
MONTANA DEPARTMENT OF TRANSPORTATION WETLAND MITIGATION MONITORING REPORT: YEAR 2005

*Little Muddy Creek
Cascade County, Montana*



Prepared for:

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

December 2005

Project No: B43054.00 - 0302

Prepared by:

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



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1.0 INTRODUCTION

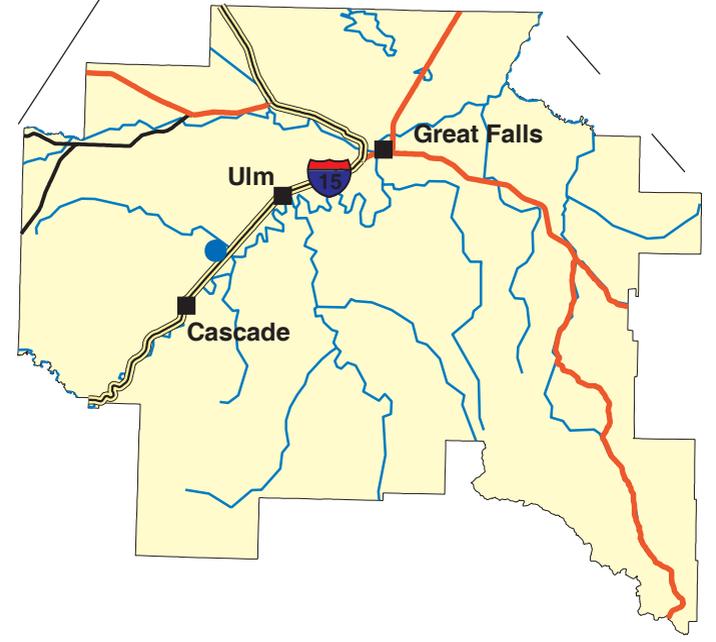
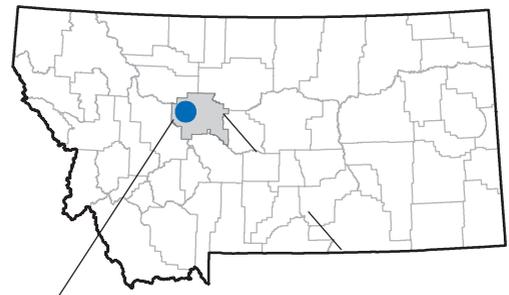
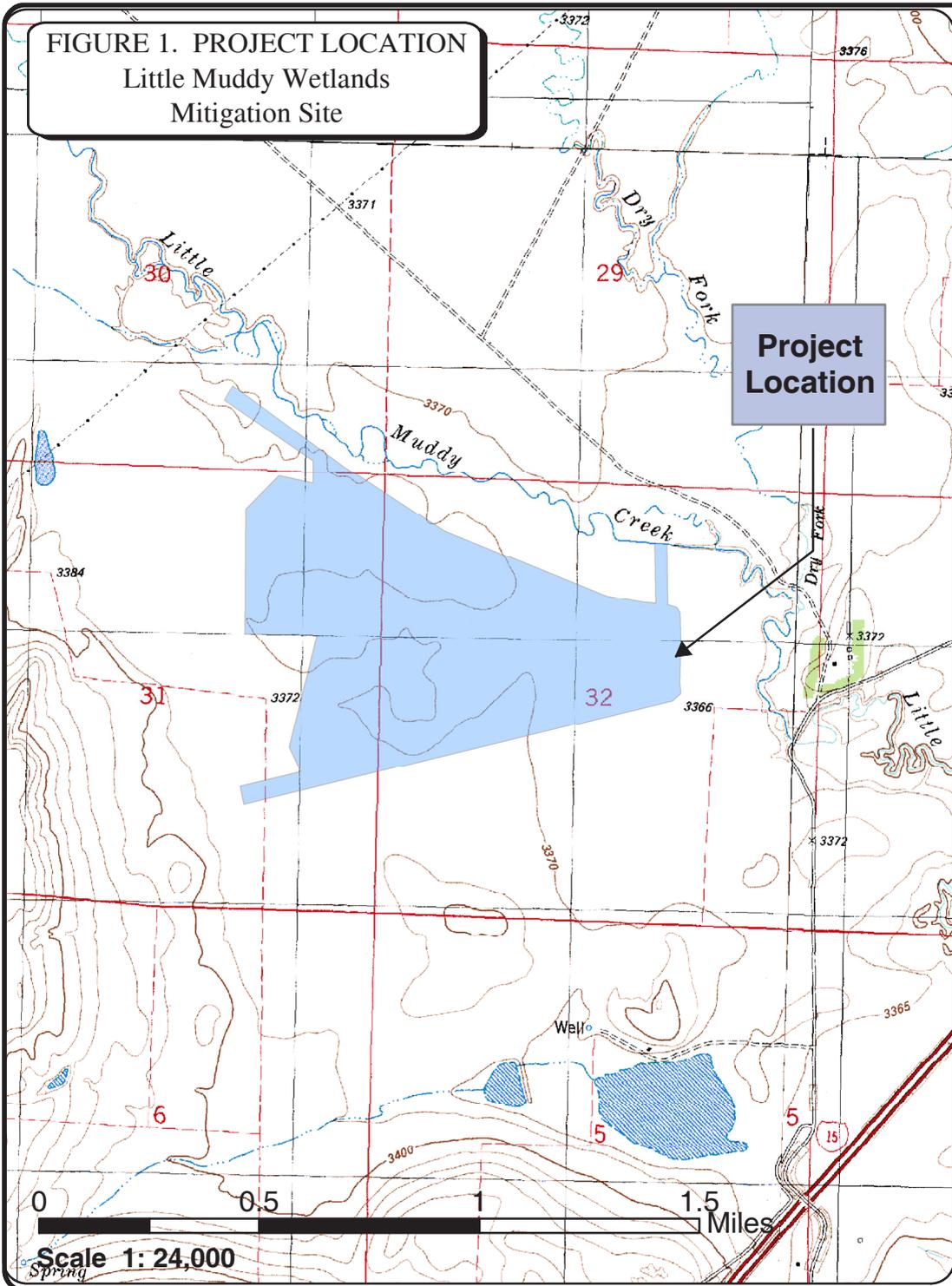
The Little Muddy Creek wetland mitigation project was constructed in 2004 by Ducks Unlimited and the property owners. The purpose of the project is to create wetland habitat for migratory birds and to serve as a wetland mitigation reserve for the Montana Department of Transportation (MDT). The MDT is 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 feet 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 second year of monitoring at the site. In Year 1 (2004), combined flows in the Missouri River at Ulm and the Sun River at Vaughn did not exceed 7,880 cfs by June 1, and therefore, no water was turned into the site. In this second year, enough precipitation occurred in May that the most of the mitigation site was inundated.

FIGURE 1. PROJECT LOCATION
 Little Muddy Wetlands
 Mitigation Site



PROJECT #: 330054.302
 DATE: FEB 2005
 LOCATION:
 PROJECT MANAGER: A. PIPP
 DRAWN BY: L. LUNDQUIST



Scale 1: 24,000

2.0 METHODS

2.1 Monitoring Dates and Activities

The site was visited on May 20th and July 12th of 2005. 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 12, 2005. 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 were also used to evaluate the presence of groundwater if occurring within 12 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, were 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 of 2004 (**Figure 2 in Appendix A**). The transect locations were recorded with a GPS unit in 2004. In 2005, these transects were inundated and the transect starts were re-established in the same location. 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 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

Soil information 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 or plants were found then a soil pit was dug to look for evidence of hydric soil formation. Soil data were 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**).

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

Per MDT instructions, macroinvertebrates were not sampled in 2004 or 2005.

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, although inundation was present, no wetland habitat had yet established within

the monitoring area, and therefore a functional assessment was deemed unnecessary for the 2005 monitoring season.

2.10 Photographs

Photographs were taken in 2005 to show the current land use surrounding the site, the upland buffer, the monitored area, and the vegetation transects. Six photograph points were established and their location recorded with a resource grade GPS unit in 2004 (**Figure 2** in **Appendix A**). Photographs were taken in 2004 and 2005 using the same direction at each photo point. 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 vegetation transect beginning and ending locations. GPS point and survey data from Ducks Unlimited was used to rectify MDT aerial photographs taken during the 2005 flight.

