MONTANA DEPARTMENT OF TRANSPORTATION
WETLAND MITIGATION MONITORING REPORT: YEAR 2011

Little Muddy Creek
Cascade County, Montana



Prepared for:

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December 2011

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CCI Project No: MDT.004

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1. INTRODUCTION

The 2011 Little Muddy Creek Wetland Mitigation Monitoring Report documents the final year of compensatory 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). An additional 50 acres of reserve credit was also sought 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 Site 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 are included in Appendix B. Appendix C contains representative site photographs and Appendix D contains 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 upstream of the structure for a distance of approximately 2,700 feet. An inlet channel approximately 400 feet long was excavated from the point of diversion to a headgate. Water flows through along the 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. 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 are less than 7,880 cfs.

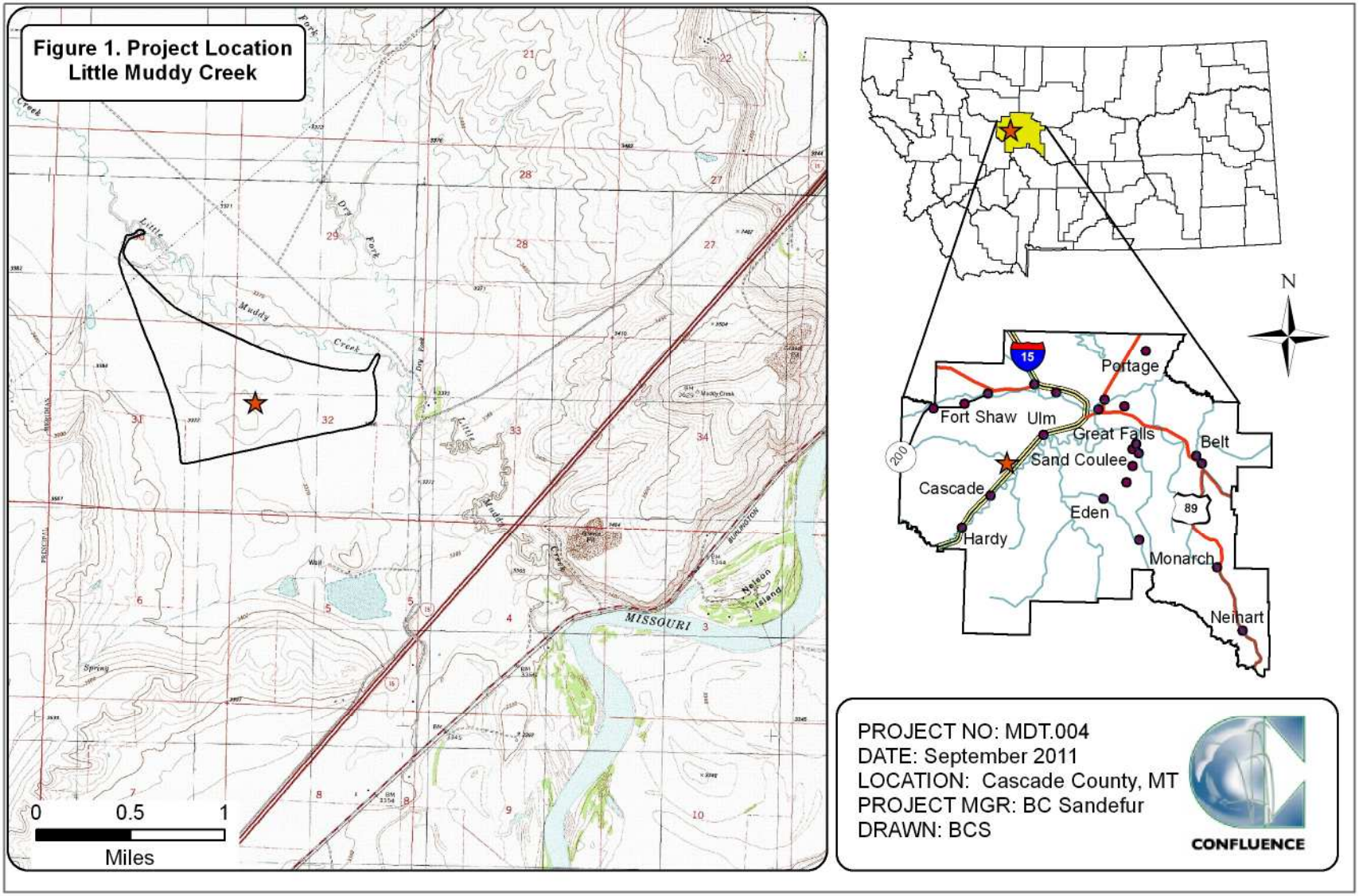


Figure 1. Project location of Little Muddy Creek.

No wetland habitat existed within the main project site prior to project implementation. Three emergent wetlands and a narrow wetland fringe have developed along most of Little Muddy Creek. Target wetland types at the site included open water/aquatic bed and shallow marsh/wet meadow created by fluctuating water levels. No specific performance criteria or ratios were stipulated in USACE correspondence regarding the project.

2. METHODS

The site was monitored on August 17, 2011. Information contained on the Mitigation Monitoring Form and Wetland Data Form 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, soil and hydrology data collection, bird and wildlife use documentation, photographic documentation, 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). The frost-free period defined for the region characterized by the dominant soil map unit on Little Muddy Creek, Lallie silty clay loam, 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.

Hydrological indicators as outlined on the USACE wetland determination data form were documented at seven data points (LM-1 through LM-6, 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 the electronic Wetland Data Form (Appendix B). Hydrologic assessments allow evaluation of mitigation goals addressing inundation/saturation requirements.

There are no groundwater monitoring wells at this 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 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 the 2011 aerial photograph. 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. 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 "**x**", "▲", 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 (Environmental Laboratories, 1987). A description of the soil profile, including hydric indicators when present, was recorded on the Wetland Data 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 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 delineation 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 Wetland Data Form (Appendix B).

The USACE determined that the 1987 delineation 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 Regional Supplement to the USACE of Engineers Wetland Delineation Manual: Western Mountains, Valleys, and Coast Region (USACE 2010) 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 2011 aerial photograph (Figure 3 in Appendix A). Wetland areas were estimated using geographic information system (GIS) methodology.

