MONTANA DEPARTMENT OF TRANSPORTATION
WETLAND MITIGATION MONITORING REPORT: YEAR 2010

Little Muddy Creek
Cascade County, Montana



Prepared for:

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

December 2010

Prepared by:

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MORRISON MAIERLE, INC.
An Employee-Owned Company

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MDT Number: STPX 7(38)

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December 2010

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1. INTRODUCTION

The Little Muddy Creek Wetland Mitigation 2010 Monitoring Report documents the seventh year of monitoring at the Little Muddy Creek 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 site encompasses portions of Sections 30, 31, and 32 of Township 19 North and Range 1 East in Cascade County.

The Little Muddy Creek wetland mitigation project was constructed in 2004 by the property owner and Ducks Unlimited. The purpose of the project was 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 would be needed to offset impacts associated with ten different projects within the Missouri-Sun-Smith River watershed (#7) (PBS&J 2009). An additional 50 acres of reserve credit was also sought by MDT for a total of 63.57 acres of projected compensatory wetland mitigation credit.

Figures 2 and 3 of Appendix A show the monitoring activity locations and mapped site features, respectively. The MDT Mitigation Monitoring Form, the US Army Corps of Engineers (USACE) Routine Wetland Determination Data Forms (Environmental Laboratory 1987), and the 2008 MDT Montana Wetland Assessment Forms completed in 2010 are included in Appendix B. Appendix C shows representative site photographs and Appendix D is the Project Plan Sheet.

Little Muddy Creek is an intermittent stream that flows directly into the Missouri River. An 88 foot-wide diversion dam was built in 2004 across the entire Little Muddy Creek channel with the central 30 feet of the dam elevated three feet above the existing channel bottom. The ends of the dam extend to the adjacent stream banks. Water is impounded in the creek channel upstream for a distance of 2,700 feet. An inlet channel approximately 400 feet long was excavated from the point of diversion to a headgate. Water flows through a long, excavated channel to the off-channel impoundment when the headgate is open. The off-channel impoundment is surrounded by an 11,500-foot long berm. A project plan sheet is provided in Appendix D.

The off-channel impoundment was 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 at full pool elevation (PBS&J 2009). A maximum of 35 cubic feet per second (cfs) of water can be diverted during spring flows to the wetland. When Little Muddy Creek is flowing, a minimum of one cfs must remain in the channel below the point of diversion. The streamflow continues downstream after filling the site. No diversion of water is allowed after June 30 of each year and 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.

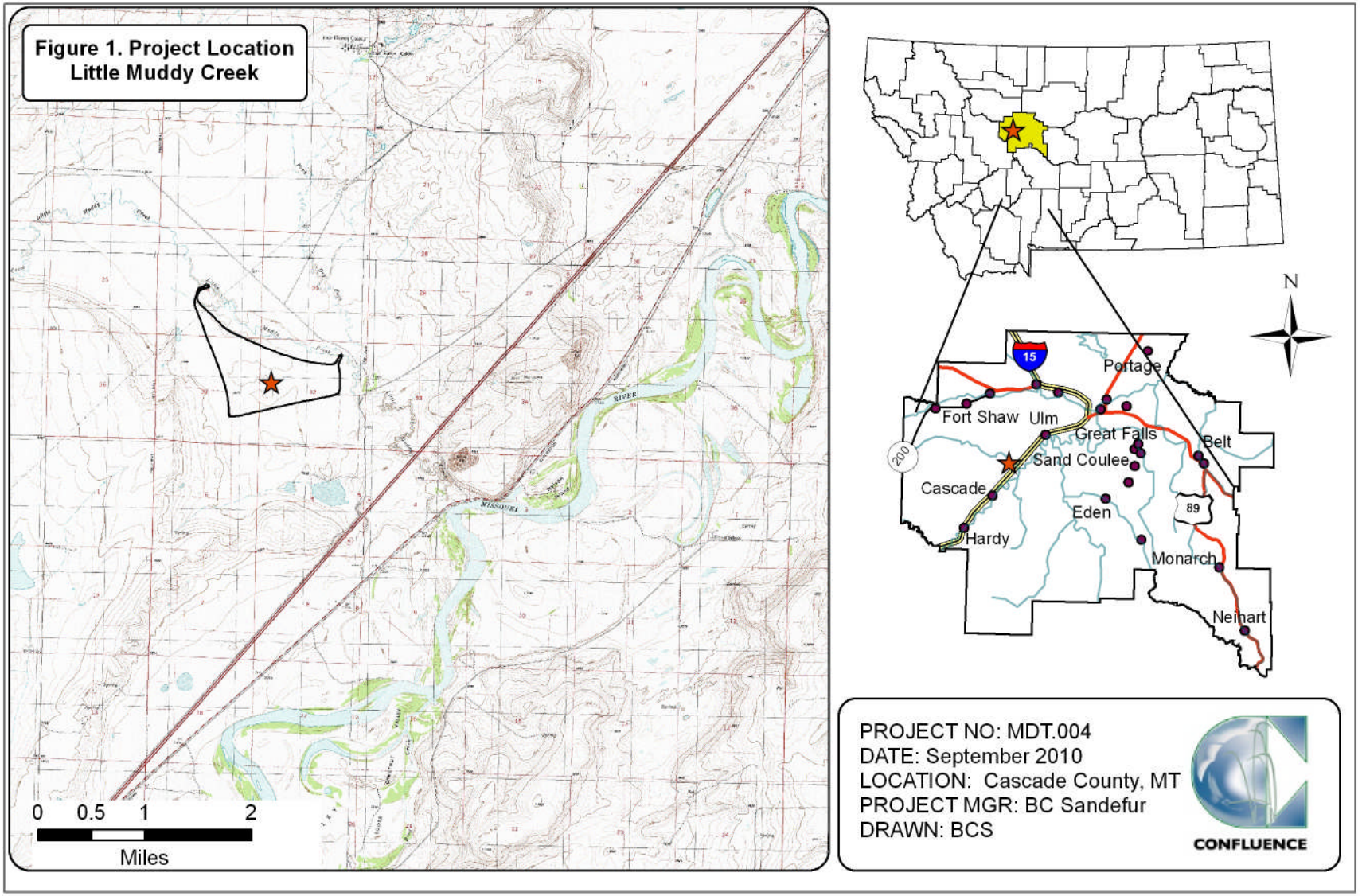


Figure 1. Project location of Little Muddy Creek.

Prior to project implementation, no wetland habitat existed within the main project site. Three emergent wetlands and a narrow wetland fringe subsequently developed along most of Little Muddy Creek. Target wetland types at the site included open water/aquatic bed and shallow marsh/wet meadow through fluctuating water levels. No specific performance criteria or ratios were stipulated in USACE correspondence regarding the project (PBS&J 2009).

2. METHODS

The site was monitored on July 24, 2010. Information contained on the Wetland Mitigation Site Monitoring Form and USACE Routine Wetland Determination Data Form (Environmental Laboratory 1987) was entered electronically in the field on a personal data assistant (PDA) palmtop computer during the field investigation (Appendix B). Monitoring activity locations were surveyed using a global positioning system (GPS) (Figure 2, Appendix A). Information collected included wetland delineation, vegetation community mapping, vegetation transect monitoring, soils data collection, hydrology data collection, bird and wildlife use documentation, photographs, and a non-engineering examination of the infrastructure established within the mitigation project area.

2.1. Hydrology

Technical criteria for wetland hydrology guidelines have been established as "permanent or periodic inundation, or soil saturation within 12 inches of the ground surface for a significant period (usually 14 days or more or 12.5 percent) during the growing season" (Environmental Laboratory 1987). Systems with continuous inundation or saturation for greater than 12.5 percent of the growing season are considered jurisdictional wetlands. The growing season is defined for purposes of this report as the number of days where there is a 50 percent probability that the minimum daily temperature is greater than or equal to 28 degrees Fahrenheit (Environmental Laboratory 1987).

Hydrological indicators as outlined on the USACE wetland determination data form were documented at seven data points (LM-1 through LM-7, Figure 2, Appendix A) established within the project area. Hydrologic indicators were evaluated according to features observed during the site visit. The data were recorded on electronic field data sheets (Appendix B). Hydrologic assessments allow evaluation of mitigation goals addressing inundation/saturation requirements.

There are no groundwater monitoring wells at the site. Soil pits excavated during the wetland delineation were used to evaluate groundwater levels within 18 inches of the ground surface. The data was recorded electronically on the wetland determination data form (Appendix B).

2.2. Vegetation

The boundaries of general dominant species-based vegetation communities were determined in the field during the active growing season and subsequently delineated on aerial photographs. The percent cover of dominant species within

a community type was estimated and recorded using the following values: 0 (less than 1 percent), 1 (1 to 5 percent), 2 (6 to 10 percent), 3 (11 to 20 percent), 4 (21 to 50 percent), and 5 (greater than 50 percent) (Appendix B).

Temporal changes in vegetation were evaluated through annual assessments of static belt transects (Figure 2, Appendix A). Vegetation composition was assessed and recorded along two vegetation belt transects approximately 10 feet wide and 585 and 310 feet long (Transects 1 and 2, respectively) (Figure 2, Appendix A). The transect locations were recorded with a GPS unit. Spatial changes in the dominant vegetation communities were recorded along the stationed transect. Percent cover of each vegetation species within the belt was estimated using the same values and cover ranges listed for the community polygon data on the aerial photograph (Appendix B). Photographs were taken at the transect endpoints during the monitoring event (Appendix C). No woody species were planted at the site.

The location of noxious weeds was noted in the field and mapped on the aerial photo (Figure 3, Appendix B). The noxious weed species identified are color-coded. The locations are denoted with the symbol "+", "▲", or "■" representing 0 to 0.1 acre, .1 to 1 acre, or greater than 1 acre in extent, respectively. Cover classes are represented by T, L, M, or H, for less than 1 percent, 1 to 5 percent, 2 to 25 percent, and 25 to 100 percent, respectively, as listed on Figure 3 (Appendix A).

2.3. Soil

Soil information was obtained from the *Soil Survey for Cascade County* and *in situ* soil descriptions (USDA 2010). Soil cores were excavated using a hand auger and evaluated according to procedures outlined in the USACE 1987 Wetland Delineation Manual. A description of the soil profile, including hydric indicators when present, was recorded on the USACE wetland determination form for each profile (Appendix B).

2.4. Wetland Delineation

Waters of the US including jurisdictional wetlands and other special aquatic sites were delineated throughout the project area in accordance with criteria established in the 1987 USACE delineation manual. In order to delineate a representative area as wetland, the technical criteria for hydrophytic vegetation, hydric soil, and wetland hydrology, as described in the 1987 Manual, must be satisfied. The indicator status of vegetation was derived from the National List of Plant Species that Occur in Wetlands: Northwest Region 9 (Reed 1988). A Routine Level-2 Onsite Determination Method (Environmental Laboratory 1987) was used to delineate wetland areas within the project boundaries. The information was recorded electronically on the USACE wetland determination data form (Appendix B).

The USACE determined that the 1987 Wetland Manual should continue to be used at MDT mitigation sites where baseline wetland conditions had been

established prior to 2008. Consequently, the use of the 2010 Interim Regional Supplement to the USACE of Engineers Wetland Delineation Manual: Western Mountains, Valleys, and Coast Region (USACE 2010b) was not required.

The wetland boundary was determined in the field based on changes in plant communities and/or hydrology, and changes in soil characteristics. Topographic relief boundaries within the project area were also examined and cross referenced with soil and vegetation communities as supportive information for this delineation. Vegetation composition, soil characteristics, and hydrology were assessed at likely wetland and adjacent upland locations. If all three parameters met the criteria, the area was designated as wetland and mapped by vegetation community type. If any one of the parameters did not exhibit positive wetland indicators, the area was determined to be upland unless the site was classified as an atypical situation, potential problem area, or special aquatic site, i.e., mudflat. The wetland boundary was identified on the aerial photograph. Wetland areas were estimated using geographic information system (GIS) methodology.

2.5. Wildlife

Observations and other positive indicators of use of mammal, reptile, amphibian, and bird species were recorded on the wetland monitoring form during the site visit. Indirect use indicators, including tracks, scat, burrow, eggshells, skins, and bones, were also recorded. These signs were recorded while traversing the site for other required activities. Direct sampling methods, such as snap traps, live traps, and pitfall traps, were not used. A comprehensive wildlife species list of species observed from 2004 to 2010 was compiled.

2.6. Functional Assessment

Functional assessments were completed from 2004 to 2007 using the 1999 MDT Montana Wetland Assessment Method (Berglund 1999). The 2008 MDT Montana Wetland Assessment Method (Berglund and McEldowney 2008) was used to evaluate functions and values from 2008 through the end of the monitoring period (PBS&J 2009). This method provides an objective means of assigning wetlands an overall rating and gives regulators a means of assessing mitigation success based on wetland functions. Functions are self-sustaining properties of a wetland ecosystem that exist in the absence of society and relate to ecological significance without regard to subjective human values (Berglund and McEldowney 2008). The 2008 revision refines ratings for some wetland functions, land management, and fish and wildlife habitat.

Field data for this assessment were collected during the site visit. A Functional Assessment Form was completed for each wetland or group of wetlands (Assessment Areas) (Appendix B).

2.7. Photo Documentation

Monitoring at photo points provides supplemental information documenting wetland condition, trends, current land use surrounding the site, the upland buffer, the monitored area, and the vegetation transects. Photographs were taken at established photo points throughout the mitigation site during the site

visit (Appendix C). Photo point locations were recorded with a resource grade GPS unit (Figure 2, Appendix A).

2.8. GPS Data

Site features and survey points were collected with a resource grade Thales Pro Mark III GPS unit during the 2010 monitoring season. Points were collected using WAAS-enabled differential corrected satellites, typically improving resolution to sub-meter accuracy. The collected data were then transferred to a personal computer, exported into GIS, and drawn in Montana State Plane Single Zone NAD 83 meters. In addition to GPS, some site features within the site were hand-mapped onto an aerial photograph and then digitized. Site features and survey points that were mapped included fence boundaries, photograph points, transect beginnings and endings, wetland boundaries, and vegetation community boundaries.

2.9. 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. Channels, structures, fencing, and other features were examined during the site visit for obvious signs of breaching, damage, or other problems. This was a cursory examination that did not constitute an engineering-level structural inspection.

3. RESULTS

3.1. Hydrology

The frost-free period defined for the region characterized by the dominant soil map unit on Little Muddy Creek, Lallie silty clay loam (119), is 110 to 135 days (USDA 2010). Areas defined as wetlands would require 14 days of inundation or saturation within 12 inches of the ground surface to meet the hydrology criteria.

The Great Falls Airport weather station (243751) recorded 14.88 inches of average total annual precipitation for the period of record from 1948 to 2009. The January through August period in 2009 was wetter than the same timeframe in 2008 (9.51 inches), 2007 (8.59 inches), and 2004 (10.34 inches), and drier than 2006 (14.21 inches) and 2005 (11.30 inches) (WRCC 2010). Precipitation rates reported in 2009, 2010, and historically from January to July were 10.26 inches, 10.25 inches, and 10.16 inches, respectively.

Combined flows in 2004 in the Missouri River at Ulm and the Sun River at Vaughn did not exceed 7,880 cfs by June 30, 2004 (PBS&J 2009), which was below the minimum level allowed for diversion to the mitigation site. Sufficient precipitation occurred in May 2005 to inundate a majority of the mitigation site. The site was inundated in 2006 from stream flow and precipitation throughout the growing season. The site was only partially filled in 2007 when an unauthorized party turned off the water although the streamflow was adequate (PBS&J 2009). The site was more than one foot short of full pool capacity in 2007 (PBS&J 2009). It was later discovered that the outlet was plugged, preventing water from flowing across the site. Stream flows were sufficient to fill the site to six inches

below full-pool capacity by August 2008 (PBS&J 2009). High precipitation rates in 2009 resulted in higher-than-average surface water levels in Little Muddy Creek (PBS&J 2009). Spring precipitation combined with heavy rainfall in early August kept the reservoir full through the 2009 growing season (PBS&J 2009).

The inlet structure was closed intentionally in 2010 to reduce water levels allowing structural repair of the impoundment berm. There were approximately 3 feet of ponded surface water at the inlet. No water was observed in the supply channel. Surface water was evident below the culvert at photo point 3 (PP3, page C-2 of Appendix C). Approximately 10 percent of the assessment area was inundated during monitoring. The average water depth was 2 feet with a range of depths from 0 to 6 feet.

Data points LM-1 through LM-7 were sampled during the wetland delineation in 2010 (Figure 2, Appendix A; USACE Forms, Appendix B). Data points LM-2 through LM-4 and LM-7 were located within the delineated wetland. Data point LM-2 was located in wetland in the northwest corner of the mitigation project. Saturation was observed within 12 inches of the ground surface. Data points LM-3 through LM-4 were located in wetland at the south edge of the site. Saturation within 12 inches of the ground surface and drainage patterns in wetlands provided evidence of wetland hydrology at LM-3. Water marks as indicated by surface soil cracks was a positive indication of wetland hydrology at LM-4 and LM-7.

3.2. Vegetation

Historical aerial photographs showed that the mixed grass and shrub land native vegetation was converted to cropland between 1937 and 1950 (PBS&J 2009). The project site was used for dryland farming (domestic barley and wheat) and, less often, grazing (PBS&J 2009) after the conversion to agriculture. Grazing was terminated before 2003 when the land was planted with native grasses and crops and placed into the Conservation Reserve Program (PBS&J 2009).