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 2005 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. Precipitation during the months of April and May created high enough flows in the Little Muddy, Missouri, and Sun rivers that water could be diverted into the wetland mitigation site. During the May visit water had filled the canal and flooded its banks such that at least a third of the site was inundated. Continued precipitation throughout May and June contributed to additional flooding of the site. During the July visit, 194.02 acres were inundated, about 90% of the anticipated 216 possible acres. Depth of inundation ranged from a few inches to about three feet in the main project impoundment. Depth of the deepest portion of the inlet channel was approximately six to eight feet.

From January to July 2005, the Great Falls Airport weather station (#243751) reported 9.42 inches of annual precipitation (Western Regional Climate Center 2005). In this year, precipitation recorded for April, May, and June measured 1.20, 1.09, and 6.02 inches, and was overall higher than that received in 2004. From 1948 to July 2005, the long-term annual total precipitation received at the Great Falls airport averaged 14.82 inches (Western Regional Climate Center 2005). 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.

3.2 Vegetation

Historical aerial photographs showed 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 used for dryland farming (domestic barley and wheat) and possibly for occasional grazing (LWC 2002). In the recent past and prior to 2003, the property had not been grazed, but was planted with native grass and crop species and placed into the Conservation Reserve Program (CRP) (LWC 2002).

Vegetation observed in the baseline year of 2004 and during 2005 were recorded (**Table 1**). In 2004, the berm surrounding the mitigation site consisted of bare dirt with scattered individual germinating plants. The entire area to be flooded was, in 2004, dominated by upland grasses mixed with a variety of herbaceous species. By July of 2005 most of this upland vegetation was inundated and undoubtedly many of the plant species observed in 2004 were drowned out. Although it was evident in 2005 that the composition of upland vegetation was changing, it was also observed that wetland vegetation had not yet established. Because of inundation, the five primary vegetation types identified in 2004 are no longer present on the site: *Elymus varnensis* (Type 1), *Festuca* (Type 2), and *Kochia scoparia* (Type 3), *Iva axillaris* (Type 4), and *Agropyron cristatum* (Type 5). These areas were classified in 2005 as 'Open Water'. Vegetation on the berm and along the water's edge flourished in 2005 resulting in the addition of a sixth primary vegetation type, *Kochia / Agropyron* (Type 6). Plant species observed in 2005 were noted and only two species were added to the comprehensive plant list (**Table 1**).

These changes in plant composition and hydrology between 2004 and 2005 were quantified on vegetation Transects 1 and 2 (**Tables 2 and 3**). Transect 1 (T-1) was completely under water (**Table 2, Chart 1, and Photograph 10 in Appendix C**). The only two recognizable plants were foxtail barley (*Hordeum jubatum*) and tall wheatgrass (*Elymus varnensis*). Foxtail barley was in full fruit and grew scattered within the first 50 feet of Transect 1. It was turning from light green to yellow-brown, and it was difficult to tell if it was aging naturally or dying from too much water. Tall wheatgrass occupied the rest of the transect, with the remains of 2004's flower stalks projecting above the water. Colonization by new plants was not yet observed. Transect 2 (T-2) was almost completely under water (**Chart 2; Photograph 11 in Appendix C**). Sparse upland vegetation occupied the first seven feet of T-2 and consisted mostly of tall wheatgrass and kochia (*Kochia scoparia*) (**Table 3 and Chart 2**). Following this was approximately four feet of barren soil that had been inundated with water earlier in the spring. The remainder of the transect was inundated and a few of 2004's flower stalks (probably tall wheatgrass) were projecting above the water. Colonization by new plants was also not yet observed along T-2.

Although several exotic plants occur on the perimeter of the site, no noxious plants were observed within the site or on the berm. Kochia, prickly lettuce (*Lactuca serriola*), and yellow sweet clover (*Melilotus officinale*) were commonly found exotic plants. At the inlet channel, yellow sweet clover has erupted in population size and has completely replaced the native common sunflower (*Helianthus annuus*) (compare Photographs 7 in the 2005 and 2004 reports).

Montana-listed noxious Canada thistle (*Cirsium arvense*), which was observed in 2004, was not observed in the impoundment area or on the berm in 2005.

Table 1: 2004-2005 Little Muddy Mitigation Site vegetation species list.

Scientific Name	Region 9 (Northwest) Wetland Indicator
<i>Agropyron cristatum</i> ¹	---
<i>Elymus hispidus</i> ¹ (syn. <i>Agropyron intermedium</i>)	---
<i>Agropyron smithii</i>	FACU
<i>Arctium minus</i>	---
<i>Artemisia frigida</i>	---
<i>Aster pansus</i>	FAC+
<i>Atriplex rosea</i> (<i>A. argentea</i>)	FACU- (FAC-)
<i>Avena</i> spp. ¹	---
<i>Bromus inermis</i>	---
<i>Bromus secalinus</i> or <i>B. japonicus</i> ¹ (previously misidentified as <i>Festuca</i> spp.)	
<i>Cardaria pubescens</i>	---
<i>Chenopodium rubrum</i> ²	FACW+
<i>Cirsium arvense</i>	FACU+
<i>Elymus varnensis</i> ¹	---
<i>Festuca</i> spp.	---
<i>Grindelia squarrosa</i>	FACU
<i>Helianthus annuus</i> ¹	FACU+
<i>Hordeum jubatum</i> ¹	FAC+
<i>Iva axillaris</i> ¹	FAC
<i>Kochia scoparia</i> ¹	FAC
<i>Lactuca serriola</i> ¹	FAC-
<i>Medicago sativa</i> ¹	---
<i>Melilotus alba</i> ²	
<i>Melilotus officinale</i> ¹	FACU
<i>Polygonum douglasii</i> ²	FACU
<i>Polygonum</i> spp.	---
<i>Rosa</i> spp.	---
<i>Rumex crispus</i> ¹	FACW
<i>Salsola iberica</i> (syn. <i>S. kali</i>)	FACU
<i>Sisymbrium altissimum</i>	FACU-
<i>Tragopogon dubois</i>	---

¹ Species observed in 2004 and 2005.

² Species observed only in 2005.

Table 2: Transect 1 data summary.

Monitoring Year	2004	2005 ¹
Transect Length (feet)	585	585
# Vegetation Community Transitions along Transect	2	0
# Vegetation Communities along Transect	3	0
# Hydrophytic Vegetation Communities along Transect	0	0
Total Vegetative Species	11	1
Total Hydrophytic Species	2	1
Total Upland Species	9	0
Estimated % Total Vegetative Cover	90	8
% Transect Length Comprised of Hydrophytic Vegetation Communities	0	0
% Transect Length Comprised of Upland Vegetation Communities	100	0
% Transect Length Comprised of Unvegetated Open Water	0	100
% Transect Length Comprised of Bare Substrate	0	0

¹Transect 1 consisted of only open water with scattered *Hordeum jubatum* plants that did not constitute a vegetation community and may have been in the process of dying due to flooding.

Chart 1: Transect map showing vegetation types of Transect 1 from start (0 feet) to end (585 feet) for 2005.

