MONTANA DEPARTMENT OF TRANSPORTATION
WETLAND MITIGATION MONITORING REPORT: YEAR 2007

Little Muddy Creek
Cascade County, Montana

Prepared for:

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

Prepared by:

POST, BUCKLEY, SCHUH, AND JERNIGAN
801 North Last Chance Gulch, Suite 101
Helena, MT 59601-3360

December 2007

PBS&J Project No: B43088.00 - 0304

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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). It was originally anticipated by MDT that approximately 13.57 acres of compensatory wetland mitigation credit could be needed to offset impacts associated with ten different projects within the Missouri-Sun-Smith River watershed (#7) (MDT 2002). An additional 50 acres of reserve credit was also sought by MDT (MDT 2002). Thus, MDT originally sought 63.57 acres of compensatory wetland mitigation credit.

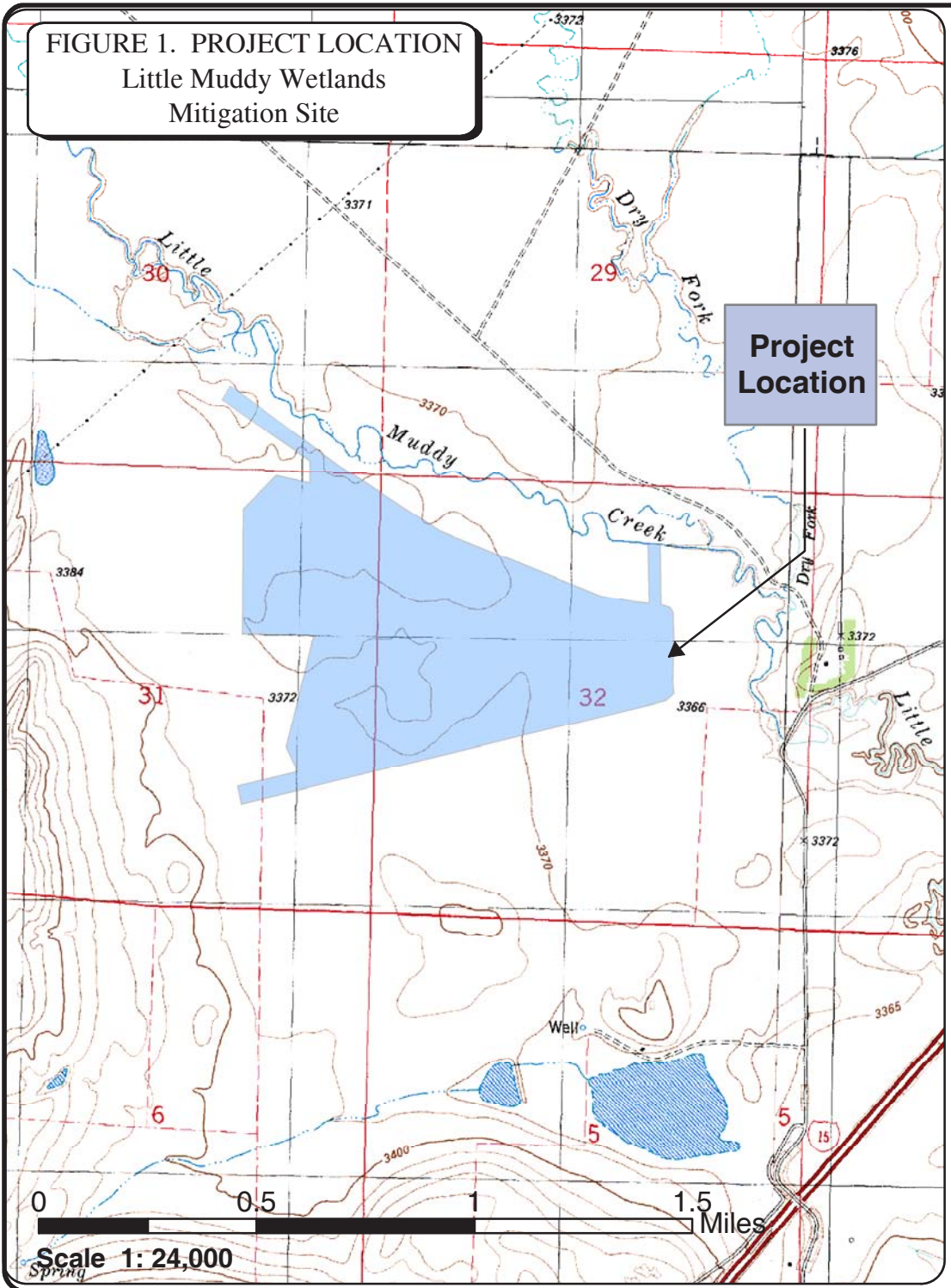
This report documents the fourth year of monitoring at the Little Muddy Creek Wetland Mitigation site. This project is located on private land, approximately one mile west of Interstate 15 between the towns of Cascade and Ulm, Montana (**Figure 1**). The project site straddles Sections 30, 31, and 32 of Township 19 North and Range 1 East in Cascade County.

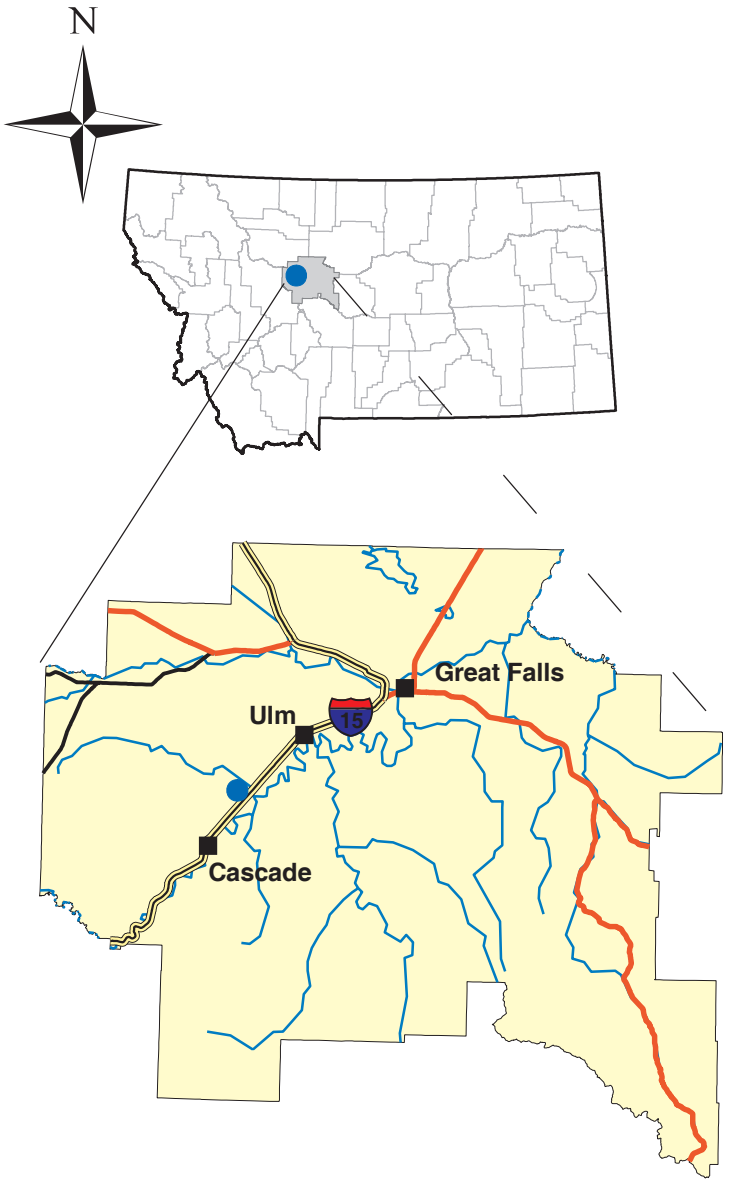
Little Muddy Creek is an intermittent stream that flows directly into the Missouri River (COE 2002). In 2004, an 88 foot-wide diversion dam was built across the entire Little Muddy Creek channel (COE 2002). The central 30 feet of the dam is elevated three feet above the existing channel bottom and the 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. When the headgate is open, water flows through a long, excavated channel to the off-channel impoundment. The off-channel impoundment is surrounded by an 11,500-foot long berm. A project plan sheet is provided in **Appendix D**.

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 flows of the Missouri River near Ulm and the Sun River near Vaughn total 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 included open water/aquatic bed and shallow marsh/wet meadow.

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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2.0 METHODS

2.1 Monitoring Dates and Activities

The site was visited on May 7th (spring bird survey) and August 22nd (mid-season survey) of 2007. 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** in **Appendix A**. Activities conducted and information collected included: wetland delineation; vegetation community mapping; vegetation transect monitoring; soils data collection; hydrology data collection; bird and wildlife use documentation; macroinvertebrate sampling; photographing; and cursory examination of the dike and water control structures.

2.2 Hydrology

Hydrologic indicators were evaluated during the mid-season visit on August 22. 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 Wetland Mitigation Site Monitoring Form (**Appendix B**).

There are no groundwater monitoring wells at the site. Soil pits excavated for wetland delineation purposes were also used to evaluate the presence of groundwater if occurring within 12 inches from the ground surface. Data were recorded on the COE 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 Wetland Mitigation Site Monitoring Form (**Appendix B**). Plants observed were identified using Flora of the Pacific Northwest (Hitchcock and Conquist 1975) and Plants of Montana (Dorn 1984). Nomenclature follows that of Dorn (1984). In addition, a few plant specimens were sent to the Montana State University Herbarium for species verification.

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 feet wide were established in early June of 2004 (**Figure 2** in **Appendix A)**. The transect start and end points were staked in the ground and recorded with a GPS unit in 2004. 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 at the start and end of each transect (if possible) during the mid-season visit (**Appendix C**). No woody species were planted at the site. Consequently, no monitoring 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 excavated to look for evidence of hydric soil formation. Soil data were then recorded on the COE Routine Wetland Delineation Form (**Appendix B**).

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 (**Appendix B**).

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 E**). Observations were categorized by species, activity code, and general habitat association (**Bird Survey Field Data Sheet** in **Appendix B**). A comprehensive bird list was compiled using these observations.

2.8 Macroinvertebrates

Per MDT instructions, aquatic macroinvertebrates were sampled for the first time in 2007. One macroinvertebrate sample was collected during the mid-season visit (**Figure 2** in **Appendix A**). The sample was collected and preserved according to the Macroinvertebrate Sampling Protocol (**Appendix F**). Laboratory analysis of the sample and reporting were conducted by Rhithron Associates, Inc. in Missoula, Montana.

2.9 Functional Assessment

A functional assessment was completed using the 1999 MDT Montana Wetland Assessment Method (Berglund 1999). Field data necessary for this assessment were primarily collected during the mid-season site visit. The remainder of the functional assessment was completed in the office. For each wetland or group of wetlands a Functional Assessment Form was completed (**Appendix B**).

2.10 Photographs

Photographs were taken in 2007 to show the current land use surrounding the site, the upland buffer, the monitored area, and the vegetation transects (**Appendix C**). Six photograph points were established and their location recorded with a resource grade GPS unit in 2004 and 2007 (**Figure 2** in **Appendix A**). Photographs have been taken at these six photo points each year since in 2004. A description and compass direction for each photograph was recorded onto the Wetland Mitigation Site Monitoring Form (**Appendix B**).

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 (**Appendix E**). GPS point and survey data from Ducks Unlimited was used to rectify MDT aerial photographs taken during the 2006 flight. Mapping of site features in 2007 included both GPS data collection and hand-mapping onto the 2007 aerial photograph.

2.12 Maintenance Needs

The diversion, excavated channels, and 11,500-foot long berm were built in winter of 2003. The berm was seeded with an upland plant mix. These were examined during the 2007 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

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 no water was allowed to flow into the site. In Year 2 (2005), enough precipitation occurred in May that the most of the mitigation site was inundated. In Year 3 (2006), the site was topped off from streamflow and precipitation and it held water through the growing season. In this fourth year of monitoring, streamflow was sufficient, but the site was only partially filled because water was turned off by an unauthorized party without permission (Durocher pers. comm.). The site was over a foot short of its full pool capacity (Durocher pers. comm.).

Little Muddy Creek is an intermittent stream that flows directly into the Missouri River (COE 2002). Although spring streamflows were sufficient, the site was only partially filled. As a result of this partial filling combined with a dry summer, the site lost a lot of water, creating drier soil conditions and exposing larger islands and a larger peninsula. Depth of inundation ranged from an inch 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 August of 2007, the Great Falls Airport weather station (#243751) reported 8.20 inches (in) of annual precipitation (Western Regional Climate Center (WRCC) 2007). This was a drier time period than observed from January to August in 2006 (14.21 in), 2005 (11.30 in), and 2004 (10.34 in). From July 1948 through August 2007, the long-term annual total precipitation received at the Great Falls airport averaged 11.63 in (WRCC 2007). It was assumed that precipitation levels measured at the Great Falls Airport would serve as an indicator of precipitation received at the mitigation 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). Prior to 2003, grazing was terminated and the land was planted with native grass and crop species and placed into the Conservation Reserve Program (LWC 2002).

Plant species observed since the baseline year of 2004 have been compiled in a list (**Table 1**). In 2004, the mitigation site remained dry. The area to be flooded consisted of upland grasses and herbaceous plants and the berm was colonized by newly germinated plants. By July 2005 most of this upland vegetation was inundated and drowned out, but no wetland vegetation had established. By August 2006, wetland vegetation had germinated over most of the saturated soils and aquatic plants had colonized inundated areas. In 2007, wetland vegetation continued to establish in areas that remained saturated for sufficient duration. With the exception of Type 8 *Polygonum / Potamogeton,* all 2006 plant communities were present in 2007 as follows: Type 6 - *Kochia / Agropyron;* Type 7 – *Rumex maritmus*; Type 9 – *Polygonum aviculare*; Type 10 – *Typha latifolia*; Type 11 – *Hordeum jubatum*; Type 12 – *Alisma gramineum*; and Type 13 – *Upland* (**Monitoring Form** in **Appendix B**).

Vegetation community types were based on topography, hydrology, and plant composition. The Type 7 – *Rumex maritmus* wetland community occurred as a discontinuous fringe along the shoreline and inlet channel (**Photo 11** in **Appendix C**). In 2007, this fringe increased in width and length. The Type 9 – *Polygonum aviculare* community occupied saturated land where the water had receded (**Photos 10, 16,** and **21** in **Appendix C**). In 2007 it was often mixed with *Hordeum jubatum* and other wetland plants. The Type 10 – *Typha latifolia* community decreased in size in 2007 presumably due to drier soil conditions (**Photo 19** in **Appendix C**). Within the *T. latifolia* community in late August, soil pits revealed dry soil and all *T. latifolia* plants exhibited excessively dry leaf tips and grew mixed with drier plants species like *H. jubatum* and *Sisymbrium*; no sign of animal herbivory was observed. The Type 11 – *Hordeum*

Table 1: ***2004 - 2007 vegetation species list for the Little Muddy Creek Wetland Mitigation Site.***

Scientific Name	Region 9 (Northwest) Wetland Indicator	Scientific Name	Region 9 (Northwest) Wetland Indicator
Agropyron cristatum	---	*Kochia scoparia*	FAC
Agropyron smithii	FACU	*Lactuca serriola*	FAC-
algae, green	---	*Medicago sativa*	---
Alisma gramineum	OBL	*Melilotus alba*	---
Arctium minus	---	*Melilotus officinale*	FACU
Artemisia frigida	---	*Polygonum aviculare*	FACW-
Aster pansus	FAC+	*Polygonum douglasii*	FACU
Atriplex rosea (*A. argentea*)	FACU- (FAC-)	*Populus tremuloides*	FAC+
Bromus inermis	---	*Potamogeton* (*amplifolius*)	OBL
Bromus japonicus	---	*Potamogeton pectinatus*	OBL
Cardaria pubescens	---	***Rorippa sinuata***	**FAC+**
Chenopodium album	FAC	*Rosa* spp.	---
Chenopodium glaucum	FAC	*Rumex crispus*	FACW
Chenopodium leptophyllum	FACU	*Rumex maritimus*	FACW+
Chenopodium spp.	---	*Salix exigua*	OBL
Cirsium arvense	FACU+	*Salix lutea*	OBL
Eleocharis palustris	**OBL**	*Salsola iberica* (syn. *S. kali*)	FACU
Elymus hispidus (syn. *Agropyron intermedium*)	---	*Scirpus acutus*	OBL
Elymus varnensis	---	***Scirpus maritimus***	**OBL**
Festuca spp.	---	***Scirpus pungens***	**OBL**
Grindelia squarrosa	FACU	*Sisymbrium altissimum*	FACU-
Helianthus annuus	FACU+	*Sisymbrium* spp.	---
Hordeum jubatum	FAC+	*Thlaspi arvense*	NI
Iva axillaris	FAC	*Tragopogon dubois*	---
		Typha latifolia	OBL

Bolded species were observed for the first time in 2007.

jubatum wetland increased in size presumably due to drier soil conditions. *H. jubatum* occupied both large (almost) pure stands and mixed stands with *T. latifolia* and *P. aviculare* (**Photos 19, 20,** and **21** in **Appendix C**). As in 2006, the Type 12 – *Alisma gramineum* wetland occupied the outlet; although A. *gramineum* plants were less abundant presumably due to drier soil conditions (**Photo 3** in **Appendix C**). Types 6 and 13 were upland habitats that colonized the berm, a portion of the peninsula, and the land west of the saturation line (**Photo 12** and **17** in **Appendix C**). The area of upland increased in 2007. As in 2006, *Transitional Open Water* occupied a large portion of the area in 2007; it ranged in depth from about an inch to six feet. It was anticipated that in 2007 this Transitional Open Water would colonize with wetland vegetation. Instead, the water became thick with a green algal bloom (**Photo 14** in **Appendix C**).

The changes in plant composition and hydrology from 2004 to 2007 were quantified on vegetation transects 1 (T-1) and 2 (T-2) (**Tables 2** and **3**). Along T-1, upland habitat found in 2004 was inundated in 2005. By 2007 all except the berm had transitioned into wetland, mudflat, and transitional open water (**Chart 1**). The wetland consisted of the Type 7 – *Rumex maritimus* fringe and Type 9 – *Polygonum aviculare* habitats (**Chart 2**) (**Photos 9-11** in **Appendix C**). Due to drier soil conditions, Type 9 within T-1 was not inundated nor mixed with

any aquatic plants as observed in 2006 (**Monitoring Forms** in **Appendix B**). The mudflat of T-1 is expected to colonize with wetland vegetation.