A comprehensive list of 51 plant species identified at the Little Muddy Creek Wetland Mitigation Site from 2004 to 2010 is summarized in Table 1 (Monitoring Forms, Appendix B). The predominant cover on the mitigation site in 2004 was upland grasses and forbs. A majority of the upland vegetation was flooded by July 2005, although wetland vegetation had not yet established (PBS&J 2009). Wetland vegetation and aquatic plants began to emerge in the saturated and inundated areas by 2006. Emergent and aquatic bed communities had established by 2007 (PBS&J 2009).

Table 1. Vegetation species identified from 2004 to 2010 at the Little Muddy Creek Wetland Mitigation Site.

Scientific Names	Common Names	Region 9 Indicator Status[1]
Agropyron cristatum	wheatgrass, crested	NL
Agropyron intermedium	**wheatgrass, intermediate**	NL
Agropyron repens	**quackgrass**	FACU
Agropyron smithii	wheatgrass,western	FACU
Alisma gramineum	water-plantain,narrow-leaf	OBL
Alopecurus aequalis	**foxtail,short-awn**	OBL
Alopecurus arundinaceus	foxtail,creeping	NI
Aster pansus	aster,many-flowered	FAC+
Atriplex rosea	orache,tumbling	FACU-
Bromus inermis	brome, smooth	NL
Bromus japonicus	brome, Japanese	FACU
Chenopodium album	goosefoot,white	FAC
Chenopodium glaucum	goosefoot,oakleaf	FAC
Chenopodium leptophyllum	goosefoot,narrow-leaf	FACU
Chenopodium rubrum	goosefoot,coast-blite	FACW+
Cirsium arvense	thistle,creeping	FACU+
Eleocharis palustris	spikerush,creeping	OBL
Elymus varnensis	wheatgrass, tall	NL
Festuca arundinacea	**fescue, Kentucky**	FACU-
Grindelia squarrosa	gumweed,curly-cup	FACU
Helianthus annuus	sunflower,common	FACU+
Hordeum jubatum	barley,fox-tail	FAC+
Iva axillaris	sumpweed,small-flower	FAC
Kochia scoparia	summer-cypress, Mexican	FAC
Lactuca serriola	lettuce,prickly	FAC-
Medicago sativa	alfalfa	NL
Melilotus alba	sweetclover,white	FACU
Melilotus officinalis	sweetclover,yellow	FACU

[1]Region 9 (Northwest) (Reed 1988).
New species identified in 2010 are show in **bold** type.

Table 1 (Continued). Vegetation species identified from 2004 to 2010 at the Little Muddy Creek Wetland Mitigation Site.

Scientific Names	Common Names	Region 9 Indicator Status[1]
Poa compressa	**bluegrass, Canada**	FACU
Polygonum aviculare	knotweed,prostrate	FACW-
Polygonum douglasii	knotweed,Douglas'	FACU
Populus tremula (tremuloides)*	aspen, quaking	FAC+ (NL)
Potamogeton amplifolius	pondweed,large-leaf	OBL
Potamogeton pectinatus	pondweed,Sago	OBL
Puccinellia nuttalliana	**grass, Nuttall's alkali**	OBL
Rorippa sinuata	yellow-cress,spreading	FAC+
Rumex crispus	dock,curly	FACW
Rumex maritimus	dock,golden	FACW+
Salix exigua	willow,sandbar	OBL
Salix lutea	willow,yellow	OBL
Salsola kali	thistle, Russian	FACU
Scirpus acutus	bulrush,hard-stem	OBL
Scirpus maritimus	bulrush,saltmarsh	OBL
Scirpus pungens	bulrush,three-square	OBL
Sisymbrium altissimum	mustard,tall tumble	FACU-
Sonchus arvensis	sowthistle,field	FACU+
Taraxacum officinale	**dandelion,common**	FACU
Thlaspi arvense	penny-cress,field	NI
Tragopogon dubius	yellow salsify	NL
Trifolium pratense	**clover,red**	FACU
Typha latifolia	cattail,broad-leaf	OBL

[1]Region 9 (Northwest) (Reed 1988).
New species identified in 2010 are show in **bold** type.

Vegetation community types were based on topography, hydrology, and plant composition and dominance. The vegetation communities are mapped on Figure 3 (Appendix A). Surface water levels were lowered intentionally in 2010 to allow repair of the berm located near the outlet and in an effort to allow for the establishment of emergent vegetation species. The 2010 reduction in inundation levels resulted in a decrease in the extent of the algae/aquatic plant wetland (Type 8 in 2009) and an increase in the extent of mud flat (polygon number 18, Figure 3.0, Appendix A). Mud flats, classified as special aquatic sites (USACE 2010 (2), encompassed 58.16 acres characterized by saturated, organic soils and a lack of vegetation. The transitional open water area increased from 26.99 acres in 2009 to 37.12 acres in 2010. The change in water levels is illustrated in the sequential 2009 and 2010 photographs of photo points 1 to 6 (PP1 to PP6) presented on pages C-1 to C-4 of Appendix C.

The vegetation community types identified in 2010 corresponded in large part to the 2009 communities except for the changes discussed in the previous paragraph. There are seven wetland communities and two upland communities, Type 6 – *Agropyron* species (spp.)/*Kochia scoparia* Upland, Type 8 –

Algae/Aquatic Plant Wetland, Type 9 – *Polygonum aviculare* Wetland, Type 10 – *Typha latifolia/Rumex* spp. Wetland, Type 11– *Hordeum jubatum* Wetland, Type 13 – Upland, Type 14 – *Rumex* spp./*Hordeum jubatum* Wetland, Type 15 – *Typha latifolia/Helianthus annuus* Wetland, and Type 16 – *Scirpus acutus/ Typha latifolia* Wetland (Figure 3, Appendix A).

Vegetation community Type 6 – *Agropyron* spp./*Kochia scoparia* upland was identified on the upland berm on the north edge of the mitigation site. Quackgrass (*Agropyron repens*), crested wheatgrass *Agropyron cristatum*), intermediate wheatgrass (*Agropyron intermedium*), smooth brome (*Bromus inermis*), tall wheatgrass (*Elymus varnensis*), meadow fescue (*Festuca arundinacea*), yellow sweet clover (*Melilotus officinalis*), kochia (*Kochia scoparia*), prickly lettuce *(Lactuca serriola*), and yellow salsify (*Tragopogon dubuis*) each contributed 6 to 10 percent to total cover.

Vegetation community Type 8 – Algae/Aquatic Plant wetland formed at the base of the inlet channel. Dominant species included Sago pondweed (*Potamogeton pectinatus*), green algae, prostrate knotweed (*Polygonum aviculare*), kochia, and foxtail barley (*Hordeum jubatum*) with 11 to 20 percent bare ground. The ditch was dry during the investigation. Many aquatic plants were present as a dry crust on the cracked soil surface. This channel area was inundated in 2009 when the diversion structure was open.

Prostrate knotweed dominated community Type 9 – *Polygonum aviculare* wetland located at the north edge of the site between open water and mudflat. The area was not inundated during the 2010 investigation although it had been in 2009. Narrow-leaf water plantain (*Alisma gramineum*), white goosefoot (*Chenopodium album*), small-flower sumpweed (*Iva axillaris*), and curly dock (*Rumex crispus*) comprised between one and five percent of the vegetation cover. Bare ground encompassed 11 to 20 percent of total cover.

Community Type 10 – *Typha latifolia/Rumex* spp. wetland (Page C-5 of Appendix C) was identified in the broader wetland fringe at the upgradient end of the inlet channel. The vegetation cover primarily consisted of broad-leaf cattail (*Typha latifolia*), curly dock, golden dock (*Rumex maritimus*), common sunflower (*Helianthus annuus*), kochia, white goosefoot, creeping spikerush (*Eleocharus palustris*), and foxtail barley (*Hordeum jubatum)*.

Community Type 11 – *Hordeum jubatum* wetland formed at the west edge of inundated areas (page C-7, Appendix C; corresponds to 2009 Types 11 and 14). Type 11 was dominated by foxtail barley with minor cover contributed by Western wheatgrass (*Agropyron smithii*), curly dock, prostrate knotweed, creeping spikerush, small-flower sumpweed, broad-leaf cattail, and field pennycress (*Thlapsi arvense*).

Western wheatgrass, Japanese brome (*Bromus japonicas*), tall wheatgrass, and yellow salsify dominated upland community Type 13 – Upland each with cover percentages of 6 to 10 percent or less (page C-7, Appendix C).

Wetland community Type 14 – *Rumex* spp./*Hordeum jubatum* wetland was located in the center of the site, west of the mud flats. The area was categorized as an algae/aquatic plant wetland in 2009 when surface water levels were higher. Dominant species included golden dock, curly dock, foxtail barley, field pennycress, common sunflower, and prostrate knotweed. The cover of *Rumex spp*. appeared to be declining.

Vegetation community Type 15 – *Typha latifolia/ Helianthus annuus* was identified in an isolated wetland area located between community types 13 and 14 (page C-6, Appendix C). This community corresponds to the 2009 community type 10, *Typha latifolia* wetland. There was an increase of common sunflower and foxtail barley in the community.

The outlet channel at the northeast border (Community Type 16 – *Scirpus acutus/ Typha latifolia* wetland) was vegetated with hardstem bulrush (*Scirpus acutus*), common cattail, creeping spikerush, and foxtail barley.

Types 17 and 18 represented by polygons 17 and 18 on Figure 3 (Appendix A) were characterized by transitional open water and mudflat, respectively. Transitional open water was defined by areas inundated with shallow surface water less than three feet deep and one to five percent aquatic plants [i.e. prostrate knotweed (*Potamogeton pectinatus*)]. The wetland plant cover in these areas is expected to increase once the repairs to the berm are made and the water is allowed to flow across the site.

Type 18 mudflat was predominantly bare ground or covered in a thin algal mat. Macrophytes comprised less than 5 percent of this community and included sago pondweed, kochia, foxtail barley, and prostrate knotweed. Mudflats are defined by the USACE as special aquatic sites that exhibit organic material and particles smaller in size than sand and either unvegetated or vegetated only by algal mats (USACE 2010).

Vegetation transect 1 data are summarized in Table 2 and Charts 1 and 2. Vegetation details are included on the Monitoring Forms (Appendix B). Photographs at the end points of the transect are shown on page C-4 of Appendix C. Water levels decreased in 2010 resulting in a reduction of the Type 8 wetland area and a reversion to mudflat. Mudflat encompassed approximately 98.12 percent of the Transect 1 intervals. Prostrate knotweed, foxtail barley and kochia were present in minor amounts on the mudflat. Bare ground encompassed 21 to 50 percent of the cover on transect 1.

Table 2. Data summary for Transect 1 from 2004 to 2010 at the Little Muddy Wetland Mitigation Site.

Monitoring Year	2004	2005	2006	2007	2008	2009	2010
Transect Length (feet)	585	585	585	585	585	585	585
Vegetation Community Transitions along Transect	2	0	3	2	2	2	2
Vegetation Communities along Transect	3	0	2	3	3	3	2
Hydrophytic Vegetation Communities along Transect	0	0	1	2	2	2	1
Total Vegetative Species	11	1	7	9	8	10	9
Total Hydrophytic Species	2	1	4	4	4	7	4
Total Upland Species	9	0	3	5	4	3	5
Estimated % Total Vegetative Cover	90	8	60	85	85	73	10
% Transect Length Comprising Hydrophytic Vegetation Communities	0	0	92	32	98	98	0.68
% Transect Length Comprising Upland Vegetation Communities	100	0	1	2	2	2	1.20
% Transect Length Comprising Unvegetated Open Water	0	100	5	34	0	0	0.00
% Transect Length Comprising Mud Flat*	0	0	2	32	0	0	98.12

*Areas identified as Mud Flat in 2010 commonly included a thin algal mat.

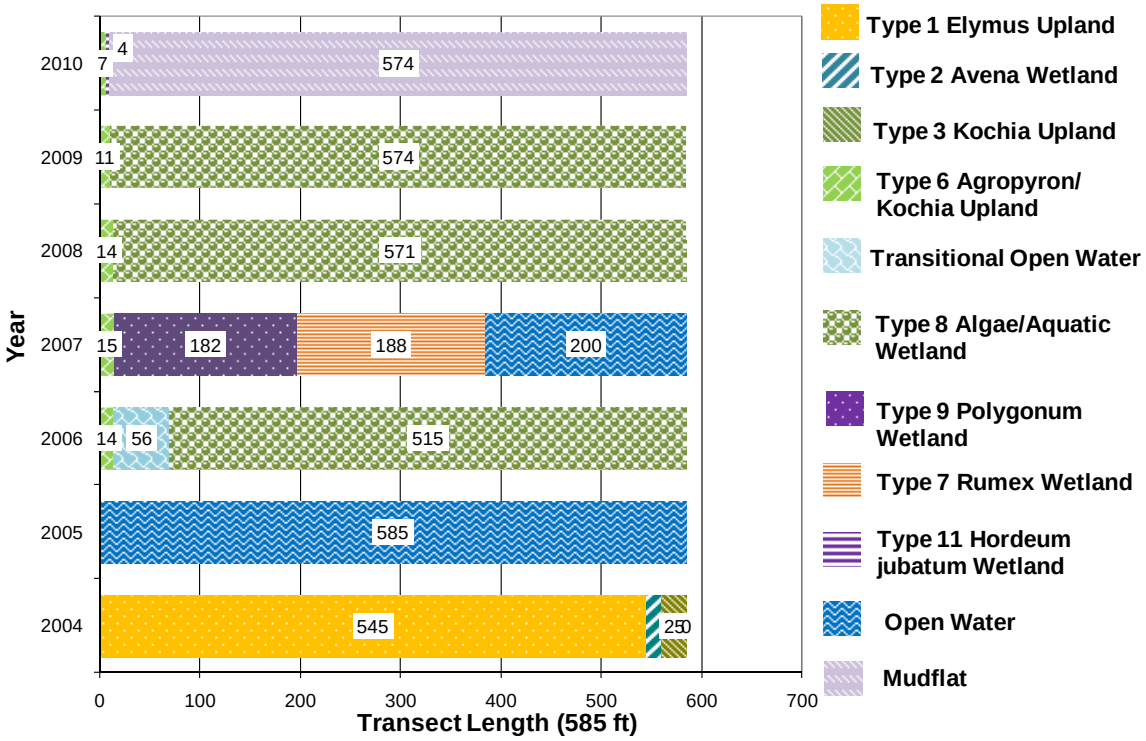


Chart 1. Transect maps from 2004 to 2010 showing vegetation and land cover types on Transect 1 from start (0 feet) to end (585 feet).

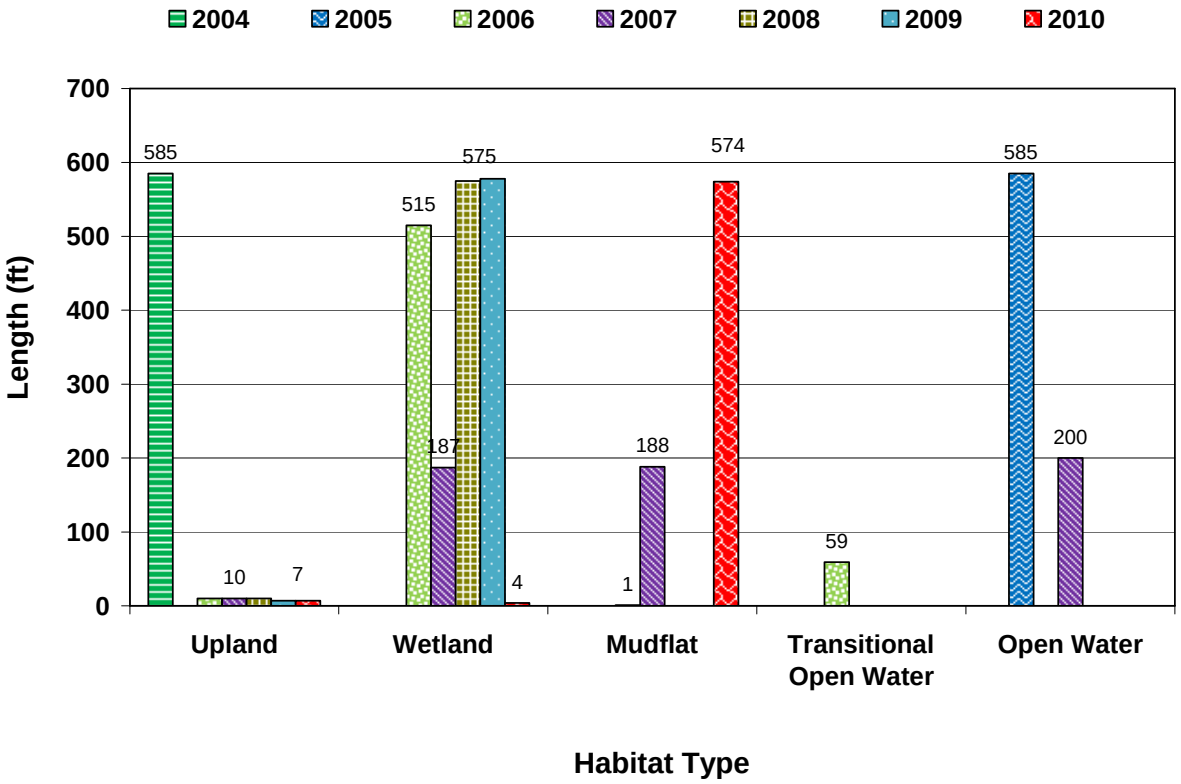


Chart 2. Length of habitat types on Transect 1 from 2004 to 2010.