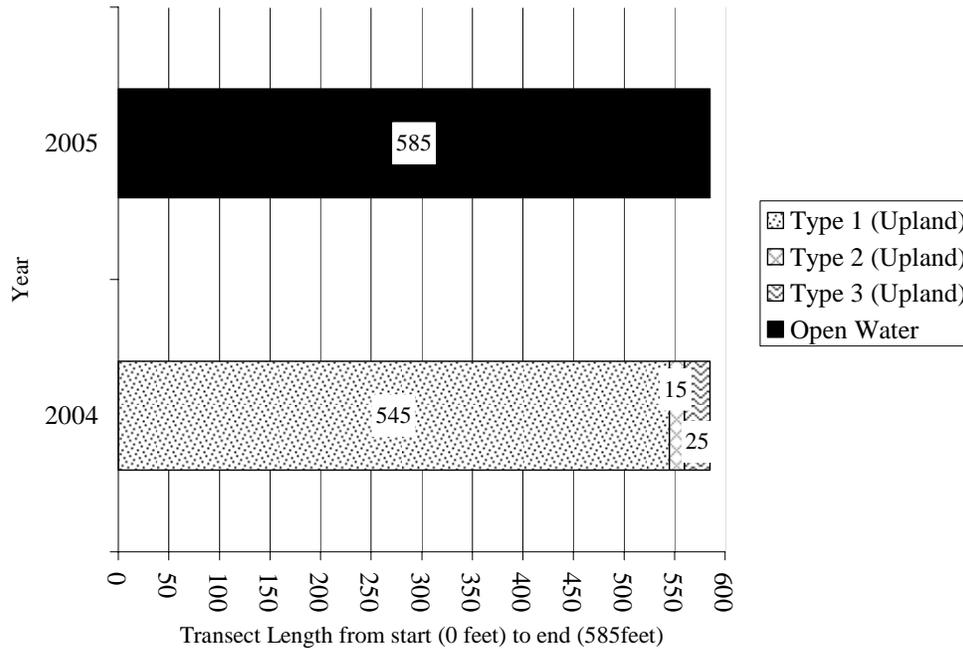
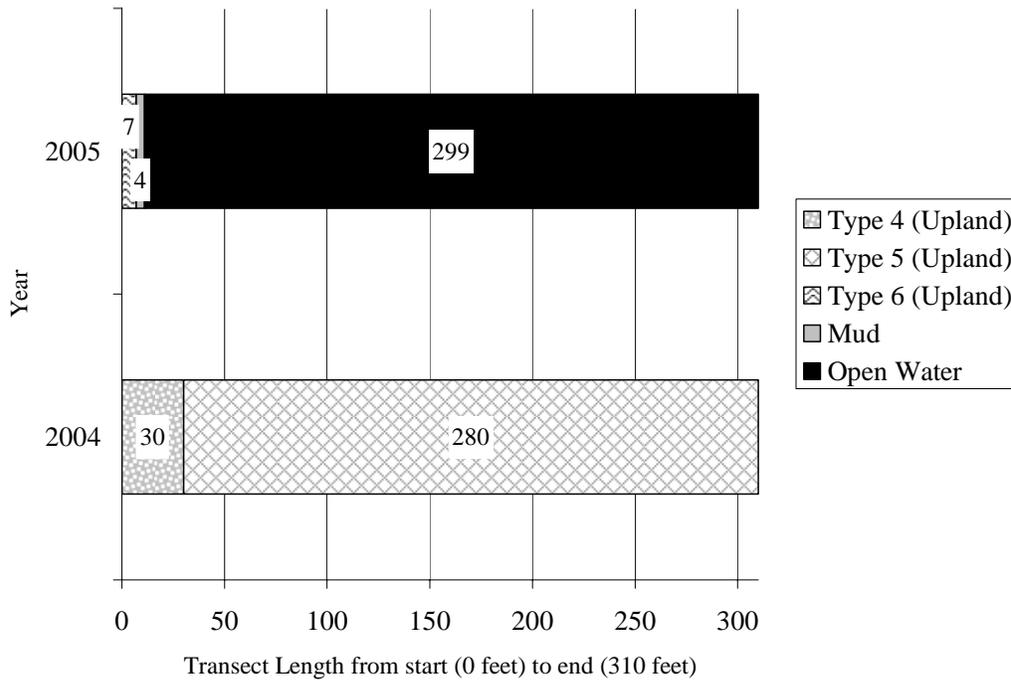


Table 3: Transect 2 data summary.

Monitoring Year	2004	2005
Transect Length (feet)	310	310
# Vegetation Community Transitions along Transect	1	2
# Vegetation Communities along Transect	2	3
# Hydrophytic Vegetation Communities along Transect	0	0
Total Vegetative Species	5	4
Total Hydrophytic Species	2	2
Total Upland Species	3	2
Estimated % Total Vegetative Cover	60	30
% Transect Length Comprised of Hydrophytic Vegetation Communities	0	0
% Transect Length Comprised of Upland Vegetation Communities	100	2
% Transect Length Comprised of Unvegetated Open Water	0	96
% Transect Length Comprised of Bare Substrate	0	1

Chart 2: Transect maps showing vegetation types of Transect 2 from start (0 feet) to end (310 feet) for 2005.



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% Noble 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 (USDA 1982). In 2005, these soil types were all inundated within the site. Soil pits were dug in both relatively dry and saturated locations along and within the site. Clay soil textures were found throughout and soil color varied very little from 2.5Y 4/2 to 2.5Y 5/2 with no mottles detected. However, the inundated soils met NRCS hydric soils Criterion 3: "Soils that are frequently (i.e., > 50% chance per year) ponded (i.e., standing water in a closed depression) for long duration (7 days to one month) or very long duration (> 1 month) during the growing season".

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). No previously delineated wetlands were filled in association with this project. Because of a dry spring in 2004, water was not released into the project site from Little Muddy Creek, and consequently no wetlands developed. In 2005, the entire site received water, but wetland plants had not yet developed. Although wetlands did not develop, the area of inundation was mapped (**Figure 3**). Water inundated 194.02 acres of the projected 216 acres in 2005 (**Figure 3**).

3.5 Wildlife

Direct observations and signs indicating use were recorded in 2004 and 2005 for all wildlife species (**Table 4; Appendix B**). A dramatic change in bird guilds were observed from 2004 to 2005. Within the site in 2004 only a few (but abundant) upland species were present: Horned Lark (*Eremophila alpestris*), Vesper Sparrow (*Pooecetes gramineus*), and Western Meadowlark (*Sturnella neglecta*). These bird species were nearly unnoticed in 2005 and had been replaced by about 20 species of shorebirds, waterfowl, gulls, and blackbirds (**Table 4**). The majority of waterfowl were found to be using the central portion (between PP 1, 2, 5, and 6) of the site where denser stalks from dead upland vegetation were projecting above the water (**Figure 2**). Use by killdeer, shorebirds, and gulls seemed heaviest along the southern portion of the site (between PP-5 and PP-6) (**Figure 2**), where feathers and bird droppings were abundant.

In vicinity of the mitigation site during May of 2005, MDT observed many species of wildlife: common carp (*Cyprinus carpio*) at the dam structure, Gray Partridge (*Perdix perdix*), Red-tailed Hawk (*Buteo jamaicensis*), Sharp-tailed Grouse (*Tympanuchus phasianellus*), Golden Eagle (*Aquila chrysaetos*), Sprague's Pipit (*Anthus spragueii*), and Bank Swallow (*Riparia riparia*).

Changes in the mammalian, amphibian, and reptile communities were also noticeable (**Table 4**). In 2002 and 2004, pronghorns (*Antilocapra americana*) were consistently observed within the site, yet in 2005 they were only observed outside the site, possibly because the site was inundated. For the first time since work began on this project in 2002, white-tailed deer (*Odocoileus virginianus*) were observed along the perimeter of the site. The plains garter snake (*Thamnophis radix*) was found in 2004, but no reptiles were observed in 2005. During the May 2005 visit many western chorus frogs (*Pseudacris triseriata*) were vocalizing inside and outside the wetland site. In July many dragonflies/damselflies were observed.

3.6 Macro-Invertebrates

Macroinvertebrates were not sampled in 2005.

3.7 Functional Assessment

As no wetlands had yet developed 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**.

Table 4: Fish and wildlife species observed within the Little Muddy Creek Wetland Mitigation Site in 2004-2005.

