-channel vegetation. The delay of water delivery to the site is likely affecting vegetation communities and use of the mitigation site by wildlife, especially pair bonding waterfowl.

3.2 Vegetation

Vegetation species identified on the site are presented in **Table 1** and on the attached data form. Four wetland community types were identified and mapped on the mitigation area (**Figure 3**, **Appendix A**). These included Type 1: *Typha latifolia/Scirpus acutus*, Type 2: *Carex rostrata/Juncus balticus*, Type 3: *Scirpus maritimus*, and Type 4: *Hordeum jubatum/Iris missouriensis*. Dominant species within each of these communities are listed on the attached data form (**Appendix B**).

Type 1 occurs in the vicinity of the upland island and along the south dike face. Type 2 is the dominant wetland type in the monitoring area. Type 3 consists of a narrow fringe along the irrigation ditch that feeds the mitigation site. Type 4 occurs in a small depression that lies east of the main impoundment and unlike the other communities, does not receive surface water from the irrigation ditch, but is groundwater fed.

Adjacent upland communities within the monitoring area are comprised primarily of seeded grasslands and dry native shrub and grass communities. Common species include western wheatgrass (*Agropyron smithii*), slender wheatgrass *(Agropyron trachycaulum*), creeping wildrye *(Elymus triticoides)*, alfalfa *(Medicago sativa)*, Canada thistle *(Cirsium arvense)*, wood's rose *(Rosa woodsii)*, and snowberry *(Symphoricarpos albus)*. The adjacent Missouri River riparian bottom is comprised of black cottonwood *(Populus trichocarpa)* and willow *(Salix spp.)* communities.

The revegetation plan for this project included the planting of several woody species. The "planted woody vegetation survival" section of the data form **(Appendix B)** was completed relative to these plantings. Overall survival for those species observed was judged to be moderate to high, with some mortality noted as a result of competition from more aggressive species and girdling by small rodents. Drought conditions may have also played a role in plant survival.

Vegetation transect results are detailed in the attached data form, and are summarized graphically below. Vegetation types 2a and 2b represent the same basic community, with slight variations in species dominance (see data sheet).

Transect Start (north)	***Upland (80')***	***Type 2a (70')***	***Type 2b (200')***	***Upland (182')***	**Total: 532'**	**Transect End (south)**

3.3 Soils

According to the Broadwater County Area soil survey (Soil Conservation Service 1976), soils at the site consist of Toston silty clay loam and saline Ustic Torriothents. According to the county hydric soils list, Toston silty clay loam can contain hydric inclusions (Villy soils) under "terrace" local landform conditions. Saline Ustic Torriothents are considered non-hydric soils.

Soils across much of the western half of the site were disturbed during construction through excavation of the main impoundment and construction of the low-level dike. Topsoil was salvaged during construction and spread across many of the disturbed areas surrounding the main impoundment. Generally, wetland soils at the site include silt loam and clay loam.

B Horizon soils along wetland portions of vegetation transect consisted of clay loams with a matrix color of 10YR5/1. The soil was saturated to the surface and contained large amounts of organic material in the upper 6 inches. Oxidized root channels were also present in the upper 12 inches.

Table 1: ***2001 Cow Coulee Vegetation Species List***

Species	Region 9 (Northwest) Wetland Indicator
Agropyron smithii	--
Agropyron trachycaulum	FAC
Agrostis alba	FACW
Alopecurus pratensis	FACW
Asclepias speciosa	FAC+
Beckmannia syzigachne	OBL
Carex rostrata	OBL
Carex spp.	--
Centaurea maculosa	--
Cirsium arvense	FAC-
Elymus triticoides	FAC
Glycyrrhiza lepidota	FAC+
Hordeum jubatum	FAC-
Iris missouriensis	FACW+
Juncus balticus	OBL
Kochia scoparia	FAC
Marsilea vestita	OBL
Medicago sativa	--
Phalaris arundinacea	FACW
Rosa woodsii	FACU
Rumex crispus	FACW
Scirpus acutus	OBL
Scirpus maritimus	OBL
Spartina gracilis	FACW
Symphoricarpos albus	--

3.4 Wetland Delineation

Delineated wetland boundaries are illustrated on **Figure 3** (**Appendix A**). Completed wetland delineation forms are included in **Appendix B**. Soils, vegetation, and hydrology are discussed in preceding sections. Delineation results are as follows:

Cow Coulee Mitigation Area: 1.59 wetland acres (emergent, aquatic bed)
1.32 acres open water

Approximately 1.59 acres of "wetlands" have been created at the site (**Figure 2**, **Appendix A**). Inclusive of open water areas in the main impoundment, approximately 2.92 acres of aquatic habitat currently exist on the Cow Coulee wetland mitigation site.

According to a *Wetland Feasibility Study* completed in July, 1996 (Peccia 1996), 0.07 acres of wet meadow wetland existed on the site prior to project implementation. At this time, 2.85 acres of aquatic habitat has been gained at this site, which is less than the anticipated 4.5 acres noted in project files.

3.5 Wildlife

Wildlife species, or evidence of wildlife, observed on the site during 2001 monitoring efforts are listed in **Table 2**. Specific evidence observed, as well as activity codes pertaining to birds, are provided on the completed monitoring form in **Appendix B**. The site provides habitat for several wildlife species; however, the site is being managed by the landowner primarily for avian species. Electric fence is being used around the perimeter of the site and small mammal traps are

being utilized within the monitoring area in an attempt to exclude mammalian predators from utilizing the area. Four mammal and numerous bird species were noted using the mitigation site.

Of special interest was the observation of a sandhill crane (*Grus canadensis*) nest near the eastern project boundary during the April field visit. It is unknown if the nest attempt was successful, as no cranes were seen on the site during the May and August field visits. Other species documented nesting at the site include Tree Swallows (*Tachycineta bicolor*), Violet-green Swallows (*Tachycineta thalassina*), Mountain Bluebirds (*Sialia currucoides*), and Mallards (*Anas platyrhynchos*). Ten of the thirteen bird boxes on the site were occupied by one of the previously mentioned cavity nesters.

Table 2: ***Fish and Wildlife Species Observed on the Cow Coulee Mitigation Site***

FISH	
None	
AMPHIBIANS	
None	
REPTILES	
Common Garter Snake (*Thamnophis sirtalis*)	
BIRDS	
American Robin (*Turdus migratorius*)	Mallard (*Anas platyrhynchos*)
American White Pelican (*Pelecanus erythrorhynchos*)	Mountain Bluebird (*Sialia currucoides*)
Blue-winged Teal (*Anas discors*)	Mourning Dove (*Zenaida macroura*)
Brown-headed Cowbird (*Molothrus ater*)	Osprey (*Pandion haliaetus*)
Canada Goose (*Branta Canadensis*)	Red-tailed Hawk (*Buteo jamaicensis)*
Cinnamon Teal (*Anas cyanoptera*)	Red-winged Blackbird (*Agelaius phoeniceus)*
Common Raven (*Corvus corax)*	Ring-necked Pheasant (*Phasianus colchicus*)
Common Snipe (*Gallinago gallinago*)	Sandhill Crane (*Grus Canadensis*)
Double-crested Cormorant (*Phalacrocorax auritus*)	Song Sparrow (*Melospiza melodia*)
Eastern Kingbird (*Tyrannus tyrannus*)	Spotted Sandpiper (*Actitis macularia*)
Gray Catbird (*Dumetella carolinensis*)	Tree Swallow (*Tachycineta bicolor*)
Killdeer (*Charadrius vociferous*)	Violet-green Swallow (*Tachycineta thalassina*)
	Yellow Warbler (*Dendroica petechia*)
MAMMALS	
White-tailed deer (*Odocoileus virginianus*)	
Raccoon (*Procyon lotor*)	
Striped skunk (*Mephitis mephitis*)	
Mountain cottontail *(Sylvilagus nuttallii)*	

3.6 Macroinvertebrates

Macroinvertebrate sampling results are provided in **Appendix B**, which lists all species collected during sampling. The macroinvertebrate synopsis prepared by Rhithron Associates is provided below. Sampling results are indicative of diverse micro-habitat substrates and unimpaired water quality.

Scores imply optimal biotic condition at this site. High taxa richness combined with high Chironomid taxa richness suggests correspondingly rich habitat availability. A low biotic index value indicates relatively unimpaired water quality.

3.7 Functional Assessment

A completed functional assessment form is presented in **Appendix B**. Functional assessment results are summarized in **Table 3**. The mitigation site rated as a Category III (moderate value) site, primarily due to its small size and low ratings for T&E and sensitive species habitat, uniqueness, and recreation/education potential. The site received a moderate rating for general wildlife habitat, food chain support, sediment/nutrient/toxicant removal, and sediment/shoreline stabilization. The site received a high rating for surface water storage and groundwater discharge/recharge.

Based on functional assessment results (**Table 3)**, approximately 15.77 functional units have been provided thus far at the Cow Coulee mitigation site.

Table 3: ***Summary of 2001 Wetland Function/Value Ratings and Functional Points*** [1] ***at the Cow Coulee Mitigation Project***

Function and Value Parameters From the 1999 MDT Montana Wetland Assessment Method	Wetland Site Historic Channel S.F. Smith River
Listed/Proposed T&E Species Habitat	Low (0.3)
MNHP Species Habitat	Low (0.1)
General Wildlife Habitat	Mod. (0.5)
General Fish/Aquatic Habitat	NA
Flood Attenuation	NA
Short and Long Term Surface Water Storage	High (0.9)
Sediment, Nutrient, Toxicant Removal	Mod (0.7)
Sediment/Shoreline Stabilization	Mod. (0.6)
Production Export/Food Chain Support	Mod. (0.7)
Groundwater Discharge/Recharge	High (1.0)
Uniqueness	low (0.3)
Recreation/Education Potential	low (0.3)
Actual Points/Possible Points	5.4 / 10
% of Possible Score Achieved	54%
Overall Category	III
Total Acreage of Assessed Wetlands and Other Aquatic Habitats within Site Boundaries	2.92 ac
Functional Units (acreage x actual points)	15.77 fu

[1] See completed MDT functional assessment forms in Appendix B for further detail.

3.8 Photographs

Representative photographs taken from photo-points are provided in **Appendix C**.

3.9 Maintenance Needs/Recommendations

The dike was in good condition during the mid-season visit, and is starting to be colonized by wetland vegetation. Similarly, the water control structure in the dike appeared to be in good condition.

At the request of MDT, a small side channel of the Missouri River, which lies outside the monitoring area, was inspected to determine if lateral migration of the stream bank had occurred since efforts to stabilize the bank had been implemented at the time of project completion. The riprap protection appeared to be working well at preventing further lateral migration of the stream bank and no maintenance appears necessary at this time.

As previously mentioned, water delivery is recognized as being a problem at this site. A more efficient delivery system would benefit the project by filling the impoundment sooner in the spring, thus encouraging use by more wildlife species especially pair bonding waterfowl and shorebirds. Filling the impoundment to the design elevation earlier in the season might also encourage the establishment of wetland habitat beyond the current limits (particular to the north), as soil near the existing periphery would be saturated for a longer duration, thus encouraging the establishment of hydrophytic vegetation. This could, in turn, result in the development of additional wetland and result in additional mitigation credit.

Improvements to the water delivery system would need to be discussed with and agreed upon by the landowner, and might ultimately depend on the costs associated with upgrading the system. A qualified hydraulic engineer would need to evaluate the site prior to making any site-specific recommendations. Options to be explored might include:

- Re-grading the existing delivery ditch.
- Lining the ditch with a less permeable substrate (e.g. clay, bentonite, concrete).
- Enlarge and re-set all road culverts crossed by the ditch.
- Pipe the water through losing reaches of the ditch or for the entire length.

3.10 Current Credit Summary

No specific performance criteria were required to be met at this site in order to document its success. However, the overall intent of the project was to create 4.5 acres of aquatic habitat to include open water, emergent marsh and wet meadow habitat. Based on monitoring results, these goals have been partially achieved. Improving the water delivery system would likely result in eventual additional wetland credit.

As the project stands, approximately 2.92 acres of aquatic habitats have been created, inclusive of all open water components. Open water areas were a designed habitat feature. Subtracting the 0.07acre of pre-existing wetland, approximately 2.85 acres of aquatic habitat have been gained at this site. Approximately 15.77 functional units are provided at the site to date.

4.0 REFERENCES

Carlson, J. Program Zoologist, Montana Natural Heritage Program. Helena, MT. April 2001 conversation.

Environmental Laboratory. 1987. *Corps of Engineers Wetlands Delineation Manual.* US Army Corps of Engineers. Washington, DC.

Ralph, C.J., Geupel, G.R., Pyle, P., Martin, T.E., and D.F. DeSante. 1993. *Handbook of field methods for monitoring landbirds*. Gen. Tech. Rep. PSW-GTR-144. Albany, CA: Pacific Southwest Research Station, Forest Service, U.S. Dept of Agriculture. 41 p.

Reed, P.B. 1988. National list of plant species that occur in wetlands: North West (Region 9). Biological Report 88(26.9), May 1988. U.S. Fish and Wildlife Service. Washington, D.C.

