MONTANA DEPARTMENT OF TRANSPORTATION
WETLAND MITIGATION MONITORING REPORT: YEAR 2004

Little Muddy
Cascade County, Montana

Prepared for:

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

Prepared by:

LAND & WATER CONSULTING
~ A DIVISION OF PBS&J
P.O. Box 239
Helena, MT 59624

June 2005

Project No: B43054.00 - 0302

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LAND & WATER

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1.0 INTRODUCTION

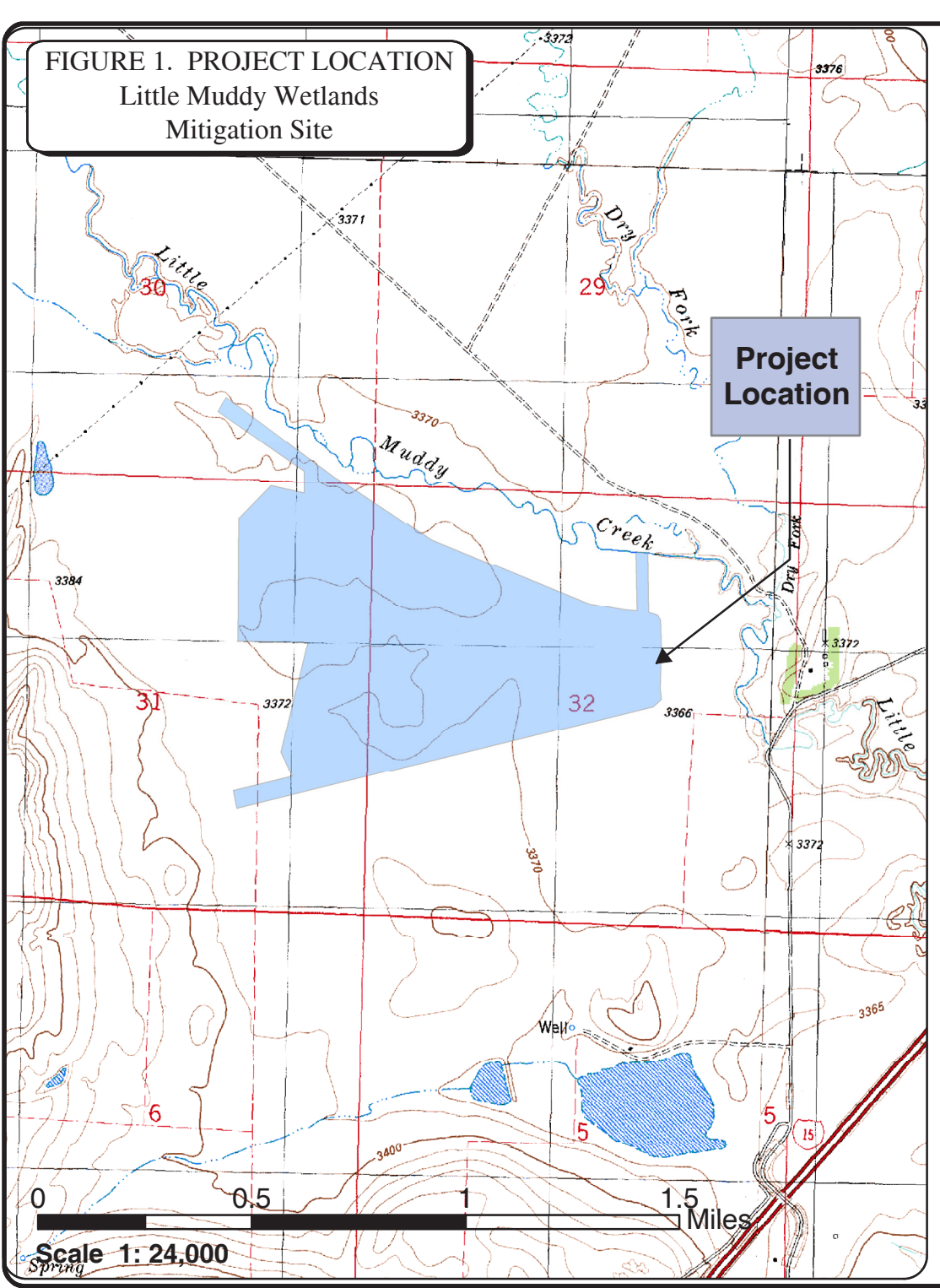
The Little Muddy Creek wetland mitigation project was constructed in 2004 by Ducks Unlimited and the property owners. The purpose of the project is to create wetland habitat for migratory birds and to serve as a wetland mitigation bank for the Montana Department of Transportation (MDT). The MDT is willing to acquire approximately 63.57 acres of wetland credit from Ducks Unlimited for this project. MDT anticipated needing about 13.57 acres of compensatory wetland mitigation credit for impacts associated with ten different projects within the Missouri-Sun-Smith River watershed (#7), and is seeking to hold another 50 credits in reserve, for a total of 63.57 credits (MDT 2002). The Little Muddy Creek wetland project is located on private land which is approximately 1 mile west of Interstate 15 between the towns of Cascade and Ulm, Montana. (**Figure 1**). The project site straddles Sections 30, 31, and 32 of Township 19 North and Range 1 East in Cascade County.