2.5. Wildlife

Observations and other positive indicators of mammal, reptile, amphibian, and bird species use within the mitigation project area were recorded on the wetland monitoring form during the site visit. Indirect use indicators, including tracks, scat, burrows, 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 animals observed from 2004 to 2011 was compiled.

2.6. Functional Assessment

Functional assessments were completed from 2004 to 2007 using the 1999 MDT Montana Wetland Assessment Method (MWAM) (Berglund 1999). The 2008 MWAM (Berglund and McEldowney 2008) was used to evaluate functions and values from 2008 through 2011. 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 Wetland 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 and upland conditions, site trends, current land uses surrounding the site, 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 2011 monitoring season. Points were collected using WAAS-enabled differential correction 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 the 2011 aerial photograph, 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 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 Great Falls Airport weather station, Montana (243751), recorded 14.93 inches of total average annual precipitation for the period of record from July 1948 to December 2010 (WRCC 2011). The total precipitation in 2010 was 19.38 inches, 4.45 inches above the 62 year average. Cumulative precipitation for January to June 2011 was 11.18 inches (NCDC 2011).

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, 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. The site was more than one foot short of full pool capacity in 2007. 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. High precipitation rates in 2009 resulted in higher-than-average surface

water levels in Little Muddy Creek. Spring precipitation combined with heavy rainfall in early August kept the reservoir full through the 2009 growing season. The inlet structure was closed intentionally in 2010 to reduce water levels and allow 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. Approximately 10 percent of the assessment area was inundated during 2010 monitoring with an average water depth of 2 feet and a maximum depth of 6 feet within the soil borrow source for levee construction.

The water elevation had returned to design levels during the 2011 site visit. The diversion dam within Little Muddy Creek (photo on C-9, Appendix C) controlled water elevations in the stream and at the inlet. The water elevation within the Little Muddy Creek mitigation site was approximately 8 inches below the standpipe outlet. Approximately thirty-five percent (135 acres) of the 406-acre project area was inundated during the site investigation. The open water boundary along the west edge of the wetland complex fluctuates considerably with just a few inches change in water elevation. Water marks, surface soil cracks, sediment deposits, algal mats, and water-stained leaves observed along this boundary indicate that the water elevation was at the designed level and controlled by the standpipe early in the 2011 growing season.

Data points LM-1 through LM-6 were sampled during the wetland delineation in 2011 (Figure 2, Appendix A; Wetland Data Forms, Appendix B). With the exception of LM-6, which was an upland data point paired with LM-5, all data points exhibited positive signs of wetland hydrology. Data point LM-1 was located in an overflow swale of Little Muddy along the north edge of the project boundary. Hydrologic indicators included drainage patterns and water-stained leaves. Data points LM-2 through LM-6 were located along the western fringe of the Little Muddy wetland. Watermarks, water-stained leaves, sediment deposits, and drift lines were positive indicators for wetland hydrology at these data points. The soil pit at data point LM-4 was located within fifteen feet of the edge of surface water and was excavated below surface water elevation. This pit was left open for approximately 30 minutes. No water entered the pit suggesting very low hydraulic conductivity for the clay and silty clay soils. The low hydraulic conductivity may limit the development of wetland hydrology beyond the open water boundary.

3.2. Vegetation

Historical aerial photographs showed that the mixed grass and shrub land native vegetation was converted to cropland between 1937 and 1950. The project site was used for dryland farming (domestic barley and wheat) and, less often, grazing 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.

A comprehensive list of 72 plant species identified at the Little Muddy Creek Wetland Mitigation Site from 2004 to 2011 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. 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. A scrub/shrub community of volunteer willows had established along the inlet channel by 2011, with open water dominated by algae and aquatic plants.

Table 1. Vegetation species identified from 2004 to 2011 at the Little Muddy Creek Wetland Mitigation Site.

Scientific Names	Common Names	Region 9 Indicator Status[1]
Achillea millefolium	**yarrow,common**	**FACU**
Agropyron cristatum	crested wheatgrass	NL
Agropyron intermedium	intermediate wheatgrass	NL
Agropyron repens	quackgrass	FACU
Agropyron smithii	wheatgrass,western	FACU
Agropyron trachycaulum	**wheatgrass,slender**	**FAC**
Algae, green	algae, green	NL
Alisma gramineum	water-plantain,narrow-leaf	OBL
Alopecurus aequalis	foxtail,short-awn	OBL
Alopecurus arundinaceus	foxtail,creeping	NI
Alopecurus pratensis	**foxtail,meadow**	**FACW**
Artemisia frigida	prairie sagewort	NL
Aster pansus	aster,many-flowered	FAC+
Atriplex rosea	orache,tumbling	FACU-
Beckmannia syzigachne	**sloughgrass,American**	**OBL**
Bromus carinatus	**California brome**	**NL**
Bromus inermis	smooth brome	NL
Bromus japonicus	brome,Japanese	FACU
Bromus tectorum	**cheatgrass**	**NL**
Chenopodium album	goosefoot,white	FAC
Chenopodium glaucum	goosefoot,oakleaf	FAC
Chenopodium leptophyllum	goosefoot,narrow-leaf	FACU
Chenopodium rubrum	goosefoot,coast-blite	FACW+
Chenopodium sp.		NL
Cirsium arvense	thistle,Canada	FACU+
Eleocharis palustris	spikerush,creeping	OBL
Elymus cinereus	**wild-rye,Basin**	**NI**

[1]Region 9 (Northwest) (Reed 1988).

New species identified in 2011 are show in **bold** type.

Table 1 (Continued). Vegetation species identified from 2004 to 2011 at the Little Muddy Creek Wetland Mitigation Site.