FISH, AMPHIBIANS, REPTILES	
Plains Garter Snake (<i>Thamnophis radix</i>) Western Chorus Frog (<i>Pseudacris triseriata</i>)	
BIRDS	
American Avocet (<i>Recurvirostra americana</i>) American Wigeon (<i>Anas americana</i>) Blue-winged Teal (<i>Anas discors</i>) Canada Goose (<i>Branta Canadensis</i>) Cinnamon Teal (<i>Anas cyanoptera</i>) Common Raven (<i>Corvus corax</i>) Franklin's Gull (<i>Larus pipixcan</i>) Gadwall (<i>Anas strepera</i>) Great Blue Heron (<i>Ardea herodias</i>) Horned Grebe (<i>Podiceps auritus</i>) Horned Lark (<i>Eremophila alpestris</i>) Killdeer (<i>Charadrius vociferous</i>) Lesser Scaup (<i>Aythya affinis</i>) Long-billed Dowitcher (<i>Limnodromus scolopaceus</i>) Mallard (<i>Anas platyrhynchos</i>)	Marbled Godwit (<i>Limosa fedoa</i>) [probably] Mourning Dove (<i>Zenaida macroura</i>) Northern Harrier (<i>Circus cyaneus</i>) Northern Pintail (<i>Anas acuta</i>) Northern Shoveler (<i>Anas clypeata</i>) Red-winged Blackbird (<i>Agelaius phoeniceus</i>) Ring-necked Duck (<i>Aythya collaris</i>) Ruddy Duck (<i>Oxyura jamaicensis</i>) Sandpiper (unidentified species) Vesper Sparrow (<i>Pooecetes gramineus</i>) Western Meadowlark (<i>Sturnella neglecta</i>) Willet (<i>Catoptrophorus semipalmatus</i>) Wilson's Phalarope (<i>Phalaropus tricolor</i>) Yellow-headed Blackbird (<i>Xanthocephalus xanthocephalus</i>)
MAMMALS	
American Badger (<i>Taxidea taxus</i>) [excavations only] Coyote (<i>Canis latrans</i>) Richardson's Ground Squirrel (<i>Spermophilus richardsonii</i>) Pronghorn (<i>Antilocapra americana</i>) White-tailed Deer (<i>Odocoileus virginianus</i>)	

Bolded species were observed in 2005. All other species were observed only in 2004.

3.9 Maintenance Needs / Recommendations

The berm, diversion structures, excavated channels, and inlet/outlet structures were in excellent condition during the mid-season visit. Water was let into the mitigation site during phases in order to prevent erosion of the berm. During the mid-July visit vegetation cover on the berm was filling in very well, though mostly by exotic species. 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 second year (but first year of inundation), no wetland habitat had developed at the site. However, by July of 2005, 194 acres or 90% of the projected wetland area was inundated (e.g., wetland hydrology had developed), and the criteria for hydric soils were met. This presence of permanent water should facilitate the development of wetlands in the coming years. Although no wetland credit, COE approved or otherwise, was attributed to this project in 2005, 194 acres

of “aquatic habitat”, in the form of inundated shallow former uplands (transitional areas), was observed over the majority of the growing season. With consistent inundation of the extent and duration observed during 2005, it is anticipated that the site will develop substantive wetland areas.

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.
- Land & Water Consulting/PBSJ (PBSJ). 2005. *Little Muddy Wetland Mitigation 2004 Monitoring Report*. Prepared for Montana Department of Transportation, Helena, Montana. June. 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. Precipitation data for Great Falls Airport weather station, Montana (243751). Obtained from <http://www.wrcc.dri.edu/CLIMATEDATA.html> on September 8th.

Appendix A

FIGURE 2

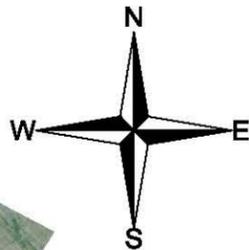
FIGURE 3

*MDT Wetland Mitigation Monitoring
Little Muddy Creek
Cascade County, Montana*

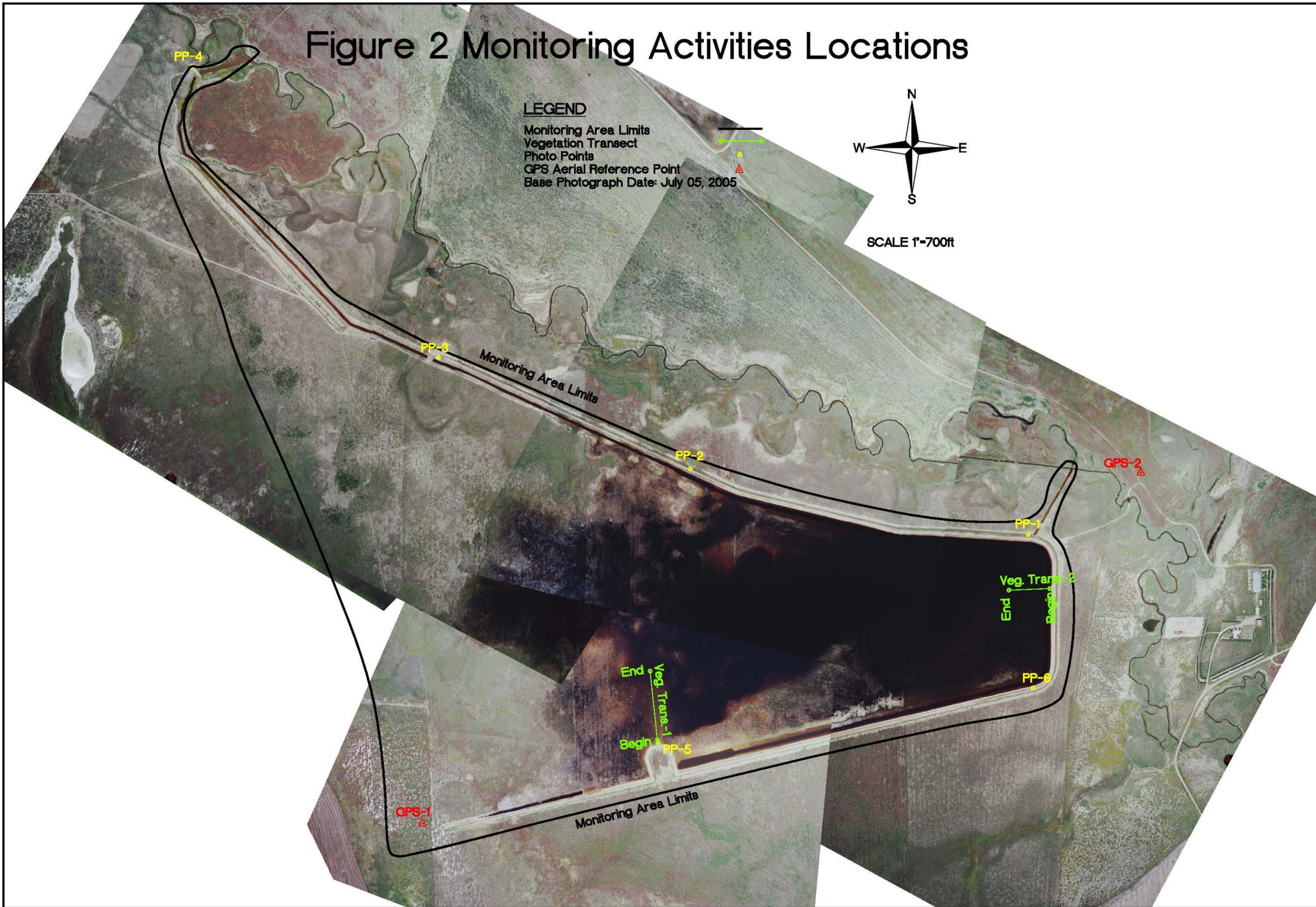
Figure 2 Monitoring Activities Locations

LEGEND

- Monitoring Area Limits
- Vegetation Transect
- Photo Points
- GPS Aerial Reference Point
- Base Photograph Date: July 05, 2005