Table 2: ***2004 - 2007 data summary for Transect 1.***

Monitoring Year	2004	2005[1]	2006	2007
Transect Length (feet)	585	585	585	585
# Vegetation Community Transitions along Transect	2	0	3	2
# Vegetation Communities along Transect	3	0	2	3
# Hydrophytic Vegetation Communities along Transect	0	0	1	2
Total Vegetative Species	11	1	7	9
Total Hydrophytic Species	2	1	4	4
Total Upland Species	9	0	3	5
Estimated % Total Vegetative Cover	90	8	60	85
% Transect Length Comprised of Hydrophytic Vegetation Communities	0	0	92	32
% Transect Length Comprised of Upland Vegetation Communities	100	0	1	2
% Transect Length Comprised of Unvegetated Open Water	0	100	5	34
% Transect Length Comprised of Bare Substrate	0	0	2	32

[1] Transect 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: ***Length of vegetation communities within Transect 1 during 2004 - 2007.***

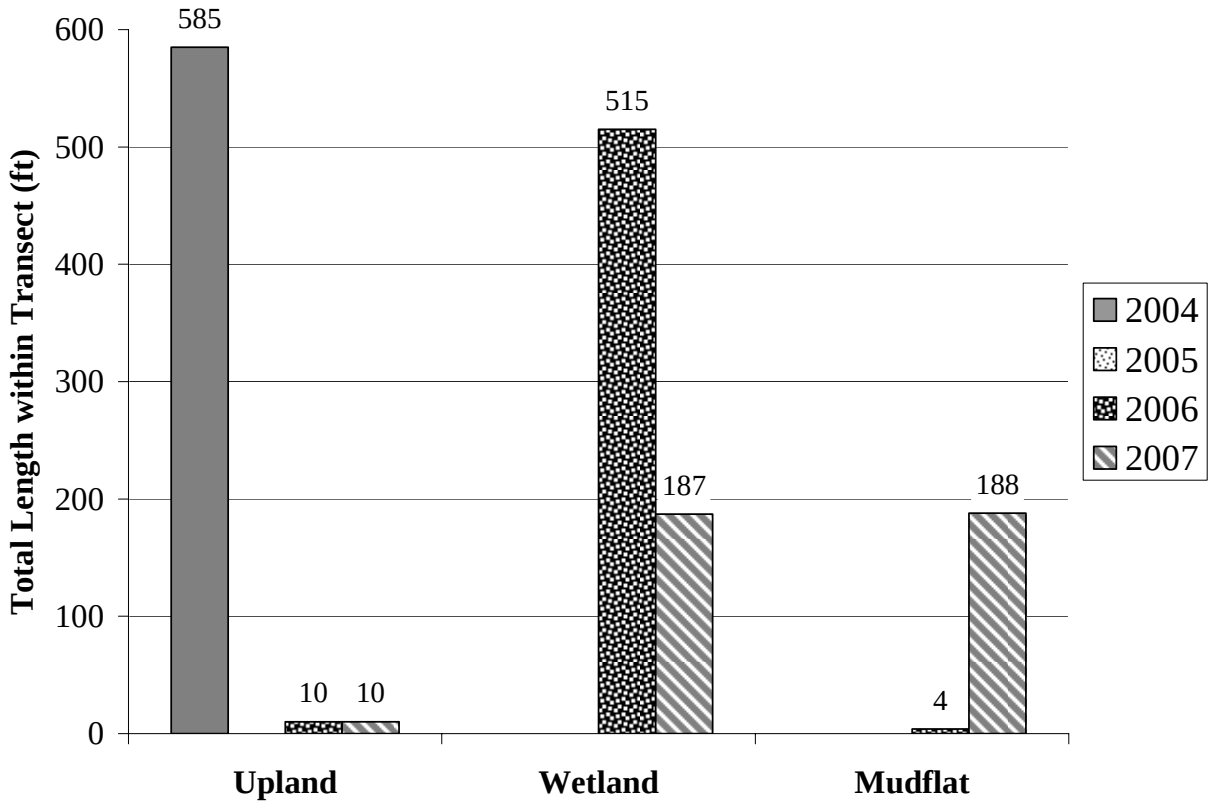
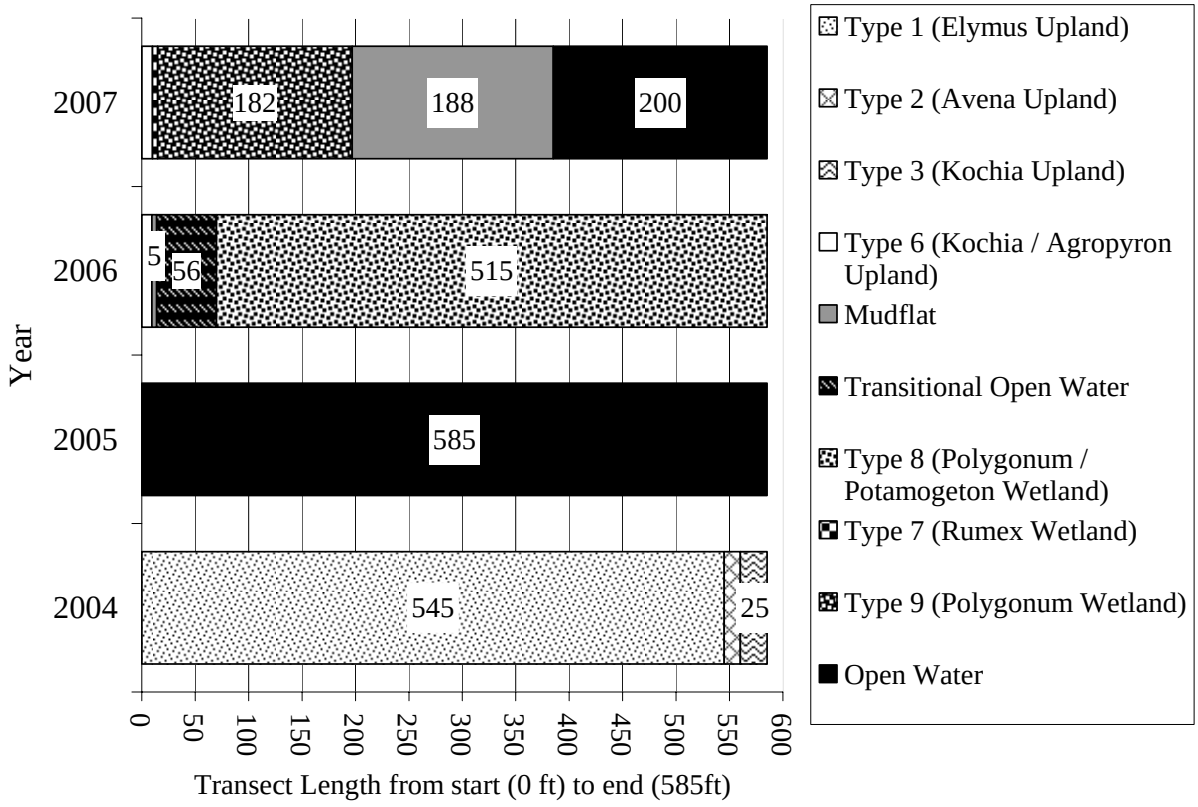


Chart 2: ***Transect maps showing vegetation types of Transect 1 from start (0 feet) to end from 2004 to 2007.***



Similar trends of wetland development were found at T-2. The 2004 upland habitat was inundated in 2005 and by 2007 had slightly transitioned into wetland (**Chart 3**). In 2007, the shoreline at T-2 continued to develop as Type 7 – *Rumex maritimus* Wetland Fringe (**Chart 4**). Due to drier conditions in 2007, more mudflat was exposed (**Photo 12** in **Appendix C**). The inundated portion of T-2 continued to be classified as transitional open water because wetland vegetation was not present (**Chart 4**).

Table 3: ***2004 - 2007 data summary for Transect 2.***

Monitoring Year	2004	2005	2006	2007
Transect Length (feet)	310	310	310	310
# Vegetation Community Transitions along Transect	1	2	3	1
# Vegetation Communities along Transect	2	3	3	2
# Hydrophytic Vegetation Communities along Transect	0	0	2	1
Total Vegetative Species	5	4	7	11
Total Hydrophytic Species	2	2	4	8
Total Upland Species	3	2	3	3
Estimated % Total Vegetative Cover	60	30	14	40
% Transect Length Comprised of Hydrophytic Vegetation Communities	0	0	2.0	2.0
% Transect Length Comprised of Upland Vegetation Communities	100	2	2.5	2.5
% Transect Length Comprised of Unvegetated Open Water	0	96	95.5	93.0
% Transect Length Comprised of Bare Substrate	0	1	0.0	2.5

Chart 3: ***Length of vegetation communities within Transect 2 during 2004 - 2007.***

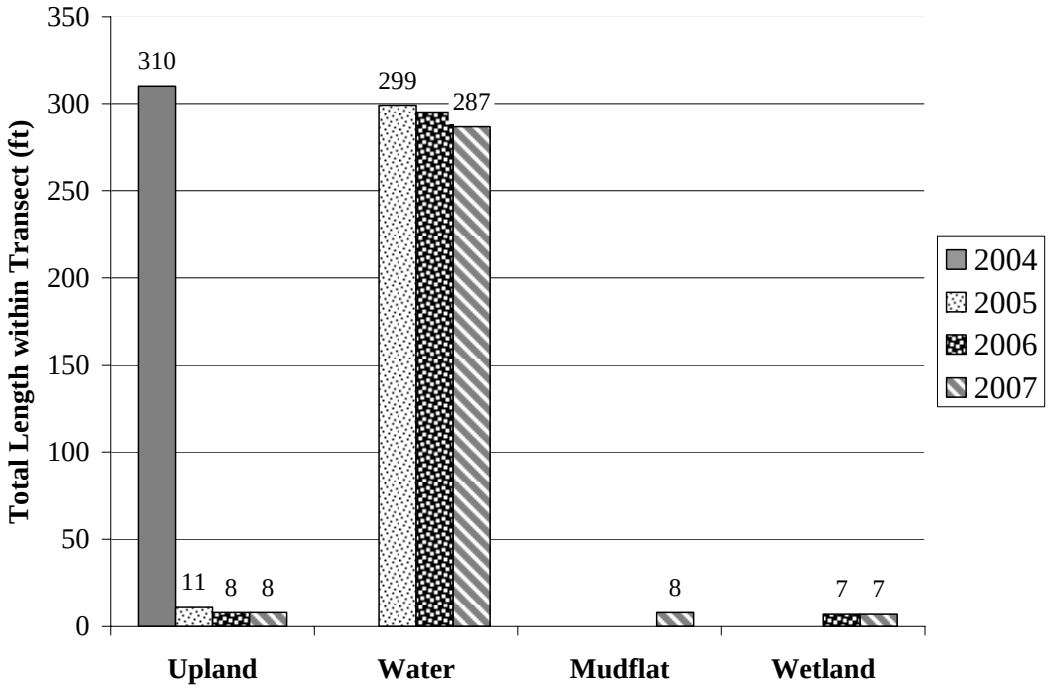
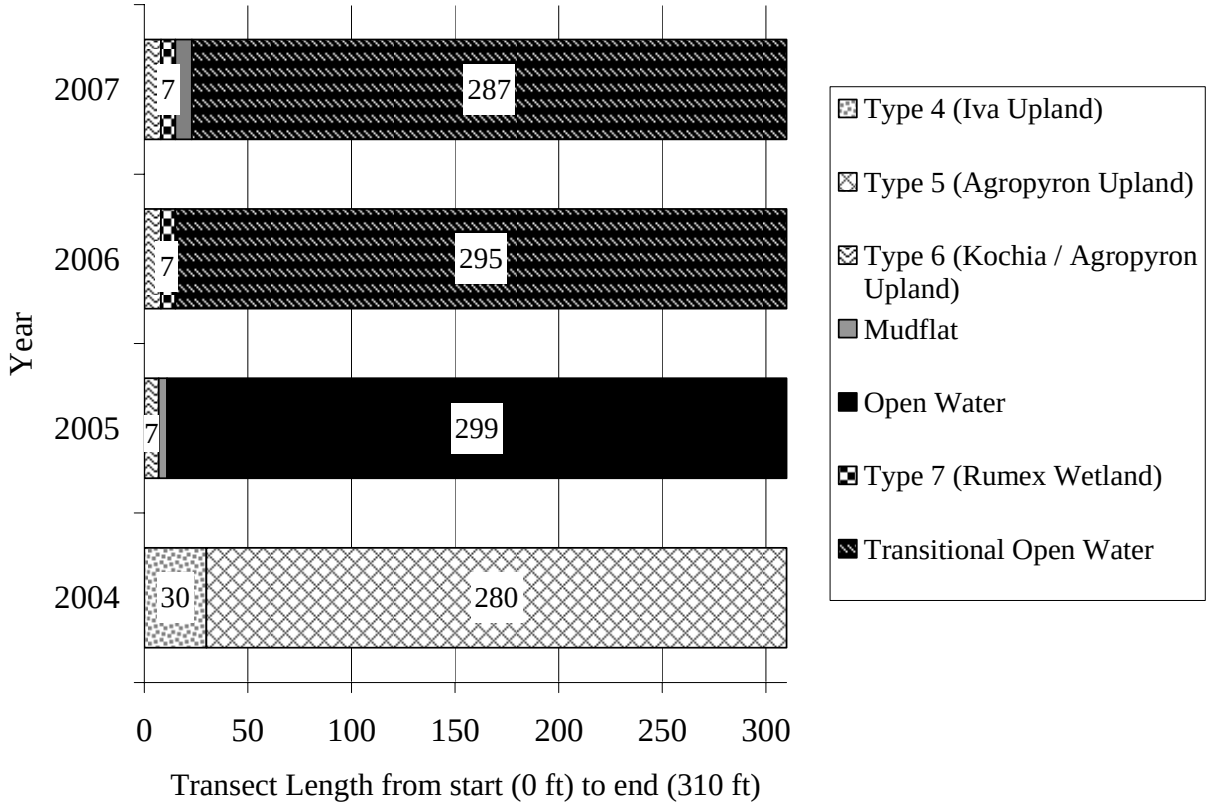


Chart 4: ***Transect maps showing vegetation types of Transect 2 from start (0 feet) to end (310 feet) from 2004 to 2007.***



Cirsium arvense was the only State noxious weed found in 2006 and 2007 within the confines of the berm (**Figure 3** in **Appendix A**). *Cirsium arvense* grew in dense patches on the western side of the saturation line (**Photo 22** in **Appendix C**). Two of these patches were mapped, though other nearby patches may be present. Outside the berm another State noxious weed has been present, *Cardaria draba*. In 2007 it appeared to be less abundant than in previous years. The landowner has been chemically controlling noxious and exotic weeds around the project site since at least 2002.

3.3 Soils

Prior to construction of the wetland mitigation site, the project site was composed of three soil types: *Absher-Noble Complex, 0-5% slopes*; *Marvan Clay, 0-2% slopes*; and *Lallie Silty Clay Loam* (USDA 1982). These soil types are conducive for creating ponds due to their high clay content and low permeability (USDA 1982). However, major excavation was performed to create a depression and build the surrounding berms; thereby, greatly disturbing these soil types.

In 2005 to 2007, these soil types were all inundated. Matrix soil colors and textures have mostly remained the same since 2005; however, some 2007 pits exhibited darker matrix colors resulting from decomposed vegetation. Clay soil textures had matrix colors ranging from 2.5Y 4/1 to 10YR 4/1 (**COE Forms** in **Appendix B**). In 2007, some soil layers exhibited mottles ranging from 10YR 4/6 to 10YR 5/8 (**COE Forms** in **Appendix B**).

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 (LWC 2002). No previously delineated wetlands were filled in during the development of this mitigation site.

Wetland development occurred for the first time in 2006 and continued to develop in 2007. Vegetation, soils, and hydrology were discussed in previous sections. Overall, 65.06 acres of wetlands, 24.72 acres of mudflat, and 66.66 acres of transitional open water were mapped in 2007 (**Figure 3** in **Appendix B**). In 2007, transitional open water and wetland decreased while mudflat and upland increased. Each wetland community was mapped onto the 2007 aerial photograph and its acreage was calculated (**Figure 3** in **Appendix B**; **Table 4**).

Table 4: ***Acreages for each 2007 wetland community within the Little Muddy Creek Wetland Mitigation Site.***

Wetland Community	Acreage
Type 7 – *Rumex maritimus* Wetland Fringe	0.24
Type 8 – *Polygonum / Potamogeton* Wetland	0.00
Type 9 – *Polygonum aviculare* Wetland	30.84
Type 10 – *Typha latifolia* Wetland	0.57
Type 11 – *Hordeum jubatum* Wetland	12.76
Type 9/11 – *Polygonum* / *Hordeum* Wetland	19.12
Type 10/11 – *Typha* / *Hordeum* Wetland	1.15
Type 12 – *Alisma gramineum* Wetland	0.38
Total Wetland Habitat	**65.06**

3.5 Wildlife

Direct observations of all wildlife species and signs indicating their presence have been compiled since 2004 (**Table 5**; **Appendix B)**. A dramatic change in bird guilds was observed from 2004 to 2005. The bird guilds observed in 2005 have been present during all site visits in 2006 and 2007. In 2007 about 25 species of shorebirds, waterfowl, and gulls inhabited the site (**Table 5**). One Trumpeter Swan, a bird species of special concern, was observed loafing in the wetland during the spring 2007 visit.

Table 5: ***Fish and wildlife species observed within the Little Muddy Creek Wetland Mitigation Site in 2004 to 2007.***

FISH, AMPHIBIANS, REPTILES	
Common Carp (*Cyprinus carpio*)	
Plains Garter Snake (*Thamnophis radix*)	
Western Chorus Frog (*Pseudacris triseriata*)	
BIRDS	
American Avocet (*Recurvirostra americana*)	**Horned Lark (*Eremophila alpestris*)**
American Coot (*Fulica americana*)	**Killdeer (*Charadrius vociferous*)**
American Wigeon (*Anas americana*)	Lesser Scaup (*Aythya affinis*)
American White Pelican (*Pelecanus erythrorhynchos*)	Long-billed Dowitcher (*Limnodromus scolopaceus*)
Blue-winged Teal (*Anas discors*)	**Mallard (*Anas platyrhynchos*)**
Brewer's Blackbird (*Euphagus cyanocephalus*)	Marbled Godwit (*Limosa fedoa*) [probably]
Bufflehead (*Bucephala albeola*)	Mourning Dove (*Zenaida macroura*)
Canada Goose (*Branta Canadensis*)	Northern Harrier (*Circus cyaneus*)
Canvasback (*Aythya valisineria*)	**Northern Pintail (*Anas acuta*)**
Cinnamon Teal (*Anas cyanoptera*)	**Northern Shoveler (*Anas clypeata*)**
Common Raven (*Corvus corax*)	**Red-winged Blackbird (*Agelaius phoeniceus*)**
Common Tern (*Sterna hirundo*)	Ring-necked Duck (*Aythya collaris*)
Double-crested Cormorant (*Phalacrocorax auritus*)	Ruddy Duck (*Oxyura jamaicensis*)
Eared Grebe (*Podiceps nigricollis*)	**Sandpiper (unidentified species)**
Ferruginous Hawk (*Buteo regalis*)	**Sparrow (unidentified species)**
Franklin's Gull (*Larus pipixcan*)	**Trumpeter Swan (*Cygnus buccinator*)**
Gadwall (*Anas strepera*)	Vesper Sparrow (*Pooecetes gramineus*)
Golden Eagle (*Aquila chrysaetos*)	Western Meadowlark (*Sturnella neglecta*)
Great Blue Heron (*Ardea herodias*)	**Willet (*Catoptrophorus semipalmatus*)**
Green-winged Teal (*Anas crecca*)	**Wilson's Phalarope (*Phalaropus tricolor*)**
Horned Grebe (*Podiceps auritus*)	Yellow-headed Blackbird (*Xanthocephalus xanthocephalus*)
MAMMALS	
American Badger (*Taxidea taxus*)	
Common Raccoon (*Procyon lotor*)	
Coyote (*Canis latrans*)	
Mule Deer (*Odocoileus hemionus*)	
Pronghorn (*Antilocapra americana*)	
Richardson's Ground Squirrel (*Spermophilus richardsonii*)	
White-tailed Deer (*Odocoileus virginianus*)	

Bolded species were observed in 2007.

Changes in the mammalian, amphibian, and reptilian communities have also been noticeable since 2004 (**Table 5**). While pronghorns (*Antilocapra americana*) were the dominant mammal in 2004 and 2005, they are now observed along with white-tailed deer (*Odocoileus virginianus*) and mule deer (*Odocoileus hemionus*). No amphibians or reptiles were observed in 2007. Dragonflies, damselflies, and mosquitoes continue to flourish.

3.6 Macroinvertebrates

Aquatic macroinvertebrates were not sampled from 2004 to 2006. However, dragonflies, damselflies, and mosquito adults and larvae have been observed during the spring visits of 2005, 2006, and 2007. Mosquitoes are a major prey of dragonflies and damselflies (Merritt and Cummins 1984). In 2007, one macroinvertebrate sample was collected (**Photo 13** in **Appendix C**). The water column was occupied with an abundance of green algae. Complete results for the macroinvertebrate sampling and analysis are presented in **Appendix F**. The following macroinvertebrate analysis was summarized by Rhithron Associates, Inc. (Bollman 2007):

> *Poor biotic conditions are indicated by the bioassessment score at this site. Ostracods and corixids were the only two taxa collected at the site, and the abundance of each of these was very low. These findings suggest that aquatic habitats were underdeveloped at the site, with the benthic surface and open water accounting for all the available colonization spaces.*

3.7 Functional Assessment

A functional assessment of the wetland habitats was completed for 2007 (**Functional Assessment Form** in **Appendix B**). In 2007, the Little Muddy Creek Wetland Mitigation Site continued to rate as a Category II wetland because it acheived an exceptional wildlife habitat rating (**Table 6**). The site also rated high for short and long term surface water storage and production export/food chain support (**Table 6**). However, the total score and functional units dropped slightly from 2006 (**Table 6**). This drop was attributable to the de-listing of the Bald Eagle and the absence of aquatic bed habitat.

3.8 Photographs

Representative photos taken from photo-points (**Photos 1-8**), transects (**Photos 9-12**), and of the general project area (**Photos 13-23**) are provided in **Appendix C**. The 2007 aerial photograph taken on July 5th was used as a base for **Figures 2** and **3** (**Appendix A**).

3.9 Maintenance Needs / Recommendations

The berm, diversion structures, excavated channels, and inlet/outlet structures were in good condition during the mid-season visit. During the initial filling of the site, water was released in phases in order to prevent erosion of the berm. Vegetation on the berm has grown dense and tall. In 2006 it was suggested that extremely wide and deep cracks on the berm near PP-5 should be monitored. However, these cracks were much shallower in 2007, indicating they are ephemeral and a result of how the soil responds to precipitation events.

Table 6: ***Summary of 2006 and 2007 wetland function/value ratings and functional points at the Little Muddy Creek Wetland Mitigation Site.***

Function and Value Parameters from the 1999 MDT Montana Wetland Assessment Method[1]	2006	2007
Listed/Proposed T&E Species Habitat	Mod (0.7)	Low (0.0)
MTNHP Species Habitat	Low (0.1)	Mod (0.6)
General Wildlife Habitat	Exc (1.00)	Exc (1.0)
General Fish/Aquatic Habitat	Mod (0.4)	Mod (0.4)
Flood Attenuation	Mod (0.6)	Mod (0.6)
Short and Long Term Surface Water Storage	High (1.0)	High (1.0)
Sediment, Nutrient, Toxicant Removal	Mod (0.7)	Mod (0.7)
Sediment/Shoreline Stabilization	Low (0.3)	Low (0.3)
Production Export/Food Chain Support	High (0.9)	High (0.8)
Groundwater Discharge/Recharge	Low (0.1)	Low (0.1)
Uniqueness	Mod (0.4)	Mod (0.4)
Recreation/Education Potential	Mod (0.7)	Mod (0.7)
Actual Points/Possible Points	**6.9 / 12**	**6.6 / 12**
% of Possible Score Achieved	**58%**	**55%**
Overall Category	**II**	**II**
Total Acreage of Assessed Wetlands and Other Aquatic Habitats within Site Boundaries (ac)	**188.25**	**156.44**
Functional Units (acreage x actual points)	**1298.93**	**1032.50**

3.10 Current Credit Summary

As of 2007, the Little Muddy site has developed 65.06 acres of Class II wetland, 66.66 acres of transitional open water, and 24.72 acres of mudflat for a total of 156.44 acres of aquatic habitat (**Figure 3** in **Appendix A**). Additionally, the site has developed over 1,000 functional units as of 2007 (**Table 6**). The COE anticipated that the project would result in the establishment of emergent marsh and some shallow water habitat, with diversity accomplished through fluctuating water levels. No specific performance criteria or ratios were stipulated in COE correspondence regarding the project (Steinle 2001; Steinle 2002).