Robert Peccia & Associates. 1997. *Cow Coulee Wetland Mitigation Project – Townsend, Montana – MDT Project STPX 0002 (300)*. Helena, MT. (project plans)

Robert Peccia & Associates and OEA Research. 1996. *Wetlands feasibility study – P. Brian Rogers, M.D. property – Townsend, Montana*. Prepared for: Montana Department of Transportation. Helena, MT.

Soil Conservation Service. 1977. Soil survey of Broadwater County Area, Montana. Bozeman, MT.

Urban, L. Wetland Mitigation Specialist, Montana Department of Transportation. Helena, MT. March 13, 2001 meeting.

USDA Natural Resources Conservation Service. 1998. *Field Indicators of Hydric Soils in the United States*, Version 4. G. Hurt, P. Whited and R. Pringle (eds.). USDA, NRCS Fort Worth, TX.

Werner, K. Herpetologist, Salish-Kootenai Community College. Pablo, MT. May 1998 instructional presentation.

Appendix A

FIGURES 2 & 3

MDT Wetland Mitigation Monitoring
Cow Coulee
Townsend, Montana

LAND & WATER

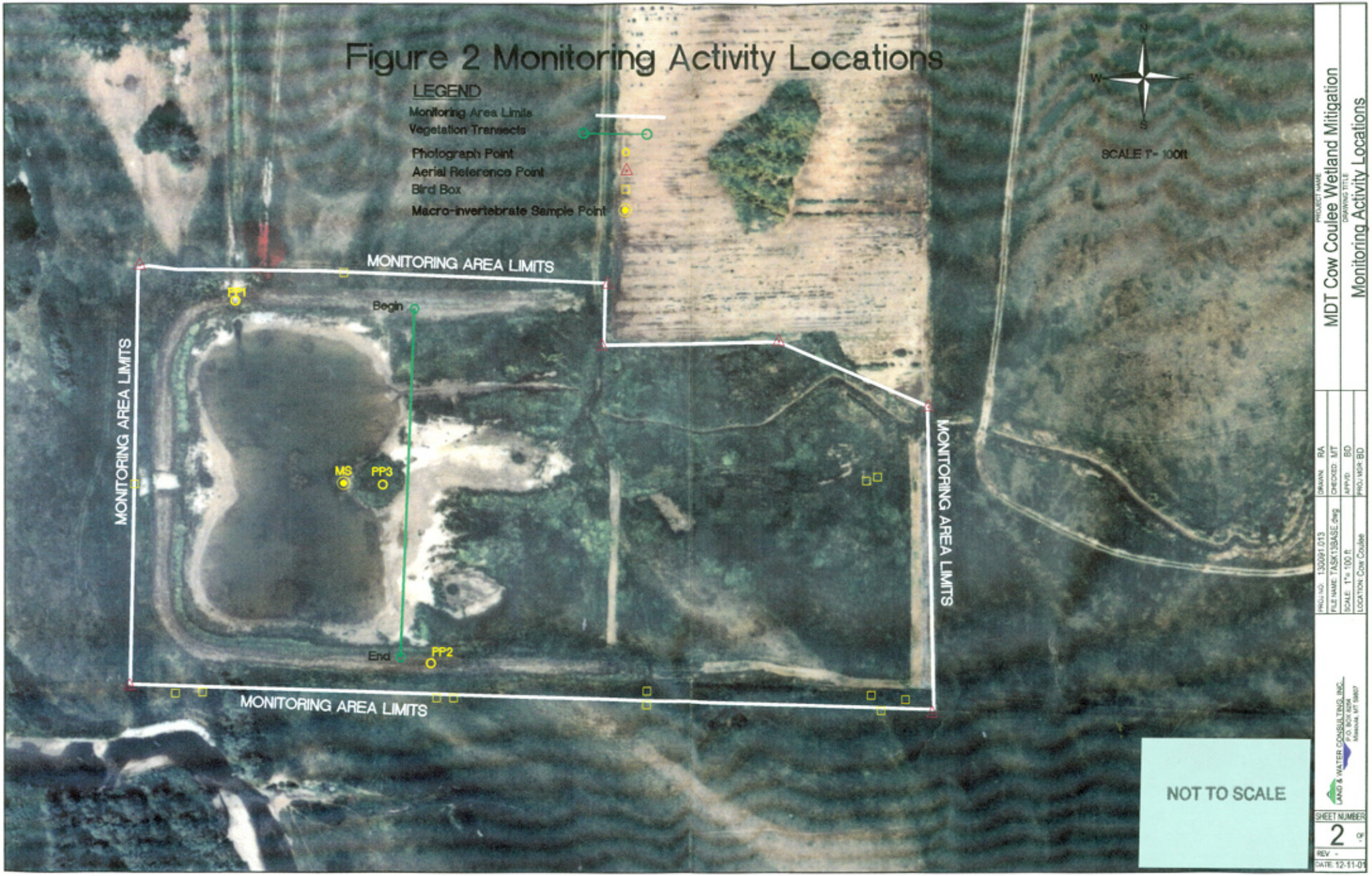
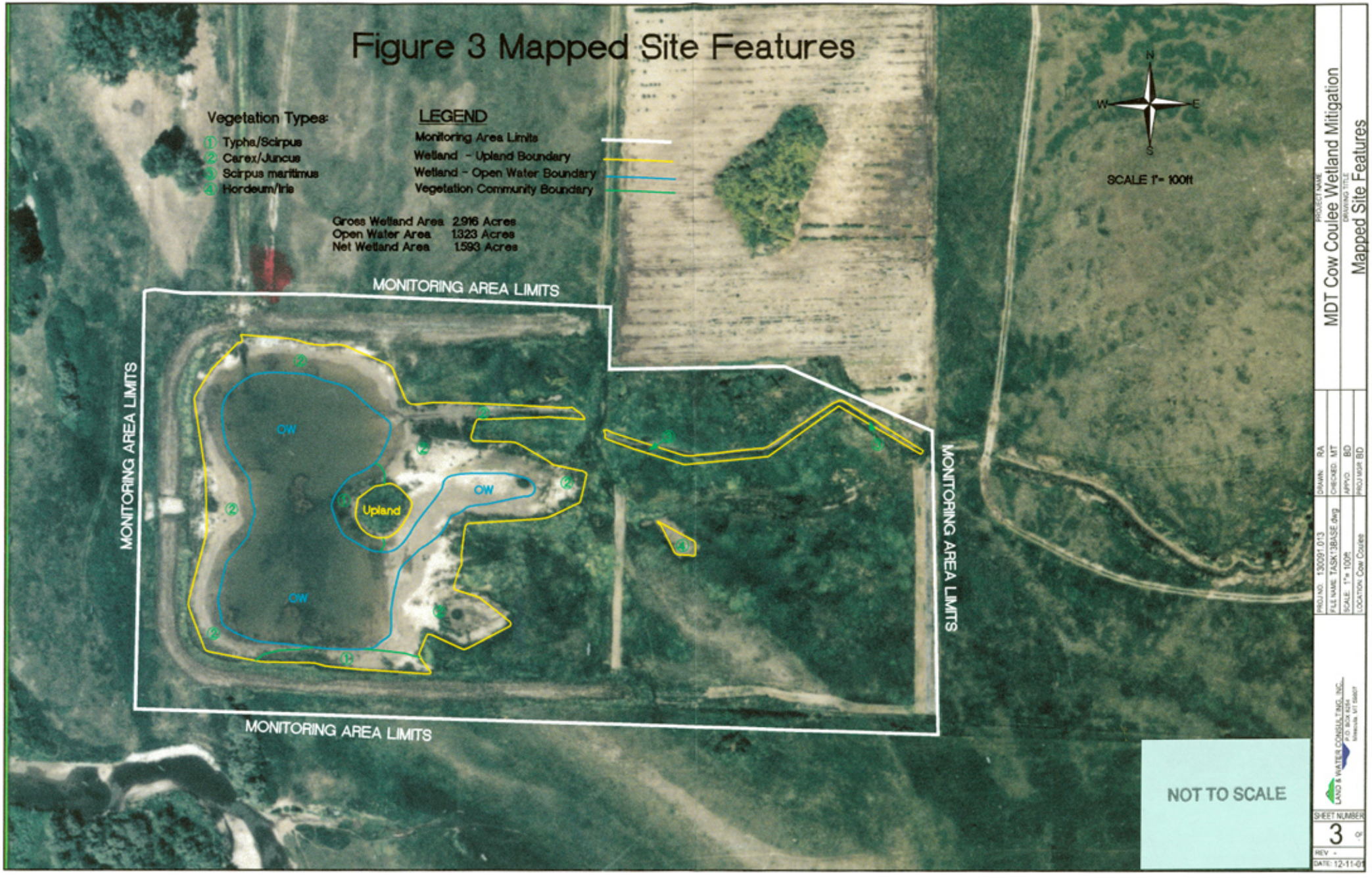


Figure 2 Monitoring Activity Locations
LEGEND
Monitoring Area Limits
Vegetation Transects
Photograph Point
Aerial Reference Point
Bird Box
Macro-invertebrate Sample Point
N
W
E
S
SCALE 1"= 100ft
MONITORING AREA LIMITS
MONITORING AREA LIMITS
MONITORING AREA LIMITS
MONITORING AREA LIMITS
PP1
Begin
MS
PP3
End
PP2
NOT TO SCALE
PROJECT NAME
MDT Cow Coulee Wetland Mitigation
DRAWING TITLE
Monitoring Activity Locations
PROJ NO: 130091.013
FILE NAME: TASK13BASE.dwg
SCALE: 1" = 100 ft
LOCATION: Cow Coulee
DRAWN: RA
CHECKED: MT
APPVD: BD
PROJ MGR: BD
LAND & WATER CONSULTING, INC.
P.O. BOX 8254
Missoula, MT 59807
SHEET NUMBER
2
REV -
DATE: 12-11-01

Figure 3 Mapped Site Features



PROJECT NAME: MDT Cow Coulee Wetland Mitigation
DRAWING TITLE: Mapped Site Features

PROJ NO: 130091.013
FILE NAME: TASK13BASE.dwg
SCALE: 1"= 100ft
LOCATION: Cow Coulee
DRAWN: RA
CHECKED: MT
APPVD: BD
PROJ MGR: BD

LAND & WATER CONSULTING, INC.
P.O. BOX 4254
Missoula, MT 59807

SHEET NUMBER: 3
REV: -
DATE: 12-11-01

Appendix B

COMPLETED 2001 WETLAND MITIGATION SITE MONITORING FORM
COMPLETED 2001 BIRD SURVEY FORMS
COMPLETED 2001 WETLAND DELINEATION FORMS
COMPLETED 2001 FIELD AND FULL FUNCTIONAL ASSESSMENT FORMS

MDT Wetland Mitigation Monitoring
Cow Coulee
Townsend, Montana

LAND & WATER

DRAFT - MDT WETLAND MITIGATION SITE MONITORING FORM

LAND & WATER B-1

Project Name: Cow Coulee Project Number: Task 13 Assessment Date: 8/01/01
Location: 1 mile SW of Townsend MDT District: Butte Milepost: _____
Legal description: T 6N R 2E Section 6 Time of Day: 8:00am - 2:00pm
Weather Conditions: Sunny 80° Person(s) conducting the assessment: Traxler
Initial Evaluation Date: 4/26/01 Visit #: 2 Monitoring Year: 2001
Size of evalusaiton area: ≈ 9 acres Land use surrounding wetland: agriculture, Missouri River Floodplain

HYDROLOGY

Surface Water

Inundation: Present X Absent ___ Average depths: 2 ft Range of depths: 0 - 4 ft
Assessment area under inundation: 30 %
Depth at emergent vegetation-open water boundary: 0.5 ft
If assessment area is not inundated are the soils saturated w/in 12" of surface: Yes ___ No ___
Other evidence of hydrology on site (drift lines, erosion, stained vegetation etc.): _____

Groundwater

Monitoring wells: Present _____ Absent X
Record depth of water below ground surface

Well #	Depth	Well #	Depth	Well #	Depth

Additional Activities Checklist:

✓ Map emergent vegetation-open water boundary on air photo
✓ Observe extent of surface water during each site visit and look for evidence of past surface water elevations (drift lines, erosion, vegetation staining etc..)
_____ GPS survey groundwater monitoring wells locations if present

COMMENTS/PROBLEMS: Irrigation water delivery to the site is inefficient for various reasons. Some areas of shallow (0-6") surface water lack rooted vegetation. These areas may develop over time

COMPREHENSIVE VEGETATION LIST Cow Coulee - Task 13 LAND & WATER B-2

Species	Vegetation Community Number(s)	Species	Vegetation Community Number(s)
Agropyron trachycaulum ✓	5		
Agropyron smithii	5		
Agrostis alba	2,4,5		
Alopecurus pratensis	2,3		
Beckmannia syzigache	2		
Carex rostrata ✓	2,3		
Carex sp. ✓	2		
Scirpus maritimus	1,3		
Typha latifolia	1		
Scirpus acutus	1		
Medicago sativa	5		
Marsilea vestita	1,3		
Rumex crispus	2,4		
Phalaris arundinacea	3		
Spartina gracilis ✓	2,4		
Hordeum jubatum	4		
Iris missouriensis	4		
Juncus balticus	2,4		
Elymus trithcoides ✓	5		
Symphoricarpos alba ✓	5		
Rosa woodsii	5		
Glycyrrhiza lepidota ✓	5		
Centaurea maculosa	5		
Circium arvense	5		
Asclepias speciosa	5		
Kochia scoparia	5		