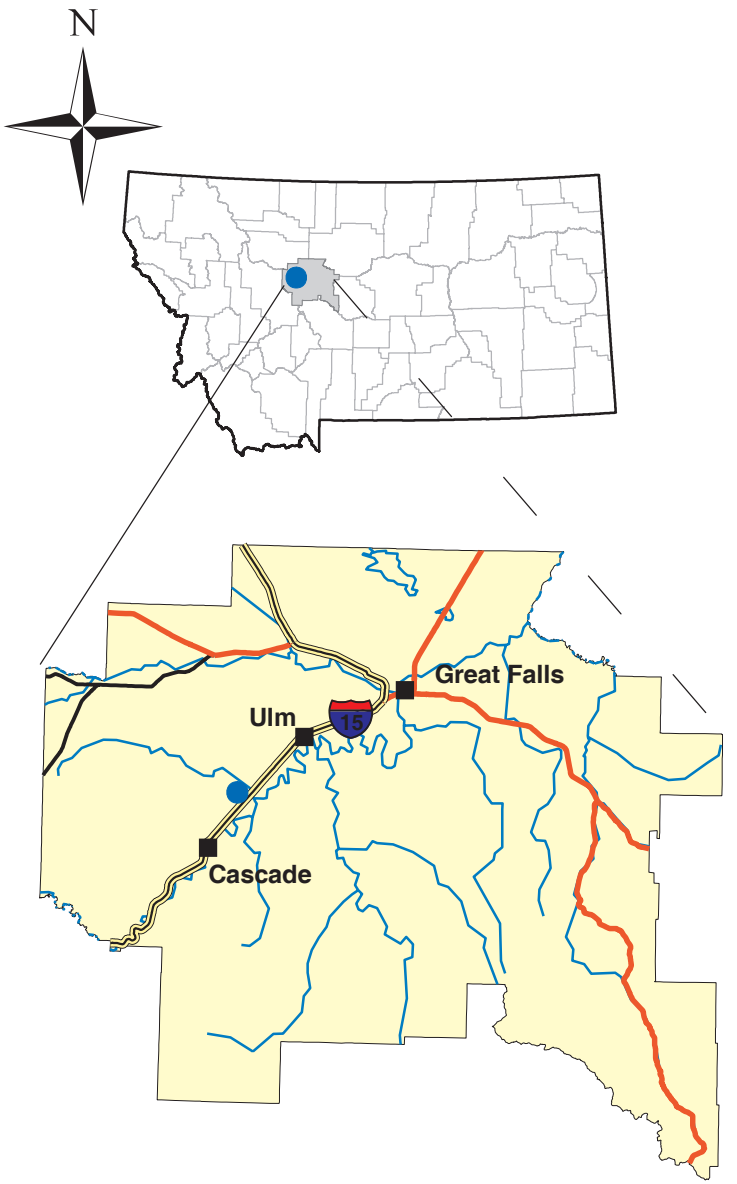
Little Muddy Creek is an intermittent stream that flows directly into the Missouri River (COE 2002). In 2004, an 88 foot-wide diversion dam was built across the entire Little Muddy Creek channel (COE 2002). The central 30 feet of the dam is elevated three feet above the existing channel bottom and the ends of the dam rise up to meet the adjacent stream banks. Water is impounded in the channel of Little Muddy Creek for a distance upstream of 2,700 feet. An inlet channel of approximately 400 feet was excavated from the point of diversion to an inlet water control structure with a headgate, at which point water flows through another excavated channel to the off-channel impoundment. The off-channel impoundment is surrounded by an 11,500-foot long berm.

At the full pool elevation, the off-channel impoundment is anticipated to have a surface area of about 216 acres, a depth of five feet, and a maximum water storage volume of 387 acre-feet. To create this wetland, a maximum of 35 cubic foot per second (cfs) of water can be diverted during spring flows (COE 2002). When Little Muddy Creek is flowing, a minimum of 1 cfs must remain in the channel below the point of diversion. Upon filling the site, all streamflow continues downstream. No diversion of water is allowed after June 1st of each year. Further, no diversion is allowed when the combined flow of the Missouri River near Ulm and the Sun River near Vaughn totals less than 7,880 cfs.

Prior to project implementation no wetland habitat existed within the main project site; however, three emergent wetlands did occur in association with Little Muddy Creek near the proposed project structures and a narrow wetland fringe occurred along most of Little Muddy Creek (LWC 2002). Target wetland communities to be produced at the site include open water/aquatic bed and shallow marsh/wet meadow. This report documents the first year of monitoring at the site. However, as combined flows in Missouri and Sun rivers at Ulm and Vaughn did not exceed 7,880 cfs by June 1, no water was turned into the site. Consequently, this first year monitoring report largely documents baseline conditions.