It was anticipated by MDT that approximately 13.57 acres of compensatory wetland mitigation credit could be needed to offset impacts associated with ten different projects within the Missouri-Sun-Smith River watershed (#7) (MDT 2002). An additional 50 acres of reserve credit was also being sought by MDT (MDT 2002). Thus, MDT originally sought a total 63.57 acres of compensatory wetland mitigation credit.

Approximately 0.80 acre, 9.97 acres, and 2.80 acres of these 13.57-acre impacts were projected at Class II, III, and IV wetlands, respectively. The COE approved application of these projected impact acres to the Little Muddy site as previously "owed" mitigation, with the exception of the Bowman's Corner project, which comprised 10.7 of the 13.57 projected impact acres (Steinle 2002). Consequently, 2.87 acres of "owed" mitigation was approved for application against the Little Muddy site, with any additional projects (including Bowman's Corner) to be applied against the 50-acre "reserve". Final application of projected or incurred wetland impacts against this mitigation site are subject to ongoing discussions and specific agreements between the COE and MDT. However, as of 2007, the site appears to be developing the anticipated target credits.

4.0 REFERENCES

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Appendix A

FIGURES 2 & 3

MDT Wetland Mitigation Monitoring
Little Muddy Creek
Cascade County, Montana

Figure 2 - 2007 Monitoring Activity Locations

PP4
Inlet
PP3
Monitoring Area Limits
Little Muddy Creek
PP2
Outlet
Soil Pit 1
PP1
Soil Pit 12
Soil Pits 2&3
T2End
T2Start
Soil Pit 4
T1End
PP6
Soil Pit 5
Soil Pit 10
T1Start
Soil Pit 7
Soil Pit 6
PP5
Soil Pit 8
Soil Pit 9
Soil Pit 11
Monitoring Area Limits

LEGEND
Monitoring Area Limits
Macroinvertebrate Sampling Point
Vegetation Transect
Photo Point Location
Soil Pit Location
Base Photograph Date: July 05, 2007

N
W
E
S

SCALE 1"=700ft
700' 350' 0 350' 700'
1"= 700'

PROJECT NAME
MDT Little Muddy CreekWetland Mitigation
DRAWING TITLE
2007 Monitoring Activity Locations

DRAWN: RA/LL
PROJ MGR: J.Berglund
CHECKED: AP APP'VD: JB
PROJ NO: 330054
LOCATION:
SCALE: 1"=700ft
FILE NAME: L:\330054.302 Muddy\dwg\Muddy2007A.dwg

PBSJ
1120 Cedar
Missoula, MT 59802

FIGURE
2 OF -
REV -
Nov/26/2007

Figure 3 - 2007 Mapped Site Features

LEGEND
- Transitional Open Water
- Vegetative Communities
- Monitoring Area Limits
- Cirsium arvense
- Base Photograph Date: July 05, 2007

Project Area	406.10 acres
Wetland Area	65.06 acres
Transitional Open Water	66.66 acres
Mudflat	24.72 acres
Upland Area	249.66 acres

N / W / E / S

SCALE 1"=700ft

7 1 ft. wide wetland fringe

Monitoring Area Limits

Berm = 6

Mudflat

Transitional Open Water

7 2 ft. wide wetland fringe

7 5 ft. wide wetland fringe

7 1 ft. wide wetland fringe

Vegetation Types
- Type 6 - Kochia/Agropyron Upland
- Type 7 - Rumex maritimus Wetland Fringe
- Type 9 - Polygonum aviculare Wetland
- Type 9/11 - Polygonum/Hordeum Wetland
- Type 10 - Typha latifolia Wetland
- Type 10/11 - Typha/Hordeum Wetland
- Type 11 - Hordeum jubatum Wetland
- Type 12 - Alisma gramineum Wetland
- Type 13 - Upland

PROJECT NAME: MDT Little Muddy Creek Wetland Mitigation

DRAWING TITLE: Mapped Site Features

DRAWN: LLL | PROJ MGR: J. Berglund | APPVD:

PROJ NO: B43088 | LOCATION: | SCALE: 1"=700' | CHECKED: | APPVD:

FILENAME: L:\330054.302 Muddy\dwg\Muddy2007A.dwg

PBS J

1120 Cedar
Missoula, MT 59802

FIGURE 3 OF 3

REV -

Oct/23/2007

Appendix B

2007 WETLAND MITIGATION SITE MONITORING FORM
2007 BIRD SURVEY FORM
2007 COE WETLAND DELINEATION FORMS
2007 MDT FUNCTIONAL ASSESSMENT FORM

MDT Wetland Mitigation Monitoring
Little Muddy Creek
Cascade County, Montana

PBS&J / MDT WETLAND MITIGATION SITE MONITORING FORM

Project Name: **Little Muddy Wetland** Project Number: **B43088.00-0304**
Assessment Date: **August 22, 2007** 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-70's** Time of Day: **9:00am-5:00pm**
Initial Evaluation Date: **June 4, 2004** Monitoring Year: **Year 4** # 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: **0.5 feet** Range of Depths: **0.1 to 8.0**
Percent of assessment area under inundation: **50%**
Depth at emergent vegetation-open water boundary: **site specific:1 or 8 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:
The site was not filled in 2007. Areas that were saturated in spring/early summer were dry by late summer. Typha latifolia was present, but not floroushing because of the dryness. An upland community was developing on the central portion of the peninsula.

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%
Bromus japonicus*	1 = 1-5%	Sisymbrium altissimum	1 = 1-5%
Hordeum jubatum	+ = < 1%	Tragopogon dubius	+ = < 1%

Comments / Problems: **Plant species and % coverage reflects conditions in 2004. Entire community became Open Water in 2005 and other communities 2006-2007. *Previously identified as Festuca spp.**

Community Number: **2** Community Title (main spp): **Avena**

Dominant Species	% Cover	Dominant Species	% Cover
Elymus varnensis	1 = 1-5%	Avena/Bromus*	5 = > 50%
Lactuca serriola	+ = < 1%		

Comments / Problems: **Plant species and % coverage reflects conditions in 2004. Entire community became Open Water in 2005 and other communities 2006-2007. *Bromus was previously identified as Festuca spp.**

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

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

Comments / Problems: **Plant species and % coverage reflects conditions in 2004. Entire community became Open Water in 2005 and other communities 2006-2007. *Previously identified as Festuca spp.**

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: **Plant species and % coverage reflects conditions in 2004. Entire community became Open Water in 2005 and other communities 2006-2007.**

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: **Plant species and % coverage reflects conditions in 2004. Entire community became Open Water in 2005 and other communities 2006-2007.**

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	2 = 6-10%
Agropyron intermedium	2 = 6-10%	Hordeum jubatum	1 = 1-5%
Polygonum douglassii	+ = < 1%	Helianthus annuus	1 = 1-5%

Comments / Problems: **In 2006-2007, this community occupied some of the upland shoreline and all of the berm.**

Community Number: **7** Community Title (main spp): **Rumex maritimus**

Dominant Species	% Cover	Dominant Species	% Cover
Rumex maritimus	3 = 11-20%	Scirpus (maritimus)	+ = < 1%
Hordeum jubatum	3 = 11-20%	Chenopodium album	2 = 6-10%
Rumex crispus	2 = 6-10%		
Rorippa sinuata	+ = < 1%		
Kochia scoparia	2 = 6-10%		
Salix lutea	+ = < 1%		

Comments / Problems: **In 2006, this community was developing as a fringe along the shoreline. In 2007, this community was more developed and often occuped the zone between Types 9 and 11.**

Community Number: **8** Community Title (main spp): **Type 8 - Polygonum / Potamogeton**

Dominant Species	% Cover	Dominant Species	% Cover
Polygonum aviculare	4 = 21-50%		
Potamogeton pectinatus	2 = 6-10%		
Potamogeton (amplifolius ?)	+ = < 1%		
Alisma gramineum	+ = < 1%		

Comments / Problems: **In 2006, these plant species were found growing up through Open Water. Percent cover is hard to determine due to inundation and a developing community. In 2007, aquatic plants were not observed and all surface water was filled with a green algal bloom.**

VEGETATION COMMUNITIES (continued)

Community Number: **9** Community Title (main spp): **Type 9 - Polygonum aviculare**

Dominant Species	% Cover	Dominant Species	% Cover
Polygonum aviculare	5 = > 50%	Rumex maritimus	2 = 6-10%
Typha latifolia	1 = 1-5%	Rumex crispus	1 = 1-5%
Sisymbrium spp.	2 = 6-10%		
Agropyron smithii	1 = 1-5%		
Hordeum jubatum	2 = 6-10%		
algae			

Comments / Problems: **In 2006, this community dominated land that became exposed as the Open Water receded. In 2007 this community dominated where land remained saturated for most of the growing season; In drier areas or in newly exposed mudflat, this community mixed with Hordeum or Rumex.**

Community Number: **10** Community Title (main spp): **Type 10 - Typha latifolia**

Dominant Species	% Cover	Dominant Species	% Cover
Typha latifolia	2 = 6-10%	Rumex crispus	2 = 6-10%
Sisymbrium spp.	4 = 21-50%	Rumex maritimus	+ = < 1%
Polygonum aviculare	2 = 6-10%	Agropyron intermedium	2 = 6-10%
Hordeum jubatum	3 = 11-20%		
Bromus japonicus	+ = < 1%		
Kochia scoparia	4 = 21-50%		

Comments / Problems: **In 2006, this community was developing on land exposed when the Open Water receded. In 2007, this community was drying out; standing Typha was browning by mid-August and other plants were invading the community. In 2007 Typha clumps were present within the Polygonum and Hordeum communities.**

Community Number: **11** Community Title (main spp): **Type 11 - Hordeum jubatum**

Dominant Species	% Cover	Dominant Species	% Cover
Hordeum jubatum	5 = > 50%		
Typha latifolia	+ = < 1%		
Sisymbrium spp.	2 = 6-10%		

Comments / Problems: **In 2006-2007, this community developed on land that was saturated, but may not have been inundated. In 2007, Hordeum comprised almost 100% coverage. Newly exposed mudflat was mixed with Hordeum and Polygonum.**

Community Number: **12** Community Title (main spp): **Type 12 - Alisma gramineum**

Dominant Species	% Cover	Dominant Species	% Cover
Alisma gramineum	+ = < 1%	Eleocharis palustris	1 = 1-5%
Scirpus acutus	1 = 1-5%		
Hordeum jubatum	1 = 1-5%		
Rumex maritimus	1 = 1-5%		
Typha latifolia	1 = 1-5%		
Chenopodium glaucum	+ = < 1%		

Comments / Problems: **In 2006, this community developed in the outlet channel. In 2007 this community was drying out by late August. Alisma coverage greatly declined in 2007.**

VEGETATION COMMUNITIES (continued)

Community Number: **13** Community Title (main spp): **Type 13 - Upland**

Dominant Species	% Cover	Dominant Species	% Cover
Cirsium arvense	1 = 1-5%	Sisymbrium altissimum	1 = 1-5%
Agropyron smithii	2 = 6-10%	Agropyron varnensis	2 = 6-10%
Elymus varnensis	2 = 6-10%	Agropyron intermedium	1 = 1-5%
Bromus japonicus	4 = 21-50%	Chenopodium album	1 = 1-5%
Sisymbrium spp.	2 = 6-10%		
Kochia scoparia	2 = 6-10%		

Comments / Problems: **In 2006, this community occurred as islands and created the boundary on the west side of the project area. In 2007 these islands expanded where soils dried early in the growing season.**

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, 6,13	Polygonum aviculare	7, 8-10, 11
Agropyron smithii	1-6, 13	Polygonum douglassii	inlet channel
algae, green	Open Water	Populus tremuloides	10
Alisma gramineum	8, 12	Potamogeton (amplifolius?)	8
Arctium minus	1-5	Potamogeton pectinatus	8
Artemisia frigida	3	Rorippa sinuata	7
Aster pansus	5, 6	Rosa spp.	1-5, inlet chan
Atriplex rosea (A. argentea)	1-5	Rumex crispus	7, 9, 10, 11
Bromus inermis	1-6, 13	Rumex maritimus	7, 9, 10, 11, 12
Bromus japonicus	6, 13	Salix exigua	7, 10
Cardaria pubescens	1-5	Salix lutea	7, 10
Chenopodium album	6, 7, 11, 13	Salsola iberica (syn. S. kali)	1-5
Chenopodium glaucum	10, 12, 13	Scirpus acutus	7, 12
Chenopodium leptophyllum	10, 13	Scirpus maritimus	7
Chenopodium spp.	6	Scirpus pungens	7, 12
Cirsium arvense	1-5, 6, 13	Sisymbium altissimum	1-6, 11-13
Eleocharis palustris	12	Sisymbrium spp.	9-11, 13
Elymus hispidus (Agropyron intermedium)	5, 6, 13	Tragopogon dubuis	1-6, 11, 13
Elymus varnensis	1-2, 6, 13	Typha latifolia	7, 9-12
Grindelia squarrosa	1-5, 6, 13		
Helianthus annuus	3, 6, 13		
Hordeum jubatum	1-7, 9-12		
Iva axillaris	1-6, 9, 11, 13		
Kochia scoparia	5-7, 11, 13		
Lactuca serriola	2-6, 11, 13		
Medicago sativa	1-6		
Melilotus alba	13,inlet channel		
Melilotus officinale	1-5, 13, inlet channel		

Comments / Problems: _____

PLANTED WOODY VEGETATION SURVIVAL

Plant Species	Number Originally Planted	Number Observed	Mortality Causes

Comments / Problems: **N/A**

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, Herptiles, and Fish

Mammal and Herptile Species	Number Observed	Indirect Indication of Use			
		Tracks	Scat	Burrows	Other
pronghorn	14	☐	☐	☐	
mule deer	2	☐	☐	☐	
common carp (all dead)	40	☐	☐	☐	
		☐	☐	☐	
		☐	☐	☐	
		☐	☐	☐	
		☐	☐	☐	
		☐	☐	☐	

Additional Activities Checklist:
Yes Macroinvertebrate Sampling (if required)

Comments / Problems: One macroinvertebrate sample was collected for the first time.

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		From P-1 [see Photo Sheet, Photo 1]	136
P-1		From P-1 [see Photo Sheet, Photo 2]	210
P-1		From behind P-1 [see Photo Sheet, Photo 3]	40
P-2		From P-2	282
P-2		From P-2	246
P-2		From P-2	208
P-2		From P-2	246-208
P-2		From P-2	180
P-2		From P-2	150
P-2		From P-2	108
P-3		From P-3	130
P-3		From P-3	culvert
P-4		From P-4	208
P-4		From P-4 towards diversion dam	71
P-5		From P-5	316
P-6		From P-6	317,283
T-1		From T-1 start	10
T-1		From T-1 end	190
T-2		From T-2 start	266
Misc.		Miscellaneous photographs	

Comments / Problems: <u>Compass declination set at 16 degrees East in 2005, 2006, and 2007; Declination was set slightly different in 2004.</u>

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: **Mapped with GPS points and by drawing directly onto the 2007 aerial photo.**

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.

Yes Survey wetland – upland boundary with a resource grade GPS survey.

Comments / Problems: _____

FUNCTIONAL ASSESSMENT

(Complete and attach full MDT Montana Wetland Assessment Method field forms.)
(Also attach any completed abbreviated field forms, if used)

Comments / Problems: _____

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: **August 22, 2007** Examiner: **A. Pipp**
Transect Number: **1** Approximate Transect Length: **200 feet** Compass Direction from Start: **10˚** Note: **Open water without a T-1 end; Declination is at 16 degrees.**

Vegetation Type A: **Type 6 - Kochia / Agropyron Upland**	
Length of transect in this type: 0-10 feet	
Plant Species	**Cover**
Kochia scoparia	1 = 1-5%
Helianthus annuus (only 2006 stalks present)	
Agropyron smithii	5 = > 50%
Elymus varnensis	1 = 1-5%
Hordeum jubatum	1 = 1-5%
Bromus japonicus	1 = 1-5%
Total Vegetative Cover:	90%

Vegetation Type B: **Type 7 - Rumex maritimus Wetland Fringe**	
Length of transect in this type: 10-15 feet	
Plant Species	**Cover**
Hordeum jubatum	5 = > 50%
Rumex maritimus	3 = 11-20%
Kochia scoparia	+ = < 1%
Lactuca serriola	+ = < 1%
Thlaspi arvense	+ = < 1%
Elymus varnensis	+ = < 1%
Total Vegetative Cover:	95%

Vegetation Type C: **Type 9 - Polygonum aviculare Wetland**	
Length of transect in this type: 15.0 to 197 feet	
Plant Species	**Cover**
Polygonum aviculare	5 = > 50%
Potamogeton pectinatus (not observed in 2007)	
Hordeum jubatum	1 = 1-5%
Bare Ground = 30%	
Total Vegetative Cover:	70%

Vegetation Type D: **Mudflat**	
Length of transect in this type: 197-200 feet	
Plant Species	**Cover**
No vegetation.	
Total Vegetative Cover:	0%

MDT WETLAND MONITORING – VEGETATION TRANSECT

Site: **Little Muddy Wetland** Date: **August 22, 2007** Examiner: **A. Pipp**
Transect Number: **2** Approximate Transect Length: **310 feet** Compass Direction from Start: **266˚** Note: **Open water without a T2 end; declination at 16 deg.**

Vegetation Type E: **Type 6 - Kochia / Agropyron Upland**	
Length of transect in this type: 0-8 feet	
Plant Species	**Cover**
Elymus varnensis	+ = < 1%
Kochia scoparia	+ = < 1%
Rumex maritimus	+ = < 1%
Agropyron intermedium	4 = 21-50%
Agropyron smithii	4 = 21-50%
Chenopodium album	+ = < 1%
Total Vegetative Cover:	80%

Vegetation Type F: **Type 7 - Rumex maritimus (above terrace)**	
Length of transect in this type: 8 to 10 feet	
Plant Species	**Cover**
Rumex maritimus	+ = < 1%
Hordeum jubatum	3 = 11-20%
Kochia scoparia	2 = 6-10%
Polygonum aviculare	+ = < 1%
Puccinellia nuttalliana	+ = < 1%
Chenopodium album	3 = 11-20%
Total Vegetative Cover:	40%

Vegetation Type G: **Type 7 - Rumex maritimus (below terrace)**	
Length of transect in this type: 10-15 feet	
Plant Species	**Cover**
Rumex maritimus	+ = < 1%
Potamogeton pectinatus (not observed in 2007)	
Polygonum aviculare	+ = < 1%
Chenopodium glaucum	+ = < 1%
Rorippa sinuata	+ = < 1%
Bare Ground = 99%	
Total Vegetative Cover:	1%

Vegetation Type H: **Mudflat**	
Length of transect in this type: 15-23 feet	
Plant Species	**Cover**
No Vegetation.	
Total Vegetative Cover:	0%

MDT WETLAND MONITORING – VEGETATION TRANSECT

Site: **Little Muddy Wetland** Date: **August 22, 2007** Examiner: **A. Pipp**
Transect Number: **2** Approximate Transect Length: **310 feet** Compass Direction from Start: **266˚** Note: **Open water without a T2 end; declination at 16 deg.**

Vegetation Type E: **Open Water**
Length of transect in this type: 23 - 310 feet

Plant Species	Cover
Clumps of what appeared to be dead vegetation	
were present.	
Total Vegetative Cover:	0%

Vegetation Type F:
Length of transect in this type: feet

Plant Species	Cover
Total Vegetative Cover:	%

Vegetation Type G:
Length of transect in this type: feet

Plant Species	Cover
Total Vegetative Cover:	%

Vegetation Type H:
Length of transect in this type: feet

Plant Species	Cover
Total Vegetative Cover:	%

MDT WETLAND MONITORING – VEGETATION TRANSECT

Cover Estimate		**Indicator Class**	**Source**
+ = < 1%	3 = 11-10%	+ = Obligate	P = Planted
1 = 1-5%	4 = 21-50%	- = Facultative/Wet	V = Volunteer
2 = 6-10%	5 = > 50%	0 = Facultative	

Percent of perimeter developing wetland vegetation (excluding dam/berm structures): **95%**

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: _____

BIRD SURVEY – FIELD DATA SHEET

Site: **Little Muddy Wetland** Date: **5/7/07**
Survey Time: **1120 am** to **1300 pm**