Scientific Names	Common Names	Region 9 Indicator Status[1]
Elymus varnensis	tall wheatgrass	NL
Elymus varnensis	Canada wildrye	NL
Festuca arundinacea	fescue,Kentucky	FACU-
Glycyrrhiza lepidota	**licorice,American**	**FAC+**
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-
Lepidium perfoliatum	**pepper-grass,clasping**	**FACU+**
Medicago sativa	alfalfa	NL
Melilotus alba	sweetclover,white	FACU
Melilotus officinalis	sweetclover,yellow	FACU
Mentha arvensis	**mint,field**	**FAC**
Myriophyllum sp.		**--**
Plantago lanceolata	**plantain,English**	**FACU+**
Poa compressa	bluegrass,Canada	FACU
Polygonum aviculare	knotweed,prostrate	FACW-
Polygonum douglasii	knotweed,Douglas'	FACU
Polypogon monspeliensis	**grass,annual rabbit-foot**	**FACW+**
Populus deltoides	**cotton-wood,eastern**	**FAC**
Potamogeton amplifolius	pondweed,large-leaf	OBL
Potamogeton pectinatus	pondweed,sago	OBL
Potamogeton sp.		**--**
Puccinellia nuttalliana	grass,Nuttall's alkali	OBL
Ranunculus cymbalaria	**butter-cup,seaside**	**OBL**
Rorippa sinuata	yellow-cress,spreading	FAC+
Rumex crispus	dock,curly	FACW
Rumex maritimus	dock,golden	FACW+
Sagittaria cuneata	**arrow-head,northern**	**OBL**
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+
Spartina pectinata	**cordgrass,prairie**	**OBL**
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 2011 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 returned to designed elevation in 2011 following the repair of the berm located near the outlet in fall of 2010. Increased inundation observed in 2011 resulted in an increase in the extent of the algae/aquatic plant wetland community (Type 8) and eliminated the areas mapped as mud flats in 2010. Areas mapped as *Rumex* spp./*Horeum jubatum* (Type 14) in 2010 were included in the Algae/Aquatic Plants community (Type 8) owing to increased water levels. The change in water levels is illustrated in the sequential 2009, 2010 and 2011 photographs at photo points 1 to 6 (PP1 to PP6) presented on pages C-1 to C-5 of Appendix C.

There were eight wetland communities and two upland communities, mapped in 2011 including upland Type 6 – *Agropyron* species (spp.)/*Kochia scoparia*, wetland Type 8 – Algae/Aquatic Plant, wetland Type 9 – *Polygonum aviculare*, wetland Type 10 – *Typha latifolia/Rumex* spp., wetland Type 11– *Hordeum jubatum*, upland Type 13 – Mixed Graminoids, wetland Type 15 – *Typha latifolia/Helianthus annuus*, wetland Type 16 – *Scirpus acutus/ Typha latifolia*, wetland Type 19 – *Eleocharis palustris*, and wetland Type 20 – *Salix* spp. (Figure 3, Appendix A).

Upland community Type 6 – *Agropyron* spp./*Kochia scoparia* was identified on the upland berm constructed around the mitigation site to impound water. Intermediate wheatgrass (*Agropyron intermedium*), western wheatgrass (*Agropyron smithii*), Mexican summer-cypress (*Kochia scoparia*), tall wheatgrass (*Elymus varnensis*), and cheatgrass (*Bromus tectorum*) are prevalent in this community.

Wetland community Type 8 – Algae/Aquatic Plant expanded in response to the higher water elevation observed in 2011. This 145-acre community was present the length of the inundated inlet canal and throughout the open water habitat. Dominant species included green algae, pondweed (*Potamogeton* spp.), and watermilfoil (*Myriophyllum* spp.). Narrow-leaf water-plantain (*Alisma gramineum*), prostrate knotweed (*Polygonum aviculate*), and creeping spikerush (*Eleocharis palustris*) were present in the shallower depths of the open water. Many of the aquatic plants were present as a dry crust on the cracked soil surface in 2010.

The wetland community Type 9 – *Polygonum aviculare* was located along the margin of inundation and appeared to be nearly continuously saturated and periodically inundated as the water elevation fluctuates. Approximately 25 to 50 percent of this area consisted of bare ground. Prostate knotweed, narrow-leaf water-plantain, Mexican summer-cypress, and white goosefoot (*Chenopodium album*) were identified within this community.

Wetland community Type 10 – *Typha latifolia/Rumex* spp. was identified in the broader wetland fringe at the upgradient end of the inlet channel and at the southwestern edge of the wetland complex. The vegetation cover primarily consisted of broad-leaf cattail (*Typha latifolia*), curly dock (*Rumex crispus*), creeping spikerush (*Eleocharus palustris*), foxtail barley (*Hordeum jubatum*), and hard-stem bulrush (*Scirpus acutus*). Eleven other species, 6 hydrophytes and 5 upland plants, were documented in this community.

Wetland community Type 11 – *Hordeum jubatum* formed along the western extent of open water in areas periodically inundated. This community is characterized by species that quickly colonize mud flats as surface water recedes. Type 11 was dominated by foxtail barley with low percent cover contributed by curly dock, broad-leaf cattail, slender wheatgrass, small-flowered sumpweed (*Iva axillaris*), Canada thistle (*Cirsium arvense*), common sunflower (*Helianthus annuus*), Mexican summer-cypress, and hard-stem bulrush.

The dry land west of the mitigation wetland was mapped as upland community Type 13 – Mixed Graminoids. This upland habitat contained a mix of foxtail barley, cheatgrass, smooth brome (*Bromus inermis*), California brome (*Bromus carinatus*), crested wheatgrass (*Agropyron cristatum*)., clasping pepper-grass (*Lepidium perfoliatum*), small-flowered sumpweed, basin wild-rye (*Elymus cinereus*), intermediate wheatgrass, and eight other species.

Wetland community Type 15 – *Typha latifolia/ Helianthus annuus* was mapped along the wetland transition into uplands. Broadleaf cattail was the dominant species. The amount of common sunflower decreased between 2010 and 2011. Other species characterizing this community included curly dock, foxtail barley, meadow foxtail (*Aleopecurus pratensis*), prostate knotweed, and trace amounts of watermilfoil and small-flowered sumpweed.

The outlet channel at the northeast border was mapped as wetland community Type 16 – *Scirpus acutus/ Typha latifolia* wetland) and was vegetated with hardstem bulrush (*Scirpus acutus*), broad-leaf cattail, creeping spikerush, foxtail barley, narrow-leaf water-plantain, and white goosefoot.

Wetland community Type 19 – *Eleocharis palustris* was mapped in a narrow depression just below the inlet channel in the northern tip of the site. This area was not directly connected to either Little Muddy Creek or the inlet channel although it does appear to receive overbank flow periodically from the creek. Creeping spikerush covered the ground surface in this swale. American sloughgrass (*Beckmannia syzigachne*) and western wheatgrass were also observed in this community.