FIGURE 1. PROJECT LOCATION
Little Muddy Wetlands
Mitigation Site





PROJECT #: 330054.302
DATE: Feb 2005
LOCATION:
PROJECT MANAGER: A. Pipp
DRAWN BY: L. Lundquist

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METHODS

2.1 Monitoring Dates and Activities

The site was visited on June 4th and July 14th of 2004. All information contained on the Wetland Mitigation Site Monitoring Form was collected during these two site visits (**Appendix B**). Monitoring activity locations are illustrated on **Figure 2, Appendix A**. Activities conducted and information collected included: wetland delineation; vegetation community mapping; vegetation transect; soils data; hydrology data; bird and general wildlife use; photograph points; and (non-engineering) examination of the dike structure. As no wetland habitat had yet established within the monitoring area, a wetland functional assessment was not performed.

2.2 Hydrology

Hydrologic indicators were evaluated during the mid-season visit on July 14, 2004. Wetland hydrology indicators were recorded using procedures outlined in the COE 1987 Wetland Delineation Manual (Environmental Laboratory 1987). Hydrology data were recorded on COE Routine Wetland Delineation Data Forms and on the mitigation site monitoring form (**Appendix B**).

There are no groundwater monitoring wells at the site. Soil pits dug for wetland delineation also reveal the presence of groundwater if occurring within 18 inches from the ground surface; data is recorded on the routine wetland delineation data form (**Appendix B**).

2.3 Vegetation

General dominant species-based vegetation community types were delineated in the field during the spring and mid-summer field visits. 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**).
Annual changes in vegetation, especially the establishment and increase of hydrophytic plants, are evaluated through the use of belt transects. Two vegetation belt transects of approximately 300 feet long by 10 feet wide and 600 feet long by 10-foot wide were established in early June (**Figure 2** in **Appendix A)**. The transect locations were drawn onto the aerial photograph and location data was taken at each end point using the GPS unit. Percent cover was estimated for each successive 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%). Photographs were taken of each transect at the end-point and beginning-point during the mid-season visit (**Appendix C**).

No woody species were planted at the site. Consequently, no monitoring relative to the survival of such species was conducted.

2.4 Soils

Information on soils was obtained from the Soil Survey for Cascade County. Soils were evaluated during the mid-season visit according to procedures outlined in the COE 1987 Wetland Delineation Manual. In the field, surface soils were evaluated for signs of wetland formation during the mid-season visit. If wetland indicators for hydrology and plants were found then a soil pit was dug to look for evidence of hydric soil formation. Soil data was then recorded on the COE Routine Wetland Delineation form.

2.5 Wetland Delineation

Wetland delineation was conducted during the mid-season visit according the 1987 COE Wetland Delineation Manual. The monitoring area was 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 a COE Routine Wetland Delineation Data Form (**Appendix B**). Information on wetlands was also obtained from field work conducted in 2002 by Land and Water Consulting, Inc.

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 the site visits. Indirect use indicators, including tracks, scat, burrow, eggshells, skins, and bones, were also recorded. These signs 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 used. A comprehensive wildlife species list for the entire site was compiled.

2.7 Birds

Bird observations were recorded during the site visits. No formal census plots, spot mapping, point counts, or strip transects were conducted. Bird observations were recorded incidental to other monitoring activity observations, using the bird survey protocol as a general guideline (**Appendix D**). Observations were categorized by species, activity code, and general habitat association (see data forms in **Appendix B**). A comprehensive bird list was compiled using these observations.

2.8 Macro-Invertebrates

Macroinvertebrates were not sampled in 2004 because wetland conditions had not yet established and surface water outside the delivery ditch was not present within the site.

2.9 Functional Assessment

A functional assessment, using the 1999 MDT Montana Wetland Assessment Method, was proposed for this site prior to monitoring. Upon conducting the mid-season field survey, it was

determined that no wetland habitat had yet established within the monitoring area, and therefore a functional assessment was deemed unnecessary for the 2004 monitoring season.

2.10 Photographs

Photographs were taken in 2004 to show the current land use surrounding the site, the upland buffer, the monitored area, and the vegetation transect. Six photograph points were established and their location recorded with a resource grade GPS unit in 2004 (**Figure 2** in **Appendix A**). All photographs were taken using a 35 mm camera. A description and compass direction for each photograph was recorded on the wetland monitoring form.

2.11 GPS Data

During the 2004 monitoring season, survey points were collected with a resource grade GPS unit at the vegetation transect's beginning and ending locations. GPS point and survey data from Ducks Unlimited was used to rectify MDT aerial photographs taken during the 2004 flight, which form the base map for the project area.

2.12 Maintenance Needs

The diversion, excavated channels, and 11,500-foot long berm were built in winter of 2003. In addition, the berm was seeded with an upland plant mix. These were examined during the 2004 site visits for obvious signs of breaching, damage, or other problems. This did not constitute an engineering-level structural inspection, but rather a cursory examination.

3.0 RESULTS

3.1 Hydrology

Little Muddy Creek is an intermittent stream. During the mid-July site visit, only small isolated pools of water were found within the ditch. These pools of water were attributed to precipitation as a dry spring precluded any release of water from Little Muddy Creek into the site. As combined flows in Missouri and Sun rivers at Ulm and Vaughn did not exceed 7,880 cfs by June 1, no water was turned into the site.