Bird Species	#	Behavior	Habitat	Bird Species	#	Behavior	Habitat
American Avocet	27	FO	OW MA	Mallard	33	FO	OW
American Coot	0			Northern Pintail	9	F	OW
American Pelican	12	F L	OW	Northern Shoveler	18	F L	OW
American Wigeon	8	F L	OW	Red-wing Blackbird	4	F N	MF
Blue-winged Teal	0			Ring-necked Duck	0		
Brewer's Blackbird	14	F	MF	Ruddy Duck	0		
Bufflehead	0			Sandpiper (Spotted or Solitary)	1	F	MF
Canada Goose	9	L	OW MF	Scaup	0		
Canvasback	0			Shorebird (unid.)	0		
Cinnamon Teal	4	F L	OW	Sparrow (unid.)	5	F FO	UP
Common Tern	0			Swallow, Tree	0		
Double-crested Cormorant	5	L	MF	Trumpeter Swan	1	L	OW MF
Ducks (uniden.)	40	L F	OW	Willet	10	F	OW MF
Eared Grebe	0			Wilson's Pharlarope	15	FO	OW
Ferruginous Hawk	0						
Franklin's Gull	0						
Gadwall	0						
Golden Eagle *	1	FO	UP				
Great Blue Heron	2	L	MF				
Green-winged Teal	9	F L	OW MF				
Gull (unident.)	0						
Horned Lark	2	FO F	UP				
Killdeer	6	L F	MF 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: **Blue sky with a few clouds; high 60's; mild wind.**

Notes: *** = Golden Eagle observed on powerlines west of project area. Mosquitos abundant; Mosquito abatement was conducted 1-2 weeks prior to this visit. Peninsula was exposed with no vegetation present and very few birds when compared to 2006.**

BIRD SURVEY – FIELD DATA SHEET

Site: **Little Muddy Wetland** Date: **8/22/07**
Survey Time: **0900 am** to **1700 pm**

Bird Species	#	Behavior	Habitat	Bird Species	#	Behavior	Habitat
American Avocet	7	F	MF MA	Mallard	1	F	OW
American Coot	4	F	OW	Northern Pintail			
American Pelican	2	L	MA	Northern Shoveler			
American Wigeon				Red-wing Blackbird			
Blue-winged Teal				Ring-necked Duck			
Brewer's Blackbird				Ruddy Duck			
Bufflehead				Sandpiper (Spotted or Solitary)	4	F	MF
Canada Goose				Scaup			
Canvasback				Shorebird (unid.)			
Cinnamon Teal				Sparrow (unid.)			
Common Tern				Swallow, Tree			
Double-crested Cormorant				Trumpeter Swan			
Ducks (uniden.)				Willet			
Eared Grebe				Wilson's Pharlarope	4	FO	OW
Ferruginous Hawk							
Franklin's Gull	70	L	MF				
Gadwall							
Golden Eagle *							
Great Blue Heron							
Green-winged Teal							
Gull (unident.)							
Horned Grebe	2	F	OW				
Horned Lark							
Killdeer							

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: **Blue Sky with some clouds; 0-5 mph wind; mid-70's.**

Notes: **Species that are listed above and lack abundance information were not specifically observed during this site visit. However, more birds were observed than recorded because this task was done incidental to vegetation monitoring and wetland delineation tasks.**

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

Project/Site: Little Muddy Wetland Mitigation Site - 2007 **Project No:** B43088
Applicant/Owner: -Montana Department of Transportation-
Investigators: Andrea Pipp

Date: 22-Aug-2007
County: Cascade
State: Montana
Plot ID: Soil Pit 1

Do Normal Circumstances exist on the site? (Yes) No
Is the site significantly disturbed (Atypical Situation:)? Yes (No)
Is the area a potential Problem Area? Yes (No)
(If needed, explain on the reverse side)

Community ID: Emergent
Transect ID:
Field Location:
Outlet Channel.

VEGETATION

(USFWS Region No. 9)

Dominant Plant Species(Latin/Common)	Stratum	Indicator	Plant Species(Latin/Common)	Stratum	Indicator
Scirpus pungens	Herb	OBL	*Rumex crispus*	Herb	FACW
Bulrush,Three-Square			Dock,Curly		
Typha latifolia	Herb	OBL	*Scirpus acutus*	Herb	OBL
Cattail,Broad-Leaf			Bulrush,Hard-Stem		
Eleocharis palustris	Herb	OBL	*Chenopodium glaucum*	Herb	FAC
Spikerush,Creeping			Goosefoot,Oakleaf		

Percent of Dominant Species that are OBL, FACW or FAC: (excluding FAC-) 6/6 = 100.00%
FAC Neutral: 5/5 = 100.00%
Numeric Index: 9/6 = 1.50

Remarks:

HYDROLOGY

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

Field Observations

Depth of Surface Water: N/A *(in.)*
Depth to Free Water in Pit: N/A *(in.)*
Depth to Saturated Soil: = 3.0 *(in.)*

Wetland Hydrology Indicators
Primary Indicators
NO **Inundated**
YES **Saturated in Upper 12 Inches**
NO **Water Marks**
NO **Drift Lines**
NO **Sediment Deposits**
YES **Drainage Patterns in Wetlands**
Secondary Indicators
NO **Oxidized Root Channels in Upper 12 Inches**
NO **Water-Stained Leaves**
NO **Local Soil Survey Data**
YES **FAC-Neutral Test**
NO **Other(Explain in Remarks)**

Remarks:
Pit dug in the 'outlet' channel. Soil cracked 5 inches deep.

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

Project/Site: Little Muddy Wetland Mitigation Site - 2007 **Project No:** B43088
Applicant/Owner: -Montana Department of Transportation-
Investigators: Andrea Pipp

Date: 22-Aug-2007
County: Cascade
State: Montana
Plot ID: Soil Pit 1

SOILS

Map Unit Name (Series and Phase): Absher-Noble Complex, 0-5% slopes
Map Symbol: 10 **Drainage Class:** moderately well drained **Mapped Hydric Inclusion?**
Taxonomy (Subgroup): Fine montmorillonitic Borollic Natragid **Field Observations Confirm Mapped Type?** Yes (No)
Profile Description

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Color (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc
0-12+	A	2.5Y4/1	10YR4/6	Many Prominent	Clay

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

Remarks:

WETLAND DETERMINATION

Hydrophytic Vegetation Present? (Yes) No
Wetland Hydrology Present? (Yes) No
Hydric Soils Present? (Yes) No

Is the Sampling Point within the Wetland? (Yes) No

Remarks:

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

Project/Site: Little Muddy Wetland Mitigation Site - 2007	**Project No:** B43088	**Date:** 22-Aug-2007
Applicant/Owner: -Montana Department of Transportation-		**County:** Cascade
Investigators: Andrea Pipp		**State:** Montana
		Plot ID: Soil Pit 2

Do Normal Circumstances exist on the site?	(Yes) No	**Community ID:** Emergent
Is the site significantly disturbed (Atypical Situation:)?	Yes (No)	**Transect ID:**
Is the area a potential Problem Area?	Yes (No)	**Field Location:**
(If needed, explain on the reverse side)		Within the '8-10 feet' zone on T-2.

VEGETATION (USFWS Region No. 9)

Dominant Plant Species(Latin/Common)	Stratum	Indicator	Plant Species(Latin/Common)	Stratum	Indicator
Kochia scoparia	Herb	FAC	*Rumex maritimus*	Herb	FACW+
Summer-Cypress,Mexican			Dock,Golden		
Polygonum aviculare	Herb	FACW-	*Puccinellia nuttalliana*	Herb	OBL
Knotweed,Prostrate			Grass,Nuttall's Alkali		
Hordeum jubatum	Herb	FAC+	*Chenopodium album*	Herb	FAC
Barley,Fox-Tail			Goosefoot,White		

Percent of Dominant Species that are OBL, FACW or FAC: (excluding FAC-) 6/6 = 100.00%

FAC Neutral: 3/3 = 100.00%
Numeric Index: 14/6 = 2.33

Remarks:

HYDROLOGY

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

YES **No Recorded Data**

Field Observations

Depth of Surface Water:	N/A *(in.)*
Depth to Free Water in Pit:	N/A *(in.)*
Depth to Saturated Soil:	N/A *(in.)*

Wetland Hydrology Indicators

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

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

Remarks:
Moist at 7 inches, but not saturated. Pit was probably saturated earlier in the season. In 2006 Soils at this location were saturated to the surface.

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

Project/Site: Little Muddy Wetland Mitigation Site - 2007	**Project No:** B43088	**Date:** 22-Aug-2007
Applicant/Owner: -Montana Department of Transportation-		**County:** Cascade
Investigators: Andrea Pipp		**State:** Montana
		Plot ID: Soil Pit 2

SOILS

Map Unit Name (Series and Phase): Absher-Noble Complex, 0-5% slopes
Map Symbol: 10 **Drainage Class:** moderately well drained **Mapped Hydric Inclusion?**
Taxonomy (Subgroup): Fine montmorillonitic Borollic Natragid **Field Observations Confirm Mapped Type?** Yes (No)
Profile Description

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Color (Munsell Moist)	Mottle Abundance/Contrast		Texture, Concretions, Structure, etc
0-12	A	2.5Y4/2	N/A	N/A	N/A	Clay

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

Remarks:
Soil satisfies NRCS Hydric Soil Criteria #3, "Soils that are frequently ponded for long duration or very long duration during the growing season."

WETLAND DETERMINATION

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

Remarks:

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

Project/Site: Little Muddy Wetland Mitigation Site - 2007	**Project No:** B43088	**Date:** 22-Aug-2007
Applicant/Owner: -Montana Department of Transportation-		**County:** Cascade
Investigators: Andrea Pipp		**State:** Montana
		Plot ID: Soil Pit 3

Do Normal Circumstances exist on the site?	(Yes) No	**Community ID:** Emergent
Is the site significantly disturbed (Atypical Situation:)?	Yes (No)	**Transect ID:**
Is the area a potential Problem Area? (If needed, explain on the reverse side)	Yes (No)	**Field Location:** Within the 10-15 ft zone on T-2.

VEGETATION (USFWS Region No. 9)

Dominant Plant Species(Latin/Common)	Stratum	Indicator	Plant Species(Latin/Common)	Stratum	Indicator
Polygonum aviculare	Herb	FACW-	*Rumex maritimus*	Herb	FACW+
Knotweed,Prostrate			Dock,Golden		
Chenopodium glaucum	Herb	FAC	*Rorippa sinuata*	Herb	FAC+
Goosefoot,Oakleaf			Yellow-Cress,Spreading		

Percent of Dominant Species that are OBL, FACW or FAC: (excluding FAC-) 4/4 = 100.00%	**FAC Neutral:** 2/2 = 100.00% **Numeric Index:** 10/4 = 2.50

Remarks:
Total vegetative cover is 1% while bare soil covers 99%.

HYDROLOGY

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

YES **No Recorded Data**

Field Observations

Depth of Surface Water:	N/A *(in.)*
Depth to Free Water in Pit:	N/A *(in.)*
Depth to Saturated Soil:	= 0.25 *(in.)*

Wetland Hydrology Indicators

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

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

Remarks:

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

Project/Site: Little Muddy Wetland Mitigation Site - 2007	**Project No:** B43088	**Date:** 22-Aug-2007
Applicant/Owner: -Montana Department of Transportation-		**County:** Cascade
Investigators: Andrea Pipp		**State:** Montana
		Plot ID: Soil Pit 3

SOILS

Map Unit Name (Series and Phase): Absher-Noble Complex, 0-5% slopes
Map Symbol: 10 **Drainage Class:** moderately well drained **Mapped Hydric Inclusion?**
Taxonomy (Subgroup): Fine montmorillonitic Borollic Natragid **Field Observations Confirm Mapped Type?** Yes (No)
Profile Description

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Color (Munsell Moist)	Mottle Abundance/Contrast		Texture, Concretions, Structure, etc
0-0.2	A	2.5Y5/2	N/A	N/A	N/A	Clay
0.2-0.7	A	10YR2/1	N/A	N/A	N/A	Organic
0.7-12+	B	2.5Y5/2	N/A	N/A	N/A	Clay

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

Remarks:
Satisfies NRCS Hydric Soil Criteria #3, "Soils that are frequently ponded for long duration or very long duration during the growing season."

WETLAND DETERMINATION

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

Remarks:

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

Project/Site: Little Muddy Wetland Mitigation Site - 2007	**Project No:** B43088	**Date:** 22-Aug-2007
Applicant/Owner: -Montana Department of Transportation-		**County:** Cascade
Investigators: Andrea Pipp		**State:** Montana
		Plot ID: Soil Pit 4

Do Normal Circumstances exist on the site?	(Yes) No	**Community ID:** Emergent
Is the site significantly disturbed (Atypical Situation:)?	Yes (No)	**Transect ID:**
Is the area a potential Problem Area? (If needed, explain on the reverse side)	Yes (No)	**Field Location:** Along east terrace.

VEGETATION (USFWS Region No. 9)

Dominant Plant Species(Latin/Common)	Stratum	Indicator	Plant Species(Latin/Common)	Stratum	Indicator
Rumex maritimus	Herb	FACW+	*Rumex crispus*	Herb	FACW
Dock,Golden			Dock,Curly		
Hordeum jubatum	Herb	FAC+	*Chenopodium album*	Herb	FAC
Barley,Fox-Tail			Goosefoot,White		
Kochia scoparia	Herb	FAC	*Rorippa sinuata*	Herb	FAC+
Summer-Cypress,Mexican			Yellow-Cress,Spreading		
Polygonum aviculare	Herb	FACW-			
Knotweed,Prostrate					

Percent of Dominant Species that are OBL, FACW or FAC: (excluding FAC-) 7/7 = 100.00%

FAC Neutral: 3/3 = 100.00%
Numeric Index: 18/7 = 2.57

Remarks:

HYDROLOGY

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

YES No Recorded Data

Field Observations

Depth of Surface Water:	N/A *(in.)*
Depth to Free Water in Pit:	N/A *(in.)*
Depth to Saturated Soil:	= 7.0 *(in.)*

Wetland Hydrology Indicators

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

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

Remarks:
Moist from 0.5 to 7.0 inches in pit.

WetForm™

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

Project/Site: Little Muddy Wetland Mitigation Site - 2007	**Project No:** B43088	**Date:** 22-Aug-2007
Applicant/Owner: -Montana Department of Transportation-		**County:** Cascade
Investigators: Andrea Pipp		**State:** Montana
		Plot ID: Soil Pit 4

SOILS

Map Unit Name (Series and Phase): Absher-Noble Complex, 0-5% slopes
Map Symbol: 10 **Drainage Class:** moderately well drained **Mapped Hydric Inclusion?**
Taxonomy (Subgroup): Fine montmorillonitic Borollic Natragid **Field Observations Confirm Mapped Type?** Yes (No)
Profile Description

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Color (Munsell Moist)	Mottle Abundance/Contrast		Texture, Concretions, Structure, etc
0-12		2.5Y5/2	N/A	N/A	N/A	Silty clay

Hydric Soil Indicators:

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

Remarks:
Satisfies NRCS Hydric Soil Criteria #3, "Soils that are frequently ponded for long duration or very long duration during the growing season."

WETLAND DETERMINATION

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

Remarks:
Wetland is 2.5 feet wide.

WetForm™

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

Project/Site:	Little Muddy Wetland Mitigation Site - 2007	**Project No:** B43088	**Date:** 22-Aug-2007
Applicant/Owner:	-Montana Department of Transportation-		**County:** Cascade
Investigators:	Andrea Pipp		**State:** Montana
			Plot ID: Soil Pit 5

Do Normal Circumstances exist on the site?	(Yes) No	**Community ID:** Emergent
Is the site significantly disturbed (Atypical Situation:)?	Yes (No)	**Transect ID:**
Is the area a potential Problem Area?	Yes (No)	**Field Location:**
(If needed, explain on the reverse side)		In '15 ft to end' zone along T-1.

VEGETATION (USFWS Region No. 9)

Dominant Plant Species(Latin/Common)	Stratum	Indicator	Plant Species(Latin/Common)	Stratum	Indicator
Polygonum aviculare	Herb	FACW-	*Hordeum jubatum*	Herb	FAC+
Knotweed,Prostrate			Barley,Fox-Tail		

Percent of Dominant Species that are OBL, FACW or FAC: (excluding FAC-) 2/2 = 100.00%

FAC Neutral: 1/1 = 100.00%
Numeric Index: 5/2 = 2.50

Remarks:

HYDROLOGY

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

YES **No Recorded Data**

Field Observations

Depth of Surface Water:	N/A *(in.)*
Depth to Free Water in Pit:	N/A *(in.)*
Depth to Saturated Soil:	> 12 *(in.)*

Wetland Hydrology Indicators

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

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

Remarks:
Soil was moist at 11 inches, and probably saturated for at least 12.5% of growing season earlier in summer. Oxidized rhizospheres were present from 0-4 inches. Soil was cracked for 3 inches deep.

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

Project/Site:	Little Muddy Wetland Mitigation Site - 2007	**Project No:** B43088	**Date:** 22-Aug-2007
Applicant/Owner:	-Montana Department of Transportation-		**County:** Cascade
Investigators:	Andrea Pipp		**State:** Montana
			Plot ID: Soil Pit 5

SOILS

Map Unit Name (Series and Phase): Absher-Noble Complex, 0-5% slopes
Map Symbol: 10 **Drainage Class:** moderately well drained **Mapped Hydric Inclusion?**
Taxonomy (Subgroup): Fine montmorillonitic Borollic Natragid **Field Observations Confirm Mapped Type?** Yes (No)
Profile Description

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Color (Munsell Moist)	Mottle Abundance/Contrast		Texture, Concretions, Structure, etc
0-12+	A	2.5YR4/2	N/A	N/A	N/A	Silty clay

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

Remarks:
Soils satisfy NRCS Hydric Soils Criteria #3, "Soils that are frequently ponded for long duration or very long duration during the growing season."

WETLAND DETERMINATION

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

Remarks:

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

Project/Site: Little Muddy Wetland Mitigation Site - 2007	**Project No:** B43088	**Date:** 22-Aug-2007
Applicant/Owner: -Montana Department of Transportation-		**County:** Cascade
Investigators: Andrea Pipp		**State:** Montana
		Plot ID: Soil Pit 6

Do Normal Circumstances exist on the site?	(Yes) No	**Community ID:** Emergent
Is the site significantly disturbed (Atypical Situation:)?	Yes (No)	**Transect ID:**
Is the area a potential Problem Area? (If needed, explain on the reverse side)	Yes (No)	**Field Location:** West of PP-5.

VEGETATION (USFWS Region No. 9)

Dominant Plant Species(Latin/Common)	Stratum	Indicator	Plant Species(Latin/Common)	Stratum	Indicator
Polygonum aviculare	Herb	FACW-	*Rumex crispus*	Herb	FACW
Knotweed,Prostrate			Dock,Curly		
Hordeum jubatum	Herb	FAC+			
Barley,Fox-Tail					

Percent of Dominant Species that are OBL, FACW or FAC: (excluding FAC-) 3/3 = 100.00%

FAC Neutral: 2/2 = 100.00%
Numeric Index: 7/3 = 2.33

Remarks:

HYDROLOGY

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

YES No Recorded Data

Field Observations

Depth of Surface Water:	N/A *(in.)*
Depth to Free Water in Pit:	N/A *(in.)*
Depth to Saturated Soil:	> 13 *(in.)*

Wetland Hydrology Indicators

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

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

Remarks:
Soil was moist at 10 inches, but not close to saturation. Soil may have been saturated for 12.5% of growing season earlier in summer. Soil was cracked 1-2 inches deep.

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

Project/Site: Little Muddy Wetland Mitigation Site - 2007	**Project No:** B43088	**Date:** 22-Aug-2007
Applicant/Owner: -Montana Department of Transportation-		**County:** Cascade
Investigators: Andrea Pipp		**State:** Montana
		Plot ID: Soil Pit 6

SOILS

Map Unit Name (Series and Phase): Absher-Noble Complex, 0-5% slopes
Map Symbol: 10 **Drainage Class:** moderately well drained **Mapped Hydric Inclusion?**
Taxonomy (Subgroup): Fine montmorillonitic Borollic Natragid **Field Observations Confirm Mapped Type?** Yes (No)
Profile Description

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Color (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc
0-12	A	2.5Y4/2	10YR5/8	Common Prominent	Clay

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

Remarks:
Mottles were very fine and hard to color.

WETLAND DETERMINATION

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

Remarks:

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

Project/Site: Little Muddy Wetland Mitigation Site - 2007	**Project No:** B43088	**Date:** 22-Aug-2007
Applicant/Owner: -Montana Department of Transportation-		**County:** Cascade
Investigators: Andrea Pipp		**State:** Montana
		Plot ID: Soil Pit 7

Do Normal Circumstances exist on the site?	(Yes) No	**Community ID:** Emergent
Is the site significantly disturbed (Atypical Situation:)?	Yes (No)	**Transect ID:**
Is the area a potential Problem Area?	Yes (No)	**Field Location:**
(If needed, explain on the reverse side)		On peninsula.