Wetland vegetation community Type 20 – *Salix* spp. was mapped along the margin of the inlet channel and has formed as a result of natural willow recruitment. Sandbar willow (*Salix exigua*) and yellow willow (*Salix lutea*)

dominated the shrub component of this community. Creeping spikerush was prevalent within the herbaceous layer, with lower amounts of foxtail barley, seaside buttercup (*Ranunculus cymbalaria*), hardstem bulrush, saltmarsh bulrush (*Scirpus maritimus*), curly dock, and Canada thistle. Seedlings and small sprigs of eastern cottonwood (*Populus deltoides*) were also present in this community.

Vegetation transect 1 (T-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 transect end points are shown on pages C-5 and C-6 of Appendix C. Increased water levels and the conversion of the mudflat to open water supporting aquatic plants was the most noteworthy change along T-1 between 2010 and 2011. The plant communities along this transect reflected the conditions present in 2008 and 2009 after the site had reached full-pool capacity. The transect starts on the upland berm. Work completed in the fall of 2010 to repair and protect the eroding levee from wind-generated waves included resloping the berm and installing geotextile fabric and rock along water level (C-9, Appendix C). Approximately four feet of the transect crossed this rock toe. The upland community Type 6 occupied the first seven feet of the transect. The remaining 578 feet traversed into Type 8 – Algae/Aquatic Plants. An estimated 75 percent of the transect was covered in vegetation, predominantly hydrophytes. The remaining 25 percent of the transect was open water.

Table 2. Data summary for Transect 1 from 2004 to 2011 at the Little Muddy Creek Wetland Mitigation Site.

Monitoring Year	2004	2005	2006	2007	2008	2009	2010	2011
Transect Length (feet)	585	585	585	585	585	585	585	585
Vegetation Community Transitions along Transect	2	0	3	2	2	2	2	1
Vegetation Communities along Transect	3	0	2	3	3	3	2	2
Hydrophytic Vegetation Communities along Transect	0	0	1	2	2	2	1	1
Total Vegetative Species	11	1	7	9	8	10	9	11
Total Hydrophytic Species	2	1	4	4	4	7	4	4
Total Upland Species	9	0	3	5	4	3	5	7
Estimated % Total Vegetative Cover	90	8	60	85	85	73	10	75
% Transect Length Comprising Hydrophytic Vegetation Communities	0	0	92	32	98	98	0.7	98.8
% Transect Length Comprising Upland Vegetation Communities	100	0	1	2	2	2	1.2	1.2
% Transect Length Comprising Unvegetated Open Water	0	100	5	34	0	0	0	0
% Transect Length Comprising Mud Flat	0	0	2	32	0	0	98	0

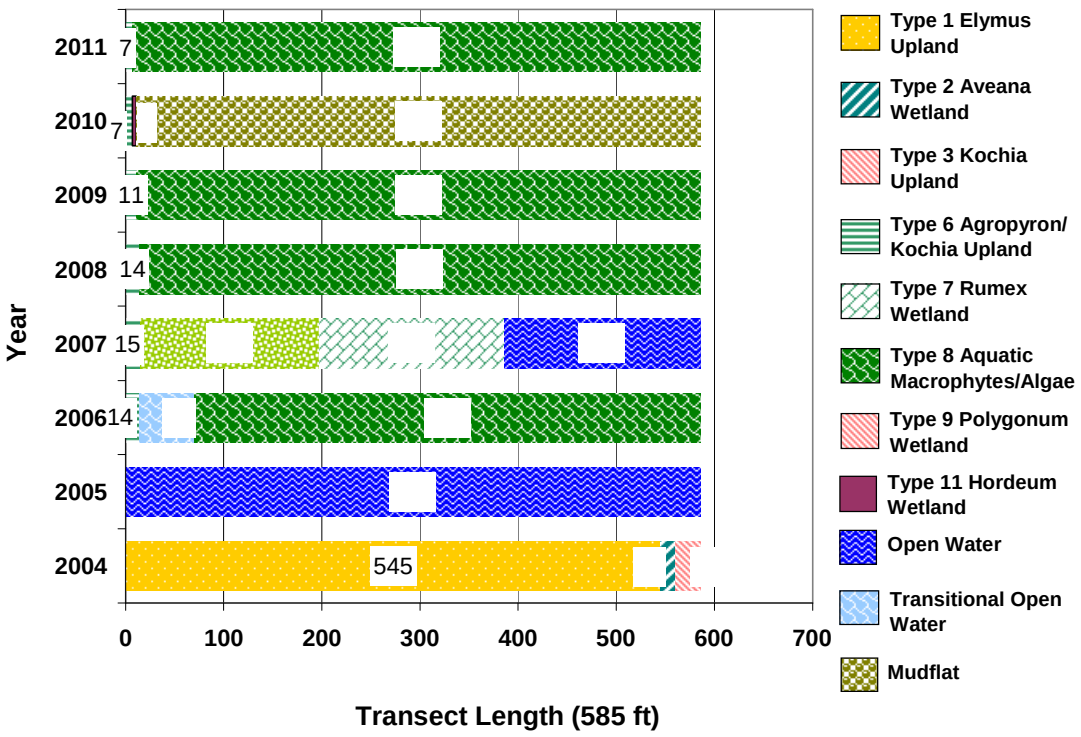


Chart 1. Transect maps from 2004 to 2011 showing vegetation and land cover types on Transect 1 from start (0 feet) to finish (585 feet).