Long-term total precipitation averaged 14.77 inches from 1948 to 2004 at the Great Falls Airport weather station (#243751) (Western Regional Climate Center 2005). Average precipitation for 2003 and 2004 was measured at 10.14 and 13.97, both of which are lower than the long-term average. The amount of precipitation received from January to May may be a good predictor for hydrologic conditions at the mitigation site, as mountain snow pack reserves and flow levels in Little Muddy would determine if water can be released into the site. Overall, 2004 monthly average precipitation was often lower than the long-term monthly averages: January [2004 vs.1948-2004] was 0.23 vs. 0.77; February [2004 vs.1948-2004] was 0.06 vs.0.60; March [2004 vs.1948-2004] was 0.29 vs.0.97; April [2004 vs.1948-2004] was 1.06 vs.1.36; and May [2004 vs.1948-2004] was 2.91 vs.2.44.

3.2 Vegetation

Historical aerial photographs show that the native vegetation of mixed grass- and shrub-land was converted into cropland sometime between 1937 and 1950 (LWC 2002). Since conversion, the project site has been solely used for dryland farming and possibly for occasional grazing (LWC 2002). In the past, the property was probably planted with domestic barley and some wheat. In present times, the property has not been grazed, but has been planted with native grass and crop species (LWC 2002).

The entire project area is comprised of upland vegetation dominated by herbaceous species, especially grasses. Plants observed in 2004 were identified and a species list compiled, which serves as baseline information for this project (**Table 1**).

Vegetation transect results are detailed in the attached data form in **Appendix B,** and are summarized in **Charts 1 and 2**. Grasses dominate the site and compose three general zones: *Elymus*, *Festuca*, and *Agropyron*. Five primary vegetation types, all upland, were identified at the site in 2004. Vegetation types *Elymus varnensis* (Type 1), *Festuca* (Type 2), and *Kochia scoparia* (Type 3) occur along Transect 1 (**Chart 1**). Vegetation types *Iva axillaris* (Type 4) and *Agropyron cristatum* (Type 5) occur along Transect 2 (**Chart 2**).

Table 1: ***2004 Little Muddy Mitigation Site vegetation species list.***

Scientific Name	Region 9 (Northwest) Wetland Indicator
Agropyron cristatum	---
Elymus hispidus (syn. *Agropyron intermedium*)	---
Agropyron smithii	FACU
Arctium minus	---
Artemisia frigida	---
Aster pansus	FAC+
Atriplex rosea (A. argentea)	FACU- (FAC-)
Avena spp.	---
Bromus inermis	---
Cardaria pubescens	---
Cirsium arvense	FACU+
Elymus varnensis	---
Festuca spp.	---
Grindelia squarrosa	FACU
Helianthus annuus	FACU+
Hordeum jubatum	FAC+
Iva axillaris	FAC
Kochia scoparia	FAC
Lactuca serriola	FAC-
Medicago sativa	---
Melilotus officinale	FACU
Polygonum spp.	---
Rosa spp.	---
Rumex crispus	FACW
Salsola iberica (syn. *S. kali*)	FACU
Sisymbrium altissimum	FACU-
Tragopogon dubois	---

Chart 1: ***Transect map showing vegetation types of Transect 1 from start (0 feet) to end (585 feet) for 2004.***