VEGETATION (USFWS Region No. 9)

Dominant Plant Species(Latin/Common)	Stratum	Indicator	Plant Species(Latin/Common)	Stratum	Indicator
Iva axillaris	Herb	FAC	*Sisymbrium altissimum*	Herb	FACU-
Sumpweed,Small-Flower			Mustard,Tall Tumble		
Hordeum jubatum	Herb	FAC+	*Bromus japonicus*	Herb	FACU
Barley,Fox-Tail			Brome,Japanese		

Percent of Dominant Species that are OBL, FACW or FAC: (excluding FAC-) 2/4 = 50.00%

FAC Neutral: 0/2 = 0.00%
Numeric Index: 14/4 = 3.50

Remarks:

HYDROLOGY

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

YES **No Recorded Data**

Field Observations

Depth of Surface Water:	N/A *(in.)*
Depth to Free Water in Pit:	N/A *(in.)*
Depth to Saturated Soil:	> 13 *(in.)*

Wetland Hydrology Indicators

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

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

Remarks:
Soil was very dry from 0-12 inches.

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

Project/Site: Little Muddy Wetland Mitigation Site - 2007	**Project No:** B43088	**Date:** 22-Aug-2007
Applicant/Owner: -Montana Department of Transportation-		**County:** Cascade
Investigators: Andrea Pipp		**State:** Montana
		Plot ID: Soil Pit 7

SOILS

Map Unit Name (Series and Phase): Absher-Noble Complex, 0-5% slopes
Map Symbol: 10 **Drainage Class:** moderately well drained **Mapped Hydric Inclusion?**
Taxonomy (Subgroup): Fine montmorillonitic Borollic Natragid **Field Observations Confirm Mapped Type?** Yes (No)
Profile Description

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Color (Munsell Moist)	Mottle Abundance/Contrast		Texture, Concretions, Structure, etc
0-10	A	2.5Y5/2	N/A	N/A	N/A	Silty clay
10-12	B	2.5YR5/3	7.5YR5/8	Few	Distinct	Silty clay

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

Remarks:

WETLAND DETERMINATION

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

Remarks:

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

Project/Site: Little Muddy Wetland Mitigation Site - 2007 **Project No:** B43088
Applicant/Owner: -Montana Department of Transportation-
Investigators: Andrea Pipp

Date: 22-Aug-2007
County: Cascade
State: Montana
Plot ID: Soil Pit 8

Do Normal Circumstances exist on the site? (Yes) No
Is the site significantly disturbed (Atypical Situation:)? Yes (No)
Is the area a potential Problem Area? Yes (No)
(If needed, explain on the reverse side)

Community ID: Emergent
Transect ID:
Field Location: On peninsula.

VEGETATION (USFWS Region No. 9)

Dominant Plant Species(Latin/Common)	Stratum	Indicator	Plant Species(Latin/Common)	Stratum	Indicator
Polygonum aviculare	Herb	FACW-	*Hordeum jubatum*	Herb	FAC+
Knotweed,Prostrate			Barley,Fox-Tail		

Percent of Dominant Species that are OBL, FACW or FAC: (excluding FAC-) 2/2 = 100.00%
FAC Neutral: 1/1 = 100.00%
Numeric Index: 5/2 = 2.50

Remarks:

HYDROLOGY

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

YES **No Recorded Data**

Field Observations

Depth of Surface Water: N/A *(in.)*
Depth to Free Water in Pit: N/A *(in.)*
Depth to Saturated Soil: > 13 *(in.)*

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

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

Remarks:
Soil was dry from 0-11 inches. It was moist, but not saturated from 11-12 inches. Site was probably saturated for 12.5% of the growing season earlier in the summer.

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

Project/Site: Little Muddy Wetland Mitigation Site - 2007 **Project No:** B43088
Applicant/Owner: -Montana Department of Transportation-
Investigators: Andrea Pipp

Date: 22-Aug-2007
County: Cascade
State: Montana
Plot ID: Soil Pit 8

SOILS

Map Unit Name (Series and Phase): Absher-Noble Complex, 0-5% slopes
Map Symbol: 10 **Drainage Class:** moderately well drained
Taxonomy (Subgroup): Fine montmorillonitic Borollic Natragid
Mapped Hydric Inclusion?
Field Observations Confirm Mapped Type? Yes (No)

Profile Description

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Color (Munsell Moist)	Mottle Abundance/Contrast		Texture, Concretions, Structure, etc
0-12	A	2.5Y4/2	N/A	N/A	N/A	Silty clay

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

Remarks:
Soils satisfy NRCS Hydric Soils Criteria #3, "Soils that are frequently ponded for long duration or very long duration during the growing season."

WETLAND DETERMINATION

Hydrophytic Vegetation Present? (Yes) No
Wetland Hydrology Present? (Yes) No
Hydric Soils Present? (Yes) No

Is the Sampling Point within the Wetland? (Yes) No

Remarks:

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

Project/Site: Little Muddy Wetland Mitigation Site - 2007 — Project No: B43088
Applicant/Owner: -Montana Department of Transportation-
Investigators: Andrea Pipp

Date: 22-Aug-2007
County: Cascade
State: Montana
Plot ID: Soil Pit 9

Do Normal Circumstances exist on the site? (Yes) No
Is the site significantly disturbed (Atypical Situation:)? Yes (No)
Is the area a potential Problem Area? Yes (No)
(If needed, explain on the reverse side)

Community ID: Emergent
Transect ID:
Field Location:

VEGETATION (USFWS Region No. 9)

Dominant Plant Species(Latin/Common)	Stratum	Indicator	Plant Species(Latin/Common)	Stratum	Indicator
Typha latifolia	Herb	OBL	*Hordeum jubatum*	Herb	FAC+
Cattail,Broad-Leaf			Barley,Fox-Tail		

Percent of Dominant Species that are OBL, FACW or FAC: (excluding FAC-) 2/2 = 100.00%
FAC Neutral: 1/1 = 100.00%
Numeric Index: 4/2 = 2.00

Remarks:
Some Bromus japonicus present, but not dominant. Typha is green at base with brown tips, not browsed, but drying due to lack of moisture; Only a few stalks are reproductive.

HYDROLOGY

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

YES No Recorded Data

Field Observations

- Depth of Surface Water: N/A *(in.)*
- Depth to Free Water in Pit: N/A *(in.)*
- Depth to Saturated Soil: > 13 *(in.)*

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

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

Remarks:
Dry from 0-11 inches. Some soil moisture from 11-12 inches. Soil was probably saturated earlier for at least 12.5% of the growing season.

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

Project/Site: Little Muddy Wetland Mitigation Site - 2007 — Project No: B43088
Applicant/Owner: -Montana Department of Transportation-
Investigators: Andrea Pipp

Date: 22-Aug-2007
County: Cascade
State: Montana
Plot ID: Soil Pit 9

SOILS

Map Unit Name (Series and Phase): Absher-Noble Complex, 0-5% slopes
Map Symbol: 10 Drainage Class: moderately well drained
Taxonomy (Subgroup): Fine montmorillonitic Borollic Natragid
Mapped Hydric Inclusion?
Field Observations Confirm Mapped Type? Yes (No)

Profile Description

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Color (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc
0-12	A	2.5Y4/1	10YR5/8	Many Prominent	Silty clay

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

Remarks:
Mottles are present, but fine and very hard to color.

WETLAND DETERMINATION

Hydrophytic Vegetation Present? (Yes) No
Wetland Hydrology Present? (Yes) No
Hydric Soils Present? (Yes) No

Is the Sampling Point within the Wetland? (Yes) No

Remarks:

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

Project/Site:	Little Muddy Wetland Mitigation Site - 2007	**Project No:** B43088	**Date:** 22-Aug-2007
Applicant/Owner:	-Montana Department of Transportation-		**County:** Cascade
Investigators:	Andrea Pipp		**State:** Montana
			Plot ID: Soil Pit 10

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

VEGETATION (USFWS Region No. 9)

Dominant Plant Species(Latin/Common)	Stratum	Indicator	Plant Species(Latin/Common)	Stratum	Indicator
Hordeum jubatum	Herb	FAC+			
Barley,Fox-Tail					

Percent of Dominant Species that are OBL, FACW or FAC: (excluding FAC-) 1/1 = 100.00%

FAC Neutral: 0/0 = 0.00%
Numeric Index: 3/1 = 3.00

Remarks:
Almost a pure stand of Hordeum. In places it mixes with Polygonum aviculare and/or Sisymbrium altissimum.

HYDROLOGY

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

YES No Recorded Data

Field Observations

Depth of Surface Water:	N/A *(in.)*
Depth to Free Water in Pit:	N/A *(in.)*
Depth to Saturated Soil:	> 13 *(in.)*

Wetland Hydrology Indicators

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

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

Remarks:
Pit was dry from 0-11 inches with a little soil moisture present at 11-12 inches. Site was probably saturated earlier for at least 12.5% of the growing season.

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

Project/Site:	Little Muddy Wetland Mitigation Site - 2007	**Project No:** B43088	**Date:** 22-Aug-2007
Applicant/Owner:	-Montana Department of Transportation-		**County:** Cascade
Investigators:	Andrea Pipp		**State:** Montana
			Plot ID: Soil Pit 10

SOILS

Map Unit Name (Series and Phase): Absher-Noble Complex, 0-5% slopes
Map Symbol: 10 **Drainage Class:** moderately well drained **Mapped Hydric Inclusion?**
Taxonomy (Subgroup): Fine montmorillonitic Borollic Natragid **Field Observations Confirm Mapped Type?** Yes (No)
Profile Description

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Color (Munsell Moist)	Mottle Abundance/Contrast		Texture, Concretions, Structure, etc
0-12	A	2.5Y4/2	10YR4/6	N/A	N/A	Silty clay

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

Remarks:

WETLAND DETERMINATION

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

Remarks:

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

Project/Site:	Little Muddy Wetland Mitigation Site - 2007	**Project No:** B43088	**Date:** 22-Aug-2007
Applicant/Owner:	-Montana Department of Transportation-		**County:** Cascade
Investigators:	Andrea Pipp		**State:** Montana
			Plot ID: Soil Pit 11

Do Normal Circumstances exist on the site?	(Yes) No	**Community ID:** Emergent
Is the site significantly disturbed (Atypical Situation:)?	Yes (No)	**Transect ID:**
Is the area a potential Problem Area? (If needed, explain on the reverse side)	Yes (No)	**Field Location:** Along inlet channel; SW side of site.

VEGETATION (USFWS Region No. 9)

Dominant Plant Species(Latin/Common)	Stratum	Indicator	Plant Species(Latin/Common)	Stratum	Indicator
Rumex crispus	Herb	FACW	*Puccinellia nuttalliana*	Herb	OBL
Dock,Curly			Grass,Nuttall's Alkali		
Hordeum jubatum	Herb	FAC+	*Kochia scoparia*	Herb	FAC
Barley,Fox-Tail			Summer-Cypress,Mexican		

Percent of Dominant Species that are OBL, FACW or FAC: (excluding FAC-) 4/4 = 100.00%

FAC Neutral: 2/2 = 100.00%
Numeric Index: 9/4 = 2.25

Remarks:

HYDROLOGY

_NO Recorded Data(Describe in Remarks):
- _N/A Stream, Lake or Tide Gauge
- _N/A Aerial Photographs
- _N/A Other

YES No Recorded Data

Field Observations

Depth of Surface Water:	N/A *(in.)*
Depth to Free Water in Pit:	N/A *(in.)*
Depth to Saturated Soil:	> 12 *(in.)*

Wetland Hydrology Indicators

Primary Indicators
- _NO Inundated
- YES Saturated in Upper 12 Inches
- _NO Water Marks
- _NO Drift Lines
- _NO Sediment Deposits
- YES Drainage Patterns in Wetlands

Secondary Indicators
- _NO Oxidized Root Channels in Upper 12 Inches
- _NO Water-Stained Leaves
- _NO Local Soil Survey Data
- YES FAC-Neutral Test
- _NO Other(Explain in Remarks)

Remarks:
Pit dug on edge of inlet channel. Soils in the bottom of the inlet channel were saturated at 2 inches and cracked.

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

Project/Site:	Little Muddy Wetland Mitigation Site - 2007	**Project No:** B43088	**Date:** 22-Aug-2007
Applicant/Owner:	-Montana Department of Transportation-		**County:** Cascade
Investigators:	Andrea Pipp		**State:** Montana
			Plot ID: Soil Pit 11

SOILS

Map Unit Name (Series and Phase): Absher-Noble Complex, 0-5% slopes
Map Symbol: 10 **Drainage Class:** moderately well drained **Mapped Hydric Inclusion?**
Taxonomy (Subgroup): Fine montmorillonitic Borollic Natragid **Field Observations Confirm Mapped Type?** Yes (No)
Profile Description

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Color (Munsell Moist)	Mottle Abundance/Contrast		Texture, Concretions, Structure, etc
0-12	A	2.5Y4/2	N/A	N/A	N/A	Silty clay

Hydric Soil Indicators:

_NO Histosol
_NO Histic Epipedon
_NO Sulfidic Odor
_NO Aquic Moisture Regime
_NO Reducing Conditions
_NO Gleyed or Low Chroma Colors
_NO Concretions
_NO High Organic Content in Surface Layer in Sandy Soils
_NO Organic Streaking in Sandy Soils
_NO Listed on Local Hydric Soils List
_NO Listed on National Hydric Soils List
YES Other (Explain in Remarks)

Remarks:
Soils satisfy NRCS Hydric Soils Criteria #3, "Soils that are frequently ponded for long duration or very long duration during the growing season."

WETLAND DETERMINATION

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

Remarks:

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

Project/Site: Little Muddy Wetland Mitigation Site - 2007	**Project No:** B43088	**Date:** 22-Aug-2007
Applicant/Owner: -Montana Department of Transportation-		**County:** Cascade
Investigators: Andrea Pipp		**State:** Montana
		Plot ID: Soil Pit 12

Do Normal Circumstances exist on the site?	(Yes) No	**Community ID:** Emergent
Is the site significantly disturbed (Atypical Situation:)?	Yes (No)	**Transect ID:**
Is the area a potential Problem Area? (If needed, explain on the reverse side)	Yes (No)	**Field Location:** West-central of the project area.

VEGETATION (USFWS Region No. 9)

Dominant Plant Species(Latin/Common)	Stratum	Indicator	Plant Species(Latin/Common)	Stratum	Indicator
Rumex crispus	Herb	FACW	*Agropyron intermedium*	Herb	NI
Dock,Curly			Wheatgrass, intermediate		
Hordeum jubatum	Herb	FAC+	*Typha latifolia*	Herb	OBL
Barley,Fox-Tail			Cattail,Broad-Leaf		

Percent of Dominant Species that are OBL, FACW or FAC: (excluding FAC-) 3/3 = 100.00%	**FAC Neutral:** 2/2 = 100.00% **Numeric Index:** 6/3 = 2.00

Remarks:
Some of the Rumex was browsed.

HYDROLOGY

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

YES **No Recorded Data**

Field Observations

Depth of Surface Water:	N/A *(in.)*
Depth to Free Water in Pit:	N/A *(in.)*
Depth to Saturated Soil:	> 13 *(in.)*

Wetland Hydrology Indicators

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

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

Remarks:
Soils were moist from 10-12 inches, but not saturated. Soils were cracked 1-2 inches deep. Soils were probably saturated for at least 12.5% of the growing season early in the summer.

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

Project/Site: Little Muddy Wetland Mitigation Site - 2007	**Project No:** B43088	**Date:** 22-Aug-2007
Applicant/Owner: -Montana Department of Transportation-		**County:** Cascade
Investigators: Andrea Pipp		**State:** Montana
		Plot ID: Soil Pit 12

SOILS

Map Unit Name (Series and Phase): Absher-Noble Complex, 0-5% slopes
Map Symbol: 10 **Drainage Class:** moderately well drained **Mapped Hydric Inclusion?**
Taxonomy (Subgroup): Fine montmorillonitic Borollic Natragid **Field Observations Confirm Mapped Type?** Yes (No)
Profile Description

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Color (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc
0-12	A	10YR4/1	10YR4/6	Few Prominent	Clay

Hydric Soil Indicators:

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

Remarks:

WETLAND DETERMINATION

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

Remarks:

MDT MONTANA WETLAND ASSESSMENT FORM (revised May 25, 1999)

1. Project Name: Little Muddy Creek Wetland Mitigation Site **2. Project #:** STPX 7(38) **Control #:** 5033

3. Evaluation Date: 8/22/2007 **4. Evaluator(s):** A. Pipp **5. Wetland / Site #(s):** All Wetlands

6. Wetland Location(s) i. T: 19 N **R:** 1 E **S:** 30, 31, 32 **T:** __ N **R:** __ E **S:** _____

ii. Approx. Stationing / Mileposts: _____

iii. Watershed: 7 - Missouri / Sun / Smith **GPS Reference No. (if applies):** _____

Other Location Information: Approximately 9 miles southwest of Ulm, MT. Along the Little Muddy Creek.

7. A. Evaluating Agency MDT

B. Purpose of Evaluation:

- ☐ Wetlands potentially affected by MDT project
- ☐ Mitigation wetlands; pre-construction
- ☒ Mitigation wetlands; post-construction
- ☐ Other

8. Wetland Size (total acres): _____ (visually estimated)
65.06 (measured, e.g. GPS)

9. Assessment Area (total acres): _____ (visually estimated)
156.44 (measured, e.g. GPS)

Comments: _____

10. CLASSIFICATION OF WETLAND AND AQUATIC HABITATS IN AA

HGM CLASS [1]	SYSTEM [2]	SUBSYSTEM [2]	CLASS [2]	WATER REGIME [2]	MODIFIER [2]	% OF AA
Riverine	Lacustrine	Littoral	Aquatic Bed	Permanently Flooded	Excavated/Impounded	0
Riverine	Lacustrine	Littoral	Emergent Wetland	Seasonally Flooded	Excavated/Impounded	37
Riverine	Lacustrine	Littoral	Unconsolidated Bottom	Permanently Flooded	Excavated/Impounded	49
Riverine	Lacustrine	Littoral	Unconsolidated Shore	Seasonally Flooded	Excavated/Impounded	14

[1] = Smith et al. 1995. [2] = Cowardin et al. 1979.

Comments:

11. ESTIMATED RELATIVE ABUNDANCE (of similarly classified sites within the same Major Montana Watershed Basin)
Common **Comments:** ____

12. GENERAL CONDITION OF AA

i. Regarding Disturbance: (Use matrix below to select appropriate response.)

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

Comments: (types of disturbance, intensity, season, etc.) AA is now managed for wildlife habitat. Adjacent to AA the fields are in CRP.

ii. Prominent weedy, alien, & introduced species: Cirsium arvense occurs in a few dense patches. Kochia scoparia, Bromus japonicus, and Sisymbrium altissimum are common.

iii. Briefly describe AA and surrounding land use / habitat: AA has been excavated and flooded to pond water for waterfowl habitat. Surrounding land use was cultivated crop fields that are now in the CRP program.

13. STRUCTURAL DIVERSITY (Based on 'Class' column of #10 above.)

Number of 'Cowardin' Vegetated Classes Present in AA	≥3 Vegetated Classes or ≥ 2 if one class is forested	2 Vegetated Classes or 1 if forested	≤ 1 Vegetated Class
Select Rating	---	---	Low

Comments: Open water is dense with green algae and presence of aquatic plants were not observed in 2007,

14A. HABITAT FOR FEDERALLY LISTED OR PROPOSED THREATENED OR ENDANGERED PLANTS AND ANIMALS

i. AA is Documented (D) or Suspected (S) to contain (check box):

Primary or Critical habitat **(list species)**	☐ D ☐ S	_____
Secondary habitat **(list species)**	☐ D ☐ S	_____
Incidental habitat **(list species)**	☐ D ☐ S	_____
No usable habitat	☐ D ☒ S	_____

ii. Rating (Based on the strongest habitat chosen in 14A(i) above, find the corresponding rating of High (H), Moderate (M), or Low (L) for this function.

Highest Habitat Level	doc/primary	sus/primary	doc/secondary	sus/secondary	doc/incidental	sus/incidental	none
Functional Point & Rating	---	---	---	---	---	---	0 (L)

If documented, list the source (e.g., observations, records, etc.)**:** _____

14B. HABITAT FOR PLANTS AND ANIMALS RATED AS S1, S2, OR S3 BY THE MONTANA NATURAL HERITAGE PROGRAM.
Do not include species listed in 14A(i).

i. AA is Documented (D) or Suspected (S) to contain (check box):

Primary or Critical habitat **(list species)**	☐ D ☐ S	_____
Secondary habitat **(list species)**	☐ D ☒ S	Bald Eagle.
Incidental habitat **(list species)**	☒ D ☒ S	Suspected for Ferruginous Hawk, Black Tern, Peregrine Falcon.. Documented for Trumpeter Swan.
No usable habitat	☐ D ☐ S	_____

ii. Rating: Based on the strongest habitat chosen in 14B(i) above, find the corresponding rating of High (H), Moderate (M), or Low (L) for this function.

Highest Habitat Level	doc/primary	sus/primary	doc/secondary	sus/secondary	doc/incidental	sus/incidental	none
Functional Point & Rating	---	---	---	.6 (M)	---	---	---

If documented, list the source (e.g., observations, records, etc.)**:** Ferruginous Hawk observed flying above site in May 2006. Trumpeter Swan observed loafing in mudflat and open water habitats in May 2007. Bald Eagles have been observed by the Landowner along Little Muddy Creek in 2006 and four Bald Eagle nests have been documented within a five-mile radius of the project area (MTNHP 2002)

14C. GENERAL WILDLIFE HABITAT RATING

i. Evidence of overall wildlife use in the AA: Check either substantial, moderate, or low.