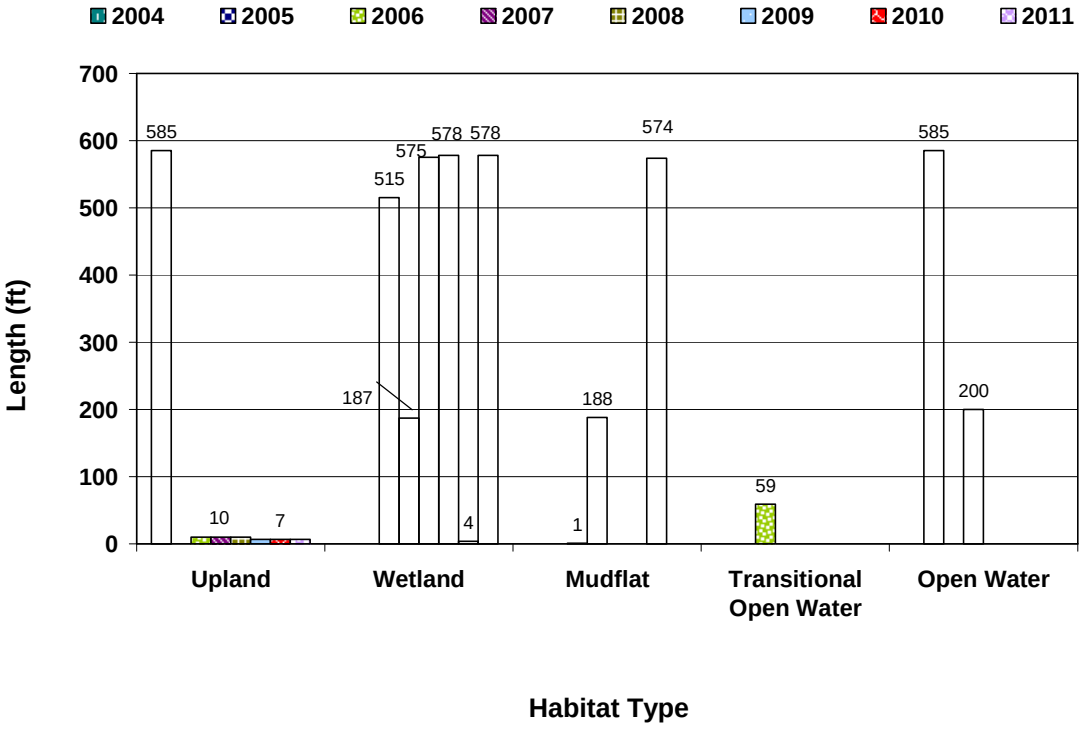


Chart 2. Length of habitat types on Transect 1 from 2004 to 2011.

Vegetation transect 2 data are summarized in Table 3 and Charts 3 and 4. Vegetation details are included on the Monitoring Form (Appendix B). Photographs at the end points of the transect are shown on page C-6 of Appendix C. Similar to T-1, Transect 2 extended from the upland berm to the aquatic macrophytes/algae community in 2011. The majority of this transect was mapped as mudflat in 2010 owing to the decreased water levels and exposed soil surface. The majority of transect in 2011 was covered with one to two feet of water containing algae and submerged aquatic plants. Similar to transect 1, an estimated 75 percent of transect 2 was covered in vegetation, predominantly hydrophytes. The remaining 25 percent of the transect was open water.

Table 3. Data summary for Transect 2 from 2004 to 2011 at the Little Muddy Creek Wetland Mitigation Site.

Monitoring Year	2004	2005	2006	2007	2008	2009	2010	2011
Transect Length (feet)	310	310	310	310	310	310	310	310
Vegetation Community Transitions along Transect	1	2	3	1	2	2	1	1
Vegetation Communities along Transect	2	3	3	2	3	3	1	2
Hydrophytic Vegetation Communities along Transect	0	0	2	1	2	2	0	1
Total Vegetative Species	5	4	7	11	8	10	12	7
Total Hydrophytic Species	2	2	4	8	4	6	9	3
Total Upland Species	3	2	3	3	4	4	3	4
Estimated % Total Vegetative Cover	60	30	14	40	70	58	5	75
% Transect Length Comprising Hydrophytic Vegetation Communities	0	0	2.0	2.0	98	98	0	96.1
% Transect Length Comprising Upland Vegetation Communities	100	2	2.5	2.5	2	2	3.9	3.9
% Transect Length Comprising Unvegetated Open Water	0	96	96	93	0	0	0	0
% Transect Length Comprising Mudflat*	0	1	0	2.5	0	0	96.1	0

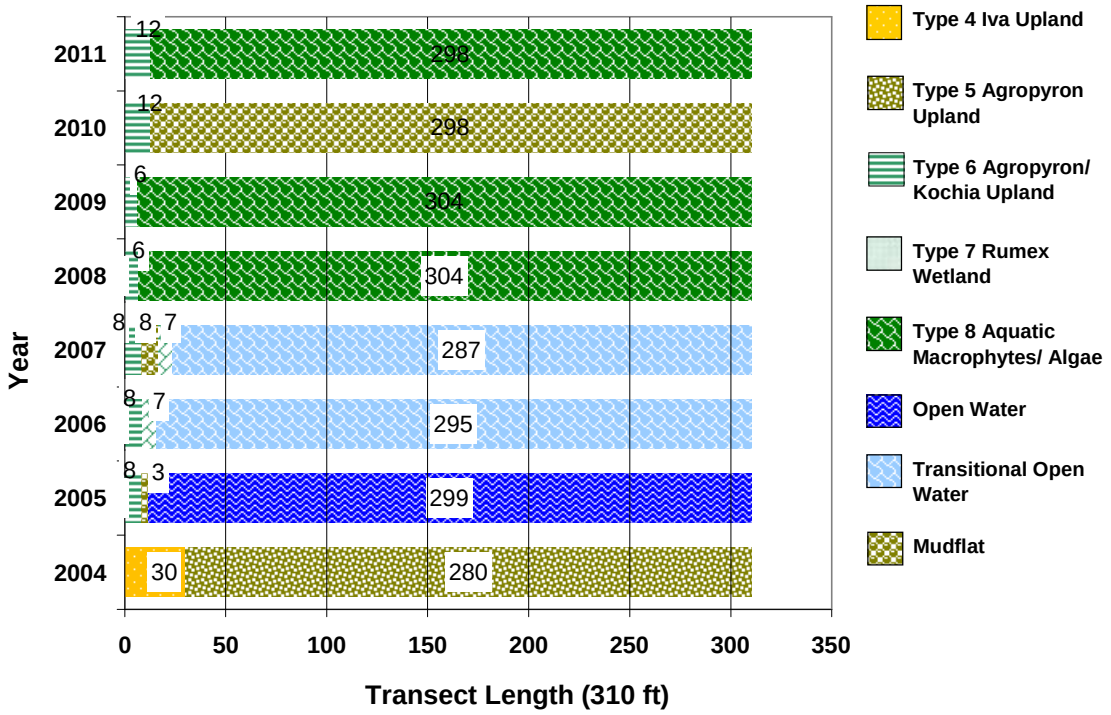


Chart 3. Transect maps showing vegetation types and habitats from 2004 to 2011 on Transect 2 from start (0 feet) to finish (310).