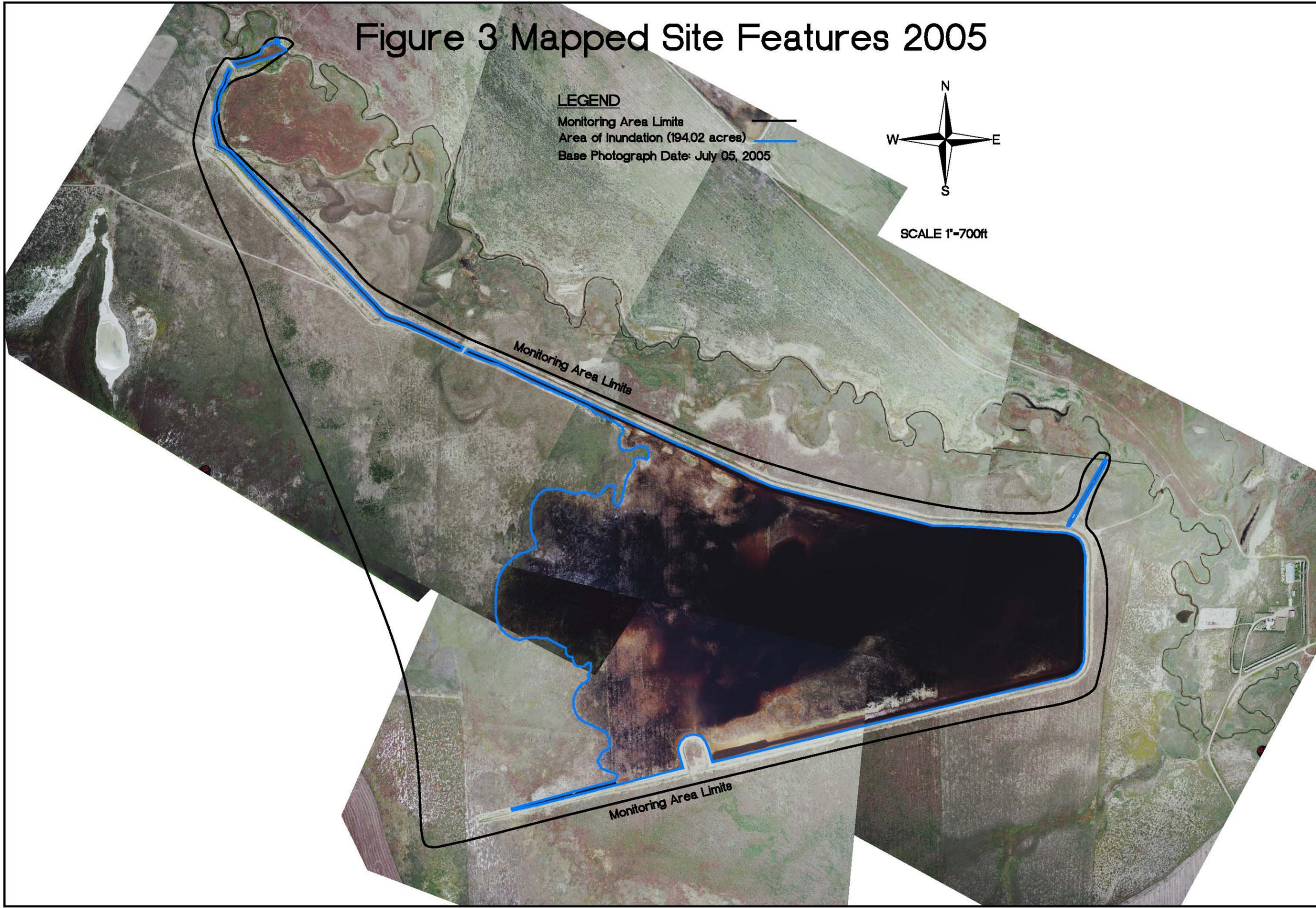
SCALE 1"=700ft



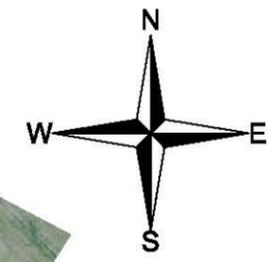
PROJECT NAME		MDT Little Muddy Creek Wetland Mitigation	
DRAWING TITLE		Monitoring Activities Locations	
PROJ NO:	330054	DRAWN:	RA/JL
LOCATION:		PROJ MGR:	J.Berglund
SCALE:	1"=700ft	CHECKED:	AP
FILE NAME:	L:\330054\302 Muddy\dwg\land water copy.dwg	APPVD:	JB

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

Figure 3 Mapped Site Features 2005



LEGEND
 Monitoring Area Limits ———
 Area of Inundation (194.02 acres) ———
 Base Photograph Date: July 05, 2005



SCALE 1"=700ft

Monitoring Area Limits

Monitoring Area Limits

PROJECT NAME MDT Little Muddy Creek Wetland Mitigation	
DRAWING TITLE Mapped Site Features	
PROJ. NO: 330054	DRAWN: LL
LOCATION:	PROJ MGR: J.Berglund
SCALE: 1"=700ft	CHECKED:
FILE NAME: L:\330054\302 Muddy\dwg\land water copy.dwg	APPVD:
A Division of 	
LAND & WATER CONSULTING, INC. P.O. BOX 8254 Missoula, MT 59807	
FIGURE 3 OF	
REV - Nov/09/2005	

Appendix B

**2005 WETLAND MITIGATION SITE MONITORING FORM
2005 BIRD SURVEY FORM
2005 COE FORMS**

*MDT Wetland Mitigation Monitoring
Little Muddy Creek
Cascade County, Montana*

LWC / MDT WETLAND MITIGATION SITE MONITORING FORM

Project Name: **Little Muddy Wetland** Project Number: **B43054.00-0302**
Assessment Date: **July 12, 2005** Person(s) conducting the assessment: **A. Pipp**
Location: **9 miles SW of Ulm** MDT District: **Great Falls** Milepost: _____
Legal Description: T **19N** R **1E** Section **30, 31, 32**
Weather Conditions: **sunny, calm, mid-eighties** Time of Day: **11:00am-3:00pm**
Initial Evaluation Date: **June 4, 2004** Monitoring Year: **2005 (Year 2)** # Visits in Year: **2**
Size of evaluation area: **265 acres** Land use surrounding wetland: **dryland agriculture**

HYDROLOGY

Surface Water Source: **Little Muddy Creek**
Inundation: **Present** Average Depth: **2.0 feet** Range of Depths: **0.1 to 8.0**
Percent of assessment area under inundation: **100%**
Depth at emergent vegetation-open water boundary: **0 feet**
If assessment area is not inundated then are the soils saturated within 12 inches of surface: **-**
Other evidence of hydrology on the site (ex. - drift lines, erosion, stained vegetation, etc.):

Groundwater Monitoring Wells: **Absent**
Record depth of water below ground surface (in feet):

Well Number	Depth	Well Number	Depth	Well Number	Depth

- Additional Activities Checklist:
- Map emergent vegetation-open water boundary on aerial photograph.
 - Observe extent of surface water during each site visit and look for evidence of past surface water elevations (drift lines, erosion, vegetation staining, etc.)
 - Use GPS to survey groundwater monitoring well locations, if present.

COMMENTS / PROBLEMS:
Water flow in the Little Muddy Creek during May was sufficient enough such that the site was partially flooded over a series of weeks until full.

VEGETATION COMMUNITIES

Community Number: 1 Community Title (main spp): Elymus varnensis

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

Comments / Problems: Entire community has become Open Water. Plant species have been covered by water and % cover reflects 2004 conditions.

Community Number: 2 Community Title (main spp): Festuca

Dominant Species	% Cover	Dominant Species	% Cover
Elymus varnensis	1 = 1-5%	Festuca	5 = > 50%
Lactuca serriola	+ = < 1%		

Comments / Problems: Entire community has become Open Water. Plant species have been covered by water and % coverage reflects 2004 conditions.

Community Number: 3 Community Title (main spp): Kochia scoparia

Dominant Species	% Cover	Dominant Species	% Cover
Avena spp.	2 = 6-10%	Kochia scoparia	5 = > 50%
Festuca spp	1 = 1-5%	Lactuca serriola	1 = 1-5%
Helianthus annuus	2 = 6-10%	Polygonum spp.	1 = 1-5%

Comments / Problems: Entire community has become Open Water. Plant species have been covered by water and % coverage reflects 2004 conditions.

Community Number: 4 Community Title (main spp): Iva axillaris

Dominant Species	% Cover	Dominant Species	% Cover
Agropyron cristatum	2 = 6-10%	Iva axillaris	4 = 21-50%
Lactuca serriola	1 = 1-5%		

Comments / Problems: Entire community has become Open Water. Plant species have been covered by water and % coverage reflects 2004 conditions.