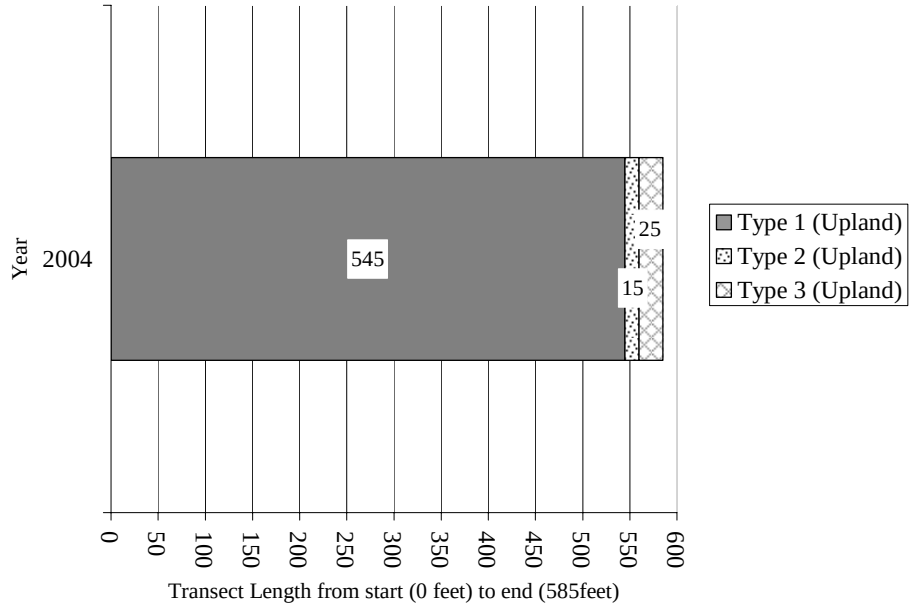
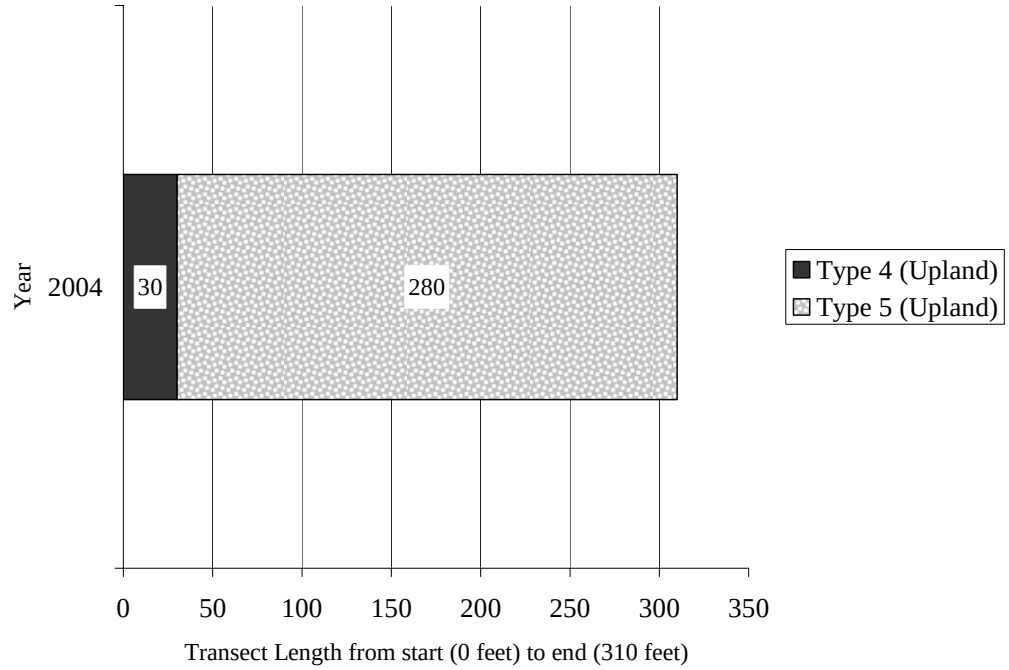


Chart 2: ***Transect maps showing vegetation types of Transect 2 from start (0 feet) to end (310 feet) for 2004.***



3.3 Soils

According to the Soil Survey for Cascade County, the project site is composed of three soil map units as follows (USDA 1982):

(10) ***Absher-Noble Complex, 0-5% slopes***:
This map unit occurs on nearly level to moderately sloping soils on terraces and foot slopes and in swales. The map unit is made up of approximately 50% Absher clay loam and 30% Nobe silty clay. Surface runoff is rated as medium, wind erosion hazard as slight, and water erosion hazard ranges from slight to moderate. This soil type is best suited as rangeland.

(143) ***Marvan Clay, 0-2% slopes***:
This map unit occurs on nearly level terraces and fans. Surface run-off is rated as slow, wind erosion hazard as moderate, and water erosion hazard as slight. This soil type is best suited for dryland farming of barley, wheat, hay, and pasture.

(119) ***Lallie Silty Clay Loam***:
This map unit occurs on nearly level terraces. It is prone to flooding in spring and during the growing season the water table may be within 3 feet of the surface. If cultivated the surface layer is cloddy and preparing the seedbed may be difficult. Surface runoff is rated as very slow, wind erosion hazard as slight, and water erosion hazard as slight. This soil type is best suited for hay and pasture production with some small grain production.

These soil types are conducive for creating ponds due to their high clay content and low permeability. Soils examined in the project area were dry, with no signs of inundation or other hydric indicators.

3.4 Wetland Delineation

Prior to project implementation, no wetland habitat existed within the main project site; however, three small emergent wetlands did occur in association with Little Muddy Creek near the project structures and a narrow wetland fringe bordered most of Little Muddy Creek (LWC 2002). None were filled in association with the project. Because of a dry spring in 2004, water was not released into the project site from Little Muddy Creek. Wetlands did not develop, and none were delineated, within the project limits. Consequently, no wetland map is provided in this 2004 report.

3.5 Wildlife

Direct observations and signs indicating use were recorded in 2004 for all wildlife species (**Table 2**; **Appendix B)**. The 2004 data represents baseline information for this project site. Horned Lark (*Eremophila alpestris*) and Western Meadowlark (*Sturnella neglecta*) were abundant throughout the monitoring site. During both field visits, several bird species were found off-site along Little Muddy Creek or the dammed water at the inflow and outflow to the project: one Canada Goose (*Branta Canadensis*), three Red-winged Blackbirds (*Agelaius*

phoeniceus), one Marbled Godwit (*Limosa fedoa*), seven Mourning Doves (*Zenaida macroura*), about ten Mallards (*Anas platyrhynchos*), at least two killdeer (*Charadrius vociferous*), and one American Avocet (*Recurvirostra americana*).

Many Pronghorn (*Antilocapra americana*), one foraging Coyote (*Canis latrans*), and a Plains Garter Snake (*Thamnophis radix*) were observed within the monitoring area. Western Chorus Frog (*Pseudacris triseriata*) were heard along Little Muddy Creek, outside of the project site.