COMMENTS/PROBLEMS: _____

VEGETATION COMMUNITIES

LAND & WATER B-3

Community No.: 1 Community Title (main species): Typha latifolia / Scirpus acutus

Dominant Species	% Cover	Dominant Species	% Cover
Typha latifolia	50%		
Scirpus acutus	50		

COMMENTS/PROBLEMS: water depth 0"-6"

Community No.: 2 Community Title (main species): Carex / Juncus

Dominant Species	% Cover	Dominant Species	% Cover
Carex rostrata	30		
Juncus balticus	30		
Juncus sp.	20		
Beckmania syzigachne	10		

COMMENTS/PROBLEMS: typically shallow or no surface water

Community No.: 3 Community Title (main species): Scirpus maritimus

Dominant Species	% Cover	Dominant Species	% Cover
Scirpus maritimus			

COMMENTS/PROBLEMS: water depths 0"-6"

Additional Activities Checklist:

X Record and map vegetative communities on air photo

VEGETATION COMMUNITIES

LAND & WATER B-4

Community No.: 4 Community Title (main species): Hordeum / Iris

Dominant Species	% Cover	Dominant Species	% Cover
Hordeum jubatum	30		
Iris missouriensis	20		
Juncus baltieus	10		

COMMENTS/PROBLEMS: ground water influenced area

Community No.: 5 Community Title (main species): upland

Dominant Species	% Cover	Dominant Species	% Cover
Agropyron trachycaulum	40		
Agropyron smithii	30		
Elymus triticoides	20		
Symphoricarpos alba			

COMMENTS/PROBLEMS:

Community No.: ____ Community Title (main species): ____

Dominant Species	% Cover	Dominant Species	% Cover

COMMENTS/PROBLEMS:

Additional Activities Checklist:

____Record and map vegetative communities on air photo

MDT WETLAND MONITORING – VEGETATION TRANSECT

Site: Cow Coulee Date: 8/1/01 Examiner: Traxler Transect # 1

Approx. transect length: 500 feet Compass Direction from Start (Upland): 170° South

Vegetation type 1:	Snowberry	
Length of transect in this type:	80 feet	feet
Symphoricarpos albus	11-20%	
Agropyron spp.	>50%	
Total Vegetative Cover:	100%	

Vegetation type 2:	Carex/Juncus	
Length of transect in this type:	70 feet	feet
Carex rostrata	11-20%	
Juncus balticus	11-20%	
Eleocharis palustris	11-20%	
Beckmannia syzigachne	11-20%	
Total Vegetative Cover:	80%	

Vegetation type 3:	Hordeum	
Length of transect in this type:	200 ft	feet
Hordeum jubatum	11-20	
Eleocharis palustris	11-20	
Juncus balticus	11-20	
Total Vegetative Cover:	70%	

Vegetation type 4:	upland wheatgrass	
Length of transect in this type:	150 ft	feet
Agropyron spp.	>50%	
Total Vegetative Cover:	100%	

MDT WETLAND MONITORING – VEGETATION TRANSECT (back of form) LAND & WATER B-6

Cover Estimate

+ = <1%
1 = 1-5%
2 = 6-10%
3 = 11-20%
4 = 21-50%
5 = >50%

Indicator Class:

+ = Obligate
- = Facultative/Wet
0 = Facultative

Source:

P = Planted
V = Volunteer

Percent of perimeter _____ % developing wetland vegetation – excluding dam/berm structures.

Establish transects perpendicular to the shoreline (or saturated perimeter). The transect should begin in the upland area. Permanently mark this location with a standard metal fencepost. Extend the imaginary transect line towards the center of the wetland, ending at the 3 food depth (in open water), or at a point where water depths or saturation are maximized. Mark this location with another metal fencepost.

Estimate cover within a 10 ft wide "belt" along the transect length. At a minimum, establish a transect at the windward and leeward sides of the wetland. Remember that the purpose of this sampling is to monitor, not inventory, representative portions of the wetland site.

Notes:

Main pond remains unvegetated in water >6" deep. Typha/scirpus communities are establishing in 0-6" of water along with scirpus maritimus.

3/01 rev

PLANTED WOODY VEGETATION SURVIVAL

LAND & WATER B-7

Species	Number Originally Planted	Number Observed	Mortality Causes
Rosa woodsii	80% +	survival	
symphoricarpos albus	80% +	survival	
Ribes aureum	80% +	survival	
Prunus virginiana	50%	survival	
shepherdia argentea	50%	survival	

COMMENTS/PROBLEMS: Most of the planted woody vegetation occurs in the upland areas within the monitoring area. Survival varied by species, and not all of the plantings were observed, as less field time was spent in the adjacent upland habitat.

Mortality appears to be from 3 sources: 1) competition from more aggressive species
2) lack of moisture - drought conditions
3) small rodents

WETLAND DELINEATION

LAND & WATER B-8

At each site conduct the items on the checklist below:

X Delineate wetlands according to the 1987 Army Corps manual.

X Delineate wetland-upland boundary on the air photo

X Survey wetland-upland boundary with a resource grade GPS survey

COMMENTS/PROBLEMS: See attached forms

FUNCTIONAL ASSESSMENT

Collect information to complete MDT Function and Values Assessment in the office.

Jeff is completing this section

COMMENTS/PROBLEMS: See Attached Forms

MAINTENANCE

Were man-made nesting structures installed at this site? YES X NO___

If yes, do they need to be repaired? YES___ NO X

If yes, describe problems below and indicate if any actions were taken to remedy the problems.

Were man-made structures build or installed to impound water or control water flow into or out of the wetland? YES X NO___

If yes, are the structures working properly and in good working order? YES X NO___

If no, describe the problems below.

COMMENTS/PROBLEMS: Dike structure and water control structure seem to be in good working condition

WILDLIFE

LAND & WATER B-9

BIRDS

Species	Number Observed	Nesting or Breeding Activity	Likely Breeding Resident	Likely Migrating	Species	Number Observed	Nesting or Breeding Activity	Likely Breeding Resident	Likely Migrating
See bird forms									

Were man made nesting structures installed? Yes____ No____Type:_____ How many?_____ Are the nesting structures being utilized? Yes____ No____ Do the nesting structures need repairs? Yes____ No____

MAMMALS AND HERPTILES

Species	Number Observed	Indirect indication of use			
		Tracks	Scat	Burrows	Other
Garter snake	1				
cottontail	3		X		
Raccoon		X			
white-tailed deer	4	X			

Additional Activities Checklist:

_X_ Macroinvertebrate sampling (if required)

COMMENTS/PROBLEMS: _____

PHOTOGRAPHS

LAND & WATER B-10

Using a camera with a 50 mm lenses and color film take photographs of the following permanent reference points listed in the checklist below. Record the direction of the photograph using a compass. (The first time at each site establish a permanent reference point by setting a ½ inch rebar or fencepost extending 2-3' above ground, survey the location with a resource grade GPS and mark the location on the air photo.)
Checklist:

- ✓ One photo for each of the 4 cardinal directions surrounding wetland
- ✓ At least one photo showing upland use surrounding wetland – if more than one upland use exists take additional photos
- ✓ At least one photo showing buffer surrounding wetland
- ✓ One photo from each end of vegetation transect showing transect

Location	Photo Frame #	Photograph Description	Compass Reading
A P1	24	From control structure	145°
B P1	23	" " "	80°
C P2	22	Top of Dike - South side	80°
D P2	21	" "	20°
E P2	20	" "	330°
F P2	19	" "	290°
G VT	18	End of veg. transect	350°
H VT	13	Start of veg. transect	170°

COMMENTS/PROBLEMS: PP3: Frame 17 - 284°; PP3: Frame 16 - 200°; PP3: Frame 15: 116°; PP3: Frame 14 - 66°

PP3 - Center of Island

P1: Frame 25 - 200°

GPS SURVEYING

Using a resource grade GPS survey the items on the checklist below. Collect at least 3 location points with the GPS unit set at 5 second recording rate. Record file numbers fore site in designated GPS field notebook

Checklist:

- ✓ Jurisdictional wetland boundary
- ✓ 4-6 landmarks recognizable on the air photo
- ✓ Start and end points of vegetation transect(s)
- ✓ Photo reference points
- ____ Groundwater monitoring well locations

COMMENTS/PROBLEMS: GPS survey done for all bird boxes

LAND & WATER B-11

BIRD SURVEY - FIELD DATA SHEET

Date: 8/1/01

Survey Time: 8:00am - 2:00pm

SITE: Cow Coulee

4/26/01 10:00am - 2:00pm

Bird Species	Behavior	Habitat Type
Killdeer	F	MS
Ring-necked Pheasant	L	UP
Red-tailed Hawk	FO	
Tree Swallow	FO, F	
Sandhill Crane	N	
Mountain bluebird	N	Boxes
White Pelican	FO	
Canada Goose	FO	
Common Raven	FO	
Violet green swallow		
Brown-headed Cowbird	L	Fence Post
Osprey	FO	
Mourning dove	F	
Cinnamon Teal	BD	OW
Blue-winged Teal	BD	OW
spotted sandpiper	F	MF
Song sparrow	F	UP
yellow warbler	FO	
Tree swallow	FO/L	
pheasant	F	UP
Canada Goose	FO	
Killdeer	F	MF
Robin	FO	

Bird Species	Behavior	Habitat Type
mourning dove	N	
Eastern Kingbird	N	
mallard	N	OW
blue-winged teal	L	OW
Osprey	FO	
white Pelican	FO	
double-crested cormorant	FO	
tree swallow	N	
violet-green swallow	N	
Canada goose	FO	
spotted sandpiper	F	MF
Pelican	FO	
Mountain bluebird	N/FO	boxes
Common Snipe	L/BD	
Eastern Kingbird	L/F	
Red-winged Blackbird	RD	
Mourning Dove	FO	
Mallard	N	UP
Gray Catbird	L	UP

5/30/01 8:00 AM

NOTES:

during 4/26/01 visit - water not yet delivered to sight

Behavior: BP - one of a breeding pair; BD-breeding display; F - foraging; FO - flyover; L - loafing; N - nesting

Habitat: AB - aquatic Bed; FO - forested; I - Island; MA - marsh; MF: Mud Flat; OW - open water; SS - scrub-shrub; UP - upland buffer; WM - wet meadow

BIRD SUMMARY TABLE

Site: Cow Coulee

Page 1 of 1
Date: 4/26/01 + 8/1/01
Survey Time: 4/26 : 10:00am - 2:00pm
8/1 : 8:00am - 2:00 pm

Scientific Name	Common Name	Total Density	Foraging	Nesting	Flyover	Breeding	Loafing
	Killdeer	3-5	X				
	Ring-necked pheasant	2				X	X
	Red-tailed Hawk	2			X		
	Tree swallow	several	X	X			
	Violet-green swallow	several	X	X			
	Sandhill crane	2	X	X			
	Mountain bluebird	several	X	X			
	Eastern Kingbird	several	X	X			X
	White Pelican	several			X		
	Canada Goose	several			X		
	Common Raven	2			X		
	Brown-headed Cowbird	2	X				X
	Osprey	3			X		
	Mourning dove	several	X		X		X
	Mallard	8	X	X			
	Blue-winged teal	2	X			X	X
	Double-crested cormorant	3			X		
	Spotted sandpiper	2	X				
	Cinnamon teal	2	X			X	X
	Yellow warbler	3	X				
	American Robin	several	X				X
	Common snipe	1	X				
	Red-winged blackbird	2	X				X
	Gray catbird	1	X				
	Song sparrow	2	X				✓

Field Data Sheet for 1999 MDT Wetland Assessment Form Site: Task 13 Cow Coulee Date: 8/1/01 By: WST

Estimated AA Size (Circle Ac.): <1 (1-5) >5 Brief Description:

HGM Class (CIRCLE)	Cowardin Class	Est. % of AA	Predominant Water Regime (CIRCLE)
Mineral Soil Flats Organic Soil Flats Riverine (nonperennial) Riverine (upper perennial) Riverine (lower perennial) Lacustrine Fringe Depression (closed) Depression (open, groundwater) Depression (open, surface water) Slope Organic Soil Flats	(Emergent)	40	Perm Flood Int Exp Sem Perm Flood (Seas Flood) Sat Tem Flood Int Flood
	(Aquatic Bed)	10	Perm Flood Int Exp (Sem Perm Flood) Seas Flood Sat Tem Flood Int Flood
	Moss-Lichen		Perm Flood Int Exp Sem Perm Flood Seas Flood Sat Tem Flood Int Flood
	Scrub-Shrub		Perm Flood Int Exp Sem Perm Flood Seas Flood Sat Tem Flood Int Flood
	Forested		Perm Flood Int Exp Sem Perm Flood Seas Flood Sat Tem Flood Int Flood
	(Unconsolidated Bottom)	50	Perm Flood Int Exp (Sem Perm Flood) Seas Flood Sat Tem Flood Int Flood
	Other:		Perm Flood Int Exp Sem Perm Flood Seas Flood Sat Tem Flood Int Flood
	Total Estimated % Vegetated	50%	

RELATIVE ABUNDANCE: rare (com.) abun. **DISTURBANCE** is: High (Moderate) Low _____