Vegetation transect 2 data are summarized in Table 3 and Charts 3 and 4. Vegetation details are included on the Monitoring Forms (Appendix B). Photographs at the end points of the transect are shown on page C-4 of Appendix C. Transect 2 extended from upland to algae/aquatic plant wetland in 2009. The wetland area transitioned to mud flat in 2010 with the reduction in water levels. Mudflat encompassed 98.1 percent of the transect intervals with 1 to 5 percent of cover contributed by narrow-leaf water plantain, green algae, sago pondweed, and prostrate knotweed. Bare ground comprised over 50 percent of the transect.

Table 3. Data summary for Transect 2 from 2004 to 2010 at the Little Muddy Wetland Mitigation Site.

Monitoring Year	2004	2005	2006	2007	2008	2009	2010
Transect Length (feet)	310	310	310	310	310	310	310
Vegetation Community Transitions along Transect	1	2	3	1	2	2	1
Vegetation Communities along Transect	2	3	3	2	3	3	1
Hydrophytic Vegetation Communities along Transect	0	0	2	1	2	2	0
Total Vegetative Species	5	4	7	11	8	10	12
Total Hydrophytic Species	2	2	4	8	4	6	9
Total Upland Species	3	2	3	3	4	4	3
Estimated % Total Vegetative Cover	60	30	14	40	70	58	5
% Transect Length Comprising Hydrophytic Vegetation Communities	0	0	2.0	2.0	98	98	0.0
% Transect Length Comprising Upland Vegetation Communities	100	2	2.5	2.5	2	2	3.9
% Transect Length Comprising Unvegetated Open Water	0	96	95.5	93.0	0	0	0.0
% Transect Length Comprising Mudflat*	0	1	0.0	2.5	0	0	96.1

*Areas identified as Mud Flat in 2010 commonly included a thin algal mat.

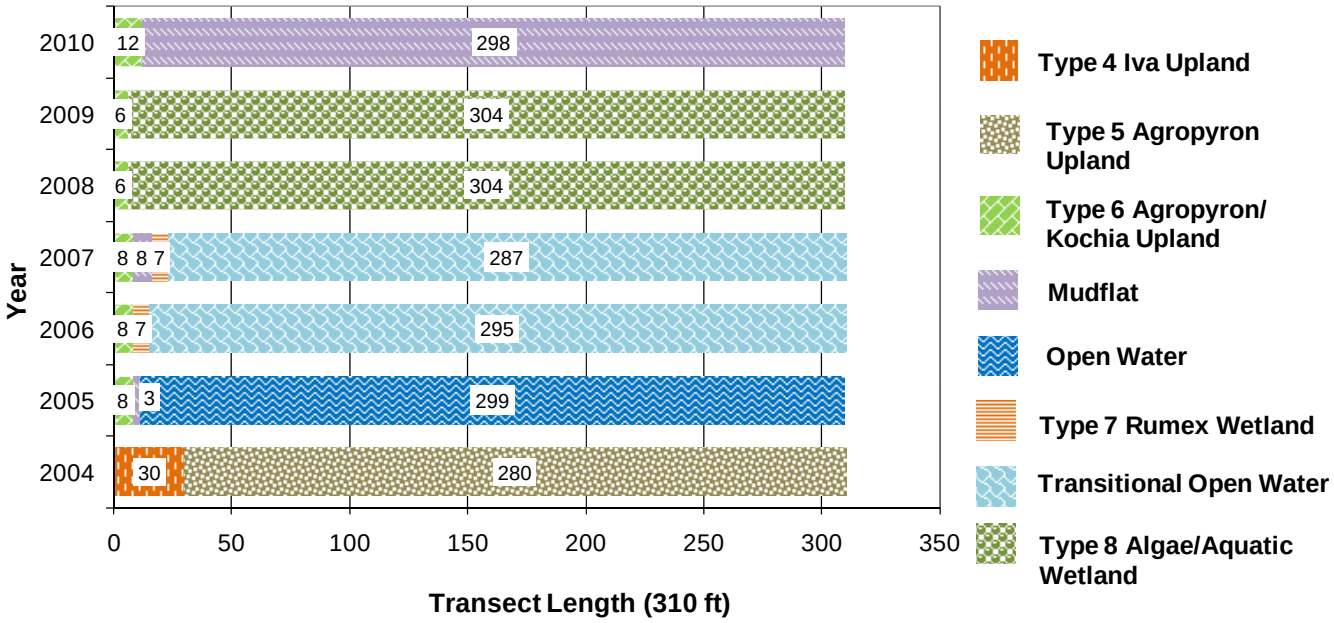


Chart 3. Transect maps showing vegetation types and habitats from 2004 to 2010 on Transect 2 from start (0 feet) to end (310).

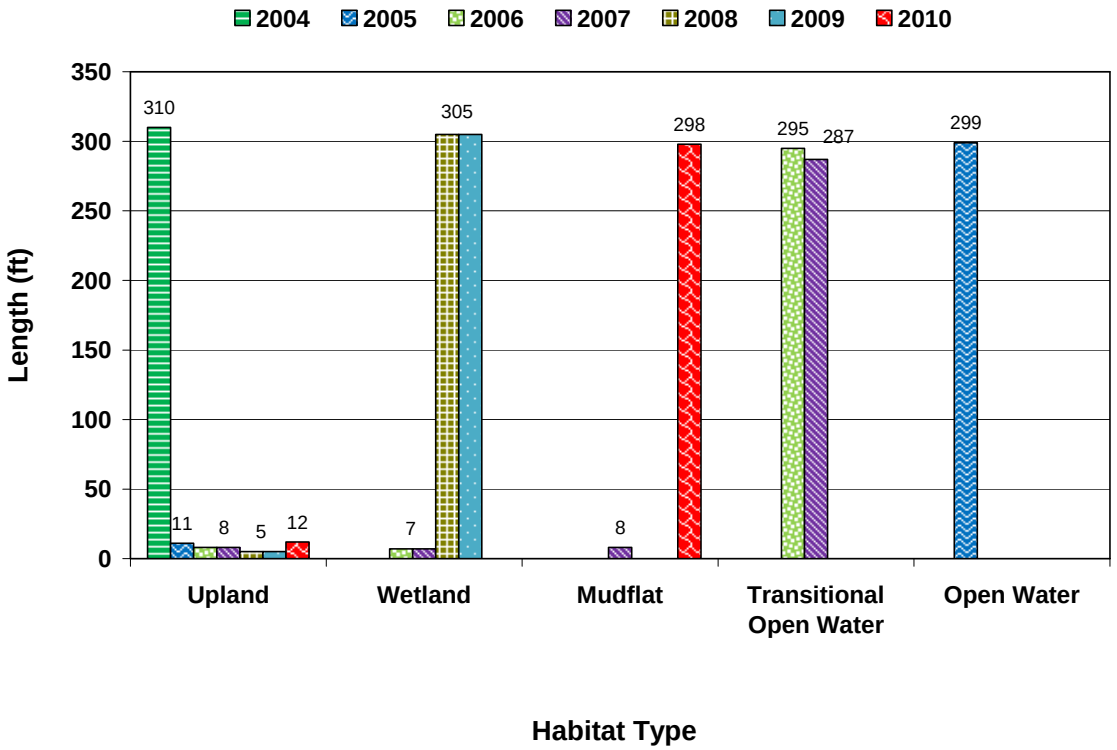


Chart 4. Length of habitat types within Transect 2 from 2004 to 2010.

Two infestations of Canada thistle (*Cirsium arvense*), a Priority 2B weed), were mapped at less than 0.1 acre and low cover (1 to 5 percent) (Figure 3, Appendix A). A limited number of Canada thistle plants were observed within the upland communities.

3.3. Soil

Three soil types, the Absher-Noble Complex found on 0 to 5 percent slopes, the Marvan Clay found on 0 to 2 percent slopes, and the Lallie Silty Clay Loam, were mapped for the site prior to project development (USDA 2010). These soil types exhibit high clay contents and low permeabilities conducive to pond construction (USDA 2010). The soil structure was disrupted during construction of the impoundments and surrounding berms. Site soils were inundated from 2005 to spring 2010 when five boards were removed from the control structure to lower water levels for berm repair, which was completed in fall of 2010.

Data points LM-2, LM-3, LM-4, and LM-7 were located in wetland areas that exhibited hydric soils. The profile in these four soil pits revealed silty clay soils (10 YR 3/2 to 4/2) with redoximorphic concentrations (10 YR 4/4 and 3/4) in the low chroma color matrix. Test pit soils generally corresponded to the map units.

3.4. Wetland Delineation

No wetland habitat existed within the mitigation site prior to project implementation. There were three small emergent wetlands associated with the

wetland fringe and control structures on Little Muddy Creek that developed naturally after construction. Wetland habitat began to develop in 2006, expanding in area each year. Approximately 163 acres of wetlands and 27 acres of transitional open water were delineated in 2009 (PBS&J 2009). Transitional open water, mudflat, and upland decreased in 2009 and the diversity of wetland community types increased. The total wetland area in 2009 encompassed 162.82 acres, which did not include mud flat or transitional open water.

The inlet control structure was closed in 2010 to allow repair of the impoundment berms. The supply channel was dry during the investigation. The drop in surface water levels across the site resulted in a decrease in the area of the algae/aquatic plant wetland type (community type 8 in 2009) and an increase in the extent of mud flats. Wetlands and other special aquatic sites, including mud flat and transitional open water encompassed 194.47 acres in 2010. It is assumed that plant cover in the transitional open water will increase wetland long-term. Jurisdictional wetlands encompassed 99.18 acres. Table 4 summarizes the acreage of wetlands and other aquatic sites delineated in 2010.

Table 4: Acreage of wetlands and other special aquatic sites in 2010 at the Little Muddy Creek Wetland Mitigation Site.

Wetlands and Other Special Aquatic Sites	2010 Acreage
Wetland Area	99.180
Mud Flat	58.162
Transitional Open Water	37.124
TOTAL	194.47

3.5. Wildlife

Direct observations of wildlife species and signs indicating presence have been compiled since 2004 (Table 5, Appendix B**)**. A notable change in the number of bird guilds was observed from 2004 to 2005 (PBS&J 2009). Bird guilds observed in 2005 have persisted through 2010. Approximately 29 species of shorebirds, waterfowl, and gulls inhabited the site in 2009 (PBS&J 2009).

Sixteen bird species were observed in 2010 including American coot (*Fulica americana*), blue-winged teal (*Anas discors*), eared grebe (*Podiceps nigricollis*), great blue heron (*Ardea herodias*), indigo bunting (*Passerina cyanea*), mallard (*Anas platyrhynchos*), northern shoveler (*Anas clypeata*), spotted sandpiper (*Actitis macularius*), American white pelican (*Pelecanus erythrorhynchos*), Canada goose (*Branta canadensis*), Franklin's gull (*Leucophaeus pipixcan*),

Table 5: Wildlife species observed within the Little Muddy Creek Wetland Mitigation Site in 2004 to 2010.

COMMON NAME	SCIENTIFIC NAME
BIRD	
American Avocet	*Recurvirostra americana*
American Coot	*Fulica americana*
American White Pelican	*Pelecanus erythrorhynchos*
American Wigeon	*Anas americana*
Blue-winged Teal	*Anas discors*
Brewer's Blackbird	*Euphagus cyanocephalus*
Bufflehead	*Bucephala albeola*
Canada Goose	*Branta canadensis*
Canvasback	*Aythya valisineria*
Cinnamon Teal	*Anas cyanoptera*
Common Raven	*Corvus corax*
Common Tern	*Sterna hirundo*
Double-crested Cormorant	*Phalacrocorax auritus*
Eared Grebe	*Podiceps nigricollis*
Eurasian Wigeon	*Anas penelope*
Ferruginous Hawk	*Buteo regalis*
Franklin's Gull	*Leucophaeus pipixcan*
Gadwall	*Anas strepera*
Golden Eagle	*Aquila chrysaetos*
GRAY PARTRIDGE	***Perdix perdix***
Great Blue Heron	*Ardea herodias*
Green-winged Teal	*Anas crecca*
Horned Grebe	*Podiceps auritus*
Horned Lark	*Eremophila alpestris*
Indigo Bunting	***Passerina cyanea***
Killdeer	*Charadrius vociferus*
Lesser Scaup	*Aythya affinis*
Lesser Yellowlegs	*Tringa flavipes*
Long-billed Curlew	*Numenius americanus*
Long-billed Dowitcher	*Limnodromus scolopaceus*
Mallard	*Anas platyrhynchos*
Marbled Godwit	*Limosa fedoa*
Mourning Dove	*Zenaida macroura*
Northern Harrier	*Circus cyaneus*

Species first identified in 2010 are listed in **bold** type.
Species identified by MDT in 2010 are listed in **CAPS**.

Table 5. (Continued): Fish and wildlife species observed within the Little Muddy Creek Wetland Mitigation Site in 2004 to 2010.

COMMON NAME	SCIENTIFIC NAME
BIRD	
Northern Pintail	*Anas acuta*
Northern Shoveler	*Anas clypeata*
Redhead	*Aythya americana*
Red-winged Blackbird	*Agelaius phoeniceus*
Ring-necked Duck	*Aythya collaris*
Ruddy Duck	*Oxyura jamaicensis*
Sandhill Crane	*Grus canadensis*
Sandpiper Spp.	
Sparrow Spp.	
Spotted Sandpiper	***Actitis macularius***
Tree Swallow	*Tachycineta bicolor*
Trumpeter Swan	*Cygnus buccinator*
Tundra Swan	*Cygnus columbianus*
Vesper Sparrow	*Pooecetes gramineus*
Western Meadowlark	*Sturnella neglecta*
Willet	*Tringa semipalmata*
Wilson's Phalarope	*Phalaropus tricolor*
Wilson's Snipe	*Gallinago delicata*
Yellow-headed Blackbird	*Xanthocephalus xanthocephalus*
MAMMALS	
Badger	*Taxidea taxus*
BLACK-TAILED JACK RABBIT	***Lepus californicus***
Coyote	*Canis latrans*
Meadow Vole	***Microtus pennsylvanicus***
Mule Deer	*Odocoileus hemionus*
Muskrat	***Ondatra zibethicus***
Pronghorn	*Antilocapra americana*
Raccoon	*Procyon lotor*
Red Fox	*Vulpes vulpes*
Richardson's Ground Squirrel	*Spermophilus richardsonii*
White-footed Mouse	***Peromyscus leucopus***
White-tailed Deer	*Odocoileus virginianus*
FISH	
Common Carp	*Cyprinus carpio*
REPTILES	
Common Gartersnake	***Thamnophis sirtalis***
Plains Gartersnake	*Thamnophis radix*

Species first identified in 2010 are listed in **bold** type.
Species identified by MDT in 2010 are listed in **CAPS**.

green-winged teal (*Anas crecca*), killdeer (*Charadrius vociferous*), northern pintail (*Anas acuta*), red-winged blackbird (*Agelaius phoeniceus*), and Wilson's phalarope (*Phalaropus tricolor*). Common gartersnakes (*Thamnophis sirtalis*) were noted in 2010. Mammals observed included seven pronghorn antelope (*Antilocapra americana*), five white-tailed deer (*Odocoileus virginianus*), coyote (*Canis latrans*), and meadow vole (*Microtus pennsylvanicus*). Indirect evidence of muskrat (*Ondatra zibethicus*), raccoon (*Procyon lotor*), and white-footed mouse (*Peromyscus leucopus*) were recorded.

3.6. Functional Assessment

The 2006 and 2007 wetland habitats were assessed using the 1999 MDT wetland assessment method (Berglund 1999). The 2008 and 2009 assessment areas were evaluated using the 2008 MDT method (Berglund and McEldowney 2008). Assessment results from 2006 to 2010 are presented in Table 6. The Little Muddy Creek Wetland Mitigation Site has been classified as a Category II wetland from 2006 to 2010 in part based on the exceptional rating for wildlife habitat (Table 6).

The assessment area evaluated in 2010 included the created wetland, mudflat, and transitional open water areas. The inlet structure was closed in 2010 to repair the berm resulting in a reduction of open water and increase of mudflat habitat. The total functional points and percent score increased as a result of an increase in the AA, high rating for Groundwater Discharge/Recharge, and a slight improvement in the Uniqueness category resulting from inclusion of aquatic bed/submerged, emergent, and shrub vegetated classes. The percent score increased from 56 percent in 2009 to 66.4 percent in 2010. The site also rated high in 2010 for Short and Long Term Surface Water Storage, Sediment/Nutrient/Toxicant Removal, and Production Export/Food Chain Support (Table 6).

3.7. Photo Documentation

Photographs taken of photo points one through six (PP1 through PP6, locations on Figure 2, Appendix A) are shown on pages C-1 to C-3 of Appendix C Panoramas taken at the canal inlet and PP1, PP3, and PP4 are presented on pages C-5 and C-6 of Appendix C. Photographs of transect end points and data points LM-1 through LM-7 are shown on page C-4 and pages C-6 and C-7, respectively, of Appendix C.

Table 6. Summary of wetland function/value ratings and functional points from 2006 to 2010 at the Little Muddy Creek Wetland Mitigation Site.