Table 2: ***Fish and wildlife species observed within the Little Muddy Wetland Mitigation Site in 2004.***

FISH, AMPHIBIANS, REPTILES
Plains Garter Snake (*Thamnophis radix*)
BIRDS
Common Raven (*Corvus corax)* Horned Lark (*Eremophila alpestris*) Vesper Sparrow (*Pooecetes gramineus*) Western Meadowlark (*Sturnella neglecta*)
MAMMALS
American Badger (*Taxidea taxus*) [excavations only] Coyote (*Canis latrans*) Richardson's Ground Squirrel (*Spermophilus richardsonii*) Pronghorn (*Antilocapra americana*)

3.6 Macro-Invertebrates

Macroinvertebrates were not sampled in 2004 because wetland conditions had not yet established and surface water outside the delivery ditch was not present within the site.

3.7 Functional Assessment

As no wetland habitat occurs within the monitoring area, a functional assessment form was not completed for this site.

3.8 Photographs

Representative photos taken from photo-points and transect ends are provided in **Appendix C**. A 2004 aerial photograph is also provided in **Appendix C**.

3.9 Maintenance Needs / Recommendations

The berm, diversion structures, excavated channels, and inlet/outlet structures were in excellent condition during the mid-season visit. Seeded plants were just starting to germinate on the berm during mid-July and establishment seems to be patchy in distribution. The spring of 2004 was extremely dry and precipitation was insufficient to support the proposed wetland creation. Monitoring of the site will continue to document any changes that may occur as a result of increased water delivery from Little Muddy Creek in spring of 2005 and from precipitation.

3.10 Current Credit Summary

In its first year, no wetland or other aquatic habitat had developed at the site. Therefore, no wetland credit, COE approved or otherwise, was attributed to this project in 2004.

4.0 REFERENCES

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

Land & Water Consulting, Inc. (LWC). 2002. Baseline Documentation Report for the Little Muddy Creek Wetland Mitigation Site. Prepared for Ducks Unlimited, Bismarck, North Dakota. Helena, Montana.

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.

U.S. Department of Agriculture (USDA). 1982. *Soil Survey of Cascade County Area, Montana*. Soil Conservation Service in cooperation with Montana Agricultural Experiment Station.

Western Regional Climate Center (WRCC). 2005. Temperature and precipitation data for Great Falls weather station, Montana (248455). Obtained from http://www.wrcc.dri.edu/CLIMATEDATA.html on January 25th and June 8th.

Appendix A

FIGURE 2

MDT Wetland Mitigation Monitoring
Little Muddy
Cascade County, Montana

Figure 2 Monitoring Activities Locations

PROJECT NAME
MDT Little Muddy Wetland Mitigation

DRAWING TITLE
Monitoring Activities Locations

PROJ NO: 330054	DRAWN: RAA
LOCATION:	PROJ MGR: J.Berglund
SCALE: 1"=700ft	CHECKED: AP / APPVD: JB
FILE NAME:L:\330054.302 Muddy\dwg\land water copy.dwg	

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

FIGURE
2 OF

REV -
Jun/28/2005

Appendix B

2004 WETLAND MITIGATION SITE MONITORING FORM
2004 BIRD SURVEY FORM

MDT Wetland Mitigation Monitoring
Little Muddy
Cascade County, Montana

LWC / MDT WETLAND MITIGATION SITE MONITORING FORM

Project Name: **Little Muddy Creek** Project Number: **330054.302** Assessment Date: **July 14, 2004**
Location: **9 miles SW of Ulm** MDT District: **Great Falls** Milepost: _____
Legal description: T **19 N** R **1 E** Section **30, 31, 32** Time of Day: **1000-1400**
Weather Conditions: **Sunny, Blue Sky, 85 degrees** Person(s) conducting the assessment: **A. Pipp**
Initial Evaluation Date: **6 / 4 / 04** Visit #: **1** Monitoring Year: **2004 (year 1)**
Size of evaluation area: **216± acres** Land use surrounding wetland: **dryland agriculture**

HYDROLOGY

Surface Water Source: **Little Muddy Creek**
Inundation**:** Present___ Absent**__X__** Average depths: 0.0 ft Range of depths: _
Assessment area under inundation: 0.0
Depth at emergent vegetation-open water boundary: **NA – no emergent vegetation**
If assessment area is not inundated are the soils saturated w/in 12" of surface**:** Yes___No**_X**
Other evidence of hydrology on site (drift lines, erosion, stained vegetation etc.):
___**none**_____

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:

VEGETATION COMMUNITIES

Community No.: **_1_** Community Title (main species): **Elymus varnensis**_____

Dominant Species	% Cover	Dominant Species	% Cover
Elymus varnensis	> 50	Melilotus officinale	1 - 5
Festuca spp.	1 - 5	Sisymbrium altissimum	1 - 5
Hordeum jubatum	< 1	Tragopogon dubois	<1

COMMENTS/PROBLEMS: Upland vegetation _____

Community No.: **__2_** Community Title (main species): **_Festuca _____**

Dominant Species	% Cover	Dominant Species	% Cover
Elymus varnensis	1 - 5		
Festuca spp.	> 50		
Lactuca serriola	< 1		