VEGETATION COMMUNITIES (continued)

Community Number: **5** Community Title (main spp): **Agropyron cristatum**

Dominant Species	% Cover	Dominant Species	% Cover
Agropyron cristatum	5 = > 50%	Kochia scoparia	5 = > 50%
Elymus hispidus	2 = 6-10%	Lactuca serriola	+ = < 1%

Comments / Problems: Entire community has become Open Water. Plant species have been covered by water and % coverage reflects 2004 conditions.

Community Number: **6** Community Title (main spp): **Kochia / Agropyron**

Dominant Species	% Cover	Dominant Species	% Cover
Kochia scoparia	4 = 21-50%	Iva axillaris	+ = < 1%
Elymus varnensis	3 = 11-20%	Agropyron cristatum	3 = 11-20%
Agropyron intermedium	2 = 6-10%	Hordeum jubatum	4 = 21-50%
Polygonum douglassii	1 = 1-5%		

Comments / Problems: This community occupies the upland shoreline and berm that surrounds the open water.

Community Number: Community Title (main spp):

Dominant Species	% Cover	Dominant Species	% Cover

Comments / Problems:

Community Number: Community Title (main spp):

Dominant Species	% Cover	Dominant Species	% Cover

Comments / Problems:

VEGETATION COMMUNITIES (continued)

Community Number: _____ Community Title (main spp): _____

Dominant Species	% Cover	Dominant Species	% Cover

Comments / Problems: _____

Community Number: _____ Community Title (main spp): _____

Dominant Species	% Cover	Dominant Species	% Cover

Comments / Problems: _____

Community Number: _____ Community Title (main spp): _____

Dominant Species	% Cover	Dominant Species	% Cover

Comments / Problems: _____

Community Number: _____ Community Title (main spp): _____

Dominant Species	% Cover	Dominant Species	% Cover

Comments / Problems: _____

Additional Activities Checklist:

- Record and map vegetative communities on aerial photograph.

COMPREHENSIVE VEGETATION LIST

Plant Species	Vegetation Community Number (s)	Plant Species	Vegetation Community Number (s)
Agropyron cristatum	5*, 6		
Agropyron smithii	1-5*		
Arctium minus	1-5*		
Artemisia frigida	3*		
Aster pansus	5*, 6		
Atriplex rosea (A. argentea)	1-5		
Avena spp.	3*, 6		
Bromus inermis	1-5*, 6		
Bromus secalinus (B. japonicus?)	6		
Cardaria pubescens	1-5*		
Cirsium arvense	1-5*		
Chenopodium rubrum	6		
Chenopodium spp.	6		
Grindelia squarrosa	1-5*		
Helianthus annuus	3, inlet channel		
Hordeum jubatum	1-5*		
Iva axillaris	1-5*, 6		
Elymus hispidus (Agropyron intermid	5*, 6		
Elymus varnensis	1-2*, 6		
Kochia scoparia	5*, 6		
Lactuca serriola	2-5*, 6		
Medicago sativa	1-5*, 6		
Melilotus officinale	1-5*, inlet chan		
Melilotus alba	inlet channel		
Polygonum douglassii	inlet channel		
Rosa spp.	1-5*, inlet chan		
Rumex crispus	inlet channel		
Salsola iberica (syn. S. kali)	1-5*		
Sisymbium altissimum	1-5*		
Tragopogon dubois	1-5*, 6		

Comments / Problems: * means plant was only observed in 2004. Communities 1-5 occurred in 2004, but became open water in 2005. In 2004 the inlet channel near the diversion was dry and bordered mostly with Helianthus annuus, but in 2005 it was flooded and bordered almost exclusively with Meliltus officinalis and some M. alba. In 2004, Community 6 was mostly bare dirt with seedlings and was not mapped as a community. In 2005, Community 6 was mapped as plants were identifiable and cover was fairly dense.

WILDLIFE

Birds

Were man-made nesting structures installed? No

If yes, type of structure: _____ How many? _____

Are the nesting structures being used? NA

Do the nesting structures need repairs? _____

Mammals and Herptiles

Mammal and Herptile Species	Number Observed	Indirect Indication of Use			
		Tracks	Scat	Burrows	Other
white-tailed deer	3	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
ground squirrel	1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

Additional Activities Checklist:

NA Macroinvertebrate Sampling (if required)

Comments / Problems: Dragonflies observed

PHOTOGRAPHS

Using a camera with a 50mm lens and color film take photographs of the following permanent reference points listed in the check list below. Record the direction of the photograph using a compass. When at the site for the first time, establish a permanent reference point by setting a ½ inch rebar or fencepost extending 2-3 feet above ground. Survey the location with a resource grade GPS and mark the location on the aerial photograph.

Photograph Checklist:

- One photograph for each of the four cardinal directions surrounding the wetland.
- At least one photograph showing upland use surrounding the wetland. If more than one upland exists then take additional photographs.
- At least one photograph showing the buffer surrounding the wetland.
- One photograph from each end of the vegetation transect, showing the transect.

Location	Photograph Frame #	Photograph Description	Compass Reading (°)
P-1	78	From P-1 [see Photo Sheet, Photo 1]	136
P-1	77	From P-1 [see Photo Sheet, Photo 2]	210
P-1	76	From behind P-1 [see Photo Sheet, Photo 3]	40
P-2	38	From P-2	282
P-2	39	From P-2	246
P-2	40	From P-2	208
P-2	41	From P-2	246-208
P-2	43	From P-2	180
P-2	45	From P-2	150
P-2	46	From P-2	108
P-3	51	From P-3	130
P-3	52	From P-3	bridge
P-4	55	From P-4	208
P-4	57	From P-4 towards diversion dam	71
P-5	24	From P-5	316
P-6	15	From P-6	312
T-1	20-22	From T-1 start	10
T-2	7-11	From T-2 start	266
Misc.	remainder	Miscellaneous photographs	

Comments / Problems: Compass declination set at 16 degrees East, which probably differed from the 2004 compass setting.

GPS SURVEYING

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

GPS Checklist:

- Jurisdictional wetland boundary.
- 4-6 landmarks that are recognizable on the aerial photograph.
- Start and End points of vegetation transect(s).
- Photograph reference points.
- Groundwater monitoring well locations.

Comments / Problems: **Water line was hand-mapped; wetland has not developed yet.**

WETLAND DELINEATION

(attach COE delineation forms)

At each site conduct these checklist items:

- Delineate wetlands according to the 1987 Army COE manual.
- Delineate wetland – upland boundary onto aerial photograph.
- NA** Survey wetland – upland boundary with a resource grade GPS survey.

Comments / Problems: **Wetlands have not developed yet (see COE Forms). Water - Upland boundary was hand-mapped.**

FUNCTIONAL ASSESSMENT

(Complete and attach full MDT Montana Wetland Assessment Method field forms.)

(Also attach any completed abbreviated field forms, if used)

Comments / Problems: **Not completed as wetland as not yet developed**

MAINTENANCE

Were man-made nesting structure installed at this site? **No**

If yes, do they need to be repaired? **NA**

If yes, describe the 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**

If yes, are the structures working properly and in good working order? **Yes**

If no, describe the problems below.