Function and Value Parameters from the MDT Montana Wetland Assessment Method	2006 [1]	2007 [1]	2008 [2]	2009 [2]	2010 [2]
Listed/Proposed T&E Species Habitat	Mod (0.7)	Low (0.0)	Low (0.0)	Low (0.0)	Low (0.0)
MTNHP Species Habitat	Low (0.1)	Mod (0.6)	Mod (0.6)	Mod (0.6)	Mod (0.6)
General Wildlife Habitat	Exc (1.0)	Exc (1.0)	Exc (1.0)	Exc (1.0)	Exc (1.0)
General Fish/Aquatic Habitat	Mod (0.4)	Mod (0.4)	Low (0.2)	Low (0.2)	Low (0.2)
Flood Attenuation	Mod (0.6)	Mod (0.6)	Mod (0.6)	Mod (0.6)	Mod (0.6)
Short and Long Term Surface Water Storage	High (1.0)	High (1.0)	High (1.0)	High (1.0)	High (1.0)
Sediment/Nutrient/Toxicant Removal	Mod (0.7)	Mod (0.7)	High (1.0)	High (1.0)	High (1.0)
Sediment/Shoreline Stabilization	Low (0.3)	Low (0.3)	Low (0.3)	Low (0.3)	Low (0.3)
Production Export/Food Chain Support	High (0.9)	High (0.8)	High (0.9)	High (0.9)	High (0.9)
Groundwater Discharge/Recharge	Low (0.1)	Low (0.1)	Low (0.1)	Low (0.1)	High (1.0)
Uniqueness	Mod (0.4)	Mod (0.4)	Mod (0.4)	Mod (0.4)	Mod (0.6)
Recreation/Education Potential	Mod (0.7)	Mod (0.7)	Mod (0.1)	Mod (0.1)	Mod (0.1)
Actual Points/Possible Points	**6.9/12**	**6.6/12**	**6.2/11**	**6.2/11**	**7.3/11**
% of Possible Score	**58%**	**55%**	**56%**	**56%**	**66.4%**
Overall Category	**II**	**II**	**II**	**II**	**II**
Total Acreage of Assessed Wetlands and Other Aquatic Habitats within Site Boundaries	**188.25**	**156.44**	**181.12**	**189.81**	**194.47**
Functional Units (acreage x actual points)	**1298.93**	**1032.50**	**1122.94**	**1176.82**	**1419.63**

[1](Berglund 1999)
[2](Berglund and McEldowney 2008)

3.8. Maintenance Needs

The excavated channels and inlet/outlet structures were in good condition during the 2010 site visit. The landowner had expressed concern in 2008 over six locations of bank erosion along the berm in the northeast corner of the project. The erosion was the result of wind-driven waves. Ducks Unlimited reduced the water levels in spring of 2010 and repaired the berm during the fall of 2010. Control boards were reinstalled to raise water levels. Canada thistle, a Priority 2B noxious weed, was observed on 0.65 acres in 2009, which was within the performance standard. This was a notable decrease from the 1.62 acres occupied in 2008. Two infestations of Canada thistle (*Cirsium arvense*) were mapped in 2010 at less than 0.1 acre and one to five percent cover) (Figure 3, Appendix A). Individual Canada thistle plants were observed within community Types 6 and 13. Continued application of the weed control plan is recommended to prevent further encroachment of Canada thistle into other areas.

3.9. Current Credit Summary

Approximately 99.18 acres of Class II wetlands, 58.16 acres of mud flat (special aquatic site), and 37.12 acres of transitional open water were delineated at the Little Muddy site in 2010 (Figure 3, Appendix A). No specific performance criteria or ratios were stipulated in USACE correspondence regarding this project

(PBS&J 2009). Credit totals for all aquatic habitat identified in 2010 total 194.47 acres at the Little Muddy mitigation area.

The MDT anticipated that approximately 13.57 acres of compensatory wetland mitigation credit would be required to offset impacts associated with ten different projects within the Missouri-Sun-Smith River watershed (#7). The MDT also obtained an additional 50 acres of reserve credit to compensate for projected projects for a total compensatory mitigation credit of 63.57 acres (PBS&J 2009). Approximately 0.80 acre, 9.97 acres, and 2.80 acres of the 13.57-acre impacts were classified as Class II, III, and IV wetlands, respectively (PBS&J 2009). The USACE 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. The Bowman's Corner project comprised 10.7 of the 13.57 projected impact acres (PBS&J 2009). 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". The final application of credit acreages are subject to specific agreements between the USACE and MDT.

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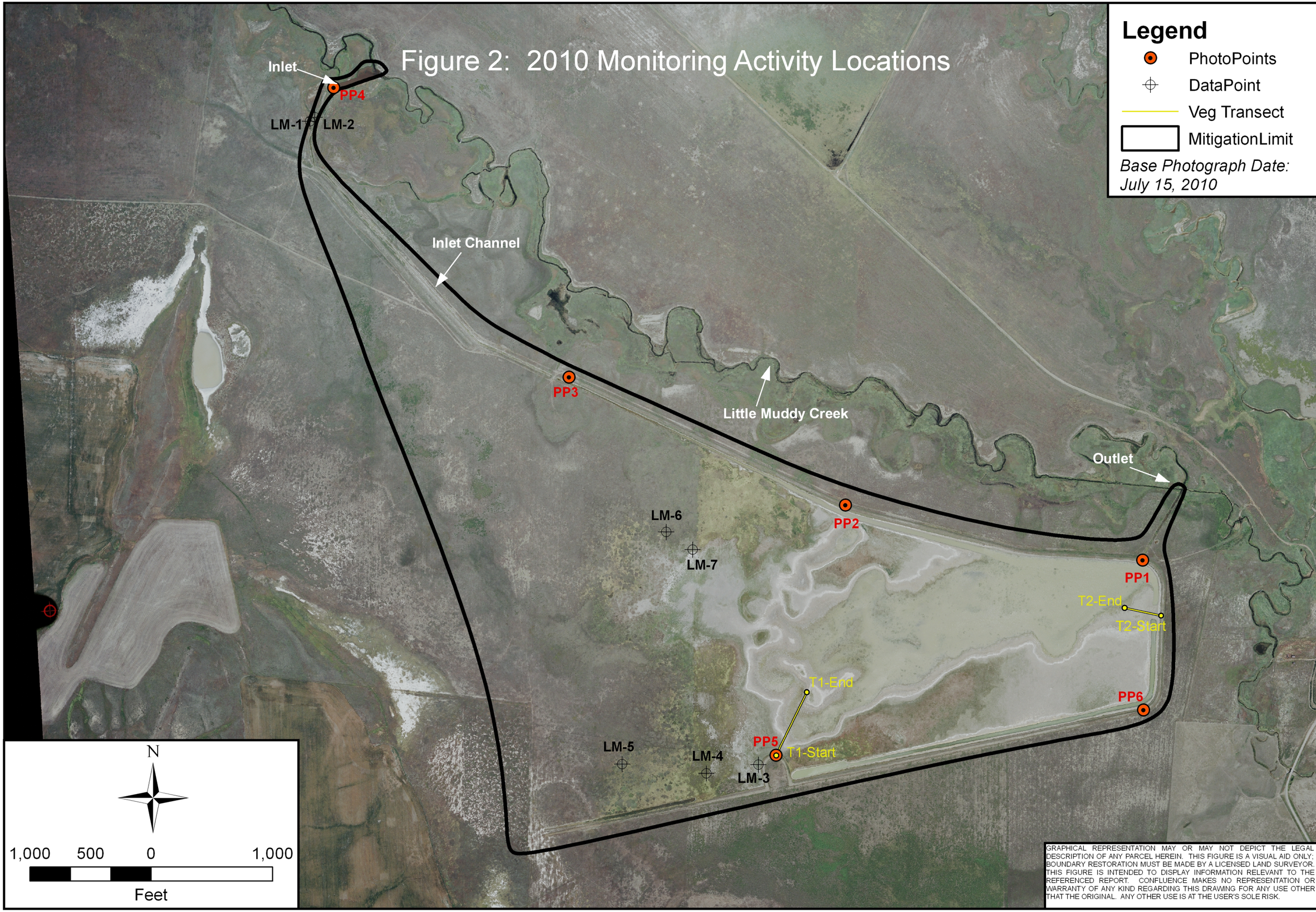
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Appendix A

Figures 2 and 3

MDT Wetland Mitigation Monitoring
Little Muddy Creek
Cascade County, Montana

Figure 2: 2010 Monitoring Activity Locations



Legend

- PhotoPoints
- DataPoint
- Veg Transect
- MitigationLimit

Base Photograph Date: July 15, 2010

LOCATION: Cascade Co., MT

PROJECT NO: STPX 7(38)

FILE: LittleMuddy/Monitor2010.mxd

Project Name
Little Muddy Wetland Mitigation

Drawing Title
2010 Monitoring Activity Locations

DRAWN	CHECKED	APPROVED
BS	BV	JL

SCALE: Noted

Drawn: September 22, 2010

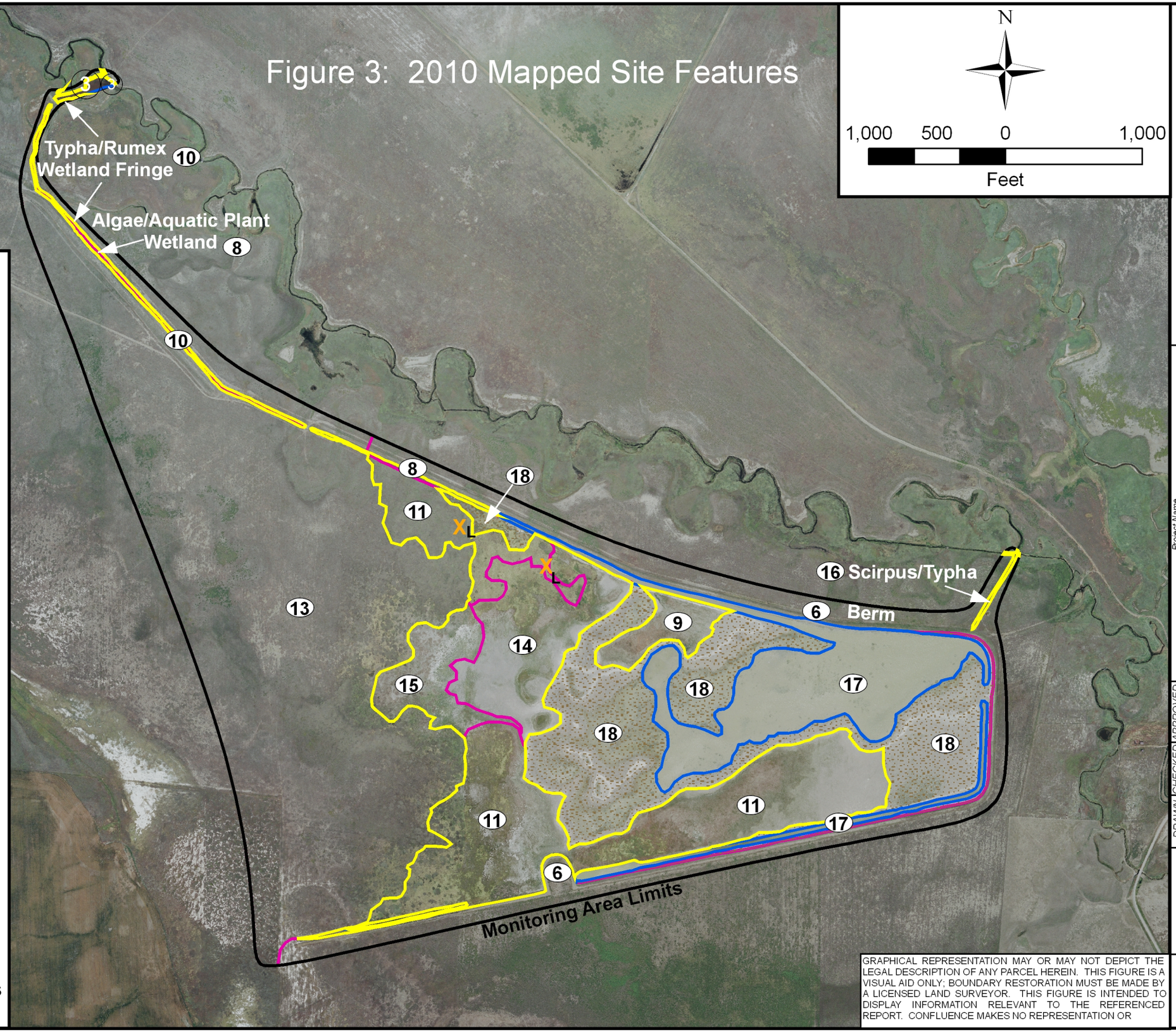
PROJ MGR: B Sandefur

CONFLUENCE
consulting incorporated

Figure 2

GRAPHICAL REPRESENTATION MAY OR MAY NOT DEPICT THE LEGAL DESCRIPTION OF ANY PARCEL HEREIN. THIS FIGURE IS A VISUAL AID ONLY; BOUNDARY RESTORATION MUST BE MADE BY A LICENSED LAND SURVEYOR. THIS FIGURE IS INTENDED TO DISPLAY INFORMATION RELEVANT TO THE REFERENCED REPORT. CONFLUENCE MAKES NO REPRESENTATION OR WARRANTY OF ANY KIND REGARDING THIS DRAWING FOR ANY USE OTHER THAT THE ORIGINAL. ANY OTHER USE IS AT THE USER'S SOLE RISK.

Figure 3: 2010 Mapped Site Features



N

1,000 500 0 1,000

Feet

Legend

- MitigationLimit
- Vegetation Communities
- Wetland Boundary
- Transitional Open Water
- Mud Flat

Base Photograph Date: July 15, 2010

Noxious Weeds

Cirsium arvense

Infestation SIze

X = <0.1 acre

▲ = 0.1 to 1 acre

■ = 1 to 5 acre

Cover Class

T = Trace (<1% cover)

L = Low (1-5% cover)

M = Moderate (5-25% cover)

H = High (25-100% cover)

Wetlands and Other Special Aquatic Sites

Gross Wetland Area	194.47 acres
Mud Flat (18)	58.16 acres
Transitional Open Water (17)	37.124 acres
Net Wetland Area	99.18 acres

Vegetation Community Types

6 Agropyron spp/Kochia scoparia
8 Algae/Aquatic Plant
9 Polygonum aviculare
10 Typha latifolia/Rumex spp.
11 Hordeum jubatum
13 Upland
14 Rumex spp./Hordeum jubatum
15 Typha latifolia/Helianthus annuus
16 Scirpus acutus/Typha latifolia

LOCATION: Cascade Co., MT

PROJECT NO: STPX 7(38)

FILE: LittleMuddy/Veg2010.mxd

Project Name: Little Muddy Wetland Mitigation

Drawing Title: 2010 Mapped Site Features

DRAWN BS | CHECKED BV | APPROVED JL

SCALE: Noted

Drawn: Sept. 22, 2010

PROJ MGR: B Sandefur

CONFLUENCE consulting incorporated

GRAPHICAL REPRESENTATION MAY OR MAY NOT DEPICT THE LEGAL DESCRIPTION OF ANY PARCEL HEREIN. THIS FIGURE IS A VISUAL AID ONLY; BOUNDARY RESTORATION MUST BE MADE BY A LICENSED LAND SURVEYOR. THIS FIGURE IS INTENDED TO DISPLAY INFORMATION RELEVANT TO THE REFERENCED REPORT. CONFLUENCE MAKES NO REPRESENTATION OR

Figure 3

Appendix B

2010 Wetland Mitigation Site Monitoring Form
2010 USACE Wetland Delineation Form
2010 MDT Functional Assessment Form

MDT Wetland Mitigation Monitoring
Little Muddy Creek
Cascade County, Montana

MDT WETLAND MITIGATION SITE MONITORING FORM

Project Site: Little Muddy Assessment Date/Time 7/24/2010

Person(s) conducting the assessment: B. Sandefur

Weather: Warm and clear, in the 90s Location: 9 miles SW of ULM

MDT District: Great Falls Milepost:

Legal Description: T 19N R 1E Section(s) 30,31, and 32

Initial Evaluation Date: 6/4/2004 Monitoring Year: 7 #Visits in Year: 1

Size of Evaluation Area: 406 (acres)

Land use surrounding wetland:

dryland agriculture, CRP within Durocher Ranch

HYDROLOGY

Surface Water Source: Diversion on Little Muddy Creek

Inundation: ☑ Average Depth: 2 **(ft)** Range of Depths: 0-6 **(ft)**

Percent of assessment area under inundation: 10 %

Depth at emergent vegetation-open water boundary: **(ft)**

If assessment area is not inundated then are the soils saturated within 12 inches of surface: No

Other evidence of hydrology on the site (ex. – drift lines, erosion, stained vegetation, etc**:**

Groundwater Monitoring Wells

Record depth of water surface below ground

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.

Hydrology Notes:

Inlet control structure closed, approx three feet of backwater at inlet; no water in supply channel; open water begins below at culvert near photo point 3.

VEGETATION COMMUNITIES

Site Little Muddy

(Cover Class Codes **0** = < 1%, **1** = 1-5%, **2** = 6-10%, **3** = 11-20%, **4** = 21-50% , **5** = >50%)

* Indicates accepted spp name not on '88 list.