HYDROLOGY: Max. acre-ft surf. water at wetlands in AA subject to inundation: <1 (1-5) >5 (if no flooding/ponding, go to groundwater* section)

Does AA contain surface or subsurface outlet? (Y) N If outlet present, is it restricted (subsurface will always be "yes")? (Y) N

Longest duration of surface water:		Surface Water Duration and other attributes (circle)		
at any wetlands within AA		Perm / Peren	(Seas / Intermit)	Temp / Ephem
in at least 10% of AA (both wetlands and nonwetlands [deepwater, streambed...]		(Perm / Peren)	Seas / Intermit	Temp / Ephem
Where fish are or historically were present (circle NA if not applicable)		Perm / Peren	Seas / Intermit	Temp / Ephem
	% of waterbody containing cover objects	>25%	10-25%	<10%
	% bank or shore with riparian or wetland shrub or forested communities	>75%	50-74%	<50%
adjacent to rooted wetland vegetation along a defined watercourse or shoreline subject to wave action (circle NA if not applicable)		Perm / Peren	Seas / Intermit	Temp / Ephem
	% cover of wetland bank or shore by sp. with binding rootmasses	>65%	35-64%	<35%

Flood Attenuation: Do any wetlands on site flood as a result of in-channel or overbank flow? Y (N) (if no, go to groundwater* section below)

Estimated wetland area subject to periodic flooding (acres):	≥10	2-10	<2
Estimated % of flooded wetland classified SS, FO or both:	≥75	25-74	<25

*Evidence of groundwater discharge or recharge? (Y) N List: discharge/recharge

HABITAT

Habitat for Listed or Proposed Threatened, Endangered, or Montana Natural Heritage Program S1, S2, or S3 Plants or Animals:
AA is Documented (D) or Suspected (S) to contain (circle based on definitions contained in instructions):

Primary or critical habitat (list species)	D S	T/E:	D S	MNHP:	
Secondary habitat (list species)	D S	T/E:	D S	MNHP:	
Incidental habitat (list species)	D (S)	T/E: Bald eagle	D (S)	MNHP: Pelicans	
No usable habitat	D S	T/E:	D S	MNHP:	

Wildlife observations? many white pelicans along Missouri River

Fish observations? _____

OTHERS

Do wetlands have potential to receive excess sediments, nutrients, or toxicants? (Y) N From: Irrigation water

Potential to receive: low to moderate levels high levels On TMDL List? Y N

Does site contain bog, fen, warm springs, >80 year-old forested wetland, or MNHP "S1" or "S2" plant association? Y (N)

List: _____

Is AA a known recreation / education site? (Y) N Type: Bird watching

Does AA offer strong potential for use as recreation / education site? (Y) N Type: By landowner only

MDT Montana Wetland Assessment Form (revised 5/25/1999)

1. Project Name: Cow Coulee Mitigation Site 2. Project #: _____ Control #: _____

3. Evaluation Date: Mo. 8 Day 01 Yr. 01 4. Evaluator(s): Traxler 5. Wetlands/Site #(s) whole site

6. Wetland Location(s): I. Legal: T 6 (N) or S; R 2 (E) or W; S 6 ; T ___ N or S; R ___ E or W; S ___ ;
II. Approx. Stationing or Mileposts: _____

III. Watershed: 10030101 GPS Reference No. (if applies): _____
Other Location Information: Rogers Property ≈ 1 mile SW of Townsend

7. a. Evaluating Agency: _____
b. Purpose of Evaluation:
1. ___ Wetlands potentially affected by MDT project
2. ___ Mitigation wetlands; pre-construction
3. X Mitigation wetlands; post-construction
4. ___ Other

8. Wetland size: (total acres) _____ (visually estimated)
3 (measured, e.g. by GPS [if applies])

9. Assessment area: (AA, tot., ac., see instructions on determining AA) _____ (visually estimated)
3 (measured, e.g. by GPS [if applies])

10. Classification of Wetland and Aquatic Habitats in AA (HGM according to Brinson, first col.; USFWS according to Cowardin [1979], remaining cols.)

HGM Class	System	Subsystem	Class	Water Regime	Modifier	% of AA
Depression (open)	Palustrine		EM	SF	E, I	40
			AB	SPF	E, I	10
			UB	SPF	E, I	50

(Abbreviations: System: Palustrine(P)/ Subsyst.: none/ Classes: Rock Bottom (RB), Unconsolidated bottom (UB), Aquatic Bed (AB), Unconsolidated Shore (US), Moss-lichen Wetland (ML), Emergent Wetland (EM), Scrub-Shrub Wetland (SS), Forested Wetland (FO)/ System: Lacustrine (L)/, Subsyst.: Limnetic (2)/ Classes: RB, UB, AB/ Subsystem: Littoral (4)/ Classes: RB, UB, AB, US, EM/ System: Riverine (R)/ Subsyst.: Lower Perennial (2)/ Classes: RB, UB, AB, US, EM/ Subsystem: Upper Perennial (3)/ Classes: RB, UB, AB, US/ Water Regimes: Permanently Flooded (H), Intermittently Exposed (G), Semipermanently Flooded (F), Seasonally Flooded (C), Saturated (B), Temporarily Flooded (A), Intermittently Flooded (J) Modifiers: Excavated (E), Impounded (I), Diked (D), Partly Drained (PD), Farmed (F), Artificial (A) HGM Classes: Riverine, Depressional, Slope, Mineral Soil Flats, Organic Soil Flats, Lacustrine Fringe

11. Estimated relative abundance: (of similarly classified sites within the same Major Montana Watershed Basin, see definitions)
(Circle one) Unknown Rare (Common) Abundant
Comments:

12. General condition of AA:
i. Regarding disturbance: (use matrix below to determine [circle] appropriate response)

Conditions within AA	Predominant conditions adjacent to (within 500 feet of) AA		
	Land managed in predominantly natural state; is not grazed, hayed, logged, or otherwise converted; does not contain roads or buildings.	Land not cultivated, but moderately grazed or hayed or selectively logged, or has been subject to minor clearing; contains few roads or buildings.	Land cultivated or heavily grazed or logged, subject to substantial fill placement, grading, clearing, or hydrological alteration; high road or building density.
AA occurs and is managed in predominantly natural state; is not grazed, hayed, logged, or otherwise converted, does not contain roads or occupied buildings.	low disturbance	low disturbance	moderate disturbance
AA not cultivated, but moderately grazed or hayed or selectively logged; or has been subject to relatively minor clearing, fill placement, or hydrological alteration; contains few roads or buildings.	moderate disturbance	(moderate disturbance)	high disturbance
AA cultivated or heavily grazed or logged, subject to relatively substantial fill placement, grading, clearing, or hydrological alteration; high road or building density.	high disturbance	high disturbance	high disturbance

Comments: (types of disturbance, intensity, season, etc.): dike, 2-track roads, grazing adjacent
ii. Prominent weedy, alien, & introduced species (including those not domesticated, feral): (list) _____

iii. Provide brief descriptive summary of AA and surrounding land use/habitat: low level dike constructed of excavated material from AA. Irrigation water feeds the site from the east. Project is adjacent to Missouri River, surrounding habitat is grassland, cultivated fields and riparian. Site contains open water, Emergent marsh, and aquatic bed habitat.

13. Structural Diversity: (based on number of "Cowardin" *vegetated* classes present [do not include unvegetated classes], see #10 above)

# of "Cowardin" vegetated classes present in AA (see #10)	≥ 3 vegetated classes (or ≥ 2 if one is forested)	2 vegetated classes (or 1 if forested)	≤ 1 vegetated class
Rating (circle)	High	(Moderate)	Low

Comments:

SECTION PERTAINING to FUNCTIONS & VALUES ASSESSMENT

14A. Habitat for Federally Listed or Proposed Threatened or Endangered Plants or Animals:

I. AA is Documented (D) or Suspected (S) to contain (circle one based on definitions contained in instructions):

Primary or critical habitat (**list species**)	D S	_____
Secondary habitat (**list species**)	D S	_____
Incidental habitat (**list species**)	D (S)	Bald eagles
No usable habitat	D S	_____

II. **Rating** (use the conclusions from i above and the matrix below to arrive at [circle] the functional points and rating [H = high, M = moderate, or L = low] for this function)

Highest Habitat Level	doc./primary	sus/primary	doc./secondary	sus./secondary	doc./incidental	sus./incidental	None
Functional Points and Rating	1 (H)	.9 (H)	.8 (M)	.7 (M)	.5 (L)	(.3 (L))	0 (L)

Sources for documented use (e.g. observations, records, etc):

14B. Habitat for plant or animals rated S1, S2, or S3 by the Montana Natural Heritage Program: (not including species listed in14A above)

I. AA is Documented (D) or Suspected (S) to contain (circle one based on definitions contained in instructions):

Primary or critical habitat (**list species**)	D S	_____
Secondary habitat (**list species**)	D S	_____
Incidental habitat (**list species**)	D (S)	_____
No usable habitat	D S	_____

II. **Rating** (use the conclusions from i above and the matrix below to arrive at [circle] the functional points and rating [H = high, M = moderate, or L = low] for this function)

Highest Habitat Level	doc./primary	sus/primary	doc./secondary	sus./secondary	doc./incidental	sus./incidental	None
Functional Points and Rating	1 (H)	.8 (H)	.7 (M)	.6 (M)	.2 (L)	(.1 (L))	0 (L)

Sources for documented use (e.g. observations, records, etc.):

14C. General Wildlife Habitat Rating:

I. **Evidence of overall wildlife use in the AA** (circle substantial, moderate, or low based on supporting evidence):

Substantial (based on any of the following [check]):
- __ observations of abundant wildlife #'s or high species diversity (during any period)
- __ abundant wildlife sign such as scat, tracks, nest structures, game trails, etc.
- __ presence of extremely limiting habitat features not available in the surrounding area
- __ interviews with local biologists with knowledge of the AA

Low (based on any of the following [check]):
- __ few or no wildlife observations during peak use periods
- __ little to no wildlife sign
- __ sparse adjacent upland food sources
- __ interviews with local biologists with knowledge of the AA

Moderate (based on any of the following [check]):
- X observations of scattered wildlife groups or individuals or relatively few species during peak periods
- X common occurrence of wildlife sign such as scat, tracks, nest structures, game trails, etc.
- X adequate adjacent upland food sources
- __ interviews with local biologists with knowledge of the AA

ii. **Wildlife habitat features** (working from top to bottom, circle appropriate AA attributes in matrix to arrive at exceptional (E), high (H), moderate (M), or low (L) rating. Structural diversity is from #13. For class cover to be considered evenly distributed, vegetated classes must be within 20% of each other in terms of their percent composition of the AA (see #10). Abbreviations for surface water durations are as follows: P/P = permanent/perennial; S/I = seasonal/intermittent; T/E = temporary/ephemeral; and A = absent [see instructions for further definitions of these terms].)

Structural diversity (see #13)	High								Moderate								Low			
Class cover distribution (all vegetated classes)	Even				Uneven				Even				Uneven				Even			
Duration of surface water in ≥ 10% of AA	P/P	S/I	T/E	A	P/P	S/I	T/E	A	P/P	S/I	T/E	A	P/P	S/I	T/E	A	P/P	S/I	T/E	A
Low disturbance at AA (see #12i)	E	E	E	H	E	E	H	H	E	H	H	M	E	H	M	M	E	H	M	M
Moderate disturbance at AA (see #12i)	H	H	H	H	H	H	H	M	H	H	M	M	H	(M)	M	L	H	M	L	L
High disturbance at AA (see #12i)	M	M	M	L	M	M	L	L	M	M	L	L	M	L	L	L	L	L	L	L

iii. **Rating** (use the conclusions from i and ii above and the matrix below to arrive at [circle] the functional points and rating [E = exceptional, H = high, M = moderate, or L = low] for this function)

Evidence of wildlife use (i)	*Wildlife habitat features rating (ii)*			
	Exceptional	High	Moderate	Low
Substantial	1 (E)	.9 (H)	.8 (H)	.7 (M)
Moderate	.9 (H)	.7 (M)	(.5 (M))	.3 (L)
Minimal	.6 (M)	.4 (M)	.2 (L)	.1 (L)

Comments: Bird boxes receiving substatial use by swallows & bluebirds, some waterfowl nesting. small mammalian predators being trapped out by landowner.

14D. General Fish/Aquatic Habitat Rating: (Assess this function if the AA is used by fish or the existing situation is "correctable" such that the AA could be used by fish [i.e., fish use is precluded by perched culvert or other barrier, etc.]. If the AA is not or was not historically used by fish due to lack of habitat, excessive gradient, etc., circle **NA** here and proceed to the next function. If fish use occurs in the AA but is not desired from a resource management perspective [such as fish use within an irrigation canal], then Habitat Quality [i below] should be marked as "Low", applied accordingly in ii below, and noted ih the comments.)

i. **Habitat Quality** (circle appropriate AA attributes in matrix to arrive at exceptional (E), high (H), moderate (M), or low (L) quality rating.