Comments / Problems: _____

MDT WETLAND MONITORING – VEGETATION TRANSECT

Site: **Little Muddy** Date: **July 12, 2005** Examiner: **A. Pipp**

Transect Number: **1** Approximate Transect Length: **585 feet** Compass Direction from Start: **10°** Note: **Open water without T1 end.**

Vegetation Type A: Open Water	
Length of transect in this type: 0-50 feet	
Plant Species	Cover
Open water with <i>Hordeum jubatum</i> partially green.	2 = 6-10%
Total Vegetative Cover:	8%

Vegetation Type B: Open Water	
Length of transect in this type: 50-535 feet	
Plant Species	Cover
Open water with drowned-out, brown grass of primarily <i>Elymus varnensis</i>	2 = 6-10%
Total Vegetative Cover:	8%

Vegetation Type C:	
Length of transect in this type: feet	
Plant Species	Cover
Total Vegetative Cover:	%

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

MDT WETLAND MONITORING – VEGETATION TRANSECT

Site: _____ Date: _____ Examiner: _____
 Transect Number: _____ Approximate Transect Length: _____ **feet** Compass Direction from Start: ____° Note: _____

Vegetation Type I:	
Length of transect in this type: _____ feet	
Plant Species	Cover
Total Vegetative Cover:	%

Vegetation Type J:	
Length of transect in this type: _____ feet	
Plant Species	Cover
Total Vegetative Cover:	%

Vegetation Type K:	
Length of transect in this type: _____ feet	
Plant Species	Cover
Total Vegetative Cover:	%

Vegetation Type L:	
Length of transect in this type: _____ feet	
Plant Species	Cover
Total Vegetative Cover:	%

MDT WETLAND MONITORING – VEGETATION TRANSECT

Cover Estimate

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

Indicator Class

+ = Obligate
- = Facultative/Wet
0 = Facultative

Source

P = Planted
V = Volunteer

Percent of perimeter developing wetland vegetation (excluding dam/berm structures): 0%

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 foot depth (in open water), or at the point where water depths or saturation are maximized. Mark this location with another metal fencepost.

Estimate cover within a 10 foot 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.

Comments: Perimeter is saturated, but only a dominance of upland vegetation is present.

BIRD SURVEY – FIELD DATA SHEET

Site: Little Muddy Wetland Date: 5/20/05

Survey Time: 0810 am to 0925 pm

Bird Species	#	Behavior	Habitat	Bird Species	#	Behavior	Habitat
Western Meadowlark	1	FO L	UP	Blue-winged Teal	4-6	F L	OW MA
Killdeer	20	F	US UP	Cinnamon Teal	4	F L	OW MA
Common Raven	2	F	FO	Gadwall	4	F L	MA
Willet	2	F	UP	Lesser Scaup	20	F L	OW MA
Horned Lark	1	L	UP	Northern Shoveler	15	F L	OW MA
Yellow-headed Blackbird	1	F	US	Mallard	4	F L	OW MA
Wilson's Phalarope	10	F L	OW MA	Ruddy Duck (pair)	2	F L	OW
Vesper Sparrow	1	L	UP	Northern Pintail	2	F L	MA
Red-Winged Blackbird	6	BD F	UP	American Wigeon	2	F L	OW MA
Long-billed Dowitcher	2	F	UP US	Canada Goose	12	FO F	OW MA
				Ring-necked Duck	2	F L	OW MA
On July 12, 2005 saw:							
American Avocet	20	F FO	OW MA US				
Mourning Dove	3	F FO	UP				
Great Blue Heron	3	FO F	OW				
Horned Grebe	3	F L	OW				
Franklin Gull	1	FO	OW				
Marbled godwit (probably)	8	F L	OW MA				
sandpipers (unidentified)	20	F FO	US UP MA				
Northern Harrier	1	FO	UP				

BEHAVIOR CODES

BP = One of a breeding pair
 BD = Breeding display
 F = Foraging
 FO = Flyover
 L = Loafing
 N = Nesting

HABITAT CODES

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 shore

Weather: Cloudy sky with some sunshine; no wind; temperature in the sixties.

Notes: On May 20th, heard many western chorus frogs inside and outside the site. On May 20th, water was in canal all the way to the 1st crossing and overspilled canal into the lowlands of the site. Edge of water is just west of the end stake for T-2. On July 12th, saw in addition to the species listed above, saw many of the species observed on May 20th.

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

Project / Site: <u>Little Muddy Wetland</u> Applicant / Owner: <u>Ducks Unlimited</u> Investigator: <u>A.Pipp</u>	Date: <u>July 12, 2005</u> County: <u>Cascade</u> State: <u>Montana</u>
Do Normal Circumstances exist on the site? <u>Yes</u> Is the site significantly disturbed (Atypical Situation)? <u>No</u> Is the area a potential Problem Area? <u>No</u> (If Yes, explain on reverse side)	Community ID: <u>Emergent</u> Transect ID: <u>T1</u> Plot ID: <u>Pit #3 at start of T1.</u>

VEGETATION

Dominant Species	Stratum	Indicator	Dominant Species	Stratum	Indicator
1. <i>Hordeum jubatum</i>	Herb	FAC+	11.		
2. <i>Lactuca serriola</i>	Herb	FAC-	12.		
3. <i>Bromus secalinus</i>	Herb	NI	13.		
4. <i>Kochia scoparia</i>	Herb	FAC	14.		
5.			15.		
6.			16.		
7.			17.		
8.			18.		
9.			19.		
10.			20.		
Percent of Dominant Species that are OBL, FACW, or FAC (excluding FAC-): 2 / 3 = 66%			FAC Neutral: 0 / 3 = 0%		
Remarks:					

HYDROLOGY

<p>No Recorded Data (Describe in Remarks): <u>N/A</u> Stream, Lake, or Tide Gauge <u>N/A</u> Aerial Photographs <u>N/A</u> Other</p> <p>Yes No Recorded Data</p>	Wetland Hydrology Indicators Primary Indicators: <u>YES</u> Inundated <u>YES</u> Saturated in Upper 12 Inches <u>NO</u> Water Marks <u>NO</u> Drift Lines <u>NO</u> Sediment Deposits <u>NO</u> Drainage Patterns in Wetland Secondary Indicators (2 or more required): <u>NO</u> Oxidized Root Channels in Upper 12 inches <u>NO</u> Water-Stained Leaves <u>NO</u> Local Soil Survey Data <u>NO</u> FAC-Neutral Test <u>NO</u> Other (Explain in Remarks)
Field Observations: Depth of Surface Water = <u>1.0</u> (in.) Depth to Free Water in Pit <u>N/A</u> ____ (in.) Depth to Saturated Soil = <u>0.0</u> (in.)	
Remarks: Soils were inundated.	

SOILS

Map Unit Name (Series and Phase): Absher-Noble Complex, 1-5% slopes
 Map Symbol: 10 Drainage Class: moderately well drained Mapped Hydric Inclusion? _
 Taxonomy (Subgroup): Fine montmorillonitic Borollic Natrargid Field Observations confirm Mapped Type? Yes

Profile Description

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Color(s) (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-12	A	2.5 Y 5/2	N/A / N/A /	N/A N/A	Clay
		/	N/A / N/A /	N/A N/A	
		/	N/A / N/A /	N/A N/A	
		/	N/A / N/A /	N/A N/A	
		/	N/A / N/A /	N/A N/A	

Hydric Soil Indicators:

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

Remarks: The inundated soils met NRCS hydric soils Criterion 3: “Soils that are frequently (i.e., > 50% chance per year) ponded (i.e., standing water in a closed depression) for long duration (7 days to one month) or very long duration (> 1 month) during the growing season”.

WETLAND DETERMINATION

Hydrophytic Vegetation Present? <u>NO</u>	Is this Sampling Point within a Wetland? <u>NO</u>
Wetland Hydrology Present? <u>YES</u>	
Hydric Soils Present? <u>YES</u>	

Remarks: Area is considered open water, as hydrology and hydric soils are present, but hydrophytic vegetation is lacking.