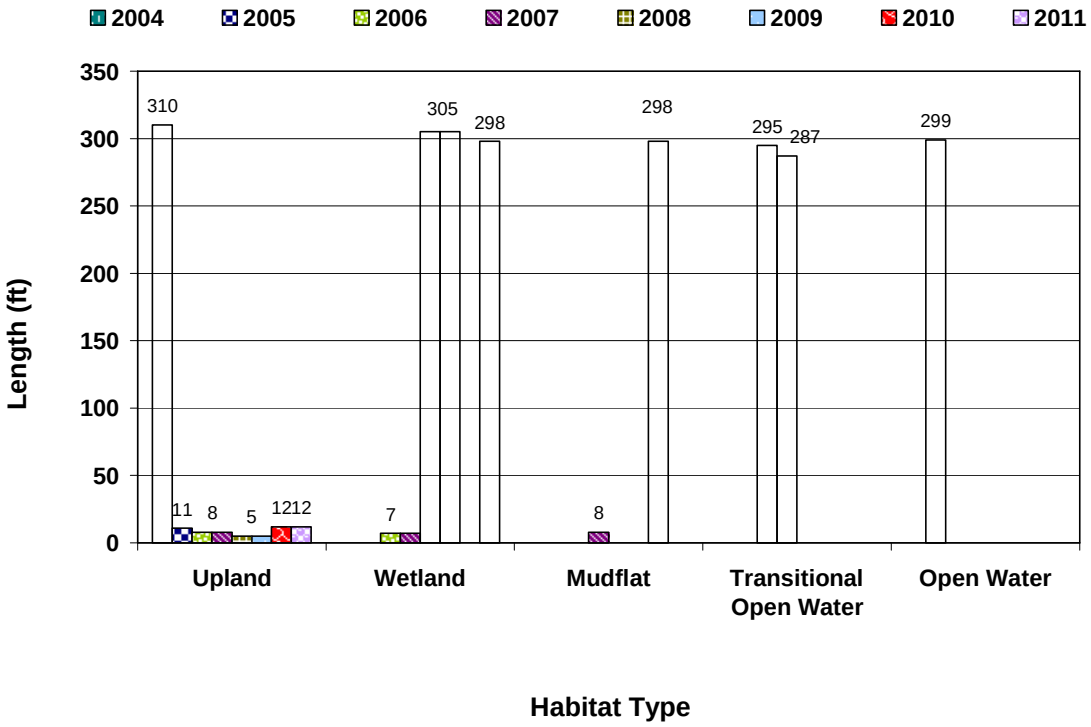


Chart 4. Length of habitat types within Transect 2 from 2004 to 2011.

Three infestations of Canada thistle (*Cirsium arvense*), a Priority 2B weed, were mapped at less than 0.1 acre in size and low (1 to 5 percent) cover. One Canada thistle infestation was mapped at 0.1 to 1.0 acre in size with moderate (5 to 25 percent) cover. The locations of these infestations are shown in Figure 3 of Appendix A.

3.3. Soil

The three soil types mapped at the site prior to project development and exhibited high clay contents and low permeabilities conducive to pond construction (USDA 2010). Mapped soils include the Lallie Silty Clay Loam, the Absher-Nobe Complex, and Marvan Clay. The Lallie series consists of very deep, poorly drained and very poorly drained, slowly permeable soils formed in lake basins and old oxbows. The Absher and Nobe series consists of very deep, moderately well drained soils that formed in clayey alluvium from sedimentary beds, found on till plains, alluvial fans, floodplains, stream terraces, and drainageways. The Marvan series consist of very deep, well drained soils that formed in alluvium, lacustrine deposits, or in residuum from semiconsolidated shale. The Lallie, Marvan, and Nobe series are found on Montana's Hydric Soil list.

Data point LM-1 was located in an area mapped as Lallie Silty Clay Loam; LM-2 through LM-4 soils were mapped in the Absher-Nobe Complex; and soils at data points LM-5 and LM-6 were mapped in the Marvan Clay series. The soil structure in the area of the berm was disrupted during construction of the impoundments. A majority of the site soils had been historically cultivated and were not disturbed during construction. Site soils were inundated from 2005 to spring 2010 when water levels were lowered for berm repair. Following completion of the berm repair in fall 2010, the water levels returned to full-pool by the spring 2011 and were again inundated and saturated throughout the mitigation wetland. In general, the soil profiles described at the test pits corresponded to the NRCS mapped soil series.

Hydric soils were identified at all data points except LM-6. A low chroma in the dark gray (10YR 4/1) matrix was the primary hydric indicator. Redoximorphic concentrations were present in the low chroma matrix of data points LM-1 and LM-5. Depletions within the matrix were observed in the soil profile at data points LM-3 and LM-4. Although the soil at LM-6 was not considered hydric, the low chroma matrix and redox concentrations observed below 12 inches suggest a shallow water table in this area.

3.4. Wetland Delineation

According to the preliminary site investigation, 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. 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 2010 investigation. The drop in surface water levels across the site resulted in a decrease in the area of the Algae/Aquatic Plants wetland type (community type 8 in 2009) and an increase in the extent of mud flats (Table 4). Wetlands and other special aquatic sites, including mud flat and transitional open water encompassed 194.47 acres in 2010.

Water levels had returned to the design elevation by the 2011 site survey. A substantial increase in Type 8 – Algae/Aquatic plants was the result of this increase in water level. Approximately 191 acres were delineated in 2011. The wetland/upland transition between upland Type 13 and wetland Type 15 was surveyed with a GPS owing to the lack of features observable on the aerial photo and to refine the boundary depicted in the 2010 report. A diverse array of wetland community types have been documented at the Little Muddy wetland mitigation site, and providing a diversity of habitat for a variety of dabbler and diving waterfowl, and wading and shore birds.

Table 4: Acreage of wetlands and other special aquatic sites in 2011 at the Little Muddy Creek Wetland Mitigation Site.