COMMENTS/PROBLEMS: Upland vegetation _____

Community No.: **_3__** Community Title (main species): **Kochia scoparia _____**

Dominant Species	% Cover	Dominant Species	% Cover
Avena spp.	6 - 10	Kochia scoparia	> 50
Festuca spp.	1 - 5	Lactuca serriola	1 - 5
Helianthus annuus	6 - 10	Polygonum spp.	1 - 5

COMMENTS/PROBLEMS: upland vegetation_____

Community No.: **_4_** Community Title (main species): **Iva axillaris _____**

Dominant Species	% Cover	Dominant Species	% Cover
Agropyron cristatum	6 - 10		
Iva axillaris	21 - 50		
Lactuca serriola	1 - 5		

COMMENTS/PROBLEMS: Disturbed upland vegetation_____

Community No.: **_5__** Community Title (main species): **Agropyron cristatum _____**

Dominant Species	% Cover	Dominant Species	% Cover
Agropyron cristatum	> 70	Kochia scoparia	> 50
Elymus hispidus	6 - 10	Lactuca serriola	< 1

COMMENTS/PROBLEMS: upland vegetation_____

Additional Activities Checklist:

_ _ Record and map vegetative communities on air photo

COMPREHENSIVE VEGETATION LIST

Plant Species	Vegetation Community Number(s)	Plant Species	Vegetation Community Number(s)
Agropyron cristatum	5		
Elymus hispidus (syn. *Agropyron intermedium*)	5		
Agropyron smithii	1-5		
Arctium minus	1-5		
Artemisia frigida	3		
Aster pansus	5		
Atriplex rosea (A. argentea)	1-5		
Avena spp.	3		
Bromus inermis	1-5		
Cardaria pubescens	1-5		
Cirsium arvense	1-5		
Elymus varnensis	1, 2		
Festuca spp.	1, 2		
Grindelia squarrosa	1-5		
Helianthus annuus	3; inlet channel		
Hordeum jubatum	1-5		
Iva axillaris	1-5		
Kochia scoparia	3		
Lactuca serriola	2, 3, 5		
Medicago sativa	1-5		
Melilotus officinale	1-5		
Polygonum spp.	inlet channel		
Rosa spp.	1-5; inlet channel		
Rumex crispus	inlet channel		
Salsola iberica (syn. *S. kali*)	1-5		
Sisymbrium altissimum	1-5		
Tragopogon dubois	1		

COMMENTS/PROBLEMS: _____

PLANTED WOODY VEGETATION SURVIVAL

Species	Percent Survival	Mortality Causes
NA		

COMMENTS/PROBLEMS: NA

WILDLIFE

BIRDS

(Attach Bird Survey Field Forms)

Were man made nesting structures installed? Yes ___ No__**X**__Type: _____ How many? _____
Are the nesting structures being used? Yes ___ No ___ Do the nesting structures need repairs? Yes __ No___

MAMMALS AND HERPTILES

Species	Number Observed	Indirect indication of use			
		Tracks	Scat	Burrows	Other
Pronghorn	3	yes	yes		
Badger	0			yes	
Ground Squirrel	0			yes	
Coyote	1				
Plains Garter Snake	1				

Additional Activities Checklist:
__**NA**__Macroinvertebrate sampling (if required)

COMMENTS/PROBLEMS:

PHOTOGRAPHS

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:

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

Location	Photo Frame #	Photograph Description	Compass Reading
P-1	25	From P-1 [see Photo Sheet, Photo 1]	210˚
P-1	23	From P-1 [see Photo Sheet, Photo 2]	136˚
P-1	22	Behind P-1 [see Photo Sheet, Photo 3]	360˚
P-3	20	From P-3 [see Photo Sheet, Photo 4]	130˚
Div.	18	Sheet Pile Diversion Structure [see Photo Sheet, Photo 5]	
P-4	16	Inflow Control Structure [see Photo Sheet, Photo 6]	40˚
P-4	17	Inflow Control Structure [see Photo Sheet, Photo 7]	187˚
GPS-1	15	From GPS-1 looking towards project	20˚
P-5	12	From P-5 [see Photo Sheet, Photo 8]	290˚
T-1	09	At Transect 1, Begin [see Photo Sheet, Photo 9]	320˚
T-1	10	At Transect 1, End [see Photo Sheet, Photo 10]	
P-6	07	From P-6 [see Photo Sheet, Photo 11]	283˚
T-2	04	At Transect 2, Begin [see Photo Sheet, Photo 12]	
T-2	03	At Transect 2, End [see Photo Sheet, Photo 13]	

COMMENTS/PROBLEMS: _____

_____

_____

_____

_____

_____

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:_____

WETLAND DELINEATION

(Attach Corps of Engineers delineation forms)

At each site conduct the items on the checklist below:
_**X**___ Delineate wetlands according to the 1987 Army Corps manual.
____ Delineate wetland-upland boundary on the air photo
_**NA**_ Survey wetland-upland boundary with a resource grade GPS survey

COMMENTS/PROBLEMS: _**See attached completed delineation forms. No wetland habitat on-site.**___

FUNCTIONAL ASSESSMENT

(Complete and attach full MDT Montana Wetland Assessment Method field forms; also attach abbreviated field forms, if used)

COMMENTS/PROBLEMS: __**NA**_____

MAINTENANCE

Were man-made nesting structures installed at this site? YES __ NO__**X**__
If yes, do they need to be repaired? YES ____ NO ____
If yes, describe problems below and indicate if any actions were taken to remedy the problems.