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

Project / Site: <u>Little Muddy</u> Applicant / Owner: <u>Ducks Unlimited</u> Investigator: <u>A.Pipp</u>	Date: <u>July 12, 2005</u> County: <u>Cascade</u> State: <u>Montana</u>
Do Normal Circumstances exist on the site? <u>Yes</u> Is the site significantly disturbed (Atypical Situation)? <u>No</u> Is the area a potential Problem Area? <u>No</u> (If Yes, explain on reverse side)	Community ID: <u>Emergent</u> Transect ID: <u>T2</u> Plot ID: <u>Pit 1 within 0-7.5 feet on transect.</u>

VEGETATION

Dominant Species	Stratum	Indicator	Dominant Species	Stratum	Indicator
1. <i>Agropyron varnensis</i>	Herb	NI	11.		
2. <i>Kochia scoparia</i>	Herb	FAC	12.		
3. <i>Iva axillaris</i>	Herb	FAC	13.		
4. <i>Polygonum douglassii</i>	Herb	FACU	14.		
5. <i>Agropyron intermedium</i>	Herb	NI	15.		
6.			16.		
7.			17.		
8.			18.		
9.			19.		
10.			20.		
Percent of Dominant Species that are OBL, FACW, or FAC (excluding FAC-): 2 / 5 = 40%			FAC Neutral: 0 / 2 = 0%		
Remarks:					

HYDROLOGY

<p>No Recorded Data (Describe in Remarks):</p> <p style="padding-left: 20px;"><u>N/A</u> Stream, Lake, or Tide Gauge</p> <p style="padding-left: 20px;"><u>N/A</u> Aerial Photographs</p> <p style="padding-left: 20px;"><u>N/A</u> Other</p> <p>Yes No Recorded Data</p>	Wetland Hydrology Indicators Primary Indicators: <u>NO</u> Inundated <u>NO</u> Saturated in Upper 12 Inches <u>NO</u> Water Marks <u>NO</u> Drift Lines <u>NO</u> Sediment Deposits <u>NO</u> Drainage Patterns in Wetland Secondary Indicators (2 or more required): <u>NO</u> Oxidized Root Channels in Upper 12 inches <u>NO</u> Water-Stained Leaves <u>NO</u> Local Soil Survey Data <u>NO</u> FAC-Neutral Test <u>NO</u> Other (Explain in Remarks)
Field Observations: Depth of Surface Water <u>N/A</u> ____ (in.) Depth to Free Water in Pit <u>N/A</u> ____ (in.) Depth to Saturated Soil > <u>12</u> (in.)	
Remarks: Very top of soil was dry and cracked with some salt deposition. Below surface to 12 inches soil was moist, but not saturated.	

SOILS

Map Unit Name (Series and Phase): Absher-Noble Complex, 1-5% slopes
 Map Symbol: 10 Drainage Class: moderately well drained Mapped Hydric Inclusion? _
 Taxonomy (Subgroup): Fine montmorillonitic Borollic Natrargid Field Observations confirm Mapped Type? Yes

Profile Description

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Color(s) (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-12	A	2.5 Y 4/2	N/A / N/A /	N/A N/A	Clay
		/	N/A / N/A /	N/A N/A	
		/	N/A / N/A /	N/A N/A	
		/	N/A / N/A /	N/A N/A	
		/	N/A / N/A /	N/A N/A	

Hydric Soil Indicators:

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

WETLAND DETERMINATION

Hydrophytic Vegetation Present? <u>NO</u>	Is this Sampling Point within a Wetland? <u>NO</u>
Wetland Hydrology Present? <u>NO</u>	
Hydric Soils Present? <u>NO</u>	
Remarks: Area is considered upland.	

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

Project / Site: <u>Little Muddy</u> Applicant / Owner: <u>Ducks Unlimited</u> Investigator: <u>A.Pipp</u>	Date: <u>July 12, 2005</u> County: <u>Cascade</u> State: <u>Montana</u>
Do Normal Circumstances exist on the site? <u>Yes</u> Is the site significantly disturbed (Atypical Situation)? <u>No</u> Is the area a potential Problem Area? <u>No</u> (If Yes, explain on reverse side)	Community ID: <u>Emergent</u> Transect ID: <u>T2</u> Plot ID: <u>Pit 2 within 7.5-11.0 feet on T2.</u>

VEGETATION

Dominant Species	Stratum	Indicator	Dominant Species	Stratum	Indicator
1. <i>none</i>			11.		
2.			12.		
3.			13.		
4.			14.		
5.			15.		
6.			16.		
7.			17.		
8.			18.		
9.			19.		
10.			20.		

Percent of Dominant Species that are OBL, FACW, or FAC (excluding FAC-): / = %	FAC Neutral: 0 / 0 = 0%
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Remarks: No plant species were observed.

HYDROLOGY

<p>No Recorded Data (Describe in Remarks): <u>N/A</u> Stream, Lake, or Tide Gauge <u>N/A</u> Aerial Photographs <u>N/A</u> Other</p> <p>Yes No Recorded Data</p>	Wetland Hydrology Indicators Primary Indicators: <u>NO</u> Inundated <u>YES</u> Saturated in Upper 12 Inches <u>NO</u> Water Marks <u>NO</u> Drift Lines <u>NO</u> Sediment Deposits <u>NO</u> Drainage Patterns in Wetland Secondary Indicators (2 or more required): <u>NO</u> Oxidized Root Channels in Upper 12 inches <u>NO</u> Water-Stained Leaves <u>NO</u> Local Soil Survey Data <u>NO</u> FAC-Neutral Test <u>NO</u> Other (Explain in Remarks)
Field Observations: Depth of Surface Water <u>N/A</u> ____ (in.) Depth to Free Water in Pit <u>N/A</u> ____ (in.) Depth to Saturated Soil = <u>0.0</u> (in.)	
Remarks: Soils were saturated throughout. Water appeared to have receded from 7.5 til 11.0 feet. At 11.0 feet was open water.	

SOILS

Map Unit Name (Series and Phase): Absher-Noble Complex, 1-5% slopes
 Map Symbol: 10 Drainage Class: moderately well drained Mapped Hydric Inclusion? _
 Taxonomy (Subgroup): Fine montmorillonitic Borollic Natrargid Field Observations confirm Mapped Type? Yes

Profile Description

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Color(s) (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-12	A	2.5 Y 4/2	N/A / N/A /	N/A N/A	Clay
		/	N/A / N/A /	N/A N/A	
		/	N/A / N/A /	N/A N/A	
		/	N/A / N/A /	N/A N/A	
		/	N/A / N/A /	N/A N/A	

Hydric Soil Indicators:

<p><u>NO</u> Histosol <u>NO</u> Histic Epipedon <u>NO</u> Sulfidic Odor <u>NO</u> Aquic Moisture Regime <u>NO</u> Reducing Conditions <u>NO</u> Gleyed or Low-Chroma Colors</p>	<p><u>NO</u> Concretions <u>NO</u> High Organic Content in Surface Layer in Sandy Soils <u>NO</u> Organic Streaking in Sandy Soils <u>NO</u> Listed on Local Hydric Soils List <u>NO</u> Listed on National Hydric Soils List <u>NO</u> Other (Explain in Remarks)</p>
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Remarks: The previously inundated soils met NRCS hydric soils Criterion 3: "Soils that are frequently (i.e., > 50% chance per year) ponded (i.e., standing water in a closed depression) for long duration (7 days to one month) or very long duration (> 1 month) during the growing season".

WETLAND DETERMINATION

Hydrophytic Vegetation Present? <u>NO</u>	Is this Sampling Point within a Wetland? <u>NO</u>
Wetland Hydrology Present? <u>YES</u>	
Hydric Soils Present? <u>YES</u>	

Remarks: Area is considered transitional, as hydrology and hydric soils are present, but hydrophytic vegetation is lacking.

Appendix C

REPRESENTATIVE PHOTOGRAPHS

*MDT Wetland Mitigation Monitoring
Little Muddy Creek
Cascade County, Montana*

2005 LITTLE MUDDY WETLAND MITIGATION SITE



Photo 1: At Photo Point 1 looking in the 136° direction.



Photo 2: At Photo Point 1 looking in the 210° direction.



Photo 3: Behind Photo Point 1 looking in the 40° direction at the outflow.



Photo 4: At Photo Point 2 looking in the 180° direction.



Photo 5: At Photo Point 3 looking in the 130° direction at the inlet channel.



Photo 6: At Photo Point 4 looking in the 71° direction at the inlet control structure with the diversion structure in background.

2005 LITTLE MUDDY WETLAND MITIGATION SITE



Photo 7: At Photo Point 4 looking in the 208° direction at the inlet channel.



Photo 8: At Photo Point 5 looking in the 316° direction with Square Butte in the background.



Photo 9: At Photo Point 6 looking in the 283° direction with Square Butte in the background.



Photo 10: At the start of the T-1 vegetation transect looking in the 10° direction.



Photo 11: At the start of the T-2 vegetation transect looking in the 266° direction.



Photo 12: Dragonflies on upland grass near T-2.

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.