Duration of surface water in AA	Permanent / Perennial			Seasonal / Intermittent			Temporary / Ephemeral		
Cover - % of waterbody in AA containing cover objects such as submerged logs, large rocks & boulders, overhanging banks, floating-leaved vegetation, etc.	>25%	10–25%	<10%	>25%	10–25%	<10%	>25%	10–25%	<10%
Shading - **>75%** of streambank or shoreline within AA contains riparian or wetland scrub-shrub or forested communities	E	E	H	H	H	M	M	M	M
Shading – **50** to **75%** of streambank or shoreline within AA contains rip. or wetland scrub-shrub or forested communities	H	H	M	M	M	M	M	L	L
Shading - **< 50%** of streambank or shoreline within AA contains rip. or wetland scrub-shrub or forested communities	H	M	M	M	L	L	L	L	L

ii. **Modified Habitat Quality** (Circle the appropriate response to the following question. If answer is Y, then reduce rating in i above by one level [E = H, H = M, M = L, L = L]). *Is fish use of the AA precluded or significantly reduced by a culvert, dike, or other man-made structure or activity or is the waterbody included on the MDEQ list of waterbodies in need of TMDL development with listed "Probable Impaired Uses" including cold or warm water fishery or aquatic life support?* **Y N** Modified habitat quality rating = (circle) **E H M L**

iii. **Rating** (use the conclusions from i and ii above and the matrix below to arrive at [circle] the functional points and rating [E = exceptional, H = high, M = moderate, or L = low] for this function)

Types of fish known or suspected within AA	*Modified Habitat Quality (ii)*			
	Exceptional	High	Moderate	Low
Native game fish	1 (E)	.9 (H)	.7 (M)	.5 (M)
Introduced game fish	.9 (H)	.8 (H)	.6 (M)	.4 (M)
Non-game fish	.7 (M)	.6 (M)	.5 (M)	.3 (L)
No fish	.5 (M)	.3 (L)	.2 (L)	.1 (L)

Comments:

14E. Flood Attenuation: (applies only to wetlands subject to flooding via in-channel or overbank flow. If wetlands in AA are not flooded from in-channel or overbank flow, circle **NA** here and proceed to next function.)

i. **Rating** (working from top to bottom, use the matrix below to arrive at [circle] the functional points and rating [H = high, M = moderate, or L = low] for this function)

Estimated wetland area in AA subject to periodic flooding	≥ 10 acres			<10, >2 acres			≤2 acres		
% of flooded wetland classified as forested, scrub/shrub, or both	75%	25-75%	<25%	75%	25-75%	<25%	75%	25-75%	<25%
AA contains **no outlet or restricted outlet**	1(H)	.9(H)	.6(M)	.8(H)	.7(H)	.5(M)	.4(M)	.3(L)	.2(L)
AA contains **unrestricted outlet**	.9(H)	.8(H)	.5(M)	.7(H)	.6(M)	.4(M)	.3(L)	.2(L)	.1(L)

ii. Are residences, businesses, or other features which may be significantly damaged by floods located within 0.5 miles downstream of the AA (circle)? **Y N**
Comments:

14F. Short and Long Term Surface Water Storage: (Applies to wetlands that flood or pond from overbank or in-channel flow, precipitation, upland surface flow, or groundwater flow. If no wetlands in the AA are subject to flooding or ponding, circle **NA** here and proceed with the evaluation.)

i. **Rating** (working from top to bottom, use the matrix below to arrive at [circle] the functional points and rating [H = high, M = moderate, or L = low] for this function. Abbreviations for surface water durations are as follows: P/P = permanent/perennial; S/I = seasonal/intermittent; and T/E = temporary/ephemeral [see instructions for further definitions of these terms].)

Estimated maximum acre feet of water contained in wetlands within the AA that are subject to periodic flooding or ponding	≥5 acre feet			<5, >1 acre feet			≤1 acre foot		
Duration of surface water at wetlands within the AA	P/P	S/I	T/E	P/P	S/I	T/E	P/P	S/I	T/E
Wetlands in AA flood or pond **≥ 5 out of 10 years**	1(H)	.9(H)	.8(H)	.8(H)	.6(M)	.5(M)	.4(M)	.3(L)	.2(L)
Wetlands in AA flood or pond **< 5 out of 10 years**	.9(H)	.8(H)	.7(M)	.7(M)	.5(M)	.4(M)	.3(L)	.2(L)	.1(L)

Comments: AA receives seasonal irrigation water and high groundwater

---

14G. Sediment/Nutrient/Toxicant Retention and Removal: (Applies to wetlands with potential to receive excess sediments, nutrients, or toxicants through influx of surface or ground water or direct input. If no wetlands in the AA are subject to such input, circle **NA** here and proceed with the evaluation.)

i. **Rating** (working from top to bottom, use the matrix below to arrive at [circle] the functional points and rating [H = high, M = moderate, or L = low] for this function.

Sediment, nutrient, and toxicant input levels within AA	AA receives or surrounding land use with potential to deliver low to moderate levels of sediments, nutrients, or compounds such that other functions are not substantially impaired. Minor sedimentation, sources of nutrients or toxicants, or signs of eutrophication present.				Waterbody on MDEQ list of waterbodies in need of TMDL development for "probable causes" related to sediment, nutrients, or toxicants or AA receives or surrounding land use with potential to deliver high levels of sediments, nutrients, or compounds such that other functions are substantially impaired. Major sedimentation, sources of nutrients or toxicants, or signs of eutrophication present.			
% cover of wetland vegetation in AA	≥ 70%		< 70%		≥ 70%		< 70%	
Evidence of flooding or ponding in AA	Yes	No	Yes	No	Yes	No	Yes	No
AA contains **no or restricted outlet**	1 (H)	.8 (H)	.7 (M)	.5 (M)	.5 (M)	.4 (M)	.3 (L)	.2 (L)
AA contains **unrestricted outlet**	.9 (H)	.7 (M)	.6 (M)	.4 (M)	.4 (M)	.3 (L)	.2 (L)	.1 (L)

Comments:

14H Sediment/Shoreline Stabilization: (applies only if AA occurs on or within the banks or a river, stream, or other natural or man-made drainage, or on the shoreline of a standing water body which is subject to wave action. If does not apply, circle **NA** here and proceed to next function)

i. Rating (working from top to bottom, use the matrix below to arrive at [circle] the functional points and rating [E = exceptional, H = high, M = moderate, or L = low] for this function.

% Cover of wetland streambank or shoreline by species with deep, binding rootmasses	*Duration of surface water adjacent to rooted vegetation*		
	permanent / perennial	seasonal / intermittent	Temporary / ephemeral
≥ 65%	1 (H)	.9 (H)	.7 (M)
35-64%	.7 (M)	.6 (M)	.5 (M)
< 35%	.3 (L)	.2 (L)	.1 (L)

Comments:

14I. Production Export/Food Chain Support:

i. Rating (working from top to bottom, use the matrix below to arrive at [circle] the functional points and rating [H = high, M = moderate, or L = low] for this function. Factor A = acreage of vegetated component in the AA; Factor B = structural diversity rating from #13; Factor C = whether or not the AA contains a surface or subsurface outlet; the final three rows pertain to duration of surface water in the AA, where P/P = permanent/perennial; S/I = seasonal/intermittent; T/E /A= temporary/ephemeral or absent [see instructions for further definitions of these terms].)

A	Vegetated component >5 acres						Vegetated component 1-5 acres						Vegetated component <1 acre					
B	High		Moderate		Low		High		Moderate		Low		High		Moderate		Low	
C	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
P/P	1H	.9H	.9H	.8H	.8H	.7M	.9H	.8H	.8H	.7M	.7M	.6M	.7M	.6M	.6M	.4M	.4M	.3L
S/I	.9H	.8H	.8H	.7M	.7M	.6M	.8H	.7M	.7M	.6M	.6M	.5M	.6M	.5M	.5M	.3L	.3L	.2L
T/E/A	.8H	.7M	.7M	.6M	.6M	.5M	.7M	.6M	.6M	.5M	.5M	.4M	.5M	.4M	.4M	.2L	.2L	.1L

Comments:

14J. Groundwater Discharge/Recharge: (Check the indicators in i & ii below that apply to the AA)

i. Discharge Indicators

- ___Springs are known or observed
- ___Vegetation growing during dormant season/drought
- ___Wetland occurs at the toe of a natural slope
- ___Seeps are present at the wetland edge
- X AA permanently flooded during drought periods *small portion*
- ___Wetland contains an outlet, but no inlet
- ___Other

ii. Recharge Indicators

- ___Permeable substrate present without underlying impeding layer
- ___Wetland contains inlet but no outlet
- ___Other

iii. Rating: Use the information from i and ii above and the table below to arrive at [circle] the functional points and rating [H = high, L = low] for this function.

Criteria	*Functional Points and Rating*
AA is known Discharge/Recharge area or one or more indicators of D/R present	1 (H)
No Discharge/Recharge indicators present	.1 (L)
Available Discharge/Recharge information inadequate to rate AA D/R potential	N/A (Unknown)

Comments:

14K. Uniqueness:

i. Rating (working from top to bottom, use the matrix below to arrive at [circle] the functional points and rating [H = high, M = moderate, or L = low] for this function.

Replacement potential	AA contains fen, bog, warm springs or mature (>80 yr-old) forested wetland or plant association listed as "S1" by the MNHP			AA does not contain previously cited rare types and structural diversity (#13) is high or contains plant association listed as "S2" by the MNHP			AA does not contain previously cited rare types or associations and structural diversity (#13) is low-moderate		
Estimated relative abundance (#11)	rare	common	abundant	rare	common	abundant	rare	common	abundant
Low disturbance at AA (#12i)	1 (H)	.9 (H)	.8 (H)	.8 (H)	.6 (M)	.5 (M)	.5 (M)	.4 (M)	.3 (L)
Moderate disturbance at AA (#12i)	.9 (H)	.8 (H)	.7 (M)	.7 (M)	.5 (M)	.4 (M)	.4 (M)	.3 (L)	.2 (L)
High disturbance at AA (#12i)	.8 (H)	.7 (M)	.6 (M)	.6 (M)	.4 (M)	.3 (L)	.3 (L)	.2 (L)	.1 (L)

Comments:

14L. Recreation/Education Potential: i. Is the AA a known rec./ed. site: (circle) Y N (If yes, rate as [circle] High [1] and go to ii; if no go to iii)

ii. Check categories that apply to the AA: ___ Educational/scientific study; ___ Consumptive rec.; X Non-consumptive rec.; ___Other

iii. Based on the location, diversity, size, and other site attributes, is there strong potential for rec./ed. use? Y N
(If yes, go to ii, then proceed to iv; if no, then rate as [circle] Low [0.1])

iv. Rating (use the matrix below to arrive at [circle] the functional points and rating [H = high, M = moderate, or L = low] for this function.

Ownership	*Disturbance at AA (#12i)*		
	low	moderate	high
public ownership	1 (H)	.5 (M)	.2 (L)
private ownership	.7 (M)	.3 (L)	.1 (L)

Comments: Site is used by landowner for bird watching. Private land with no public Access

FUNCTION & VALUE SUMMARY & OVERALL RATING

Function & Value Variables	Rating	Actual Functional Points	Possible Functional Points	Functional Units; (Actual Points x Estimated AA Acreage)
A. Listed/Proposed T&E Species Habitat	low	0.3	1	
B. MT Natural Heritage Program Species Habitat	low	0.1	1	
C. General Wildlife Habitat	mod.	0.5	1	
D. General Fish/Aquatic Habitat	NA	NA	NA	
E. Flood Attenuation	NA	NA	NA	
F. Short and Long Term Surface Water Storage	high	0.9	1.0	
G. Sediment/Nutrient/Toxicant Removal	mod.	0.7	1.0	
H. Sediment/Shoreline Stabilization	mod	0.6	1.0	
I. Production Export/Food Chain Support	mod.	0.7	1	
J. Groundwater Discharge/Recharge	high	1.0	1	
K. Uniqueness	Low	0.3	1	
L. Recreation/Education Potential	low	0.3	1	
Totals:		5.4	10	

54%

OVERALL ANALYSIS AREA (AA) RATING: (Circle appropriate category based on the criteria outlined below) I II (III) IV

Category I Wetland: (Must satisfy **one** of the following criteria; if does not meet criteria, go to Category II)
- ___ Score of 1 functional point for Listed/Proposed Threatened or Endangered Species; **or**
- ___ Score of 1 functional point for Uniqueness; **or**
- ___ Score of 1 functional point for Flood Attenuation **and** answer to Question 14E.ii is "yes"; **or**
- ___ Total actual functional points > 80% (round to nearest whole #) of total possible functional points.

Category II Wetland: (Criteria for Category I not satisfied **and** meets any **one** of the following criteria; if not satisfied, go to Category IV)
- ___ Score of 1 functional point for Species Rated S1, S2, or S3 by the MT Natural Heritage Program; **or**
- ___ Score of .9 or 1 functional point for General Wildlife Habitat; **or**
- ___ Score of .9 or 1 functional point for General Fish/Aquatic Habitat; **or**
- ___ "High" to "Exceptional" ratings for **both** General Wildlife Habitat **and** General Fish/Aquatic Habitat; **or**
- ___ Score of .9 functional point for Uniqueness; **or**
- ___ Total Actual Functional Points > 65% (round to nearest whole #) of total possible functional points.