Were man-made structures built 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:

MDT WETLAND MONITORING – VEGETATION TRANSECT

Site: Little Muddy Creek Date: July 14, 2004 Examiner: A.Pipp Transect # 1

Approx. transect length: 585 feet Compass Direction from Start (Upland): _____

Vegetation type A:	Type 1 – Elymus varnensis	
Length of transect in this type:	25	feet
Species:		Cover:
Elymus varnensis		5
Festuca spp.		1
Hordeum jubatum		+
Melilotus officinale		1
Sisymbrium altissimum		1
Tragopogon dubois		+
Total Vegetative Cover:		90%

Vegetation type B:	Type 2 - Festuca	
Length of transect in this type:	15	feet
Species:		Cover:
Elymus varnensis		1
Festuca spp.		5
Lactuca serriola		+
Total Vegetative Cover:		90%

Vegetation type C:	Type 3 – Kochia scoparia	
Length of transect in this type:	545	feet
Species:		Cover:
Avena spp.		2
Festuca spp.		1
Helianthus annuus		2
Kochia scoparia		5
Lactuca serriola		1
Polygonum spp.		1
Total Vegetative Cover:		85%

Vegetation type D:		
Length of transect in this type:		feet
Species:		Cover:
Total Vegetative Cover:		

MDT WETLAND MONITORING – VEGETATION TRANSECT

Site: Little Muddy Creek Date: July 14, 2004 Examiner: A.Pipp Transect # 2

Approx. transect length: 310 feet Compass Direction from Start (Upland):

Vegetation type E:	Type 4 – Iva axillaris	
Length of transect in this type:	30	feet
Species:		Cover:
Agropyron cristatum		2
Iva axillaris		4
Lactuca serriola		1
Total Vegetative Cover:		40%

Vegetation type F:	Type 5 - Agropyron cristatum	
Length of transect in this type:	280	feet
Species:		Cover:
Agropyron cristatum		5
Elymus hispidus		2
Kochia scoparia		5
Lactuca serriola		+
Total Vegetative Cover:		80%

Vegetation type G:		
Length of transect in this type:		feet
Species:		Cover:
Total Vegetative Cover:		

Vegetation type H:		
Length of transect in this type:		feet
Species:		Cover:
Total Vegetative Cover:		

MDT WETLAND MONITORING – VEGETATION TRANSECT (back of form)

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 0 % 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:

3/01

BIRD SURVEY – FIELD DATA SHEET

Page **1** of **1**
Date: 6/4/04

SITE: Little Muddy Creek

Survey Time: 9:00am to 12:34am

Bird Species	#	Behavior	Habitat	Bird Species	#	Behavior	Habitat
Common Raven	3	FO	UP				
Horned Lark	40	F	UP				
Vesper Sparrow	2	F	UP				
Western Meadowlark	30	F	UP				

Notes:
Conditions: Sun / Clouds (50/50%), calm, dry, but recent rained had occurred.
Water flowing over diversion structure and backed up to project's inlet control structure (screw gate). Inlet
control structure was closed. A few puddles were present in ditch within project site, but probably from
from recent rains.
Water was also backed up from Little Muddy Creek's tributary to the project's outlet structure, which is
downstream of berm.
Site was completely dry.

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, US – unconsolidated shoreline

Appendix C

REPRESENTATIVE PHOTOGRAPHS

MDT Wetland Mitigation Monitoring
Little Muddy Creek
Cascade County, Montana

2004 LITTLE MUDDY WETLAND MITIGATION SITE – SHEET 1

Photo 1: At Photo Point 1 looking in 210˚ direction.

Photo 2: At Photo Point 1 looking in 136˚ direction.

Photo 3: At Photo Point 1 in 360˚, viewing outflow.

Photo 4: At Photo Point 3 in 130˚ direction.

Photo 5: Sheet Pile Diversion Structure.

Photo 6: At Photo Point 4 in 40˚ direction. At inlet control structure looking at diversion structure in background.

Photo 7: At Photo Point 4 in 187˚ direction showing inlet channel.

Photo 8: At Photo Point 5 in 290˚ direction.

Photo 9: Start of T-1 vegetation transect in ~320˚ direction.

Photo 10: End of T-1 vegetation transect in southerly direction.

Photo 11: At Photo Point 6 in 283˚ direction.

Photo 12: At start of Vegetation Transect 2 in westerly direction.

Photo 13: At end of Vegetation Transect 2, in easterly direction.

Appendix D

BIRD SURVEY PROTOCOL
GPS PROTOCOL

MDT Wetland Mitigation Monitoring
Little Muddy Creek
Cascade County, Montana

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.

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.