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

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

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

ii. Wildlife Habitat Features: Working from top to bottom, select the AA attribute to determine the exceptional (E), high (H), moderate (M), or low (L) rating. Structural diversity is from 13. For class cover to be considered evenly distributed, vegetated classes must be within 20% of each other in terms of their percent composition in the AA (see 10). Duration of Surface Water: P/P = permanent/perennial; S/I = seasonal/intermittent; T/E = temporary/ephemeral; A= absent.

Structural Diversity (from 13)	☐**High**								☐**Moderate**								☒**Low**			
Class Cover Distribution (all vegetated classes)	☐**Even**				☐**Uneven**				☐**Even**				☐**Uneven**				☒**Even**			
Duration of Surface Water in ≥ 10% of AA	**P/P**	**S/I**	**T/E**	**A**	**P/P**	**S/I**	**T/E**	**A**	**P/P**	**S/I**	**T/E**	**A**	**P/P**	**S/I**	**T/E**	**A**	**P/P**	**S/I**	**T/E**	**A**
Low disturbance at AA (see 12)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	E	--	--	--
Moderate disturbance at AA (see 12)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
High disturbance at AA (see 12)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

iii. Rating: Use 14C(i) and 14C(ii) above and the matrix below to arrive at the functional point and rating of exceptional (E), high (H), moderate (M), or low (L) for this function.

Evidence of Wildlife Use from 14C(i)	**Wildlife Habitat Features Rating** from 14C(ii)			
	☒ **Exceptional**	☐ **High**	☐ **Moderate**	☐ **Low**
Substantial	1 (E)	--	--	--
Moderate	--	--	--	--
Low	--	--	--	--

Comments: _____

14D. GENERAL FISH / AQUATIC HABITAT RATING ☐ **NA** (proceed to 14E)

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

i. Habitat Quality: Pick the appropriate AA attributes in matrix to determine the quality rating of exceptional (E), high (H), moderate (M), or low (L).

Duration of Surface Water in AA	☒**Permanent/Perennial**			☐**Seasonal / Intermittent**			☐**Temporary / Ephemeral**		
Cover - % of waterbody in AA containing cover objects (*e.g.* submerged logs, large rocks & boulders, overhanging banks, floating-leaved vegetation)	**>25%**	**10-25%**	**<10%**	**>25%**	**10-25%**	**<10%**	**>25%**	**10-25%**	**<10%**
Shading - >75% of streambank or shoreline of AA contains riparian or wetland scrub-shrub or forested communities	--	--	--	--	--	--	--	--	--
Shading – 50 to 75% of streambank or shoreline of AA contains riparian or wetland scrub-shrub or forested communities.	--	--	--	--	--	--	--	--	--
Shading - < 50% of streambank or shoreline of AA contains riparian or wetland scrub-shrub or forested communities.	--	--	M	--	--	--	--	--	--

ii. Modified Habitat Quality: Is fish use of the AA precluded or significantly reduced by a culvert, dike, other man-made structure or activity **or** is the waterbody included on the 'MDEQ list of waterbodies in need of TMDL development' with 'Probable Impaired Uses' listed as cold or warm water fishery or aquatic life support**?**
☒ **Y** ☐ **N** If yes, reduce the rating from 14D(i) by one level and check the modified habitat quality rating: ☐ E ☐ H ☐ M ☒ L

iii. Rating: Use the conclusions from 14D(i) and 14D(ii) above and the matrix below to arrive at the functional point and rating of exceptional (E), high (H), moderate (M), or low (L).

Types of Fish Known or Suspected within AA	**Modified Habitat Quality** from 14D(ii)			
	☐ **Exceptional**	☐ **High**	☐ **Moderate**	☒ **Low**
Native game fish	--	--	--	--
Introduced game fish	--	--	--	.4 (M)
Non-game fish	--	--	--	--
No fish	--	--	--	--

Comments: Carp have been found in Little Muddy Creek and in the mitigation site.

14E. FLOOD ATTENUATION ☐ **NA** (proceed to 14F)

Applies only to wetlands subject to flooding via in-channel or overbank flow. If wetlands in AA do not flood from in-channel or overbank flow, then check NA.

i. Rating: Working from top to bottom, mark the appropriate attributes to arrive at the functional point and rating of high (H), moderate (M), or low (L) for this function.

Estimated wetland area in AA subject to periodic flooding	☒ **≥ 10 acres**			☐ **<10, >2 acres**			☐ **≤2 acres**		
% of flooded wetland classified as forested, scrub/shrub, or both	**75%**	**25-75%**	**<25%**	**75%**	**25-75%**	**<25%**	**75%**	**25-75%**	**<25%**
AA contains **no outlet or restricted outlet**	--	--	.6 (M)	--	--	--	--	--	--
AA contains **unrestricted outlet**	--	--	--	--	--	--	--	--	--

ii. Are residences, businesses, or other features which may be significantly damaged by floods located within 0.5 miles downstream of the AA? (check)
☒**Y** ☐**N** **Comments:** One residence occurs within 0.5 miles downstream of the project site.

14F. SHORT AND LONG TERM SURFACE WATER STORAGE ☐ **NA** (proceed to 14G)

Applies to wetlands that flood or pond from overbank or in-channel flow, precipitation, upland surface flow, or groundwater flow.
If no wetlands in the AA are subject to flooding or ponding, then check NA above.

i. Rating: Working from top to bottom, use the matrix below to arrive at the functional point and rating of high (H), moderate (M), or low (L) for this function.
P/P = permanent/perennial; S/I = seasonal/intermittent; T/E = temporary/ephemeral.

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

Comments: _____

14G. SEDIMENT/NUTRIENT/TOXICANT RETENTION AND REMOVAL ☐ **NA** (proceed to 14H)

Applies to wetlands with the potential to receive excess sediments, nutrients, or toxicants through influx of surface or ground water or direct input.
If no wetlands in the AA are subject to such input, check NA above.

i. Rating Working from top to bottom, use the matrix below to arrive at the functional point and rating of high (H), moderate (M), or low (L) for this function.

Sediment, Nutrient, and Toxicant Input Levels Within AA	AA receives or surrounding land use has potential to deliver low to moderate levels of sediments, nutrients, or compounds such that other functions are not substantially impaired. Minor sedimentation, sources of nutrients or toxicants, or signs of eutrophication present.				Waterbody on MDEQ list of waterbodies in need of TMDL development for "probable causes" related to sediment, nutrients, or toxicants **or** AA receives or surrounding land use has potential to deliver high levels of sediments, nutrients, or compounds such that other functions are substantially impaired. Major sedimentation, sources of nutrients or toxicants, or signs of eutrophication present.			
% cover of wetland vegetation in AA	☐ **≥ 70%**		☒ **< 70%**		☐ **≥ 70%**		☐ **< 70%**	
Evidence of flooding or ponding in AA	☐ **Yes**	☐ **No**	☒ **Yes**	☐ **No**	☐ **Yes**	☐ **No**	☐ **Yes**	☐ **No**
AA contains **no or restricted outlet**	--	--	.7 (M)	--	--	--	--	--
AA contains **unrestricted outlet**	--	--	--	--	--	--	--	--

Comments: _____

14H. SEDIMENT/SHORELINE STABILIZATION ☐ **NA** (proceed to 14I)

Applies only if AA occurs on or within the banks of a river, stream, or other natural or man-made drainage, or on the shoreline of a standing water body that is subject to wave action. If this does not apply, then check NA above.

i. Rating: Working from top to bottom, use the matrix below to arrive at the functional point and rating exceptional (E), high (H), moderate (M), or low (L) for this function.

% Cover of wetland streambank or shoreline by species with deep, binding rootmasses.	Duration of Surface Water Adjacent to Rooted Vegetation		
	☒Permanent / Perennial	☐Seasonal / Intermittent	☐Temporary / Ephemeral
≥ 65 %	--	--	--
35-64 %	--	--	--
< 35 %	.3 (L)	--	--

Comments: _____

14I. PRODUCTION EXPORT / FOOD CHAIN SUPPORT

i. Rating: Working from top to bottom, use the matrix below to arrive at the functional point and rating of high (H), moderate (M), or low (L) for this function. **A** = acreage of vegetated component in the AA. **B** = structural diversity rating from #13. **C** = Yes (Y) or No (N) as to whether or not the AA contains a surface or subsurface outlet. **P/P** = permanent/perennial; **S/I** = seasonal/intermittent; **T/E/A**= temporary/ephemeral/absent.

A	☒ Vegetated component >5 acres						☐ Vegetated component 1-5 acres						☐ Vegetated component <1 acre					
B	☐ High		☐ Moderate		☒ Low		☐ High		☐ Moderate		☐ Low		☐ High		☐ Moderate		☐ Low	
C	☐Y	☐N	☐Y	☐N	☒Y	☐N	☐Y	☐N	☐Y	☐N	☐Y	☐N	☐Y	☐N	☐Y	☐N	☐Y	☐N
P/P	--	--	--	--	.8H	--	--	--	--	--	--	--	--	--	--	--	--	--
S/I	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
T/E/A	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Comments: _____

14J. GROUNDWATER DISCHARGE / RECHARGE (DR) (Check the indicators in i & ii below that apply to the AA.)

i. ☐ **Discharge Indicators**

- ☐ Springs are known or observed.
- ☐ Vegetation growing during dormant season / drought.
- ☐ Wetland occurs at the toe of a natural slope.
- ☐ Seeps are present at the wetland edge.
- ☐ AA permanently flooded during drought periods.
- ☐ Wetland contains an outlet, but no inlet.
- ☐ Other _____

ii. ☐ **Recharge Indicators**

- ☐ Permeable substrate presents without underlying impeding layer.
- ☐ Wetland contains inlet but not outlet.
- ☐ Other _____

iii. Rating: Use information from 14J(i) and 14J(ii) above and the table below to arrive at the functional point and rating of high (H) or low (L) for this function.

Criteria	Functional Point and Rating
AA has known Discharge/Recharge area or one or more indicators of D/R present	--
No Discharge/Recharge indicators present	0.1 (L)
Available Discharge/Recharge information inadequate to rate AA D/R potential	--

Comments: Site filled and maintained by surface water.

14K. UNIQUENESS

i. Rating: Working from top to bottom, use the matrix below to arrive at the functional point and rating of high (H), moderate (M), or low (L) for this function.

Replacement Potential	AA contains fen, bog, warm springs or mature (>80 yr-old) forested wetland or plant association listed as "S1" by the MTNHP.			AA does not contain previously cited rare types and structural diversity (#13) is high or contains plant association listed as "S2" by the MTNHP.			AA does not contain previously cited rare types or associations and structural diversity (#13) is low-moderate.		
Estimated Relative Abundance from 11	☐rare	☐common	☐abundant	☐rare	☐common	☐abundant	☐rare	☒common	☐abundant
Low disturbance at AA (12i)	--	--	--	--	--	--	--	.4M	--
Moderate disturbance at AA (12i)	--	--	--	--	--	--	--	--	--
High disturbance at AA (12i)	--	--	--	--	--	--	--	--	--

Comments: _____

14L. RECREATION / EDUCATION POTENTIAL

i. Is the AA a known recreational or educational site? ☐ **Yes** [**Rate** ☐ **High (1.0)**, then proceed to 14L(ii) only] ☒ **No** [Proceed to 14L(iii)]

ii. Check categories that apply to the AA: ☒ Educational / scientific study ☒ Consumptive rec. ☐ Non-consumptive rec. ☐ Other

iii. Based on the location, diversity, size, and other site attributes, is there a strong potential for recreational or educational use?

☒ **Yes** [Proceed to 14L (ii) and then 14L(iv)] ☐ **No** [Rate as low (0.1) in 14L(iv)]

iv. Rating Use the matrix below to arrive at the functional point and rating of high (H), moderate (M), or low (L) for this function.

Ownership	Disturbance at AA from 12(i)		
	☒ Low	☐ Moderate	☐ High
Public ownership	--	--	--
Private ownership	.7(M)	--	--

Comments: Site located near Cascade and Ulm, Montana, providing potential educational and hunting opportunities with permission from the landowner.

FUNCTION, VALUE SUMMARY, AND OVERALL RATING

Function and Value Variables	Rating	Actual Functional Points	Possible Functional Points	Functional Units (Actual Points x Estimated AA Acreage)
A. Listed/Proposed T&E Species Habitat	low	0.00	1	
B. MT Natural Heritage Program Species Habitat	moderate	0.60	1	
C. General Wildlife Habitat	exceptional	1.00	1	
D. General Fish/Aquatic Habitat	moderate	0.40	1	
E. Flood Attenuation	moderate	0.60	1	
F. Short and Long Term Surface Water Storage	high	1.00	1	
G. Sediment/Nutrient/Toxicant Removal	moderate	0.70	1	
H. Sediment/Shoreline Stabilization	low	0.30	1	
I. Production Export/Food Chain Support	high	0.80	1	
J. Groundwater Discharge/Recharge	low	0.10	1	
K. Uniqueness	moderate	0.40	1	
L. Recreation/Education Potential	moderate	0.70	1	
	Total:	**6.60**	**12.00**	____
		Percent of Total Possible Points:	**55%** (Actual / Possible) x 100 [rd to nearest whole #]	

Category I Wetland: (Must satisfy **one** of the following criteria. If not satisfied, proceed to Category II.)
- ☐ Score of 1 functional point for Listed/Proposed Threatened or Endangered Species; **or**
- ☐ Score of 1 functional point for Uniqueness; **or**
- ☐ Score of 1 functional point for Flood Attenuation **and** answer to Question 14E(ii) is "yes"; **or**
- ☐ Percent of total Possible Points is > 80%.

Category II Wetland: (Criteria for Category I not satisfied **and** meets any **one** of the following Category II criteria. If not satisfied, proceed to Category IV.)
- ☐ Score of 1 functional point for Species Rated S1, S2, or S3 by the MT Natural Heritage Program; **or**
- ☒ Score of .9 or 1 functional point for General Wildlife Habitat; **or**
- ☐ Score of .9 or 1 functional point for General Fish/Aquatic Habitat; **or**
- ☐ "High" to "Exceptional" ratings for **both** General Wildlife Habitat **and** General Fish / Aquatic Habitat; **or**
- ☐ Score of .9 functional point for Uniqueness; **or**
- ☐ Percent of total possible points is > 65%.

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

Category IV Wetland: (Criteria for Categories I or II are not satisfied **and** all of the following criteria are met; If not satisfied, return to Category III.)
- ☐ "Low" rating for Uniqueness; **and**
- ☐ "Low" rating for Production Export / Food Chain Support; **and**
- ☐ Percent of total possible points is < 30%.

OVERALL ANALYSIS AREA (AA) RATING: (Check appropriate category based on the criteria outlined above.)

☐ **I** ☒ **II** ☐ **III** ☐ **IV**

Appendix C

2007 REPRESENTATIVE PHOTOGRAPHS

MDT Wetland Mitigation Monitoring
Little Muddy Creek
Cascade County, Montana

LITTLE MUDDY WETLAND MITIGATION SITE 2007

Photo 1: At Photo Point 1 facing 136˚ southeast.

Photo 2: At Photo Point 1 facing 210˚ southwest.

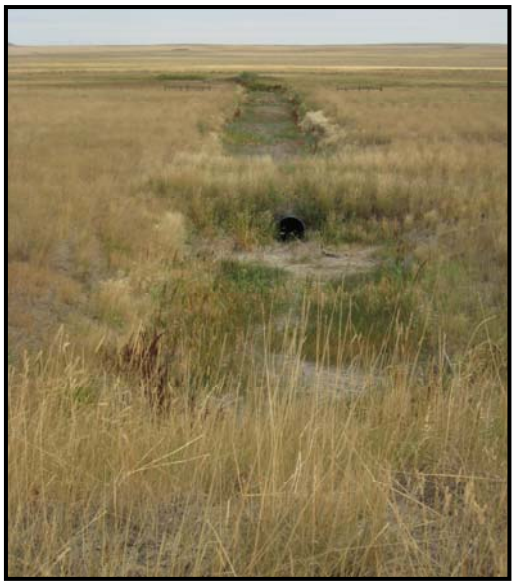


Photo 3: View is of the outflow behind Photo Point 1 facing 40˚ northeast. Outflow is of Type 12-*Alisma* wetland.

Photo 4: At Photo Point 2 facing 180˚ south.

Photo 5: At Photo Point 3 facing 130˚ southeast at the inlet channel and the Type 7-*Rumex* wetland fringe.

Photo 6: At Photo Point 4 facing 71˚ east at the inlet control structure with the diversion structure in background.

Photo 7: View is of the inlet channel at Photo Point 4 facing 208˚southwest. Inlet has Type 7-*Rumex* wetland fringe.

Photo 8: At Photo Point 6 facing 317˚northwest with Square Butte in the background.

Photo 9: View is facing 10˚ north at the start of Transect 1.

Photo 10: View is facing 190˚ south at the end of the Type 8 -*Polygonum aviculare* community on Transect 1.

Photo 11: View is east from T-1 showing the 5 foot wide Type 7–*Rumex* wetland fringe.

Photo 12: View is facing 266˚ west at the start of Transect 2.

Photo 13: Macroinvertebrate Sampling location.

Photo 14: In 2007 the water was colonized by a type of green algae.

Photo 15: Common carp found dead along the shore.

Photo 16: Near PP5 looking east along the north shore of the peninsula. From left to right: *Polygonum*, *Rumex* spp., and grasses.

Photo 17: View is east at Type 13–Upland showing a high density of *Bromus japonicus* and *Sisymbiu*m spp.

Photo 18: View is north at *Hordeum*, Upland Grass, and *Rumex* fringe types on peninsula and *Polygonum* type on islands.

Photo 19: View is north at Type 10/11-*Typha*/*Hordeum*. *Typha* were browning due to a lack of water.

Photo 20: View is northwest at Type 11-*Hordeum* with Square Butte in the background.

Photo 21: View is west at Type 9/11-*Polygonum*/*Hordeum*.

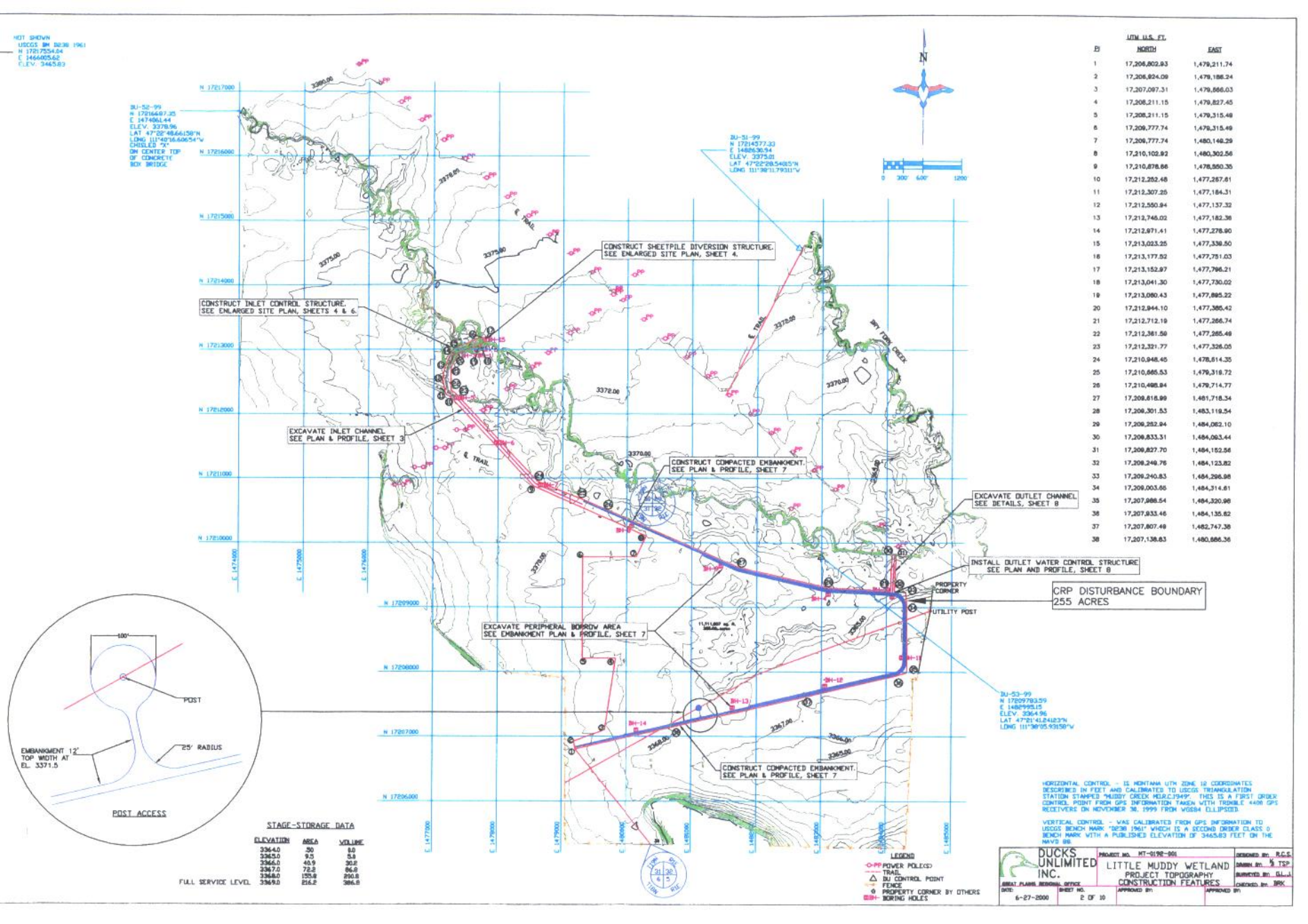
Photo 22: View is south at *Rumex* spp. surrounding *Cirsium arvense*.