Wetlands and Other Special Aquatic Sites	Acreage				
	2007	2008	2009	2010	2011
Type 7 - *Rumex maritimus* Wetland Fringe	0.24	1.43	1.54	--	--
Type 8 - Algae/Aquatic Plants Wetland	--	69.38	119.52	1.86	145.72
Type 9 - *Polygonum aviculare* Wetland	30.84	--	--	5.69	11.33
Type 10 - *Typha latifolia* Wetland	0.57	9.76	9.55	1.03	1.44
Type 11 - *Hordeum jubatum* Wetland	12.76	13.61	6.92	59.38	18.12
Type 8/10 - *Aquatic Plants*/*Typha* Wetland	--	--	--	--	1.00
Type 9/11 - *Polygonum*/*Hordeum* Wetland	19.12	6.23	1.79	--	--
Type 10/11 - *Typha*/*Hordeum* Wetland	1.15	--	--	--	--
Type 12 - *Alisma gramineum* Wetland	0.38	0.39	0.39	--	--
Type 14 - *Rumex*/*Eleocharis* Wetland	--	9.47	23.11	20.87	--
Type 15 - *Typha*/*Helianthus* Wetland	--	--	--	9.98	12.40
Type 16 - *Scirpus*/*Typha* Wetland	--	--	--	0.35	0.35
Type 17 - Open Water	--	--	--	37.12	--
Type 18 - Mud Flat Wetland	--	--	--	58.16	--
Type 19 - *Eleocharis palustris* Wetland	--	--	--	--	0.01
Type 20 - *Salix* spp. Wetland	--	--	--	--	0.65
Total Wetland Habitat	**65.06**	**110.27**	**162.82**	**194.47**	**191.01**

3.5. Wildlife

Direct observations of wildlife species and signs indicating presence have been compiled since 2004 (Table 5). A notable change in the number of bird guilds was observed from 2004 to 2005. Bird guilds observed in 2005 have persisted through 2011. Twenty-one bird species were observed in 2011 and are noted in Table 5. Owing to the extent of the open water, the use of a spotting scope and formal bird survey would undoubtedly result in additional waterfowl observation at this site. Hundreds of individual birds were observed throughout the field survey in 2011. Shallow open water with abundant aquatic plants provided excellent

forage for a range of waterfowl. Abundant shorebirds were observed along the margin of the open water. Fluctuating water levels promoted ample opportunities for shorebirds that forage on macroinvertebrates in the exposed mud. Red-winged blackbirds (*Agelaius phoeniceus*) inhabited the cattail fringes of the open water.

Several common gartersnakes (*Thamnophis sirtalis*) were observed along the west boundary of the wetland in areas that appeared to have been inundated during the first part of the 2011 growing season and exposed by the August 17 survey owing to the decrease in water elevation. Northern leopard frogs (*Rana pipiens*) were also noted along this boundary and likely provide an important food source for the gartersnakes. Several large white-tailed bucks (*Odocoileus* virginianus), pronghorns (*Antilocapra americana*), and a coyote (*Canis latrans*) were observed on the site within the uplands along the western boundary. A muskrat (*Ondatra zibethicus*) was observed within community Type 8/10 along the southern boundary. Raccoon (*Procyon lotor*) tracks were observed throughout the muddy fringes of the wetland.

Table 5: Wildlife species observed within the Little Muddy Creek Wetland Mitigation Site in 2004 to 2011.

COMMON NAME	SCIENTIFIC NAME
AMPHIBIAN	
Northern Leopard Frog	***Rana pipiens***
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*

Species identified in 2011 are listed in **bold** type.

Table 5. (Continued): Fish and wildlife species observed within the Little Muddy Creek Wetland Mitigation Site in 2004 to 2011.

COMMON NAME	SCIENTIFIC NAME
BIRD	
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***
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*

Species identified in 2011 are listed in **bold** type.

Table 5. (Continued): Fish and wildlife species observed within the Little Muddy Creek Wetland Mitigation Site in 2004 to 2011.

COMMON NAME	SCIENTIFIC NAME
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 identified in 2011 are listed in **bold** type.

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 MWAM (Berglund and McEldowney 2008). Assessment results from 2006 to 2011 are presented in Table 6. The assessment area (AA) evaluated in 2011 included the entire wetland area that has developed as a result of mitigation construction. Emergent marsh and open water/aquatic plant habitats were prevalent within the 191-acre AA. A scrub/shrub habitat type was developing along the inlet channel although it occupied less than half of a percent of the total AA.

The Little Muddy Creek Wetland Mitigation Site has been classified as a Category II wetland from 2006 to 2011 based in part on the exceptional rating for wildlife habitat (Table 6). The total functional points and percent score decreased slightly in 2011 as a result of the decrease in the size of the AA and the modification of the groundwater discharge/recharge rating to NA. The percent of possible score exhibited a consistent increase from 2007 to 2010. The site received high ratings for short and long term surface water storage, sediment/nutrient/toxicant removal, sediment/shoreline stabilization, and production export//food chain support. A total of 1356.17 functional units was calculated for this mitigation site based on the results of the 2011 survey.

Table 6. Summary of wetland function/value ratings and functional points from 2006 to 2011 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]	2011 [2]
Listed/Proposed T&E Species Habitat	Mod (0.7)	Low (0.0)	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)	Mod (0.6)
General Wildlife Habitat	Exc (1.0)	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)	Low (0.3)
Flood Attenuation	Mod (0.6)	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)	High (1.0)
Sediment/Nutrient/Toxicant Removal	Mod (0.7)	Mod (0.7)	High (1.0)	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)	High (1.0)
Production Export/Food Chain Support	High (0.9)	High (0.8)	High (0.9)	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)	NA
Uniqueness	Mod (0.4)	Mod (0.4)	Mod (0.4)	Mod (0.4)	Mod (0.6)	Mod (0.6)
Recreation/Education Potential	Mod (0.7)	Mod (0.7)	Mod (0.1)	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**	**7.1/10**
% of Possible Score	**58%**	**55%**	**56%**	**56%**	**66.4%**	**71.0%**
Overall Category	**II**	**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**	**191.01**
Functional Units (acreage x actual points)	**1298.93**	**1032.50**	**1122.94**	**1176.82**	**1419.63**	**1356.17**

[1](Berglund 1999)

[2](Berglund and McEldowney 2008)

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-5 of Appendix C Panoramas taken at PP2 and PP3 are presented on pages C-7 and C-8 of Appendix C. Photographs of transect end points are shown on C-5 and C-6. Data points LM-1 through LM-6 are shown on page C-8 and C-9 of Appendix C.