Category III Wetland: (Criteria for Categories I, II or IV not satisfied)

Category IV Wetland: (Criteria for Categories I or II are not satisfied and all of the following criteria are met; if does not satisfy criteria go to Category III)
- ___ "Low" rating for Uniqueness; **and**
- ___ "Low" rating for Production Export/Food Chain Support; **and**
- ___ Total actual functional points < 30% (round to nearest whole #) of total possible functional points

DATA FORM
ROUTINE WETLAND
(1987 COE Wetlands Delineation Manual)

Project/Site:	Cow Coulee Mitigation Site	Project No: Task 013	Date: 1-Aug-2001
Applicant/Owner:	Montana Department of Transportation		County: Broadwater
Investigators:	Traxler		State: Montana
			Plot ID: 1

Do Normal Circumstances exist on the site?	(Yes) No	Community ID: EM
Is the site significantly disturbed (Atypical Situation:)?	Yes (No)	Transect ID:
Is the area a potential Problem Area?	Yes (No)	Field Location:
(If needed, explain on the reverse side)		east of small island

VEGETATION (USFWS Region No. 9)

Dominant Plant Species(Latin/Common)	Stratum	Indicator	Plant Species(Latin/Common)	Stratum	Indicator
Hordeum jubatum	Herb	FAC+	*Rumex crispus*	Herb	FACW
Barley,Fox-Tail			Dock,Curly		
Carex rostrata	Herb	OBL	*Marsilea vestita*	Herb	OBL
Sedge,Beaked			Fern,Hairy Water		
Juncus balticus	Herb	OBL			
Rush,Baltic					

Percent of Dominant Species that are OBL, FACW or FAC: (excluding FAC-) 5/5 = 100.00%

FAC Neutral: 4/4 = 100.00%
Numeric Index: 8/5 = 1.60

Remarks:
Taken along vegetation transect

HYDROLOGY

NO Recorded Data(Describe in Remarks):
- N/A Stream, Lake or Tide Gauge
- N/A Aerial Photographs
- N/A Other

YES No Recorded Data

Field Observations

Depth of Surface Water:	N/A (in.)
Depth to Free Water in Pit:	+/- 6 (in.)
Depth to Saturated Soil:	= 3 (in.)

Wetland Hydrology Indicators
Primary Indicators
- NO Inundated
- YES Saturated in Upper 12 Inches
- NO Water Marks
- YES Drift Lines
- NO Sediment Deposits
- YES Drainage Patterns in Wetlands

Secondary Indicators
- YES Oxidized Root Channels in Upper 12 Inches
- NO Water-Stained Leaves
- NO Local Soil Survey Data
- YES FAC-Neutral Test
- NO Other(Explain in Remarks)

Remarks:

DATA FORM
ROUTINE WETLAND
(1987 COE Wetlands Delineation Manual)

Project/Site:	Cow Coulee Mitigation Site	Project No: Task 013	Date: 1-Aug-2001
Applicant/Owner:	Montana Department of Transportation		County: Broadwater
Investigators:	Traxler		State: Montana
			Plot ID: 1

SOILS

Map Unit Name (Series and Phase): Ustic torriothents
Map Symbol: UI Drainage Class: unknown
Taxonomy (Subgroup):
Mapped Hydric Inclusion? no
Field Observations Confirm Mapped Type? Yes (No)

Profile Description

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Color (Munsell Moist)	Mottle Abundance/Contrast		Texture, Concretions, Structure, etc
4	A	10R3/1	N/A	N/A	N/A	Silt loam
16	B	10R5/1	N/A	N/A	N/A	Clay loam

Hydric Soil Indicators:
- NO Histosol
- NO Histic Epipedon
- NO Sulfidic Odor
- NO Aquic Moisture Regime
- YES Reducing Conditions
- YES Gleyed or Low Chroma Colors
- NO Concretions
- NO High Organic Content in Surface Layer in Sandy Soils
- NO Organic Streaking in Sandy Soils
- NO Listed on Local Hydric Soils List
- NO Listed on National Hydric Soils List
- NO Other (Explain in Remarks)

Remarks:

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	(Yes) No	Is the Sampling Point within the Wetland? (Yes) No
Wetland Hydrology Present?	(Yes) No	
Hydric Soils Present?	(Yes) No	

Remarks:

Montana Department of Transportation		Project Name	Cow Coulee
Wetland Mitigation Monitoring Project		Project/task number	13
for		Date	8/1/2001
Land and Water Consulting		Field Personnel	MT
		Note	
2001		Rhithron Sample Identification	14
Coelenterata		*Hydra*	
Oligochaeta	Enchytraeidae	Enchytraeidae	
	Naididae	*Chaetogaster*	
		Nais elinguis	
		Nais variabilis	
		Ophidonais serpentina	
	Tubificidae	Tubificidae - immature	
		Limnodrilus hoffmeisteri	
Hirudinea	Erpobdellidae	*Mooreobdella microstoma*	
		Nephelopsis	
	Glossiphoniidae	*Helobdella stagnalis*	
		Helobdella	
		Glossiphonia	
Bivalvia	Sphaeriidae	*Sphaerium*	
Gastropoda	Lymnaeidae	*Fossaria*	4
	Physidae	*Physa*	
	Planorbidae	*Gyraulus*	54
		Helisoma	
Crustacea	Cladocera	Cladocera	1
	Copepoda	Calanoida	4
		Cyclopoida	
	Ostracoda	Ostracoda	3
	Amphipoda	*Gammarus*	
		Hyalella azteca	2
	Decapoda	*Orconectes*	
Acarina		Acari	2
Odonata	Aeshnidae	*Anax*	1
	Libellulidae	Libellulidae-early instar	
		Sympetrum	
	Coenagrionidae	Coenagrionidae-early instar	26
		Enallagma	
	Lestidae	*Lestes*	
Ephemeroptera	Baetidae	*Callibaetis*	15
	Caenidae	*Caenis*	16
Hemiptera	Corixidae	Corixidae - immature	3
		Hesperocorixa	
		Sigara	
		Trichocorixa	
	Nepidae	*Ranatra*	
	Notonectidae	*Notonecta*	2
Trichoptera	Hydroptilidae	Hydroptilidae - pupa	
	Leptoceridae	Leptoceridae - early instar	
		Mystacides	
		Ylodes	
Coleoptera	Chrysomelidae	Chrysomelidae	
	Curculionidae	*Bagous*	
	Dytiscidae	*Acilius*	
		Hydroporinae - early instar larvae	
		Hygrotus	
		Liodessus	
		Laccophilus	
		Neoporus	
	Elmidae	*Heterlimnius*	
	Haliplidae	*Haliplus*	
		Peltodytes	
	Hydrophilidae	*Berosus*	
		Helophorus	
		Hydrobius	
		Hydrochara	
		Laccobius	
		Tropisternus	2
Diptera	Ceratopogoninae	*Bezzia/Palpomyia*	4
		Dasyhelea	
	Chaoboridae	*Chaoborus*	2
	Culicidae	*Anopheles*	
		Culex	
	Ephydridae	Ephydridae	
	Simuliidae	*Simulium*	
	Sciomyzidae	Sciomyzidae	
	Stratiomyidae	*Odontomyia*	
	Chironomidae	*Acricotopus*	1
		Chironomus	
		Cladotanytarsus	4
		Corynoneura	4
		Cryptotendipes	
		Dicrotendipes	2
		Einfeldia	
		Endochironomus	1
		Labrundinia	
		Microtendipes	
		Orthocladius annectens	1
		Parachironomus	
		Paramerina	
		Paratanytarsus	
		Phaenopsectra	
		Polypedilum	4
		Procladius	10
		Psectrocladius	
		Psectrotanypus	
		Pseudochironomus	1
		Tanypus	
		Tanytarsus	34
	TOTAL		203
grids			9

Total taxa	26
POET	4
Chironomidae taxa	10
Crustacea taxa + Mollusca taxa	3
% Chironomidae	30.5418719
Orthocladiinae/Chironomidae	9.67741935
%Amphipoda	0.98522167
%Crustacea + %Mollusca	29.5566502
HBI	7.01477833
%Dominant taxon	26.6009852
%Collector-Gatherers	42.8571429
%Filterers	2.46305419

Total taxa	5
POET	3
Chironomidae taxa	5
Crustacea taxa + Mollusca taxa	5
% Chironomidae	1
Orthocladiinae/Chironomidae	3
%Amphipoda	3
%Crustacea + %Mollusca	1
HBI	3
%Dominant taxon	5
%Collector-Gatherers	1
%Filterers	1
site score	36

Appendix C

REPRESENTATIVE PHOTOGRAPHS

MDT Wetland Mitigation Monitoring
Cow Coulee
Townsend, Montana

LAND & WATER

Photo point 1: 185 degrees south
Photo taken while standing on top of outlet control structure.

Photo point 1: 145 degrees southeast
Photo taken while standing on top of outlet control structure.

Photo point 1: 90 degrees east
Photo taken while standing on top of outlet control structure.

Photo point 2: 80 degrees east

Photo point 2: 338 degrees northwest

Photo point 2: 290 degrees west

Photo point 3: 284 degrees northwest
Photo taken from middle of Island.

Photo point 3: 200 degrees southwest
Photo taken from middle of Island.

Photo point 3: 116 degrees east
Photo taken from middle of Island.

Photo point 3: 66 degrees northeast
Photo taken from middle of Island.

Vegetation Transect Start: 170 degrees South

Vegetation Transect End: 350 degrees North

Appendix D

COW COULEE WETLAND PLAN
REVEGETATION PLAN & LIST OF PLANTED SPECIES

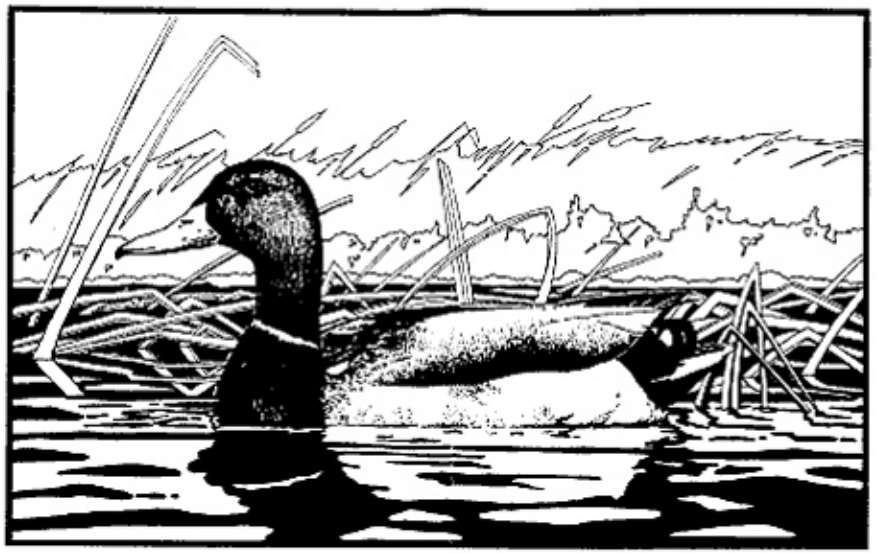
MDT Wetland Mitigation Monitoring
Cow Coulee
Townsend, Montana

LAND & WATER

Cow Coulee
Wetland Mitigation Project

Townsend, Montana

MDT Project No. STPX 0002 (300)