Photo 23: View is southeast from the northern perimeter of the site. Photo shows mudflat, green *Polygonum*, red *Rumex*, and yellow *Hordeum*.

Appendix D

PROJECT PLAN SHEET

MDT Wetland Mitigation Monitoring
Little Muddy Creek
Cascade County, Montana



PT	UTM U.S. FT. NORTH	EAST
1	17,206,802.93	1,479,211.74
2	17,206,824.09	1,479,186.24
3	17,207,097.31	1,479,866.03
4	17,208,211.15	1,479,827.45
5	17,208,211.15	1,479,315.49
6	17,209,777.74	1,479,315.49
7	17,209,777.74	1,480,148.29
8	17,210,102.92	1,480,302.56
9	17,210,878.66	1,478,550.35
10	17,212,252.48	1,477,267.61
11	17,212,307.25	1,477,184.31
12	17,212,550.94	1,477,137.32
13	17,212,746.02	1,477,182.36
14	17,212,971.41	1,477,278.90
15	17,213,023.25	1,477,338.50
16	17,213,177.52	1,477,751.03
17	17,213,152.97	1,477,796.21
18	17,213,041.30	1,477,730.02
19	17,213,080.43	1,477,895.22
20	17,212,944.10	1,477,385.42
21	17,212,712.19	1,477,266.74
22	17,212,361.50	1,477,265.48
23	17,212,321.77	1,477,326.05
24	17,210,948.45	1,478,614.35
25	17,210,665.53	1,479,318.72
26	17,210,498.84	1,479,714.77
27	17,209,818.99	1,481,718.34
28	17,209,301.53	1,483,119.54
29	17,209,252.94	1,484,082.10
30	17,209,833.31	1,484,093.44
31	17,209,827.70	1,484,152.56
32	17,209,249.76	1,484,123.82
33	17,209,240.83	1,484,296.98
34	17,209,003.66	1,484,314.61
35	17,207,988.54	1,484,320.98
36	17,207,933.46	1,484,135.82
37	17,207,807.48	1,482,747.38
38	17,207,138.63	1,480,886.36

STAGE-STORAGE DATA

ELEVATION	AREA	VOLUME
3364.0	.30	8.0
3365.0	9.5	5.8
3366.0	40.9	30.2
3367.0	72.8	86.0
3368.0	155.8	290.8
FULL SERVICE LEVEL 3369.0	216.2	386.8

LEGEND
- POWER POLE(S)
- TRAIL
- DU CONTROL POINT
- FENCE
- PROPERTY CORNER BY OTHERS
- BORING HOLES

HORIZONTAL CONTROL - IS MONTANA UTM ZONE 12 COORDINATES DESCRIBED IN FEET AND CALIBRATED TO USCGS TRIANGULATION STATION STAMPED "MUDDY CREEK HEAD,1949". THIS IS A FIRST ORDER CONTROL POINT FROM GPS INFORMATION TAKEN WITH TRIMBLE 4400 GPS RECEIVERS ON NOVEMBER 30, 1999 FROM WGS84 ELLIPSOID.

VERTICAL CONTROL - WAS CALIBRATED FROM GPS INFORMATION TO USCGS BENCH MARK "DE38 1961" WHICH IS A SECOND ORDER CLASS 0 BENCH MARK WITH A PUBLISHED ELEVATION OF 3465.83 FEET ON THE NAVD 88.

DUCKS UNLIMITED INC.
GREAT PLAINS REGIONAL OFFICE

PROJECT NO. MT-0192-001
LITTLE MUDDY WETLAND
PROJECT TOPOGRAPHY
CONSTRUCTION FEATURES

DESIGNED BY: R.C.S.
DRAWN BY: K TSP
SURVEYED BY: G.L.J.
CHECKED BY: BRK
APPROVED BY:
APPROVED BY:

DATE: 6-27-2000
SHEET NO. 2 OF 10

Appendix E

BIRD SURVEY PROTOCOL
GPS PROTOCOL

MDT Wetland Mitigation Monitoring
Little Muddy Creek
Cascade County, Montana

BIRD SURVEY PROTOCOL

This protocol was developed by the Montana Department of Transportation (MDT) to monitor bird use within their Wetland Mitigation Sites. Though each wetland mitigation site is vastly different, the bird survey data collection methods were standardized to order to increase repeatability. The protocol uses an "area search within a restricted time frame" to collect data on bird species, density, behavior, and habitat-type use.

Survey Area

Sites that can be entirely walked: Sites where the entire perimeter or area can be walked include, but are not limited to: small ponds, enhanced historic river channels, and wet meadows. If the wetland is not uncomfortably inundated, walk several meandering transects to sufficiently cover the wetland. Meandering transects can be used, even if a small portion of the area is inaccessible (e.g. cannot cross due to inundation). Use binoculars to identify the bird species, to count the number of individuals, and to identify their behavior and habitat type. Data can be recorded directly onto the bird survey form or into a field notebook. The number of meandering transects and their direction (or location) should be recorded in the field notebook and/or drawn onto the aerial photograph or topographic map. Meandering transects are not formal and should not be staked. Each site should be walked and surveyed to the fullest extent within the set time limit.

Sites than cannot be entirely walked: Sites where the entire perimeter or area cannot be walked include, but are not limited to: very large sites (i.e. perimeter of 2-3 miles), and large-bodied waters (i.e. reservoirs), where deep water habitat (> 6 feet) is close to shore. For large-bodied waters where only one area was graded to create or enhance the development of wetland, bird surveys should be walked along meandering transects within or around the graded area (see above.). For sites that cannot be walked, bird surveys should be conducted from many lookout posts, established at key vantage points. The general location of lookout posts should be recorded in the field notebook or drawn onto the aerial photograph or topographic map. Lookout post locations do not need to be staked. Both binoculars and spotting scopes may be used in order to accurately identify and count the birds. Depending upon the size of the open water, more time may be spent viewing the mitigation area from lookout posts than is spent traveling between posts.

Survey Time

Ideally, bird surveys should be conducted in the morning hours when bird activity is often greatest (i.e. sunrise to no later than 11:00 am). Surveys can be completed before 11am if all transects have been walked or all lookout posts have been viewed with no new bird activity observed. For some sites bird surveys may need to be performed in the late afternoon or evening due to traveling constraints or weather. The overall limiting time factor will be the number of budgeted hours for the project.

Data Recording

Bird Species List: Record each bird species observed onto the Bird Survey-Field Data Sheet (or field notebook). Record the bird's common name using the appropriate 4-letter code. The 4-letter code uses the first two letters of the first two word's of the bird's common name or if one name, the first four letters. For example, Mourning Dove is coded as MODO while Mallard is coded as MALL. If an unknown individual is observed, use the 4-letter protocol, but define your

abbreviation at the bottom of the field data sheet. For example, unknown shorebird is UNSB; unknown brown bird is UNBR; unknown warbler is UNWA; and unknown waterfowl is 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 parenthesis; do not fill in the habitat column. For example, a flock of black, medium-sized birds could be coded as UNBB / FO (25).

Bird Density: For each observation record the actual or estimated number of individuals observed per species and per behavior. Totals can be tallied in the office and entered onto the Bird Survey-Field Data Sheet.

Bird Behavior: Bird behavior must be identified by what is known. When a species is observed, the behavior that is immediately exhibited is recorded. Only behaviors that have discreet descriptive terms should be used. The following terms are recommended: breeding pair (BP); foraging (F); flyover (FO); loafing (L), which is defined as sleeping, roosting, or floating with head tucked under wing; and nesting (N). If other behaviors that have a specific descriptive word are observed then it can be used and should later be added to the protocol. Descriptive words or phrases such as "migrating" or "living on site" are unknown behaviors.

Bird Species Habitat Use: When a species is observed, the habitat is also recorded. The following broad habitat categories are used:

- aquatic bed (AB), defined as rooted-floating, floating-leaved, or submergent vegetation.
- marsh (MA), defined as emergent (e.g. cattail, bulrush) vegetation with surface water.
- wet meadow (WM), defined as grasses, sedges, or rushes with little to no surface water.
- scrub-shrub (SS), defined as shrub covered wetland.
- forested (FO), defined as tree covered wetland.
- open water (OW), defined as unvegetated surface water.
- upland (UP), defined as the upland buffer.

Other categories can be used and defined on the data sheet and should later be added to the protocol.

Other Fields

Bird Visit: Each bird survey (i.e. spring, fall, and mid-season) should be completed on separate Bird Survey-Field Data Sheets.

Time: Record the start time and end time on the Bird Survey-Field Data Sheet.

Date: Record the date of the bird survey.

Weather: Record the weather conditions (i.e. temperature, wind, condition).

Notes: Note if a particular individual bird is using a constructed nest box and note the condition of constructed nest box(es). Also record any comments about the site, wildlife, wetland conditions, etc.

GPS MAPPING AND AERIAL PHOTO REFERENCING PROCEDURE

From 2001 through 2006, PBS&J mapped the vegetation community boundaries, photograph points, and other sampling locations in the field using the resource-grade Trimble GEO III GPS (Global Positioning System) unit. The data were collected with a minimum of three positions per feature using Course/Acquisition code. The collected data were then transferred to a personal computer (PC) and differentially corrected to the nearest operating Community Base Station. The corrected data were then exported to ACAD drawings in Montana State Plain Coordinates NAD 83 international feet.

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

In 2007, some sites continued to be mapped using the Trimble GEO III GPS unit while most sites were mapped using the resource-grade Magellan MobileMapper Office GPS unit. The Magellan GPS unit has a comparable accuracy level to the Trimble Geo III unit.

Each year, MDT photographs each mitigation site from the air. These aerial photographs are not geo-referenced, but serve as a visual aid to map wetland development and vegetation communities, and to show approximate locations for various monitoring activities (i.e. photograph points, transects, or macroinvertebrate sampling). Reference points that are observable on the aerial photo (i.e. road, stream channel, or fence) were also marked with the GPS unit in order to better position the aerial photograph. This positioning did not remove any of the distortion inherent to all photos. All mapped features and community boundaries were reviewed by the wetland biologist, to increase the figure's accuracy.

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.

Appendix F

2007 MACROINVERTEBRATE SAMPLING PROTOCOL AND DATA

MDT Wetland Mitigation Monitoring
Little Muddy Creek
Cascade County, Montana

AQUATIC INVERTEBRATE SAMPLING PROTOCOL

Equipment List

- D-frame sampling net with 1 mm mesh.
- 1-liter, wide-mouth, plastic sample jars provided by Rhithron Associates, Inc. (Quart sized, wide-mouthed canning jars can be substituted.)
- 95% ethanol (alternatively isopropyl alcohol).
- Pre-printed sample labels (printed on rite-in-the-rain paper); two labels per sample.
- Pencil.
- Clear packaging tape.
- 3-5 gallon plastic pail.
- Large tea strainer or framed screen.
- Cooler with ice for storing sample.

Site Selection

Select a site that is accessible with hip waders or rubber boots. If the substrate is too soft, place a wide board down to walk on. Choose a site that is representative of the overall condition of the wetland. Annual sampling should occur at the same site within the wetland.

Sampling Procedure

Wetland invertebrates (macroinvertebrates) inhabit the substrate, the water column, the stems and leaves of aquatic vegetation, and the water surface. At the given location, each habitat type is sampled and combined into a single 1-liter sample jar. Pre-cautions are made to minimize disturbing the sample site in order to maximize the number of animals collected.

Fill the pail with approximately 1 gallon of wetland water. Ideally, sample the water column from near-shore outward to a depth of 3 feet. Sample the water column using a long sweep of the net, keeping the net at about half the depth of the water. Sample the water surface with a long sweep of the net. Aquatic vegetation is sampled by pulling the net beneath the water surface, for at least a meter in distance. The substrate is sampled by pulling the net along the bottom, bumping it against the substrate several times as you pull. Be sure to place some muck, mud, and/or vegetation into the jar. After sampling a habitat, rinse the net in the bucket and look for insects, crustaceans, and other aquatic invertebrates. It is not necessary to sample habitats in any specific order, but all habitats, if present, are to be sampled. Habitats can be sampled more than once.

Fill about 1 cup of ethanol into the sample jar. Sieve the contents of the bucket through the straining device and pour or carefully scrape the contents of the strainer into the sample jar. Top off the jar with enough ethanol to cover all the material and leave as little headroom as possible. Alternatively, sampled materials can be lifted out of the net and put directly into the jar. Be sure to include some muck, mud, and/or vegetation into the jar. Each macroinvertebrate sampling site should have only one sampling jar.

Using pencil, complete two labels with the required information: project name, project number, date, collector's name, and habitats sampled. Do not complete the label with ink as it will dissolve in ethanol. For wetlands with at least two macroinvertebrate sampling sites, number the site consecutively followed by the total number of sites (e.g. Sample 2 of 3 sites). Place one label into the jar and seal the jar. Dry the jar off, if necessary, and tape the second label to the outside of the jar.

Photograph each macroinvertebrate sampling site.

Sample Handling/Delivery

In the field, keep sample jars cool by placing in a cooler with a small amount of ice.
Deliver samples to the PBS&J office in Missoula, where they will be inventoried and delivered to Rhithron Associates, Inc.

MDT Mitigated Wetland Monitoring Project: Aquatic Invertebrate Monitoring
Summary 2001 – 2007

Prepared for Post, Buckley, Schuh, and Jernigan (PBS&J)
Prepared by W.Bollman, Rhithron Associates, Inc.

INTRODUCTION

Aquatic invertebrate assemblages were collected at a number of mitigated wetlands throughout Montana. This report summarizes data generated from seven years of collection. Over all years of sampling, a total of 182 invertebrate samples were collected. Table 1 lists the currently monitored sites at which aquatic invertebrates were collected in 2007, and summarizes the sampling history of each.

METHODS

Sample processing

Aquatic invertebrate samples were collected at mitigated wetland sites in the summer months of 2001, 2002, 2003, 2004, 2005, 2006 and 2007 by personnel of PBS&J. Sampling procedures utilized were based on the protocols developed by the Montana Department of Environmental Quality (MT DEQ) for wetland sampling. Sampling consisted of D-frame net sweeps through emergent vegetation (when present), the water column, and over the water surface, and included disturbing and scraping substrates at each sampled site. These sample components were composited and preserved in ethanol at each wetland site. Samples were delivered to Rhithron Associates, Inc. for processing, taxonomic determinations, and data analysis.

Standard sorting protocols were applied to achieve representative subsamples of a minimum of 100 organisms. Caton sub-sampling devices (Caton 1991), divided into 30 grids, each approximately 5 cm by 6 cm, were used. Grid contents were examined under stereoscopic microscopes using 10x-30x magnification. All aquatic invertebrates from each selected grid were sorted from the substrate, and placed in 95% ethanol for subsequent identification. Grid selection, examination, and sorting continued until at least 100 organisms were sorted. A large/rare search was conducted to collect any taxa not found in the subsampling procedure.

Organisms were individually examined using 10x – 80x stereoscopic dissecting scopes (Leica S8E and S6E) and identified to the lowest practical taxonomic levels using appropriate published taxonomic references. Identification, counts, life stages, and information about the condition of specimens were recorded on bench sheets. To obtain accuracy in richness measures, organisms that could not be identified to the target level specified in MDEQ protocols were designated as “not unique” if other specimens from the same group could be taken to target levels. Organisms designated as “unique” were those that could be definitively distinguished from other organisms in the sample. Identified organisms were preserved in 95% ethanol in labeled vials, and archived at the Rhithron laboratory. Midges were morphotyped using 10x – 80x stereoscopic dissecting microscopes (Leica S8E and S6E) and representative specimens were slide mounted and examined at 200x – 1000x magnification using an Olympus BX 51 compound microscope. Slide mounted organisms were also archived at the Rhithron laboratory.

Quality assurance systems

Quality control procedures for initial sample processing and subsampling involved checking sorting efficiency. These checks were conducted on 96% of the samples by independent observers who microscopically re-examined 20% of sorted substrate from each sample. All organisms that were missed were counted and this number was added to the total number obtained in the original sort. Sorting efficiency was evaluated by applying the following calculation:

$$SE = \frac{n_1}{n_{1+2}} \times 100$$

where: SE is the sorting efficiency, expressed as a percentage, n_1 is the total number of specimens in the first sort, and n_{1+2} is the total number of specimens in the first and second sorts combined.

Quality control procedures for taxonomic determinations of invertebrates involved checking accuracy, precision and enumeration. At least 10% of samples are targeted for quality assurance procedures. For this project, three samples were randomly selected and all organisms re-identified and counted by an independent taxonomist. Taxa lists and enumerations were compared by calculating a Bray-Curtis similarity statistic (Bray and Curtis 1957) for each

selected sample. Routinely, discrepancies between the original identifications and the QC identifications are discussed among the taxonomists, and necessary rectifications to the data are made. Discrepancies that cannot be rectified by discussions are routinely sent out to taxonomic specialists for identification. However, taxonomic certainty for identifications in this project was high, and no external verifications were necessary.

Assessment

The method employed to assess these wetlands is based on an index incorporating a battery of 12 bioassessment metrics or attributes (Table 1) tested and recommended by Stribling et al. (1995) in a report to the Montana Department of Health and Environmental Science. In that study, it was determined that some of the metrics were of limited use in some geographic regions, and for some wetland types. Despite that finding, all 12 metrics are used in this evaluation of mitigated wetlands, since detailed geographic information and wetland classifications were unavailable. Scoring criteria for the 12 metrics were developed specifically for this project, since mitigated wetlands were not included in original criteria development.

Scoring criteria for wetland metrics were developed by generally following the tactic used by Stribling et al. (1995). Boxplots were generated using a statistical software package (Statistica™), and distributions, median values, ranges, and quartiles for each metric were examined. For the wetland sites, "optimal" scores were generally those that fell above the 75th percentile (for those metrics that decrease in value in response to stress) or below the 25th percentile (for metrics that respond to stress by an increase in value) of all scores. Additional scoring ranges were established by bisecting the range below the 75th percentile for decreasing scores (or above the 25th percentile for increasing scores) into "sub-optimal" and "poor" assessment categories. A score of 5, 3, or 1 was assigned to optimal, sub-optimal, and poor metric performance, respectively. In this way, metric values were translated into normalized metric scores, and scores for all metrics were summed to produce a total bioassessment score, which is expressed as a percentage of the maximum possible score (60). Total bioassessment scores were classified according to a similar process, using the ranges and distributions of total scores for all sites studied in all years. Data from a total of 167 samples were used to develop criteria.

Several sites in this study supported aquatic fauna characteristic of lotic habitats rather than lentic wetland habitats; these sites were excluded from mitigated wetland scoring criteria development, and were evaluated with a metric battery specific to flowing water habitats. In 2007, the lotic sites were Camp Creek (2 sites), Cloud Ranch stream, Kleinschmidt stream, Jack Creek, and Woodson Creek-Ringling stream. Invertebrate assemblages at these sites were generally characteristic of montane or foothill stream conditions and were assessed using the tested metric battery developed for montane streams of Western Montana (Bollman 1998).

The purpose of constructing an index from biological attributes or metrics is to provide a means of integrating information to facilitate the determination of whether management action is needed. However, the nature of the action needed is not determined solely by the index score or impairment classification, but by consideration of an analysis of the component metrics, the taxonomic composition of the assemblages, and other issues. The diagnostic functions of the metrics and taxonomic data need more study since our understanding of the interrelationships of natural environmental factors and anthropogenic disturbances is tentative. Thus, the further interpretive remarks accompanying the raw taxonomic and metric data in this summary are offered cautiously. Year-to-year comparisons depend on an assumption that specific sites were revisited in each year, and that equivalent sampling methods were utilized at each site revisit.

Bioassessment metrics - wetlands

An index based on the performance of 12 metrics was constructed, as described above. Table 2 lists those metrics, describes their calculation and the expected response of each to increased degradation or impairment of the wetland.

In addition to the summed scores of each metric and the associated impairment classification described above, each individual metric informs the bioassessment to some degree. The four richness metrics (Total taxa, POET, Chironomidae taxa, and Crustacea taxa + Mollusca taxa) can be interpreted to express habitat complexity as well as water quality. Complex, diverse habitats consist of variable substrates, emergent vegetation, variable water depths and other factors, and are potential features of long-established stable wetlands with minimal human disturbance. In the study conducted by Stribling et al. (1995), all four richness metrics were found to be significantly associated with water quality parameters including conductance, salinity, and total dissolved solids.

Four composition metrics (%Chironomidae, %Orthocladiinae of Chironomidae, %Crustacea + %Mollusca, and %Amphipoda) measure the relative contributions of certain taxonomic groups that may have significant responses to habitat and/or water quality impacts. For example, amphipods have been demonstrated to increase in abundance in

alkaline conditions. Short-lived, relatively mobile taxa such as chironomids dominate ephemeral environments; many are hemoglobin-bearers capable of tolerating de-oxygenated conditions.

Two tolerance metrics (the Hilsenhoff Biotic Index and %Dominant taxon) were included in the bioassessment battery. The HBI indicates the overall invertebrate assemblage tolerance to nutrient enrichment, warm water, and/or low dissolved oxygen conditions. The percent abundance of the dominant taxon has been demonstrated to be strongly associated with pH, conductance, salinity, total organic carbon, and total dissolved solids.