Community # 6 **Community Type:** Agropyron spp. / Kochia scoparia

Species	Cover class	Species	Cover class
Agropyron cristatum	2	Agropyron intermedium	2
Agropyron repens	2	Bromus inermis	2
Bromus japonicus	1	Chenopodium album	1
Chenopodium glaucum	1	Cirsium arvense	0
Elymus varnensis	2	Festuca arundinacea	2
Iva axillaris	0	Kochia scoparia	2
Lactuca serriola	2	Melilotus officinalis	2
Poa compressa	1	Sisymbrium altissimum	1
Taraxacum officinale	1	Tragopogon dubius	2
Trifolium pratense	1		

Comments:

Community # 8 **Community Type:** Algae / Aquatic Plant

Species	Cover class	Species	Cover class
Algae, green	3	Alisma gramineum	1
Bare Ground	3	Hordeum jubatum	2
Kochia scoparia	2	Polygonum aviculare	4
Potamogeton pectinatus	3		

Comments:

Community dry at time of investigation. Many aquatic plants, including algae and Potamogeton, present as dry crust atop cracked soil surface. Area inundated when water diverted into headgate supplying the wetland complex.

Community # 9 **Community Type:** Polygonum aviculare /

Species	Cover class	Species	Cover class
Alisma gramineum	1	Bare Ground	3
Chenopodium album	1	Iva axillaris	1
Polygonum aviculare	5	Rumex crispus	1

Comments:

Area periodically inundated, not inundated at time of investigation

Community # 10 Community Type: Typha latifolia / Rumex spp

Species	Cover class	Species	Cover class
Alopecurus aequalis	1	Chenopodium album	2
Chenopodium leptophyllum	1	Eleocharis palustris	2
Helianthus annuus	2	Hordeum jubatum	2
Kochia scoparia	2	Rorippa sinuata	0
Rumex crispus	2	Rumex maritimus	2
Salix lutea	1	Scirpus maritimus	1
Typha latifolia	3		

Comments:

Community # 11 Community Type: Hordeum jubatum /

Species	Cover class	Species	Cover class
Agropyron smithii	2	Eleocharis palustris	1
Hordeum jubatum	5	Iva axillaris	1
Polygonum aviculare	1	Rumex crispus	2
Thlaspi arvense	1	Typha latifolia	1

Comments:

Community # 13 Community Type: Upland /

Species	Cover class	Species	Cover class
Agropyron smithii	2	Bromus japonicus	2
Cirsium arvense	0	Elymus varnensis	2
Kochia scoparia	1	Melilotus officinalis	1
Sisymbrium altissimum	1	Tragopogon dubius	2

Comments:

Community # 14 Community Type: Rumex spp. / Hordeum jubatum

Species	Cover class	Species	Cover class
Eleocharis palustris	1	Helianthus annuus	2
Hordeum jubatum	3	Polygonum aviculare	2
Rumex crispus	1	Rumex maritimus	3
Thlaspi arvense	2	Typha latifolia	1

Comments:

Community # 15 Community Type: Typha latifolia / Helianthus annuus

Species	Cover class	Species	Cover class
Grindelia squarrosa	1	Helianthus annuus	3
Hordeum jubatum	2	Iva axillaris	1
Rumex crispus	1	Rumex maritimus	1
Typha latifolia	5		

Comments:

Community # 16 Community Type: Scirpus acutus / Typha latifolia

Species	Cover class	Species	Cover class
Alisma gramineum	0	Chenopodium album	1
Eleocharis palustris	2	Hordeum jubatum	2
Scirpus acutus	3	Typha latifolia	3

Comments:

Community established along outlet channel

Community # 17 Community Type: Transitional Open Water /

Species	Cover class	Species	Cover class
Potamogeton pectinatus	1		

Comments:

Community # 18 Community Type: Mud Flat /

Species	Cover class	Species	Cover class
Bare Ground	5	Polygonum douglasii	0

Comments:

VEGETATION TRANSECTS

Site: Little Muddy Date: 7/24/2010

Transect Number: 1 **Compass Direction from Start:** 10

Interval Data:

Ending Station 7 **Community Type:** Agropyron spp. / Kochia scoparia

Species	Cover class	Species	Cover class
Agropyron smithii	4	Bromus japonicus	2
Elymus varnensis	2	Hordeum jubatum	3
Kochia scoparia	2		

Ending Station 11 **Community Type:** Hordeum jubatum wetland /

Species	Cover class	Species	Cover class
Elymus varnensis	1	Helianthus annuus	1
Hordeum jubatum	4	Kochia scoparia	2
Polygonum aviculare	0	Rumex crispus	2
Rumex maritimus	3		

Ending Station 585 **Community Type:** Mud flat /

Species	Cover class	Species	Cover class
Algae, green	2	Bare Ground	5
Polygonum aviculare	1		

Transect Notes:

Water level substantially lower in 2010 than observed in 2009.

Transect Number: 2 **Compass Direction from Start:** 265

Interval Data:

Ending Station 12 **Community Type:** Agropyron spp. / Kochia scoparia

Species	Cover class	Species	Cover class
Agropyron smithii	4	Chenopodium album	1
Elymus varnensis	3	Kochia scoparia	1
Lactuca serriola	1	Polygonum aviculare	1
Polygonum douglasii	0	Puccinellia nuttalliana	1
Rumex crispus	0	Rumex maritimus	2

Ending Station 310 **Community Type:** Mud flat /

Species	Cover class	Species	Cover class
Algae, green	1	Alisma gramineum	1
Bare Ground	5	Polygonum aviculare	1
Potamogeton pectinatus	1		

Transect Notes:

Vegetation transect mapped as transitional open water in 2009. Water levels substantially lower in 2010 with no inundation present along length of transect. Area mapped as mud flat.

PLANTED WOODY VEGETATION SURVIVAL

Little Muddy

Planting Type	#Planted	#Alive	Notes
None planted			

Comments

All shrubs, primarily along inlet canal, the result of natural recruitment.

Little Muddy

WILDLIFE

Birds

Were man-made nesting structures installed? No

If yes, type of structure: _____

How many? _____

Are the nesting structures being used? No

Do the nesting structures need repairs? No

Nesting Structure Comments:

Species	#Observed	Behavior	Habitat
American Coot	3	L	OW
American White Pelican	7		MA, MF, OW
Blue-winged Teal	6	L	OW
Canada Goose	40	L	OW
Eared Grebe	1	L	OW
Franklin's Gull	12	FO	MA, MF, WM
Great Blue Heron	1		MA, MF, OW, WM
Green-winged Teal	2	L	OW
Indigo Bunting	1	FO	UP,
Killdeer	24		MF, OW
Mallard	6	L, N	AB, OW
Northern Pintail	5	L	MA, OW
Northern Shoveler	3	L	AB, OW
Red-winged Blackbird	2	FO	MA, WM
Spotted Sandpiper	6		MF
Wilson's Phalarope	1		MA, MF

Bird Comments

BEHAVIOR CODES

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

HABITAT CODES

AB = Aquatic bed **SS** = Scrub/Shrub **FO** = Forested **UP** = Upland buffer **I** = Island

WM = Wet meadow **MA** = Marsh **US** = Unconsolidated shore **MF** = Mud Flat **OW** = Open Water

Mammals and Herptiles

Species	# Observed	Tracks	Scat	Burrows	Comments
Black-tailed Jack Rabbit		No	No	No	
Common Gartersnake	2	No	No	No	
Coyote	1	No	No	No	
Meadow Vole	1	No	No	No	
Muskrat		Yes	No	Yes	
Pronghorn	7	No	No	No	
Raccoon		Yes	No	No	
White-footed Mouse		No	No	Yes	
White-tailed Deer	5	No	No	No	

Wildlife Comments:

Little Muddy

PHOTOGRAPHS

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.

Photo #	Latitude	Longitude	Bearing	Description
5418				LM-1
5420				LM-2
5422			200	PP4
5427			90	Inlet
5430				Inlet canal, upstream
5431				Inlet canal, downstream
5436			130	Pano at PP3, 5436-40
5448			310	PP5
5451			10	VegTran1, start
5453			350	VegTran1, End; 5454
5455				LM-3
5458			283	VegTran2, start
5460			75	VegTran2, end
5461				Hordeum wetland
5461				LM-4
5462				LM-5
5462				Upland grass comm
5472			130	PP1
5473			270	Pano at PP1, 5472-79
5476			180	Pano at PP2, 5467-71
5480			40	PP1
5481			315	PP6
5497				LM-6
5498				LM-7
5501				Rumex wetland

Comments:

ADDITIONAL ITEMS CHECKLIST

Hydrology

☑ Map emergent vegetation/open water boundary on aerial photos.
☑ Observe extent of surface water. Look for evidence of past surface water elevations (e.g. drift lines, vegetation staining, erosion, etc).

Photos

☑ One photo from the wetland toward each of the four cardinal directions
☑ One photo showing upland use surrounding the wetland.
☑ One photo showing the buffer around the wetland
☑ One photo from each end of each vegetation transect, toward the transect

Vegetation

☑ Map vegetation community boundaries

☑ Complete Vegetation Transects

Soils

☑ Assess soils

Wetland Delineations

☑ Delineate wetlands according to applicable USACE protocol (1987 form or Supplement)
☑ Delineate wetland – upland boundary onto aerial photograph.

Wetland Delineation Comments

Functional Assessments

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

Functional Assessment Comments:

Maintenance

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

If yes, do they need to be repaired? No

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.

All control structures appear in working order. Bank erosion along southeast corner of berm still in need of repair.

WETLAND DETERMINATION DATA FORM – Routine Weltand Delineation, 1987 COE Protocol

Project/Site: Little Muddy | City/County: Cascade | Sampling Date: 7/24/2010

Applicant/Owner: MDT | State: MT | Sampling Point: LM-1

Investigator(s): B. Sandefur | Section, Township, Range: S 32 T 19N R 1E

Landform (hillslope, terrace, etc.): Bench | Local relief (concave, convex, none): flat | Slope (%):

Subregion (LRR): LRR E | Lat: | Long: | Datum:

Soil Map Unit Name: Lallie Silt Clay Loam

Do Normal Circumstances Exist on this site? Yes ☑

Is the site significantly disturbed (Atypical Situation)? Yes ☐

Is the area a potential Problem Area? Yes ☐

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ☐	No ☑	**Is the Sampled Area within a Wetland?** Yes ☐ No ☑
Hydric Soil Present?	Yes ☑	No ☐	
Wetland Hydrology Present?	Yes ☐	No ☑	

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 0)	Absolute % Cover	Dominant Species?	Indicator Status
1. 0	0	☐	0
2. 0	0	☐	0
3. 0	0	☐	0
4. 0	0	☐	0
	0 = Total Cover		
Sapling/Shrub Stratum (Plot size: 0)			
1. 0	0	☐	0
2. 0	0	☐	0
3. 0	0	☐	0
4. 0	0	☐	0
5. 0	0	☐	0
	0 = Total Cover		
Herb Stratum (Plot size: 0)			
1. Tragopogon dubius	15	☑	NL
2. Sonchus arvensis	10	☑	FACU+
3. Vicia ludoviciana	5	☐	NI
4. Agropyron intermedium	5	☐	NL
5. Agropyron smithii	15	☑	FACU
6. Lactuca serriola	5	☐	FAC-
7. Bromus japonicus	5	☐	FACU
8. 0	0	☐	0
9. 0	0	☐	0
10. 0	0	☐	0
11. 0	0	☐	0
	60 = Total Cover		
Woody Vine Stratum (Plot size: 0)			
1. 0	0	☐	0
2. 0	0	☐	0
	0 = Total Cover		

% Bare Ground in Herb Stratum 0

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0 (A/B)

Dominance Test is >50% ☐

Hydrophytic Vegetation Present? Yes ☐ No ☑

Remarks:
0

SOIL

Sampling Point: LM-1

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-5	10YR 3/2	100					Silty Clay	fine roots
5-12	10YR 3/1	90	7.5YR 5/1	5		M	Clay	Mottles appear to be inherited from PM

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ☐ Histosol
- ☐ Histic Epipedon
- ☐ Sulfidic Odor
- ☐ Aquatic Moisture Regime
- ☐ Reducing Conditions
- ☑ Gleyed or Low-Chroma Colors
- ☐ Concretions
- ☐ High Organic Content in Surface Layer in Sandy Soils
- ☐ Organic Streaking in Sandy Soils
- ☑ Listed on Local Soils List
- ☐ Listed on National Soils List
- ☐ Other (explain in remarks)

Taxonomy Subgroup: frigid Vertic Fluvaquents

Confirm Mapped Type?: ☐

Hydric Soil Present? Yes ☑ No ☐

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators

- ☐ Innundated
- ☐ Saturated in upper 12 inches
- ☐ Water Marks
- ☐ Drift Lines
- ☐ Sediment Deposits
- ☐ Drainage patterns in wetlands

Secondary Indicators (2 or more required)

- ☐ Oxidized Rhizospheres along Living Roots
- ☐ Water-Stained Leaves
- ☑ Local Soil Survey Data
- ☐ FAC-Neutral Test
- ☐ Other (Explain in Remarks)

Field Observations:

Surface Water Present? Yes ☐ No ☑ Depth (inches): _____

Water Table Present? Yes ☐ No ☑ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes ☐ No ☑ Depth (inches): _____

Wetland Hydrology Present? Yes ☐ No ☑

Remarks: No hydro indicators

WETLAND DETERMINATION DATA FORM – Routine Weltand Delineation, 1987 COE Protocol

Project/Site: Little Muddy | City/County: Cascade | Sampling Date: 7/24/2010

Applicant/Owner: MDT | State: MT | Sampling Point: LM-2

Investigator(s): B. Sandefur | Section, Township, Range: S 32 T 19N R 1E

Landform (hillslope, terrace, etc.): Shoreline | Local relief (concave, convex, none): flat | Slope (%): 0

Subregion (LRR): LRR E | Lat: | Long: | Datum:

Soil Map Unit Name: Lallie Silt Clay Loam

Do Normal Circumstances Exist on this site? Yes ☑

Is the site significantly disturbed (Atypical Situation)? Yes ☐

Is the area a potential Problem Area? Yes ☐

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ☑	No ☐	**Is the Sampled Area within a Wetland?** Yes ☑ No ☐
Hydric Soil Present?	Yes ☑	No ☐	
Wetland Hydrology Present?	Yes ☑	No ☐	

Remarks:
narrow margin along irrigation canal

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 0)	Absolute % Cover	Dominant Species?	Indicator Status
1. 0	0	☐	0
2. 0	0	☐	0
3. 0	0	☐	0
4. 0	0	☐	0
	0 = Total Cover		
Sapling/Shrub Stratum (Plot size: 0)			
1. 0	0	☐	0
2. 0	0	☐	0
3. 0	0	☐	0
4. 0	0	☐	0
5. 0	0	☐	0
	0 = Total Cover		
Herb Stratum (Plot size: 0)			
1. Eleocharis palustris	40	☑	OBL
2. Helianthus anuus	5	☐	NL
3. Alopecurus aequalis	7	☐	OBL
4. Bromus inermis	5	☐	NL
5. Typha latifolia	30	☑	OBL
6. 0	0	☐	0
7. 0	0	☐	0
8. 0	0	☐	0
9. 0	0	☐	0
10. 0	0	☐	0
11. 0	0	☐	0
	87 = Total Cover		
Woody Vine Stratum (Plot size: 0)			
1. 0	0	☐	0
2. 0	0	☐	0
	0 = Total Cover		

% Bare Ground in Herb Stratum 0

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Dominance Test is >50% ☑

Hydrophytic Vegetation Present? Yes ☑ No ☐

Remarks:
0

SOIL

Sampling Point: LM-2

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-4	10YR 3/2	95					Silty Clay	
4-14	10YR 3/2	90	10YR 4/4	5	C	M	Silty Clay	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ☐ Histosol
- ☐ Histic Epipedon
- ☐ Sulfidic Odor
- ☐ Aquatic Moisture Regime
- ☐ Reducing Conditions
- ☑ Gleyed or Low-Chroma Colors
- ☐ Concretions
- ☐ High Organic Content in Surface Layer in Sandy Soils
- ☐ Organic Streaking in Sandy Soils
- ☑ Listed on Local Soils List
- ☐ Listed on National Soils List
- ☐ Other (explain in remarks)

Taxonomy Subgroup: frigid Vertic Fluvaquents

Confirm Mapped Type?: ☐

Hydric Soil Present? Yes ☑ No ☐

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators

- ☐ Innundated
- ☑ Saturated in upper 12 inches
- ☐ Water Marks
- ☐ Drift Lines
- ☐ Sediment Deposits
- ☐ Drainage patterns in wetlands

Secondary Indicators (2 or more required)

- ☐ Oxidized Rhizospheres along Living Roots
- ☐ Water-Stained Leaves
- ☑ Local Soil Survey Data
- ☐ FAC-Neutral Test
- ☐ Other (Explain in Remarks)

Field Observations:

Surface Water Present? Yes ☐ No ☑ Depth (inches): _____

Water Table Present? Yes ☐ No ☑ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes ☑ No ☐ Depth (inches): 12

Wetland Hydrology Present? Yes ☑ No ☐

Remarks:

WETLAND DETERMINATION DATA FORM – Routine Weltand Delineation, 1987 COE Protocol

Project/Site: Little Muddy | City/County: Cascade | Sampling Date: 7/24/2010

Applicant/Owner: MDT | State: MT | Sampling Point: LM-3

Investigator(s): B. Sandefur | Section, Township, Range: S 32 T 19N R 1E

Landform (hillslope, terrace, etc.): Shoreline | Local relief (concave, convex, none): flat | Slope (%): 0

Subregion (LRR): LRR E | Lat: | Long: | Datum:

Soil Map Unit Name: Absher-Nobe Complex

Do Normal Circumstances Exist on this site? Yes ☑

Is the site significantly disturbed (Atypical Situation)? Yes ☐

Is the area a potential Problem Area? Yes ☐

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ☑	No ☐	**Is the Sampled Area within a Wetland?** Yes ☑ No ☐
Hydric Soil Present?	Yes ☑	No ☐	
Wetland Hydrology Present?	Yes ☑	No ☐	

Remarks:
Previously inundated

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 0)	Absolute % Cover	Dominant Species?	Indicator Status
1. 0	0	☐	0
2. 0	0	☐	0
3. 0	0	☐	0
4. 0	0	☐	0
	0 = Total Cover		
Sapling/Shrub Stratum (Plot size: 0)			
1. 0	0	☐	0
2. 0	0	☐	0
3. 0	0	☐	0
4. 0	0	☐	0
5. 0	0	☐	0
	0 = Total Cover		
Herb Stratum (Plot size: 0)			
1. Kochia scoparia	10	☐	FAC
2. Hordeum jubatum	30	☑	FAC+
3. Rumex crispus	20	☑	FACW
4. Chenopodium murale	5	☐	NO
5. 0	0	☐	0
6. 0	0	☐	0
7. 0	0	☐	0
8. 0	0	☐	0
9. 0	0	☐	0
10. 0	0	☐	0
11. 0	0	☐	0
	65 = Total Cover		
Woody Vine Stratum (Plot size: 0)			
1. 0	0	☐	0
2. 0	0	☐	0
	0 = Total Cover		

% Bare Ground in Herb Stratum 0

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Dominance Test is >50% ☑

Hydrophytic Vegetation Present? Yes ☑ No ☐

Remarks:
0

SOIL

Sampling Point: LM-3

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-7	10YR 4/2	95	10YR 3/4	5	C	M	Silty Clay	
7-13	10YR 4/2	60	10YR 3/4	30	C	M	Silty Clay	Moist at 12 inches

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ☐ Histosol
- ☐ Histic Epipedon
- ☐ Sulfidic Odor
- ☐ Aquatic Moisture Regime
- ☐ Reducing Conditions
- ☑ Gleyed or Low-Chroma Colors
- ☐ Concretions
- ☐ High Organic Content in Surface Layer in Sandy Soils
- ☐ Organic Streaking in Sandy Soils
- ☑ Listed on Local Soils List
- ☐ Listed on National Soils List
- ☐ Other (explain in remarks)

Taxonomy Subgroup: frigid Torrertic Ustorthents

Confirm Mapped Type?: ☐

Hydric Soil Present? Yes ☑ No ☐

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators

- ☐ Innundated
- ☑ Saturated in upper 12 inches
- ☐ Water Marks
- ☐ Drift Lines
- ☐ Sediment Deposits
- ☑ Drainage patterns in wetlands

Secondary Indicators (2 or more required)

- ☐ Oxidized Rhizospheres along Living Roots
- ☐ Water-Stained Leaves
- ☑ Local Soil Survey Data
- ☐ FAC-Neutral Test
- ☐ Other (Explain in Remarks)

Field Observations:

Surface Water Present? Yes ☐ No ☑ Depth (inches): _____

Water Table Present? Yes ☐ No ☑ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes ☑ No ☐ Depth (inches): 12

Wetland Hydrology Present? Yes ☑ No ☐

Remarks:

WETLAND DETERMINATION DATA FORM – Routine Weltand Delineation, 1987 COE Protocol

Project/Site: Little Muddy | City/County: Cascade | Sampling Date: 7/24/2010

Applicant/Owner: MDT | State: MT | Sampling Point: LM-4

Investigator(s): B. Sandefur | Section, Township, Range: S 30 T 19N R 1E

Landform (hillslope, terrace, etc.): Shoreline | Local relief (concave, convex, none): flat | Slope (%): 0

Subregion (LRR): LRR E | Lat: | Long: | Datum:

Soil Map Unit Name: Absher-Nobe Complex

Do Normal Circumstances Exist on this site? Yes ☑

Is the site significantly disturbed (Atypical Situation)? Yes ☐

Is the area a potential Problem Area? Yes ☐

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ☑	No ☐	**Is the Sampled Area within a Wetland?** Yes ☑ No ☐
Hydric Soil Present?	Yes ☑	No ☐	
Wetland Hydrology Present?	Yes ☑	No ☐	

Remarks:
Previously veg community 14, now hordeum wetland

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 0)	Absolute % Cover	Dominant Species?	Indicator Status
1. 0	0	☐	0
2. 0	0	☐	0
3. 0	0	☐	0
4. 0	0	☐	0
	0 = Total Cover		
Sapling/Shrub Stratum (Plot size: 0)			
1. 0	0	☐	0
2. 0	0	☐	0
3. 0	0	☐	0
4. 0	0	☐	0
5. 0	0	☐	0
	0 = Total Cover		
Herb Stratum (Plot size: 0)			
1. Chenopodium glaucum	10	☐	FAC
2. Hordeum jubatum	95	☑	FAC+
3. Polygonum aviculare	10	☐	FACW-
4. 0	0	☐	0
5. 0	0	☐	0
6. 0	0	☐	0
7. 0	0	☐	0
8. 0	0	☐	0
9. 0	0	☐	0
10. 0	0	☐	0
11. 0	0	☐	0
	115 = Total Cover		
Woody Vine Stratum (Plot size: 0)			
1. 0	0	☐	0
2. 0	0	☐	0
	0 = Total Cover		

% Bare Ground in Herb Stratum 0

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Dominance Test is >50% ☑

Hydrophytic Vegetation Present? Yes ☑ No ☐

Remarks:
0

SOIL

Sampling Point: LM-4

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-8	10YR 4/2	90	10YR 3/4	5	C	M	Silty Clay	
8-16	10YR 4/2	70	10YR 3/4	15	C	M	Silty Clay	Depletions also present

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ☐ Histosol
- ☐ Histic Epipedon
- ☐ Sulfidic Odor
- ☐ Aquatic Moisture Regime
- ☐ Reducing Conditions
- ☑ Gleyed or Low-Chroma Colors
- ☐ Concretions
- ☐ High Organic Content in Surface Layer in Sandy Soils
- ☐ Organic Streaking in Sandy Soils
- ☑ Listed on Local Soils List
- ☐ Listed on National Soils List
- ☐ Other (explain in remarks)

Taxonomy Subgroup: frigid Torrertic Ustorthents

Confirm Mapped Type?: ☐

Hydric Soil Present? Yes ☑ No ☐

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators

- ☐ Innundated
- ☐ Saturated in upper 12 inches
- ☐ Water Marks
- ☐ Drift Lines
- ☐ Sediment Deposits
- ☑ Drainage patterns in wetlands

Secondary Indicators (2 or more required)

- ☐ Oxidized Rhizospheres along Living Roots
- ☐ Water-Stained Leaves
- ☑ Local Soil Survey Data
- ☐ FAC-Neutral Test
- ☐ Other (Explain in Remarks)

Field Observations:

Surface Water Present? Yes ☐ No ☑ Depth (inches): _____

Water Table Present? Yes ☐ No ☑ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes ☑ No ☐ Depth (inches): 14

Wetland Hydrology Present? Yes ☑ No ☐

Remarks: Saturation present at 14 inches.

WETLAND DETERMINATION DATA FORM – Routine Weltand Delineation, 1987 COE Protocol

Project/Site: Little Muddy | City/County: Cascade | Sampling Date: 7/24/2010

Applicant/Owner: MDT | State: MT | Sampling Point: LM-5

Investigator(s): B. Sandefur | Section, Township, Range: S 32 T 19N R 1E

Landform (hillslope, terrace, etc.): Lowland | Local relief (concave, convex, none): flat | Slope (%): 0

Subregion (LRR): LRR E | Lat: | Long: | Datum:

Soil Map Unit Name: Absher-Nobe Complex

Do Normal Circumstances Exist on this site? Yes ☑

Is the site significantly disturbed (Atypical Situation)? Yes ☐

Is the area a potential Problem Area? Yes ☐

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ☐	No ☑	**Is the Sampled Area within a Wetland?** Yes ☐ No ☑
Hydric Soil Present?	Yes ☑	No ☐	
Wetland Hydrology Present?	Yes ☐	No ☑	

Remarks:
Grass upland transition from hordeum wetland. No apparent soil cracks at surface.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 0)	Absolute % Cover	Dominant Species?	Indicator Status
1. 0	0	☐	0
2. 0	0	☐	0
3. 0	0	☐	0
4. 0	0	☐	0
	0 = Total Cover		
Sapling/Shrub Stratum (Plot size: 0)			
1. 0	0	☐	0
2. 0	0	☐	0
3. 0	0	☐	0
4. 0	0	☐	0
5. 0	0	☐	0
	0 = Total Cover		
Herb Stratum (Plot size: 0)			
1. Agropyron smithii	70	☑	FACU
2. Poa compressa	10	☐	FACU
3. Agropyron repens	15	☐	FACU
4. Hordeum jubatum	10	☐	FAC+
5. Thlaspi arvense	5	☐	NI
6. 0	0	☐	0
7. 0	0	☐	0
8. 0	0	☐	0
9. 0	0	☐	0
10. 0	0	☐	0
11. 0	0	☐	0
	110 = Total Cover		
Woody Vine Stratum (Plot size: 0)			
1. 0	0	☐	0
2. 0	0	☐	0
	0 = Total Cover		

% Bare Ground in Herb Stratum 0

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0 (A/B)

Dominance Test is >50% ☐

Hydrophytic Vegetation Present? Yes ☐ No ☑

Remarks:
0

SOIL

Sampling Point: LM-5

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-4	10YR 4/3	95					Silty Clay	many roots
4-14	10YR 4/2	90	10YR 5/1	5	D	M	Silty Clay	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ☐ Histosol
- ☐ Histic Epipedon
- ☐ Sulfidic Odor
- ☐ Aquatic Moisture Regime
- ☐ Reducing Conditions
- ☑ Gleyed or Low-Chroma Colors
- ☐ Concretions
- ☐ High Organic Content in Surface Layer in Sandy Soils
- ☐ Organic Streaking in Sandy Soils
- ☑ Listed on Local Soils List
- ☐ Listed on National Soils List
- ☐ Other (explain in remarks)

Taxonomy Subgroup: frigid Torrertic Ustorthents

Confirm Mapped Type?: ☐

Hydric Soil Present? Yes ☑ No ☐

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators

- ☐ Innundated
- ☐ Saturated in upper 12 inches
- ☐ Water Marks
- ☐ Drift Lines
- ☐ Sediment Deposits
- ☐ Drainage patterns in wetlands

Secondary Indicators (2 or more required)

- ☐ Oxidized Rhizospheres along Living Roots
- ☐ Water-Stained Leaves
- ☑ Local Soil Survey Data
- ☐ FAC-Neutral Test
- ☐ Other (Explain in Remarks)

Field Observations:

Surface Water Present? Yes ☐ No ☑ Depth (inches): _____

Water Table Present? Yes ☐ No ☑ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes ☐ No ☑ Depth (inches): _____

Wetland Hydrology Present? Yes ☐ No ☑

Remarks:

WETLAND DETERMINATION DATA FORM – Routine Weltand Delineation, 1987 COE Protocol

Project/Site: Little Muddy | City/County: Cascade | Sampling Date: 7/24/2010

Applicant/Owner: MDT | State: MT | Sampling Point: LM-6

Investigator(s): B. Sandefur | Section, Township, Range: S 31 T 19N R 1E

Landform (hillslope, terrace, etc.): Lowland | Local relief (concave, convex, none): flat | Slope (%): 0

Subregion (LRR): LRR E | Lat: | Long: | Datum:

Soil Map Unit Name: Absher-Nobe Complex

Do Normal Circumstances Exist on this site? Yes ☑

Is the site significantly disturbed (Atypical Situation)? Yes ☐

Is the area a potential Problem Area? Yes ☐

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ☐	No ☑	**Is the Sampled Area within a Wetland?** Yes ☐ No ☑
Hydric Soil Present?	Yes ☑	No ☐	
Wetland Hydrology Present?	Yes ☐	No ☑	

Remarks:
upland grass community

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 0)	Absolute % Cover	Dominant Species?	Indicator Status
1. 0	0	☐	0
2. 0	0	☐	0
3. 0	0	☐	0
4. 0	0	☐	0
	0 = Total Cover		
Sapling/Shrub Stratum (Plot size: 0)			
1. 0	0	☐	0
2. 0	0	☐	0
3. 0	0	☐	0
4. 0	0	☐	0
5. 0	0	☐	0
	0 = Total Cover		
Herb Stratum (Plot size: 0)			
1. Agropyron repens	25	☑	FACU
2. Agropyron cristatum	20	☑	NL
3. Lactuca serriola	5	☐	FAC-
4. Astragalus bisulcatus	2	☐	NL
5. Tragopogon dubius	2	☐	NL
6. Taraxacum officinale	1	☐	FACU
7. Thlaspi arvense	8	☐	NI
8. Bromus inermis	10	☐	NL
9. Bromus japonicus	10	☐	FACU
10. 0	0	☐	0
11. 0	0	☐	0
	83 = Total Cover		
Woody Vine Stratum (Plot size: 0)			
1. 0	0	☐	0
2. 0	0	☐	0
	0 = Total Cover		

% Bare Ground in Herb Stratum 0

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0 (A/B)

Dominance Test is >50% ☐

Hydrophytic Vegetation Present? Yes ☐ No ☑

Remarks:
0

SOIL

Sampling Point: LM-6

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-4	10YR 4/2	95					Silty Clay	
4-14	10YR 4/2	80	10YR 7/1	20	D	M	Silty Clay	Increase of white depletipns/salt conce

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ☐ Histosol
- ☐ Histic Epipedon
- ☐ Sulfidic Odor
- ☐ Aquatic Moisture Regime
- ☐ Reducing Conditions
- ☑ Gleyed or Low-Chroma Colors
- ☐ Concretions
- ☐ High Organic Content in Surface Layer in Sandy Soils
- ☐ Organic Streaking in Sandy Soils
- ☐ Listed on Local Soils List
- ☐ Listed on National Soils List
- ☐ Other (explain in remarks)

Taxonomy Subgroup: frigid Torrertic Ustorthents

Confirm Mapped Type?: ☐

Hydric Soil Present? Yes ☑ No ☐

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators

- ☐ Innundated
- ☐ Saturated in upper 12 inches
- ☐ Water Marks
- ☐ Drift Lines
- ☐ Sediment Deposits
- ☐ Drainage patterns in wetlands

Secondary Indicators (2 or more required)

- ☐ Oxidized Rhizospheres along Living Roots
- ☐ Water-Stained Leaves
- ☑ Local Soil Survey Data
- ☐ FAC-Neutral Test
- ☐ Other (Explain in Remarks)

Field Observations:

Surface Water Present? Yes ☐ No ☑ Depth (inches): _____

Water Table Present? Yes ☐ No ☑ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes ☐ No ☑ Depth (inches): _____

Wetland Hydrology Present? Yes ☐ No ☑

Remarks:

WETLAND DETERMINATION DATA FORM – Routine Weltand Delineation, 1987 COE Protocol

Project/Site: Little Muddy | City/County: Cascade | Sampling Date: 7/24/2010

Applicant/Owner: MDT | State: MT | Sampling Point: LM-7

Investigator(s): B. Sandefur | Section, Township, Range: S 32 T 19N R 1E

Landform (hillslope, terrace, etc.): Lowland | Local relief (concave, convex, none): flat | Slope (%): 0

Subregion (LRR): LRR E | Lat: | Long: | Datum:

Soil Map Unit Name: Absher-Nobe Complex

Do Normal Circumstances Exist on this site? Yes ☑

Is the site significantly disturbed (Atypical Situation)? Yes ☐

Is the area a potential Problem Area? Yes ☐

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ☑	No ☐	**Is the Sampled Area within a Wetland?** Yes ☑ No ☐
Hydric Soil Present?	Yes ☑	No ☐	
Wetland Hydrology Present?	Yes ☑	No ☐	

Remarks:
Salt accumulation at cracked soil surface. Soil moist at 10in

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 0)	Absolute % Cover	Dominant Species?	Indicator Status
1. 0	0	☐	0
2. 0	0	☐	0
3. 0	0	☐	0
4. 0	0	☐	0
	0 = Total Cover		
Sapling/Shrub Stratum (Plot size: 0)			
1. 0	0	☐	0
2. 0	0	☐	0
3. 0	0	☐	0
4. 0	0	☐	0
5. 0	0	☐	0
	0 = Total Cover		
Herb Stratum (Plot size: 0)			
1. Helianthus annuus	3	☐	FACU+
2. Grindelia squarrosa	5	☐	FACU
3. Typha latifolia	20	☑	OBL
4. Hordeum jubatum	10	☐	FAC+
5. Chenopodium album	15	☑	FAC
6. Rumex maritimus	15	☑	FACW+
7. 0	0	☐	0
8. 0	0	☐	0
9. 0	0	☐	0
10. 0	0	☐	0
11. 0	0	☐	0
	68 = Total Cover		
Woody Vine Stratum (Plot size: 0)			
1. 0	0	☐	0
2. 0	0	☐	0
	0 = Total Cover		

% Bare Ground in Herb Stratum 20

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Dominance Test is >50% ☑

Hydrophytic Vegetation Present? Yes ☑ No ☐

Remarks:
0

SOIL

Sampling Point: LM-7

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-14	10YR 4/2	80	10YR 3/4	15	C	M	Silty Clay	increase of white depletions with depth