Designed by
Robert Peccia & Associates
Helena, Montana
March, 1997

Project Location - Townsend, Montana

Sheet Index

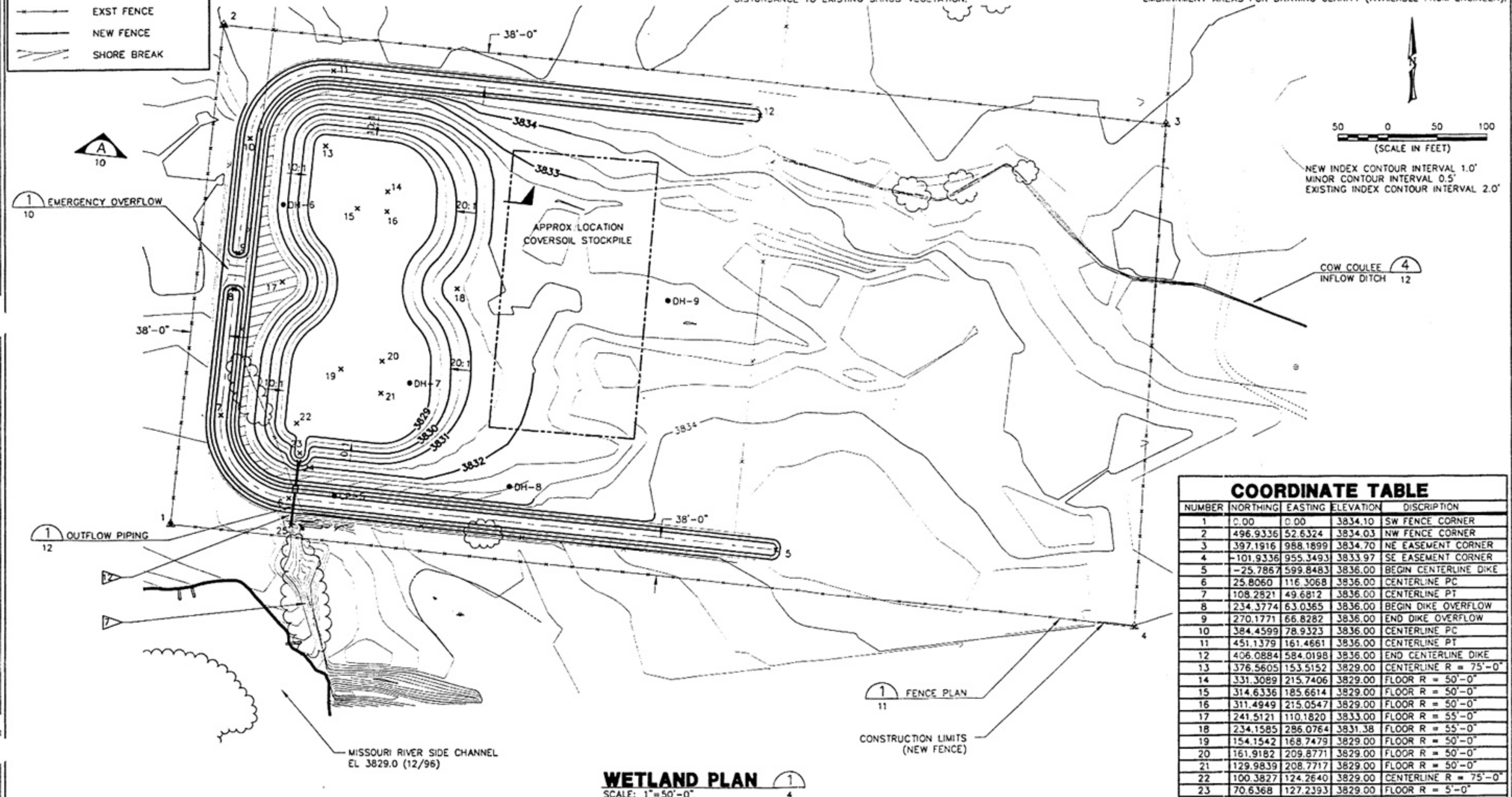
LAND & WATER D-1

LEGEND

- NEW INDEX CONTOUR
- EXST INDEX CONTOUR
- CONTOUR
- CP-5 CONTROL POINT
- COORDINATE LOCATION
- SURVEY CONTROL
- SHRUBS
- DITCH CENTERLINE
- EXST FENCE
- NEW FENCE
- SHORE BREAK

CONSTRUCTION NOTES:

1. REMOVE EXISTING FENCE AS NECESSARY FOR CONSTRUCTION (WITHIN 100' OF WETLAND DIKE). RELOCATE AND INSTALL FENCE WHERE SHOWN, SEE DETAIL 1, SHEET 11. AT CONTRACTORS DISCRETION MAY INSTALL TEMPORARY FENCE UNTIL PROJECT IS COMPLETED. BEWARE OF LIVESTOCK IN AREA.
2. PREPARE SITE FOR EARTHWORK. CLEAR & GRUB AREAS TO BE DISTURBED BY DIKE CONSTRUCTION AND WETLAND EXCAVATION. SALVAGE AND STOCKPILE COVERSOIL FROM ALL AREAS TO BE DISTURBED BY DIKE CONSTRUCTION AND WETLAND EXCAVATION.
3. CONDUCT SITE DEWATERING AS NEEDED FOR EXCAVATION AND EMBANKMENT. ABANDON MONITORING WELLS @ DH-6, DH-8, AND DH-9.
4. EXCAVATE WETLAND BASIN AS SHOWN. USE CUT MATERIAL FOR DIKE CONSTRUCTION. MINIMUM COMPACTION IS 95% OF MAXIMUM DRY DENSITY (STANDARD PROCTOR). PLACE EXCESS CUT MATERIAL IN SOIL STOCKPILE AREA (SEE SHEET 4). CONSTRUCT DIKES AND WETLAND BASIN ABOUT 1 FOOT LOWER THAN ELEVATION SHOWN UNTIL COVERSOIL PLACEMENT.
5. DURING WETLAND BASIN EXCAVATION DO NOT EXCAVATE INTO GRAVELLY MATERIAL. IF GRAVELLY MATERIAL IS ENCOUNTERED CONTACT FIELD ENGINEER BEFORE PROCEEDING. IF ENCOUNTERED, GRAVELLY MATERIAL SHALL BE STOCKPILED SEPARATELY AT THE SOIL STOCKPILE AREA.
6. INSTALL WETLAND OUTLET PIPING AND EMERGENCY SPILLWAY.
7. CLEAR & GRADE OUTFLOW DITCH TO RIVER SIDE CHANNEL. PROVIDE POSITIVE DRAINAGE (>0.01%), MAXIMUM SIDE SLOPE 2:1. MINIMIZE DISTURBANCE TO EXISTING SHRUB VEGETATION.
8. PLACE SALVAGED COVERSOIL AT ABOUT 1 FOOT THICKNESS TO ATTAIN LINES AND GRADES SHOWN ON DIKES AND BASIN EXCAVATION AREAS.
9. PLACE SALVAGED WETLAND COVERSOIL AT ABOUT 1 FOOT THICKNESS IN THE EXCAVATED WETLAND BASIN AREA BETWEEN ELEVATIONS 3833 AND 3831 (SEE SHEET 4 AND 9).
10. FERTILIZE, SEED AND MULCH ALL CONSTRUCTION DISTURBED AREAS, INCLUDING ACCESS ROAD. TRANSPLANT VEGETATION. SEE REVEGETATION PLAN IN DETAIL 1, SHEET 9.
11. ELEVATIONS: DIKE TOP @ 3836.0; DESIGN WATER LEVEL 3833.0; EMERGENCY OVERFLOW 3834.0.
12. DISCONTINUE GRANULAR PIPE BEDDING 10' FROM EACH END OF PIPE.
13. EXISTING CONTOURS ARE OMITTED FROM WETLAND EXCAVATION & EMBANKMENT AREAS FOR DRAWING CLARITY (AVAILABLE FROM ENGINEER).



COORDINATE TABLE

NUMBER	NORTHING	EASTING	ELEVATION	DISCRIPTION
1	0.00	0.00	3834.10	SW FENCE CORNER
2	496.9336	52.6324	3834.03	NW FENCE CORNER
3	397.1916	988.1899	3834.70	NE EASEMENT CORNER
4	-101.9336	955.3493	3833.97	SE EASEMENT CORNER
5	-25.7867	599.8483	3836.00	BEGIN CENTERLINE DIKE
6	25.8060	116.3068	3836.00	CENTERLINE PC
7	108.2821	49.6812	3836.00	CENTERLINE PT
8	234.3774	63.0365	3836.00	BEGIN DIKE OVERFLOW
9	270.1771	66.8282	3836.00	END DIKE OVERFLOW
10	384.4599	78.9323	3836.00	CENTERLINE PC
11	451.1379	161.4661	3836.00	CENTERLINE PT
12	406.0884	584.0198	3836.00	END CENTERLINE DIKE
13	376.5605	153.5152	3829.00	CENTERLINE R = 75'-0"
14	331.3089	215.7406	3829.00	FLOOR R = 50'-0"
15	314.6336	185.6614	3829.00	FLOOR R = 50'-0"
16	311.4949	215.0547	3829.00	FLOOR R = 50'-0"
17	241.5121	110.1820	3833.00	FLOOR R = 55'-0"
18	234.1585	286.0764	3831.38	FLOOR R = 55'-0"
19	154.1542	168.7479	3829.00	FLOOR R = 50'-0"
20	161.9182	209.8771	3829.00	FLOOR R = 50'-0"
21	129.9839	208.7717	3829.00	FLOOR R = 50'-0"
22	100.3827	124.2640	3829.00	CENTERLINE R = 75'-0"
23	70.6368	127.2393	3829.00	FLOOR R = 5'-0"
24	61.5430	126.1115	3830.00	BEGIN OUTFLOW PIPING
25	0.9886	118.9770	3829.50	END OUTFLOW PIPING

WETLAND PLAN (1/4)

SCALE: 1"=50'-0"

SYM | REVISION | BY | APPR | DATE

R. MORTON — DESIGNED BY; MARCH 1997 — DATE
G. LESOFSKI — DRAWN BY; 96-56 — PROJECT NO.
K. JENSEN, P.E. — CHECKED BY; CC7C004 — FILE NO.

PROJECT TITLE: ROGERS' WETLANDS COW COULEE

SHEET TITLE: COW COULEE WETLAND PLAN

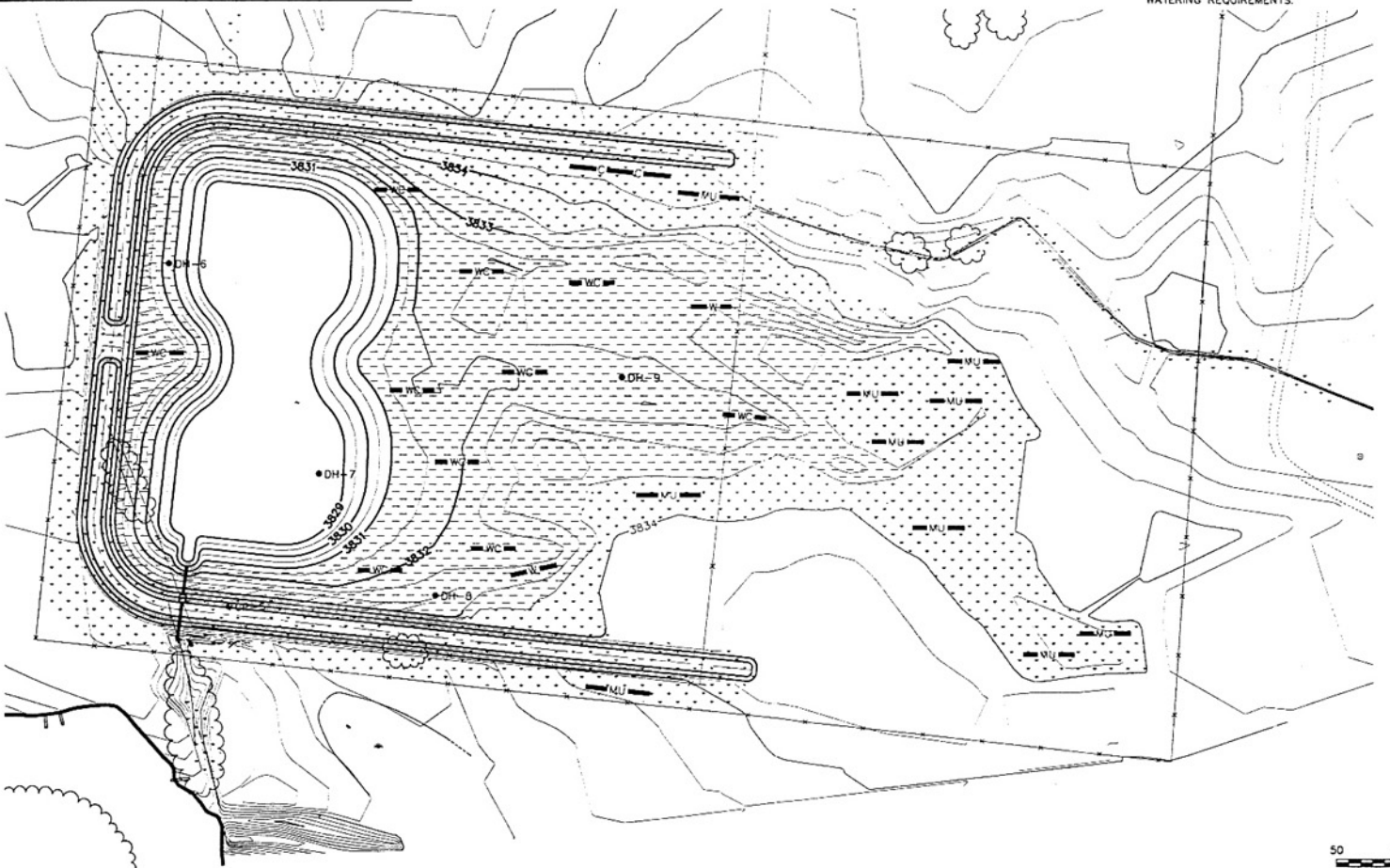
SHEET 8

LEGEND

NEW INDEX CONTOUR	SEED MIX 1
EXST INDEX CONTOUR	SEED MIX 2
CONTOUR	C COTTONWOODS
CP-5 CONTROL POINT	MU MESIC / UPLAND
SHRUBS	W WILLOWS
DITCH CENTERLINE	WC WETLAND COVERSOIL
FENCE	

CONSTRUCTION NOTES:

1. PREPARE SEEDBEDS AND OBTAIN ENGINEER APPROVAL TO PROCEED PRIOR TO SEEDING. VERIFY LOCATION OF VEGETATION ZONES WITH ENGINEER PRIOR TO INSTALLATION.
2. ALL DISTURBED AREAS ABOVE ELEVATION 3831.0 TO RECEIVE FERTILIZER, SEED AND MULCH.
3. PLACE WETLAND COVER SOIL (WC) SALVAGED FROM ADJACENT SITE IN APPROX. 5 CY PILES WHERE SHOWN. PILES APPROX. 10'x10'x1.5', 3:1 SLOPE MAX.
4. COMPLETE SEEDING, FERTILIZING AND MULCHING PRIOR TO TRANSPLANTING.
5. VEGETATION TYPES FOR SEED MIX AND TRANSPLANT ZONES ARE DESCRIBED IN THE SPECIFICATIONS, AS ARE SEQUENCING AND WATERING REQUIREMENTS.