Two trophic measures (%Collector-gatherers and %Filterers) may be helpful in expressing functional integrity of the invertebrate assemblage, which can be impacted by poor water quality or habitat degradation. High proportions of filtering organisms suggest nutrient and/or organic enrichment, while abundant collectors suggest more positive functional conditions and well-developed wetland morphology. These organisms graze periphyton growing on stable surfaces such as macrophytes.

Summary metric values and scores for the 2007 samples are given in Tables 4a-4c and 5.

In 2007, thermal preference of the invertebrate assemblages was calculated when possible, using the tool developed by Brandt 2001.

Bioassessment metrics – lotic habitats

For sites supporting rheophilic invertebrate assemblages, bioassessment was based on a metric battery and scoring criteria developed for montane regions of Montana (MVFP index: Bollman 1998). The six metrics constituting the bioassessment index used for MVFP sites in this study were selected because, both individually and as an integrated metric battery, they are robust at distinguishing impaired sites from relatively unimpaired sites (Bollman 1998). They have been demonstrated to be more variable with anthropogenic disturbance than with natural environmental gradients (Bollman 1998). Each of the six metrics, and their expected responses to various stressors is described below.

1. Ephemeroptera (mayfly) taxa richness. The number of mayfly taxa declines as water quality diminishes. Impairments to water quality which have been demonstrated to adversely affect the ability of mayflies to flourish include elevated water temperatures, heavy metal contamination, increased turbidity, low or high pH, elevated specific conductance and toxic chemicals. Few mayfly species are able to tolerate certain disturbances to instream habitat, such as excessive sediment deposition.
2. Plecoptera (stonefly) taxa richness. Stoneflies are particularly susceptible to impairments that affect a stream on a reach-level scale, such as loss of riparian canopy, streambank instability, channelization, and alteration of morphological features such as pool frequency and function, riffle development and sinuosity. Just as all benthic organisms, they are also susceptible to smaller scale habitat loss, such as by sediment deposition, loss of interstitial spaces between substrate particles, or unstable substrate.
3. Trichoptera (caddisfly) taxa richness. Caddisfly taxa richness has been shown to decline when sediment deposition affects habitat. In addition, the presence of certain case-building caddisflies can indicate good retention of woody debris and lack of scouring flow conditions.
4. Number of sensitive taxa. Sensitive taxa are generally the first to disappear as anthropogenic disturbances increase. The list of sensitive taxa used here includes organisms sensitive to a wide range of disturbances, including warmer water temperatures, organic or nutrient pollution, toxic pollution, sediment deposition, substrate instability and others. Unimpaired streams of western Montana typically support at least four sensitive taxa (Bollman 1998).
5. Percent filter feeders. Filter-feeding organisms are a diverse group; they capture small particles of organic matter, or organically enriched sediment material, from the water column by means of a variety of adaptations, such as silken nets or hairy appendages. In forested montane streams, filterers are expected to occur in insignificant numbers. Their abundance increases when canopy cover is lost and when water temperatures increase and the accompanying growth of filamentous algae occurs. Some filtering organisms, specifically the Arctopsychid caddisflies (*Arctopsyche* spp. and *Parapsyche* spp.) build silken nets with large mesh sizes that capture small organisms such as chironomids and early-instar mayflies. Here they are considered predators, and, in this study, their abundance does not contribute to the percent filter feeders metric.
6. Percent tolerant taxa. Tolerant taxa are ubiquitous in stream sites, but when disturbance increases, their abundance increases proportionately. The list of taxa used here includes organisms tolerant of a wide range of disturbances, including warmer water temperatures, organic or nutrient pollution, toxic pollution, sediment deposition, substrate instability and others.

Table 1. Montana Department of Transportation Mitigated Wetlands Monitoring Project sites: sampling history. Only those sites monitored in 2007 are included. An asterisk (*) indicates lotic sites.

Site Identifier	2001	2002	2003	2004	2005	2006	2007
Roundup	+	+	+	+	+	+	+
Ridgeway	+	+	+	+	+	+	+
Hoskins Landing MS-1		+	+	+	+		+
Hoskins Landing MS-2							+
Peterson Ranch pond 1		+	+	+	+	+	+
Peterson Ranch pond 2		+		+	+	+	+
Peterson Ranch pond 4		+	+	+	+	+	+
Peterson Ranch pond 5		+	+	+	+	+	+
Camp Creek MS-1*		+	+	+	+	+	+
Camp Creek MS-2*						+	+
Kleinschmidt		+	+	+	+	+	+
Kleinschmidt – stream*			+	+	+	+	+
Cloud Ranch Pond				+	+		+
Cloud Ranch Stream*				+			+
Jack Creek – pond				+	+		+
Jack Creek – McKee*							+
Norem				+	+	+	+
Rock Creek Ranch					+	+	+
Wagner Marsh					+	+	+
Alkali Lake 1						+	+
Charley Creek							+
Woodson pond MI 1							+
Woodson stream MI 2*							+
Little Muddy Creek							+
Selkirk Ranch							+
DH Ranch							+

Table 2. Aquatic invertebrate metrics employed for wetland (lentic) invertebrate assemblages in the MDT mitigated wetlands study, 2001 – 2007.

Metric	Metric calculation	Expected response to degradation or impairment
Total taxa	Count of unique taxa identified to lowest recommended taxonomic level	Decrease
POET	Count of unique Plecoptera, Trichoptera, Ephemeroptera, and Odonata taxa identified to lowest recommended taxonomic level	Decrease
Chironomidae taxa	Count of unique midge taxa identified to lowest recommended taxonomic level	Decrease
Crustacea taxa + Mollusca taxa	Count of unique Crustacea taxa and Mollusca taxa identified to lowest recommended taxonomic level	Decrease
% Chironomidae	Percent abundance of midges in the subsample	Increase
Orthocladiinae / Chironomidae	Number of individual midges in the sub-family Orthocladiinae / total number of midges in the subsample.	Decrease
%Amphipoda	Percent abundance of amphipods in the subsample	Increase
% Crustacea + % Mollusca	Percent abundance of crustaceans in the subsample plus percent abundance of molluscs in the subsample	Increase
HBI	Relative abundance of each taxon multiplied by that taxon's modified Hilsenhoff Biotic Index (tolerance) value. These numbers are summed over all taxa in the subsample.	Increase
% Dominant taxon	Percent abundance of the most abundant taxon in the subsample	Increase
% Collector-Gatherers	Percent abundance of organisms in the collector-gatherer functional group	Decrease
% Filterers	Percent abundance of organisms in the filterer functional group	Increase

RESULTS

(Note: Individual site discussions were removed from this report by PBS&J and are included in the macroinvertebrate section of individual project monitoring reports. Summary tables for lentic (4a – 4c) and lotic (5) sites and project specific taxa listings and metrics reports are provided on the following pages.)

Quality Assurance

Table 3 gives the results of quality assurance procedures for sample sorting efficiency (SE) and Bray-Curtis similarity statistics for comparisons of taxonomic determinations and enumeration. Sorting efficiency averaged 97.54% for the project, and taxonomic similarity averaged 97.44%.

Table 3. Results of quality control procedures for subsampling and taxonomic and enumeration similarity.

Site name	SE	Bray-Curtis similarity
Roundup	100.00%	
Ridgeway	100.00%	
Hoskins Landing MS-1	100.00%	
Hoskins Landing MS-2	93.40%	
Peterson Ranch pond 1	100.0%	95.38%
Peterson Ranch pond 2	96.64%	
Peterson Ranch pond 4	91.66%	
Peterson Ranch pond 5	96.64%	
Camp Creek MS-1	100.00%	
Camp Creek MS-2	100.00%	96.94%
Kleinschmidt – pond	100.00%	
Kleinschmidt – stream	99.10%	
Cloud Ranch Pond	95.65%	
Cloud Ranch Stream	91.61%	
Jack Creek – pond	n.a.	
Jack Creek - McKee	96.49%	
Norem	100.00%	100.00%
Rock Creek Ranch	100.00%	
Wagner Marsh	100.00%	
Alkali Lake 1	98.04%	
Charley Creek	100.00%	
Woodson pond	91.37%	
Woodson stream	100.00%	
Little Muddy Creek	92.31%	
Selkirk Ranch	95.56%	
DH Ranch	100.00%	

Table 4a. Metric values and scores for wetland (lentic) sites in the MDT mitigated wetland study – 2007 sampling.

	ROUNDUP	RIDGEWAY	HOSKINS LANDING MS-1	HOSKINS LANDING MS-2	PETERSON RANCH 1	PETERSON RANCH 2	PETERSON RANCH 4	PETERSON RANCH 5
Total taxa	7	13	18	21	17	18	26	18
POET	0	2	3	5	2	0	6	4
Chironomidae taxa	5	5	2	8	8	12	12	6
Crustacea + Mollusca	1	2	5	4	4	5	4	4
% Chironomidae	7.62%	30.00%	18.75%	52.68%	36.45%	51.79%	42.59%	14.78%
Orthocladiinae/Chir	0.38	0.17	0.00	0.03	0.08	0.16	0.09	0.12
%Amphipoda	0.00%	10.00%	0.00%	0.00%	0.93%	0.00%	21.30%	1.74%
%Crustacea + %Mollusca	89.52%	15.00%	26.79%	8.04%	10.28%	43.75%	28.70%	37.39%
HBI	8.02	7.11	7.23	6.55	7.42	7.76	6.53	7.23
%Dominant taxon	89.52%	30.00%	17.86%	35.71%	39.25%	23.21%	17.59%	30.43%
%Collector-Gatherers	92.38%	70.00%	78.57%	82.14%	49.53%	71.43%	38.89%	26.96%
%Filterers	0.00%	0.00%	0.89%	6.25%	9.35%	3.57%	1.85%	5.22%
Total taxa	1	1	3	5	3	3	5	3
POET	1	1	3	5	1	1	5	5
Chironomidae taxa	3	3	1	5	5	5	3	3
Crustacea + Mollusca	1	1	3	3	3	3	1	3
% Chironomidae	5	3	3	1	3	1	1	5
Orthocladiinae/Chir	3	1	1	1	1	1	3	1
%Amphipoda	5	3	5	5	5	5	5	5
%Crustacea + %Mollusca	1	5	5	5	5	3	5	3
HBI	1	3	3	5	3	1	5	3
%Dominant taxon	1	5	5	3	3	5	1	5
%Collector-Gatherers	5	3	3	5	3	3	3	1
%Filterers	3	3	3	1	1	3	5	3
Total score	**30**	**32**	**38**	**44**	**36**	**34**	**42**	**40**
Percent of maximum score	**50.00%**	**53.33%**	**63.33%**	**73.33%**	**60.00%**	**56.67%**	**70.00%**	**66.67%**
Impairment classification	**poor**	**sub-optimal**	**optimal**	**optimal**	**sub-optimal**	**sub-optimal**	**optimal**	**optimal**

Table 4b. Metric values and scores for wetland (lentic) sites in the MDT mitigated wetland study – 2007 sampling.

	KLEIN-SCHMIDT POND	CLOUD RANCH POND	JACK CREEK POND	NOREM	ROCK CREEK RANCH	WAGNER MARSH	ALKALI LAKE 1	CHARLEY CREEK
Total taxa	25	13	9	6	18	11	9	13
POET	5	2	0	1	2	2	0	0
Chironomidae taxa	8	11	5	2	4	4	2	3
Crustacea + Mollusca	8	1	4	1	4	0	2	3
% Chironomidae	18.63%	81.54%	92.79%	31.58%	4.76%	11.39%	1.96%	27.17%
Orthocladiinae/Chir	0.53	0.38	0.03	0.00	0.60	0.44	0.50	0.68
%Amphipoda	10.78%	3.08%	0.00%	0.00%	17.14%	0.00%	0.00%	22.83%
%Crustacea + %Mollusca	36.27%	3.08%	7.21%	21.05%	23.81%	0.00%	61.76%	53.26%
HBI	7.35	7.22	9.73	6.63	6.33	7.28	8.07	6.88
%Dominant taxon	13.73%	18.46%	62.16%	26.32%	29.52%	45.57%	60.78%	29.35%
%Collector-Gatherers	53.92%	84.62%	70.27%	57.89%	29.52%	15.19%	70.59%	32.61%
%Filterers	11.76%	9.23%	0.90%	0.00%	0.95%	0.00%	0.00%	0.00%
Total taxa	5	1	1	1	3	1	1	1
POET	5	1	1	1	1	1	1	1
Chironomidae taxa	5	5	3	1	3	3	1	3
Crustacea + Mollusca	5	1	3	1	3	1	1	1
% Chironomidae	3	1	1	3	5	5	5	3
Orthocladiinae/Chir	5	3	1	1	5	3	5	5
%Amphipoda	3	5	5	5	3	5	5	3
%Crustacea + %Mollusca	3	5	5	5	5	5	3	3
HBI	3	3	1	5	5	3	1	5
%Dominant taxon	5	5	1	5	5	3	1	5
%Collector-Gatherers	3	5	3	3	1	1	3	1
%Filterers	1	1	3	3	3	3	3	3
Total score	**46**	**36**	**28**	**34**	**42**	**34**	**30**	**34**
Percent of maximum score	**76.67%**	**60.00%**	**46.67%**	**56.67%**	**70.00%**	**56.67%**	**50.00%**	**56.67%**
Impairment classification	**optimal**	**sub-optimal**	**poor**	**sub-optimal**	**poor**	**sub-optimal**	**poor**	**sub-optimal**

Table 4c. Metric values and scores for wetland (lentic) sites in the MDT mitigated wetland study – 2007 sampling.

	WOODSON POND	LITTLE MUDDY CREEK	SELKIRK RANCH	DH RANCH
Total taxa	12	2	16	8
POET	0	0	2	1
Chironomidae taxa	9	0	8	4
Crustacea + Mollusca	1	1	2	2
% Chironomidae	85.71%	0.00%	77.27%	27.50%
Orthocladiinae/Chir	0.32	0.00	0.61	0.00
%Amphipoda	0.00%	0.00%	0.00%	0.00%
%Crustacea + %Mollusca	2.86%	75.00%	8.18%	64.17%
HBI	9.34	8.50	7.82	7.38
%Dominant taxon	33.33%	75.00%	46.36%	39.17%
%Collector-Gatherers	55.24%	75.00%	32.73%	27.50%
%Filterers	0.00%	0.00%	8.18%	17.50%
Total taxa	1	1	3	1
POET	1	1	1	1
Chironomidae taxa	5	1	5	3
Crustacea + Mollusca	1	1	1	1
% Chironomidae	1	5	1	3
Orthocladiinae/Chir	3	1	5	1
%Amphipoda	5	5	5	5
%Crustacea + %Mollusca	5	1	5	1
HBI	1	1	1	3
%Dominant taxon	5	1	3	3
%Collector-Gatherers	3	3	1	1
%Filterers	3	3	1	1
Total score	**34**	**24**	**32**	**24**
Percent of maximum score	**56.67%**	**40.00%**	**53.33%**	**40.00%**
Impairment classification	**sub-optimal**	**poor**	**sub-optimal**	**poor**

Table 5. Metric values and scores for stream (lotic) sites in the MDT mitigated wetland study – 2007 sampling.

	CAMP CREEK MS-1	CAMP CREEK MS-2	KLEIN-SCHMIDT STREAM	CLOUD RANCH STREAM	JACK CREEK - MCKEE	WOODSON STREAM
E Richness	6	6	0	2	1	1
P Richness	0	0	0	2	0	0
T Richness	4	6	2	4	4	0
Pollution Sensitive Richness	3	4	0	1	0	0
Filterer Percent	4.85%	5.56%	7.14%	3.57%	2.83%	16.67%
Pollution Tolerant Percent	32.04%	34.26%	9.82%	14.29%	58.49%	8.33%
E Richness	3	3	0	1	0	0
P Richness	0	0	0	2	0	0
T Richness	2	3	1	2	2	0
Pollution Sensitive Richness	2	3	0	1	0	0
Filterer Percent	3	2	2	3	3	1
Pollution Tolerant Percent	1	1	2	1	0	2
Total score	**11**	**12**	**5**	**10**	**5**	**3**
Percent of maximum score	**61.11%**	**66.67%**	**27.78%**	**55.56%**	**27.78%**	**16.67%**
Impairment classification	**slight**	**slight**	**moderate**	**slight**	**moderate**	**severe**

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Taxa Listing

Project ID: MDT07PBSJ
RAI No.: MDT07PBSJ024

RAI No.: MDT07PBSJ024 **Sta. Name:** Little Muddy Creek
Client ID:
Date Coll.: 8/22/2007 **No. Jars:** 1 **STORET ID:**

Taxonomic Name	Count	PRA	Unique	Stage	Qualifier	BI	Function
Non-Insect							
Ostracoda	9	75.00%	Yes	Unknown		8	CG
Heteroptera							
Corixidae							
Corixidae	3	25.00%	Yes	Larva		10	PH
Sample Count	**12**						

Metrics Report

Project ID: MDT07PBSJ
RAI No.: MDT07PBSJ024
Sta. Name: Little Muddy Creek
Client ID:
STORET ID:
Coll. Date: 8/22/2007

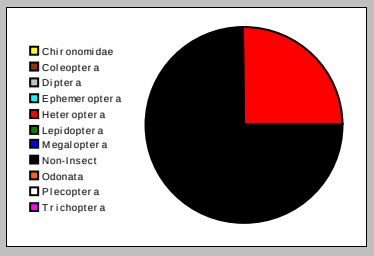
Abundance Measures

Sample Count: 12
Sample Abundance: 12.00 100.00% of sample used

Coll. Procedure:
Sample Notes:

Taxonomic Composition

Category	R	A	PRA
Non-Insect	1	9	75.00%
Odonata			
Ephemeroptera			
Plecoptera			
Heteroptera	1	3	25.00%
Megaloptera			
Trichoptera			
Lepidoptera			
Coleoptera			
Diptera			
Chironomidae			

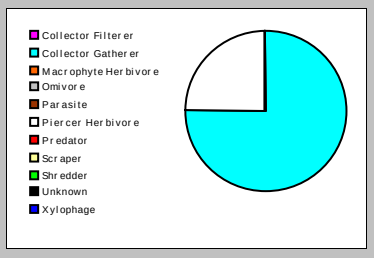


Dominant Taxa

Category	A	PRA
Ostracoda	9	75.00%
Corixidae	3	25.00%

Functional Composition

Category	R	A	PRA
Predator			
Parasite			
Collector Gatherer	1	9	75.00%
Collector Filterer			
Macrophyte Herbivore			
Piercer Herbivore	1	3	25.00%
Xylophage			
Scraper			
Shredder			
Omivore			
Unknown			



Metric Values and Scores

Metric	Value	BIBI	MTP	MTV	MTM
Composition					
Taxa Richness	2	1	0		0
Non-Insect Percent	75.00%				
E Richness	0	1		0	
P Richness	0	1		0	
T Richness	0	1		0	
EPT Richness	0		0		0
EPT Percent	0.00%		0		0
Oligochaeta+Hirudinea Percent					
Baetidae/Ephemeroptera	0.000				
Hydropsychidae/Trichoptera	0.000				
Dominance					
Dominant Taxon Percent	75.00%		0		0
Dominant Taxa (2) Percent	100.00%				
Dominant Taxa (3) Percent	100.00%	1			
Dominant Taxa (10) Percent	100.00%				
Diversity					
Shannon H (loge)	0.562				
Shannon H (log2)	0.811		0		
Margalef D	0.402				
Simpson D	0.591				
Evenness	0.358				
Function					
Predator Richness	0		0		
Predator Percent	0.00%	1			
Filterer Richness	0				
Filterer Percent	0.00%			3	
Collector Percent	75.00%		2		1
Scraper+Shredder Percent	0.00%		0		0
Scraper/Filterer	0.000				
Scraper/Scraper+Filterer	0.000				
Habit					
Burrower Richness	0				
Burrower Percent	0.00%				
Swimmer Richness	1				
Swimmer Percent	25.00%				
Clinger Richness	0	1			
Clinger Percent	0.00%				
Characteristics					
Cold Stenotherm Richness	0				
Cold Stenotherm Percent	0.00%				
Hemoglobin Bearer Richness					
Hemoglobin Bearer Percent					
Air Breather Richness	0				
Air Breather Percent	0.00%				
Voltinism					
Univoltine Richness	1				
Semivoltine Richness	0	1			
Multivoltine Percent	75.00%		1		
Tolerance					
Sediment Tolerant Richness	0				
Sediment Tolerant Percent	0.00%				
Sediment Sensitive Richness	0				
Sediment Sensitive Percent	0.00%				
Metals Tolerance Index	5.000				
Pollution Sensitive Richness	0	1		0	
Pollution Tolerant Percent	0.00%	5		3	
Hilsenhoff Biotic Index	8.500		0		0
Intolerant Percent	0.00%				
Supertolerant Percent	100.00%				
CTQa					

Bioassessment Indices

BioIndex	Description	Score	Pct	Rating
BIBI	B-IBI (Karr et al.)	14	28.00%	
MTP	Montana DEQ Plains (Bukantis 1998)	3	10.00%	Severe
MTV	Montana Revised Valleys/Foothills (Bollman 1998)	6	33.33%	Moderate
MTM	Montana DEQ Mountains (Bukantis 1998)	1	4.76%	Severe