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ☐ Histosol
- ☐ Histic Epipedon
- ☐ Sulfidic Odor
- ☐ Aquatic Moisture Regime
- ☐ Reducing Conditions
- ☑ Gleyed or Low-Chroma Colors
- ☐ Concretions
- ☐ High Organic Content in Surface Layer in Sandy Soils
- ☐ Organic Streaking in Sandy Soils
- ☑ Listed on Local Soils List
- ☐ Listed on National Soils List
- ☐ Other (explain in remarks)

Taxonomy Subgroup: frigid Torrertic Ustorthents

Confirm Mapped Type?: ☐

Hydric Soil Present? Yes ☑ No ☐

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators

- ☐ Innundated
- ☐ Saturated in upper 12 inches
- ☑ Water Marks
- ☐ Drift Lines
- ☐ Sediment Deposits
- ☐ Drainage patterns in wetlands

Secondary Indicators (2 or more required)

- ☐ Oxidized Rhizospheres along Living Roots
- ☐ Water-Stained Leaves
- ☑ Local Soil Survey Data
- ☐ FAC-Neutral Test
- ☐ Other (Explain in Remarks)

Field Observations:

Surface Water Present? Yes ☐ No ☑ Depth (inches): _____

Water Table Present? Yes ☐ No ☑ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes ☐ No ☑ Depth (inches): _____

Wetland Hydrology Present? Yes ☑ No ☐

Remarks:

MDT Montana Wetland Assessment Form (revised March 2008)

1. Project name Little Muddy Creek Wetland Mitigation Site **2. MDT project#** STPX 7(38) **Control#**

3. Evaluation Date 7/24/2010 **4. Evaluators** B. Sandefur **5. Wetland/Site# (s)** Entire Little Muddy Creek Site

6. Wetland Location(s): **T** 19N **R** 1E **Sec1** 31, 32, 33 **T** **R** **Sec2**

Approx Stationing or Mileposts

Watershed 7 - Missouri-Sun-Smith **County** Cascade

7. Evaluating Agency Confluence for MDT

8. Wetland size acres 194.47

Purpose of Evaluation

How assessed: Measured e.g. by GPS

☐ **Wetlands potentially affected by MDT project**

9. Assesssment area (AA) size (acres) 194.47

☐ **Mitigation Wetlands: pre-construction**

How assessed: Measured e.g. by GPS

☑ **Mitigation Wetlands: post construction**

☐ **Other**

10. Classification of Wetland and Aquatic Habitats in AA

HGM Class (Brinson)	Class (Cowardin)	Modifier (Cowardin)	Water Regime	% of AA
Riverine	Emergent Wetland	Impounded	Permanent/Perennial	25
Riverine	Emergent Wetland	Impounded	Seasonal/Intermittant	40
Riverine	Unconsolidated Shore	Impounded	Permanent/Perennial	20
Riverine	Aquatic Bed	Impounded	Permanent/Perennial	15

11. Estimated Relative Abundance Common

12. General Condition of AA

i. Disturbance: (use matrix below to determine [circle] appropriate response – see instructions for Montana-listed noxious weed and aquatic nuisance vegetation species (**ANVS**) lists)

Conditions within AA	*Predominant conditions adjacent to (within 500 feet of) AA*		
	Managed in predominantly natural state; is not grazed, hayed, logged, or otherwise converted; does not contain roads or buildings; and noxious weed or ANVS cover is ?15%.	Land not cultivated, but may be moderately grazed or hayed or selectively logged; or has been subject to minor clearing; contains few roads or buildings; noxious weed or ANVS cover is ?30%.	Land cultivated or heavily grazed or logged; subject to substantial fill placement, grading, clearing, or hydrological alteration; high road or building density; or noxious weed or ANVS cover is >30%.
AA occurs and is managed in predominantly natural state; is not grazed, hayed, logged, or otherwise converted; does not contain roads or occupied buildings; and noxious weed or ANVS cover is ?15%.	low disturbance	low disturbance	moderate disturbance
AA not cultivated, but may be moderately grazed or hayed or selectively logged; or has been subject to relatively minor clearing, fill placement, or hydrological alteration; contains few roads or buildings; noxious weed or ANVS cover is ?30%.	moderate	moderate disturbance	high disturbance
AA cultivated or heavily grazed or logged; subject to relatively substantial fill placement, grading, clearing, or hydrological alteration; high road or building density; or noxious weed or ANVS cover is >30%.	high disturbance	high disturbance	high disturbance

Comments: (types of disturbance, intensity, season, etc)

Assessment area includes the 58-ac mud flat

ii. Prominent noxious, aquatic nuisance, other exotic species:

Cirsium arvense

iii. Provide brief descriptive summary of AA and surrounding land use/habitat

AA has been excavated, impounded, and flooded to pond water for waterfowl habitat. Surrounding land was cultivated crops that are now in CRP.

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

Existing # of "Cowardin" Vegetated Classes in AA	Initial Rating	Is current management preventing (passive) existence of additional vegetated classes?		Modified Rating
>=3 (or 2 if 1 is forested) classes	H	NA	NA	NA
2 (or 1 if forested) classes	M	NA	NA	NA
1 class, but not a monoculture	M	<NO	YES>	L
1 class, monoculture (1 species comprises>=90% of total cover)	L	NA	NA	NA

Comments: Small area of willows scattered along irrigation canal, emergent and aquatic bed/submerged also present.

SECTION PERTAINING to FUNCTIONS_VALUES ASSESSMENT

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

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

Primary or critical habitat (list species) ◉ D ◉ S

Secondary habitat (list Species) ◉ D ◉ S

Incidental habitat (list species) ◉ D ◉ S

No usable habitat ☑ S

ii. Rating (use the conclusions from i above and the matrix below to arrive at [check] the functional points and rating)

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

Sources for documented use USF&WS

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

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

Primary or critical habitat (list species) ◉ D ◉ S

Secondary habitat (list Species) ◉ D ○ S Bald Eagle, Great Blue Heron

Incidental habitat (list species) ◉ D ◉ S

No usable habitat ☐ S

ii. Rating (use the conclusions from i above and the matrix below to arrive at [check] the functional points and rating)

Highest Habitat Level	doc/primary	sus/primary	doc/secondary	sus/secondary	doc/incidental	sus/incidental	None
S1 Species: *Functional Points and Rating*	1H	.8H	.7M	.6M	.2L	.1L	0L
S2 and S3 Species: *Functional Points and Rating*	.9H	.7M	.6M	.5M	.2L	.1L	0L

Sources for documented use MT NHP

14C. General Wildlife Habitat Rating:

i. Evidence of overall wildlife use in the AA (check substantial, moderate, or low based on supporting evidence): Substantial

Substantial (based on any of the following [check]):

- [x] 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

Minimal (based on any of the following [check]):

- [ ] few or no wildlife observations during peak use periods
- [ ] little to no wildlife sign
- [ ] sparse adjacent upland food sources
- [ ] interviews with local biologists with knowledge of the AA

Moderate (based on any of the following [check]):

- [ ] 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, check appropriate AA attributes in matrix to arrive at rating. Structural diversity is from #13. For class cover to be considered evenly distributed, the most and least prevalent **vegetated** classes must be within 20% of each other in terms of their percent composition of the AA (see #10). Abbreviations for surface water durations are as follows: P/P = permanent/perennial; S/I = seasonal/intermittent; T/E = temporary/ephemeral; and A = absent [see instructions for further definitions of these terms])

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

iii. Rating (use the conclusions from i and ii above and the matrix below to arrive at [check] the functional points and rating)

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

Comments Abundant bird numbers and diverstiy observed on open water and mud flats. High ungulate diversity and abundance.

14D. General Fish Habitat Rating: (Assess this function if the AA is used by fish or the existing situation is "correctable" such that the AA could be used by fish [i.e., fish use is precluded by perched culvert or other barrier, etc.]. If the AA is not used by fish, fish use is not restorable due to habitat constraints, or is not desired from a management perspective [such as fish entrapped in a canal], then check ☐ **NA** here and proceed to 14E.) Warm Water

i. Habitat Quality and Known / Suspected Fish Species in AA (use matrix to arrive at [check the functional points and rating)

Duration of surface water in AA	Permanent / Perennial						Seasonal / Intermittent						Temporary / Ephemeral					
Aquatic hiding / resting / escape cover	Optimal		Adequate		Poor		Optimal		Adequate		Poor		Optimal		Adequate		Poor	
Thermal cover optimal / suboptimal	O	S	O	S	O	S	O	S	O	S	O	S	O	S	O	S	O	S
FWP Tier I fish species	1E	.9H	.8H	.7M	.6M	.5M	.9H	.8H	.7M	.6M	.5M	.4M	.7M	.6M	.5M	.4M	.3L	.3L
FWP Tier II or Native Game fish species	.9H	.8H	.7M	.6M	.5M	.5M	.8H	.7M	.6M	.5M	.4M	.4M	.6M	.5M	.4M	.3L	.2L	.2L
FWP Tier III or Introduced Game fish	.8H	.7M	.6M	.5M	.5M	.4M	.7M	.6M	.5M	.4M	.4M	.3L	.5M	.4M	.3L	.2L	.2L	.1L
FWP Non-Game Tier IV or No fish species	.5M	.5M	.5M	.4M	.4M	.3L	.4M	.4M	.4M	.3L	.3L	.2L	.2L	.2L	.2L	.1L	.1L	.1L

Sources used for identifying fish sp. potentially found in AA:

ii. Modified Rating (**NOTE:** Modified score cannot exceed 1 or be less than 0.1)
*a) Is fish use of the AA significantly reduced by a culvert, dike, or other man-made structure or activity **or** is the waterbody included on the current final MDEQ list of waterbodies in need of TMDL development with listed "Probable Impaired Uses" including cold or warm water fishery or aquatic life support, **or** do aquatic nuisance plant or animal species (see **Appendix E**) occur in fish habitat?* **Y** ◉ **N** ○ *If yes, reduce score in **i** above by 0.1:* **Modified Rating** .2L

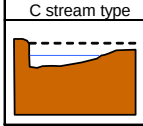
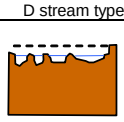
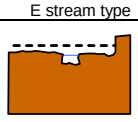
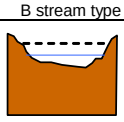
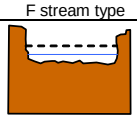
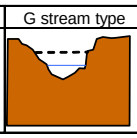
b) Does the AA contain a documented spawning area or other critical habitat feature (i.e., sanctuary pool, upwelling area, etc.- specify in comments) for native fish or introduced game fish? ○ **Y** ◉ **N** *If yes, add 0.1 to the adjusted score in **i** or **iia** above:*
Modifed Rating

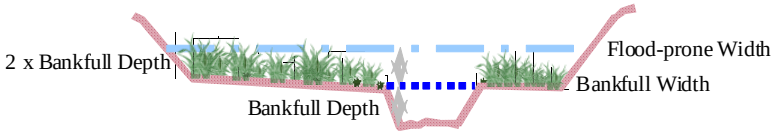
iii. Final Score and Rating: _____ **Comments:**

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

i. Rating (working from top to bottom, use the matrix below to arrive at [check] the functional points and rating)

Estimated or Calculated Entrenchment (Rosgen 1994, 1996)	Slightly entrenched - C, D, E stream types			Moderately entrenched – B stream type			Entrenched-A, F, G stream types		
% of flooded wetland classified as forested and/or scrub/shrub	75%	25-75%	<25%	75%	25-75%	<25%	75%	25-75%	<25%
AA contains **no outlet or restricted outlet**	1H	.9H	.6M	.8H	.7M	.5M	.4M	.3L	.2L
AA contains **unrestricted outlet**	.9H	.8H	.5M	.7M	.6M	.4M	.3L	.2L	.1L

Slightly Entrenched ER = >2.2			**Moderately Entrenched ER = 1.41 – 2.2**	**Entrenched ER = 1.0 – 1.4**		
C stream type	D stream type	E stream type	B stream type	A stream type	F stream type	G stream type
						



Floodrpone width _____ **/** **Bankfull width** _____ **=** **Entrenchment ratio** _____

ii. Are ≥10 acres of wetland in the AA subject to flooding **AND** are man-made features which may be significantly damaged by floods located within 0.5 mile downstream of the AA (check)? **Y** ◉ **N** ○

Comments:

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

i. Rating (Working from top to bottom, use the matrix below to arrive at [check] the functional points and rating. Abbreviations for surface water durations are as follows: P/P = permanent/perennial; S/I = seasonal/intermittent; and T/E = temporary/ephemeral [see instructions for further definitions of these terms].)

Estimated maximum acre feet of water contained in wetlands within the AA that are subject to periodic flooding or ponding	>5 acre feet			1.1 to 5 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**	1H	.9H	.8H	.8H	.6M	.5M	.4M	.3L	.2L
Wetlands in AA flood or pond **< 5 out of 10 years**	.9H	.8H	.7M	.7M	.5M	.4M	.3L	.2L	.1L

Comments:

14G. Sediment/Nutrient/Toxicant Retention and Removal: (Applies to wetlands with potential to receive 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, click ☐ **NA** here and proceed to 14H.)

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

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

Comments:

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

i. Rating (working from top to bottom, use the matrix below to arrive at [check] the functional points and rating)

*% Cover of **wetland** streambank or shoreline by species with stability ratings of ≥6 (see **Appendix F**).*	*Duration of surface water adjacent to rooted vegetation*		
	Permanent / Perennial	Seasonal / Intermittent	Temporary / Ephemeral
≥ 65%	1H	.9H	.7M
35-64%	.7M	.6M	.5M
< 35%	.3L	.2L	.1L

Comments:

14I. Production Export/Food Chain Support:

i. Level of Biological Activity (synthesis of wildlife and fish habitat ratings [check])

General Fish Habitat Rating (14D.iii.)	**General Wildlife Habitat Rating (14C.iii.)**		
	E/H	M	L
E/H	H	H	M
M	H	M	M
L	M	M	L
N/A	H	M	L

ii. Rating (Working from top to bottom, use the matrix below to arrive at [check] the functional points and rating. Factor A = acreage of vegetated wetland component in the AA; Factor B = level of biological activity rating from above (14I.i.); Factor C = whether or not the AA contains a surface or subsurface outlet; the final three rows pertain to duration of surface water in the AA, where P/P, S/I, and T/E are as previously defined, and A = "absent" [see instructions for further definitions of these terms].)

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

iii. Modified Rating (**NOTE:** Modified score cannot exceed 1 or be less than 0.1.) **Vegetated Upland Buffer (VUB)**: Area with ≥ 30% plant cover, ≤ 15% noxious weed or ANVS cover, and that is not subjected to periodic mechanical mowing or clearing (unless for weed control).

a) Is there an average ≥ 50 foot-wide vegetated upland buffer around ≥ 75% of the AA circumference? **Y** ◉ **N** ○ *If yes, add 0.1 to the score in **ii** above and adjust rating accordingly:* **Modified Rating** .9H

Comments:

14J. Groundwater Discharge/Recharge: (check the appropriate indicators in i & ii below)

i. Discharge Indicators

- ☐ The AA is a slope wetland
- ☐ Springs or seeps 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
- ☐ Shallow water table and the site is saturated to the surface
- ☐ Other:

ii. Recharge Indicators

- ☑ Permeable substrate present without underlying impeding layer
- ☐ Wetland contains inlet but no outlet
- ☐ Stream is a known 'losing' stream; discharge volume decreases
- ☐ Other:

iii. Rating (use the information from i and ii above and the table below to arrive at [check] the functional points and rating)

	Duration of saturation at AA Wetlands *FROM GROUNDWATER DISCHARGE OR WITH WATER THAT IS RECHARGING THE GROUNDWATER SYSTEM*			
Criteria	P/P	S/I	T	None
Groundwater Discharge or Recharge	1H	.7M	.4M	.1L
Insufficient Data/Information		NA		

Comments: No restrictive or underlying impeding layers identified

14K. Uniqueness:

i. Rating (working from top to bottom, use the matrix below to arrive at [check] the functional points and rating)

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 (#11)	rare	common	abundant	rare	common	abundant	rare	common	abundant
Low disturbance at AA (#12i)	1H	.9H	.8H	.8H	.6M	.5M	.5M	.4M	.3L
Moderate disturbance at AA (#12i)	.9H	.8H	.7M	.7M	.5M	.4M	.4M	.3L	.2L
High disturbance at AA (#12i)	.8H	.7H	.6M	.6M	.4M	.3L	.3L	.2L	.1L

Comments:

14L. Recreation/Education Potential: (affords "bonus" points if AA provides recreation or education opportunity)

i. Is the AA a known or potential rec./ed. site: (check) **Y** ◉ **N** ○ (if 'Yes' continue with the evaluation; if 'No' then click ☐ **NA** here and proceed to the overall summary and rating page)

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

iii. Rating (use the matrix below to arrive at [check] the functional points and rating)

Known or Potential Recreation or Education Area	Known	Potential
Public ownership or public easement with general public access (no permission required)	.2H	.15H
Private ownership with general public access (no permission required)	.15H	.1M
Private or public ownership without general public access, or requiring permission for public access	.1M	.05L

Comments:

General Site Notes

FUNCTION & VALUE SUMMARY & OVERALL RATING FOR WETLAND/SITE #(S): Entire Little Muddy Creek Site

Function & Value Variables	Rating	Actual Functional Points	Possible Functional Points	Functional Units: (Actual Points x Estimated AA Acreage)	Indicate the four most prominent functions with an asterisk (*)
A. Listed/Proposed T&E Species Habitat	L	0	1	0	☐
B. MT Natural Heritage Program Species Habitat	M	.6	1	116.682	☐
C. General Wildlife Habitat	E	1	1	194.47	☑
D. General Fish Habitat	L	.2	1	38.894	☐
E. Flood Attenuation	M	.6	1	116.682	☐
F. Short and Long Term Surface Water Storage	H	1	1	194.47	☑
G. Sediment/Nutrient/Toxicant Removal	H	1	1	194.47	☑
H. Sediment/Shoreline Stabilization	L	.3	1	58.341	☐
I. Production Export/Food Chain Support	H	.9	1	175.023	☐
J. Groundwater Discharge/Recharge	H	1	1	194.47	☑
K. Uniqueness	M	.6	1	116.682	☐
L. Recreation/Education Potential (bonus points)	M	.1	NA	19.447	☐
Totals:		7.3	11	1419.631	
Percent of Possible Score			**66.36** %		

Category I Wetland: (must satisfy **one** of the following criteria; otherwise go to Category II)
- ☐ Score of 1 functional point for Listed/Proposed Threatened or Endangered Species; **or**
- ☐ Score of 1 functional point for Uniqueness; **or**
- ☐ Score of 1 functional point for Flood Attenuation **and** answer to Question 14E.ii is "yes"; **or**
- ☐ Percent of possible score > 80% (round to nearest whole #).