50 0 50 100
(SCALE IN FEET)

REVEGETATION PLAN (1)
SCALE: 1"=50'-0" 8

NEW INDEX CONTOUR INTERVAL 1.0'
EXST INDEX CONTOUR INTERVAL 2.0'
MINOR CONTOUR INTERVAL 0.5'

SYM	REVISION	BY	APPR	DATE

R. MORTON — DESIGNED BY
MARCH 1997 — DATE
G. LESOFSKI — DRAWN BY
96-56 — PROJECT NO.
K. JENSEN, P.E. — CHECKED BY
CC7C005 — FILE NO.

PROJECT TITLE
ROGERS' WETLANDS
COW COULEE

SHEET TITLE
COW COULEE
REVEGETATION PLAN

SHEET
9

having any of the following objectionable features will be rejected prior to planting, and replaced at no cost to the owner:

*abrasions of the bark;
*dried root system;
*diseased or insect-infested plants;
*plants not in a viable, healthy condition.

The following table describes the species and planting density for each zone to be transplanted.

PLANTING SPECIES				
Planting Zone	**Common Name**	**Scientific Name**	**Number of Plants**	**Planting Density**
C(Cottonwood)	Narrow-leaf cottonwood	Populus augustifolia	25	1 plant/8 sq. ft.
W(Willow)	Yellow willow	Salix lutea	20	1 plant /1sq. ft.
MU (Mesic/Upland)	Shrubby cinquefoil	Potentilla fruticosa	60	1 plant/1sq. ft.
MU	American plum	Prunus americana	75	1 plant/1sq. ft.
MU	Common chokecherry	Prunus virginiana	60	1 plant/1sq. ft.
MU	Golden currant	Ribes aureum	60	1 plant/1sq. ft.
MU	Wood's rose	Rosa woodsii	100	1 plant/1sq. ft.
MU	Greasewood	Sarcobatus vermiculatus	40	1 plant/1sq. ft.
MU	Silver buffaloberry	Shepherdia argentea	60	1 plant/1sq. ft.
MU	Common snowberry	Symphoricarpos albus	100	1 plant/1sq. ft.

(2) Weed Control Fabric. Weed control fabric shall be "Lumite 994GC" weed fabric (Shaw Enterprises, 1-800-359-1912), or equivalent. About 900 feet of weed fabric will be needed to complete the plantings. Anchoring pins (staples) for the fabric shall be a minimum of 8-inch long 9 gauge wire.

(3) Seedling Protector Netting. Flexible seedling protector netting shall be Vexar netting, or equivalent. Bamboo stakes shall be used for attaching the netting.

Cow Coulee Mitigation Site

PROJECT SEED MIX - ZONE ONE Emergents & Graminoids			
Common	Scientific	Variety	Seed Mix (lb. PLS/acre)*
American sloughgrass	Beckmanii syzigachne	Egan	0.8
Beaked sedge	Carex rostrata (utriculata)		1.8
Creeping spikerush	Eleocharis palustris		1.0
Western mannagrass	Glyceria occidentalis		2.9
Olney threesquare	Scirpus americanus		3.2
Alkalai bulrush	Scirpus maritimus		2.3
Total			12.0

*Pounds "pure live seed" per acre.

PROJECT SEED MIX - ZONE TWO Graminoids			
Common	Scientific	Variety	Seed Mix (lb. PLS/acre)*
Slender wheatgrass	Agropyron trachycaulum	Pryor	1.0
Inland saltgrass	Distichlis stricta		0.4
Western mannagrass	Glyceria occidentalis		1.1
Basin wildrye	Elymus cinereus	Magnar	1.7
Creeping wildrye	Elymus triticoides	Shoshone	4.3
Western wheatgrass	Agropyron smithii		1.0
Big bluegrass	Poa ampla	Sherman	0.3
Nuttail alkaligrass	Puccinella airoides (nutalliana)		0.1
Small burnet	Sanguisorba minor		1.0
Alkali sacaton	Sporobolus airoides	Salado	0.1
Green needle-grass	Stipa viridula	Lodorm	1.2
Total			12.2

*Pounds "pure live seed" per acre.

Appendix E

BIRD SURVEY PROTOCOL
MACROINVERTEBRATE SAMPLING PROTOCOL
GPS PROTOCOL

MDT Wetland Mitigation Monitoring
Cow Coulee
Townsend, Montana

LAND & WATER

BIRD SURVEY PROTOCOL

The following is an outline of the MDT Wetland Mitigation Site Monitoring Bird Survey Protocol. Though each site is vastly different, the bird survey data collection methods must be standardized to a certain degree to increase repeatability. An Area Search within a restricted time frame will be used to collect the following data: a bird species list, density, behavior, and habitat-type use. There will be some decisions that team members must make to fit the protocol to their particular site. Each of the following sections and the desired result describes the protocol established to reflect bird species use over time.

Species Use within the Mitigation Wetland: Survey Method

Result: To conduct a bird survey of the wetland mitigation site within a restricted period of time and the budget allotment.

Sites that can be circumambulated or walked throughout.

These types of sites will include ponds, enhanced historic river channels, wet meadows, and any area that can be surveyed from the entirety of its perimeter or walked throughout. If the wetland is not uncomfortably inundated, conduct several "meandering" transects through the site in an orderly fashion (record the number and approximate location/direction of the transects in the field notebook; they do not have to be formalized or staked). If a very small portion of the site cannot be crossed due to inundation, this method will also apply. Though the sizes of the site vary, each site will require surveying to the fullest extent possible within a set time limit. The optimum times to conduct the survey are in the morning hours. Conduct the survey from sunrise to no later than 11:00 AM. (Note: some sites may have to be surveyed in the late afternoon or evening due to time constraints or weather; if this is the case, record the time of day and include this information in your report discussion.) If the survey is completed before 11:00 AM and no additions are being made to the list, then the task is complete. The overall limiting factor regarding the number of hours that are spent conducting this survey is the number of budgeted hours; this determination must be made by site by each individual.

In many cases, binoculars will be the only instrument that is needed to identify and count the birds using the wetland. If the wetland includes deep water habitat that can not be assessed with binoculars, then a scope and tripod are necessary. If this is the case, establish as many lookout posts as necessary from key vantage points to collect the data. Depending on the size of the open water, more time may be spent viewing the mitigation area from these vantage points than is spent walking the peripheries of more shallow-water wetlands.

Sites that cannot be circumambulated.

These types of sites will include large-bodied waters, such as reservoirs, particularly those with deep water habitat (>6 ft) close to the shore and no wetland development in that area of the shoreline. If one area of the reservoir was graded in such a way to create or enhance the development of a wetland, then that will be the area in which the ambulatory bird survey is conducted. The team member must then determine the length of the shoreline that will be surveyed during each visit.

As stated above in the ambulatory site section, these large sites most likely will have to be surveyed from established vantage points.

Species Use within the Mitigation Wetland: Data Recording

Result: A complete list of bird species using the site, an estimate of bird densities and associated behaviors, and identification of habitat use.

1. Bird Species List

Record the bird species on the Bird Survey - Field Data Sheet using the appropriate 4-letter code of the common name. The coding uses the first two letters of the first two words of the birds' common name or if one name, the first four (4) letters. For example, mourning dove is coded MODO and mallard is MALL. If an unknown individual is observed, use the following protocol and define your abbreviation at the bottom of the field data sheet: unknown shorebird: UNSB; unknown brown bird (UNBR); unknown warbler (UNWA); unknown waterfowl (UNWF). For a flyover of a flock of unknown species, use a term that describes the birds' general characteristics and include the approximate flock size in parentheses; do not fill in the habitat column. For example, a flock of black, medium-sized birds could be coded: UNBB / FO (25). You may also note on the data sheet if that particular individual is using a constructed nest box.

2. Bird Density

In the office, sum the Bird Survey – Field Data Sheet data by species and by behavior. Record this data in the Bird Summary Table.

3. Bird Behavior

Bird behavior must be identified by what is known. When a species is simply observed, the behavior that it is immediately exhibiting is what is recorded. Only behaviors that have discreet descriptive terms should be used. The following terms are recommended: breeding pair individual (BP); foraging (F); flyover (FO); loafing (L; e.g. sleeping, roosting, floating with head tucked under wing are loafing behaviors); and, nesting (N). If more behaviors are observed that do have a specific descriptive word, use them and we will add it to the protocol; descriptive words or phrases such as "migrating" or "living on site" are unknown behaviors.

4. Bird Species Habitat Use

We are interested in what bird species are using which particular habitat within the mitigation wetlands. This data is easily collected by simply recording what habitat the species was initially observed. Use the following broad category habitat classifications: aquatic bed (AB - rooted floating, floating-leaved, or submergent vegetation); forested (FO); marsh (MA – cattail, bulrush, emergent vegetation, etc. with surface water); open water (OW – primarily unvegetated); scrub-shrub (SS); and upland buffer (UP); wet meadow (WM – sedges, rushes, grasses with little to no surface water). If other categories are observed onsite that are not suggested here, we will make a new category next year.

AQUATIC INVERTEBRATE SAMPLING PROTOCOL

Equipment List

- D-frame sampling net with 1 mm mesh. Wildco is a good source of these.
- Spare net.
- 1-liter plastic sample jars, wide-mouth. VWR has these: catalog #36319-707.
- 95% ethanol: Northwest Scientific in Billings carries this.

All these other things are generally available at hardware or sporting goods stores. Make the labels on an ink jet printer preferably.

- hip waders.
- pre-printed sample labels (printed on Rite-in-the-Rain or other coated paper, two labels per sample).
- pencil.
- plastic pail (3 or 5 gallon).
- large tea strainer or framed screen.
- towel.
- tape for affixing label to jar.
- cooler with ice for sample storage.

Site Selection

Select the sampling site with these considerations in mind:

- Select a site accessible with hip waders. If substrates are too soft, lay a wide board down to walk on.
- Determine a location that is representative of the overall condition of the wetland.

Sampling

Wetland invertebrates inhabit the substrate, the water column, the stems and leaves of aquatic vegetation, and the water surface. Your goal is to sweep the collecting net through each of these habitat types, and then to combine the resulting samples into the 1-liter sample jar.

Dip out about a gallon of water into the pail. Pour about a cup of ethanol into the sample jar. Fill out the top half of the sample labels, using pencil, since ink will dissolve in the ethanol.

Ideally, you can sample a swath of water column from near-shore outward to a depth of approximately 3 feet with a long sweep of the net, keeping the net at about half the depth of the water throughout the sweep. Sweep the water surface as well. Pull the net through a vegetated area, beneath the water surface, for at least a meter of distance.

Sample the substrate by pulling the net along the bottom, bumping it against the substrate several times as you pull.

This step is optional, but it gives you a chance to see that you've collected some invertebrates. Rinse the net out into the bucket, and look for insects, crustaceans, etc. If necessary, repeat the sampling process in a nearby location, and add the net contents to the bucket. Remember to sample all four environments.

Sieve the contents of the bucket through the straining device and pour or carefully scrape the contents of the strainer into the sample jar.

If you skip the bucket-and-sieve steps, simply lift handfuls of material out of the sampling net into the jars. In either case, please include some muck or mud and some vegetation in the jar. Often, you will have collected a large amount of vegetable material. If this is the case, lift out handfuls of material from the sieve into the jar, until the jar is about half full. Please limit material you include in the sample, so that there is only a single jar for each sample.

Top off the sample jar with enough ethanol to cover all the material in the jar. Leave as little headroom as possible.

It is not necessary to sample habitats in any specified order. Keep in mind that disturbing the habitats prior to sampling will chase off the animals you are trying to capture.

Complete the sample labels. Place one label inside the sample jar and tape the other label securely to the outside of the jar. Dry the jar before attaching the outer label if necessary. In some situations, it may be necessary to collect more than one sample at a site. If you take multiple samples from the same site, clearly indicate this by using individual sample numbers, along with the total number of samples collected at the site (e.g. Sample #3 of 5 total samples).

Photograph the sampled site.

Sample Handling/Shipping

- In the field, keep collected samples cool by storing them in a cooler. Only a small amount of ice is necessary.
- Inventory all samples, preparing a list of all sites and enumerating all samples, before shipping or delivering to the laboratory.
- Deliver samples to Rhithron.

GPS Mapping and Aerial Photo Referencing Procedure

The wetland boundaries, photograph location points and sampling locations were field located with mapping grade Trimble Geo III GPS units. The data was collected with a minimum of three positions per feature using Course/Acquisition code. The collected data was then transferred to a PC and differentially corrected to the nearest operating Community Base Station. The corrected data was then exported to ACAD drawings in Montana State Plain Coordinates NAD 83 international feet.

The GPS positions collected and processed had a 68% accuracy of 7 feet except in isolated areas of Tasks .008 and .011, where it went to 12 feet. This is within the 1 to 5 meter range listed as the expected accuracy of the mapping grade Trimble GPS.

Aerial reference points were used to position the aerial photographs. This positioning did not remove the distortion inherent in all photos; this imagery is to be used as a visual aide only. The located wetland boundaries were given a final review by the wetland biologist and adjustments were made if necessary.

Any relationship of features located to easement or property lines are not to be construed from these figures. These relationships can only be determined with a survey by a licensed surveyor.