Category II Wetland: (Criteria for Category I not satisfied **and** meets any **one** of the following criteria; otherwise go to Category IV)
- ☐ Score of 1 functional point for MT Natural Heritage Program Species Habitat; **or**
- ☑ Score of .9 or 1 functional point for General Wildlife Habitat; **or**
- ☐ Score of .9 or 1 functional point for General Fish 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 possible score > 65% (round to nearest whole #).

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; otherwise go to Category III)
- ☐ "Low" rating for Uniqueness; **and**
- ☐ Vegetated wetland component < 1 acre (do not include upland vegetated buffer); **and**
- ☐ Percent of possible score < 35% (round to nearest whole #).

OVERALL ANALYSIS AREA RATING:
(check appropriate category based on the criteria outlined above)

I	II	III	IV

Appendix C

Project Area Photographs

MDT Wetland Mitigation Monitoring
Little Muddy Creek
Cascade County, Montana



Photo Point 1 – *Photo 1* **Location:** Berm
Bearing: 136 Degrees **Taken in 2009**



Photo Point 1 – *Photo 1* **Location:** Berm
Bearing: 136 Degrees **Taken in 2010**



Photo Point 1 – *Photo 2* **Location:** Outlet
Bearing: 210 Degrees **Taken in 2009**



Photo Point 1 – *Photo 2* **Location:** Outlet
Bearing: 210 Degrees **Taken in 2010**



Photo Point 1 – *Photo 3* **Location:** Outlet canal
Bearing: 40 Degrees **Taken in 2009**



Photo Point 1 – *Photo 3* **Location:** Outlet canal
Bearing: 40 Degrees **Taken in 2010**



Photo Point 2 – *Photo 1* **Location:** PP2
Bearing: 180 Degrees **Taken in 2009**



Photo Point 2 – *Photo 1* **Location:** PP2
Bearing: 180 Degrees **Taken in 2010**



Photo Point 3 – *Photo 1* **Location:** Inlet canal
Bearing: 130 Degrees **Taken in 2009**



Photo Point 3 – *Photo 1* **Location:** Inlet canal
Bearing: 130 Degrees **Taken in 2010**



Photo Point 4 – *Photo 1* **Location:** Inlet control
Bearing: 71 Degrees **Taken in 2009**



Photo Point 4 – *Photo 1* **Location:** Inlet control
Bearing: 71 Degrees **Taken in 2010**



Photo Point 4 – *Photo 2*
Bearing: 208 Degrees
Location: Inlet canal
Taken in 2009



Photo Point 4 – *Photo 2*
Bearing: 208 Degrees
Location: Inlet canal
Taken in 2010



Photo Point 5 – *Photo 1*
Bearing: 316 Degrees
Location: PP5
Taken in 2009



Photo Point 5 – *Photo 1*
Bearing: 316 Degrees
Location: PP5
Taken in 2010



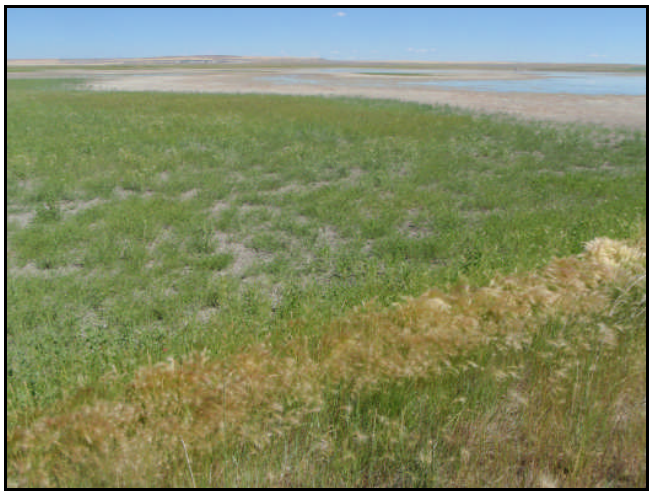
Photo Point 6 – *Photo 1*
Bearing: 317 Degrees
Location: PP6
Taken in 2009



Photo Point 6 – *Photo 1*
Bearing: 317 Degrees
Location: PP6
Taken in 2010



Transect 1 – *Photo 1*
Bearing: 10 Degrees
Location: T1 Start
Taken in 2009



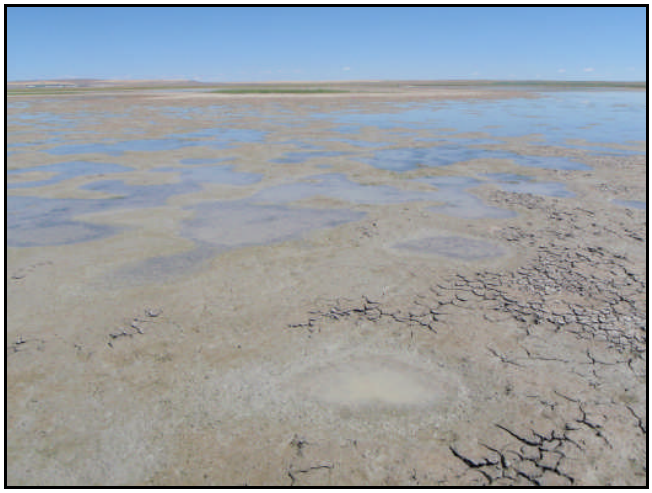
Transect 1 – *Photo 1*
Bearing: 10 Degrees
Location: T1 Start
Taken in 2010



Transect 2 – *Photo 1*
Bearing: 266 Degrees
Location: T2 Start
Taken in 2009



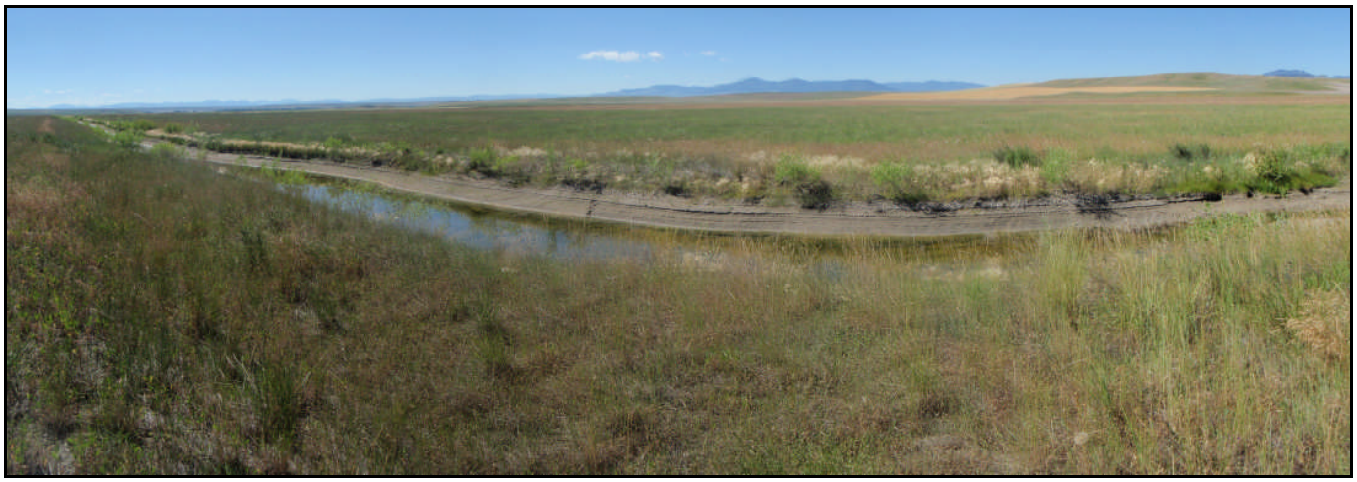
Transect 2 – *Photo 1*
Bearing: 266 Degrees
Location: T2 Start
Taken in 2010



Transect 1 – *Photo 1*
Bearing: 190 Degrees
Location: T1 End
Taken in 2010



Transect 2 – *Photo 1*
Bearing: 86 Degrees
Location: T2 End
Taken in 2010



Panorama 1
Compass Bearing: Approx 180 Degrees

Location: PP3
Taken in 2010



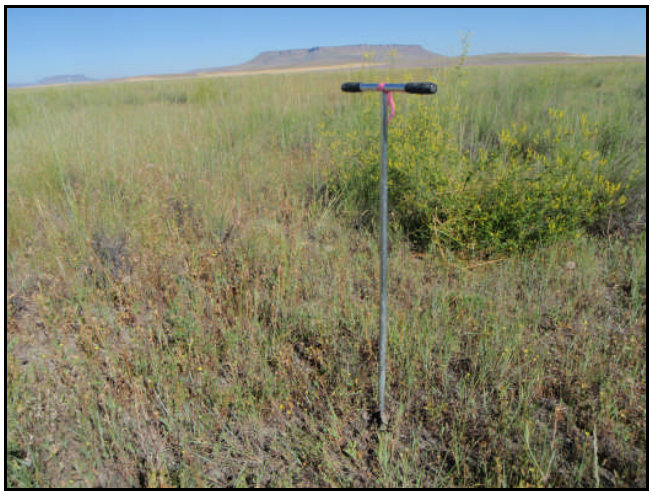
Panorama 2
Compass Bearing: Approx 40 Degrees

Location: Inlet canal
Taken in 2010



Panorama 3
Compass Bearing: Approx 180 Degrees

Location: PP2
Taken in 2010



Data Point: LM-1
Bearing: 360 Degrees
Location: Veg Com 13
Taken in 2010



Data Point: LM-2
Bearing: 90 Degrees
Location: Veg Com 10
Taken in 2010



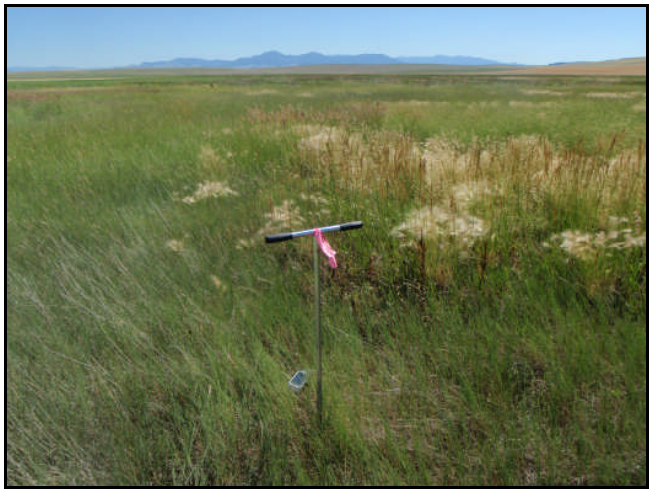
Data Point: LM-3
Bearing: 360 Degrees
Location: Near T-1 start
Taken in 2010



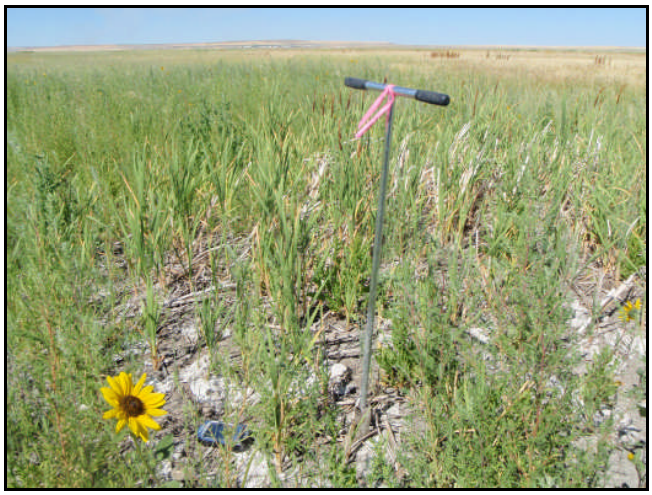
Data Point: LM-4
Bearing: 20 Degrees
Location: Veg Com 11
Taken in 2010



Data Point: LM-5
Bearing: 20 Degrees
Location: Veg Com 13
Taken in 2010



Data Point: LM-6
Bearing: 20 Degrees
Location: Veg Com 13
Taken in 2010

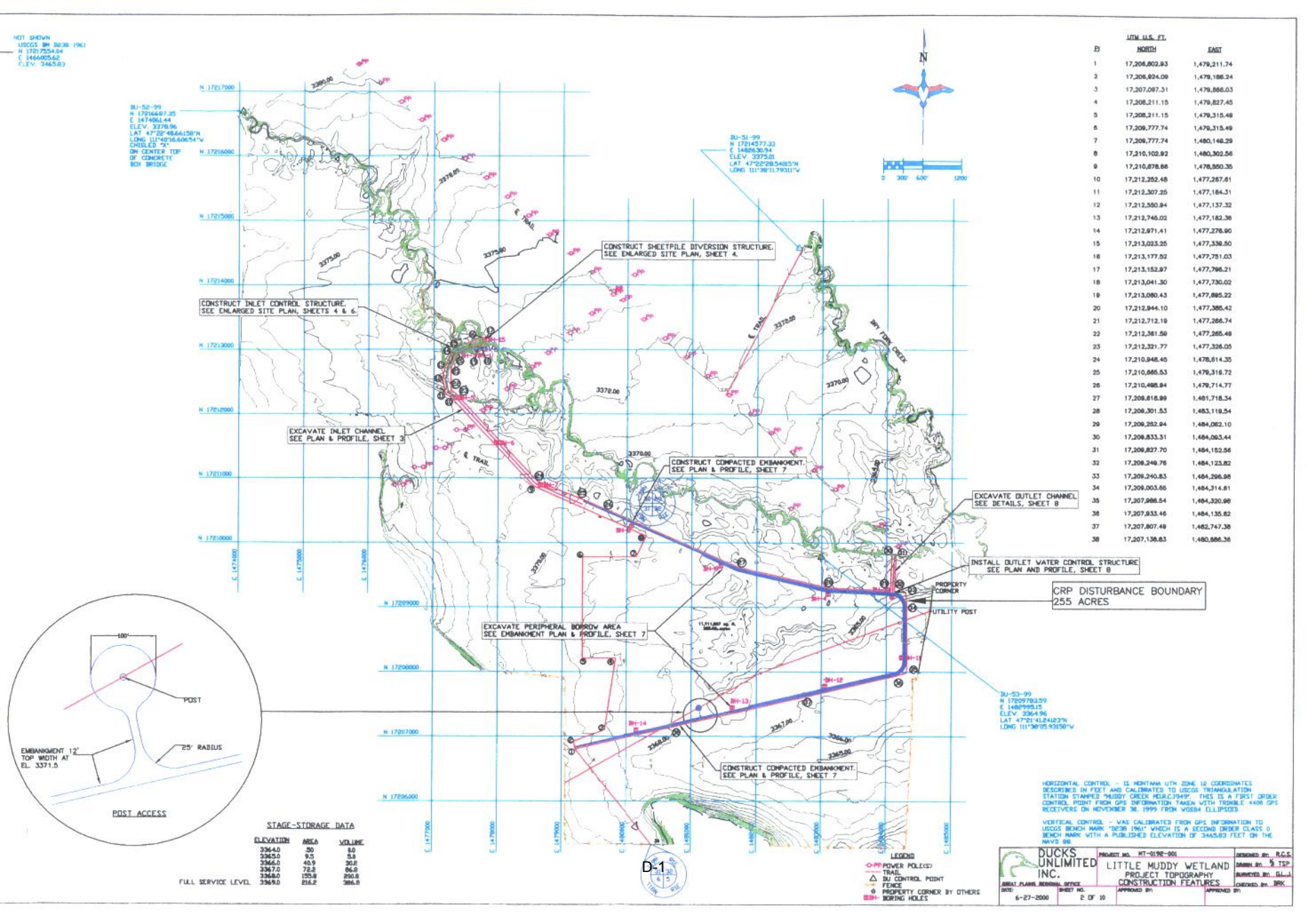


Data Point: LM-7
Bearing: 270 Degrees
Location: Veg Com 15
Taken in 2010

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	17,210,876.66	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	49.9	30.2
3367.0	72.8	86.0
3368.0	155.8	290.8
3369.0	216.2	386.8

FULL SERVICE LEVEL

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

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