3.8. Maintenance Needs

The excavated channels and inlet/outlet structures were in good condition during the 2011 site visit. Repair work along the berm was completed in 2010 and it was in excellent condition when observed during the 2011 field survey. Canada thistle, a Priority 2B noxious weed, was mapped at four locations in 2011 and comprised less than 1 percent of the total vegetation cover throughout the mitigation site. Three infestations of Canada thistle (*Cirsium arvense*), a Priority 2B weed), were mapped at less than 0.1 acre in size and low (1 to 5 percent) cover. One Canada thistle infestation was mapped at 0.1 to 1.0 acre in size with moderate (5 to 25 percent) cover. The locations of these infestations are shown in Figure 3 of Appendix A. No woody species were planted at this site. Natural willow and cottonwood recruitment has occurred along a reach of the inlet channel near photo point 3. A few bluebird boxes were observed on the ground next to the inlet channel and had yet to be installed.

3.9. Current Credit Summary

Approximately 191 acres of Class II wetlands were delineated within the Little Muddy Creek mitigation area in 2011 (Figure 3, Appendix A). No specific performance criteria or ratios were stipulated in USACE correspondence regarding this project.

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. 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. The USACE approved application of these projected impact acres to the Little Muddy Creek 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. Consequently, 2.87 acres of "owed" mitigation was approved for application against the Little Muddy Creek site, with any additional projects (including Bowman's Corner) to be applied against the 50-acre "reserve". As of 2011, 191.01 acres of wetland habitat and 1356.17 functional units have developed on the Little Muddy Creek wetland mitigation site.

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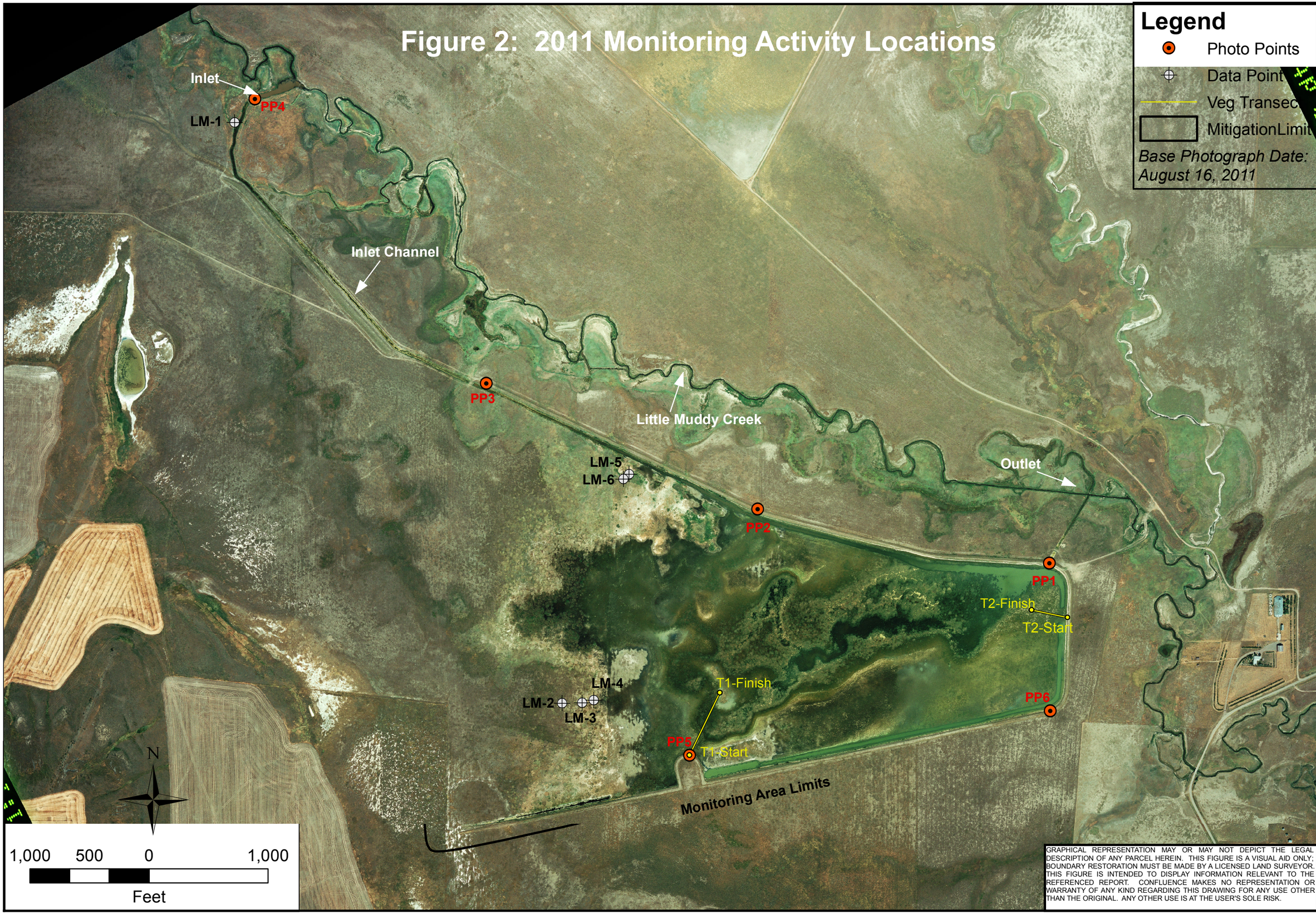
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Appendix A

Figures 2 and 3

MDT Wetland Mitigation Monitoring
Little Muddy Creek
Cascade County, Montana

Figure 2: 2011 Monitoring Activity Locations



Legend

- Photo Points
- Data Point
- Veg Transec
- MitigationLimit

Base Photograph Date: August 16, 2011

LOCATION: Cascade Co., MT

PROJECT NO: STPX 7(38)

FILE: LittleMuddy/Monitor2011.mxd

Project Name: Little Muddy Creek Wetland Mitigation

Drawing Title: 2011 Monitoring Activity Locations

DRAWN	CHECKED	APPROVED
BS	BV	JJ

SCALE: Noted

Drawn: September 8, 2011

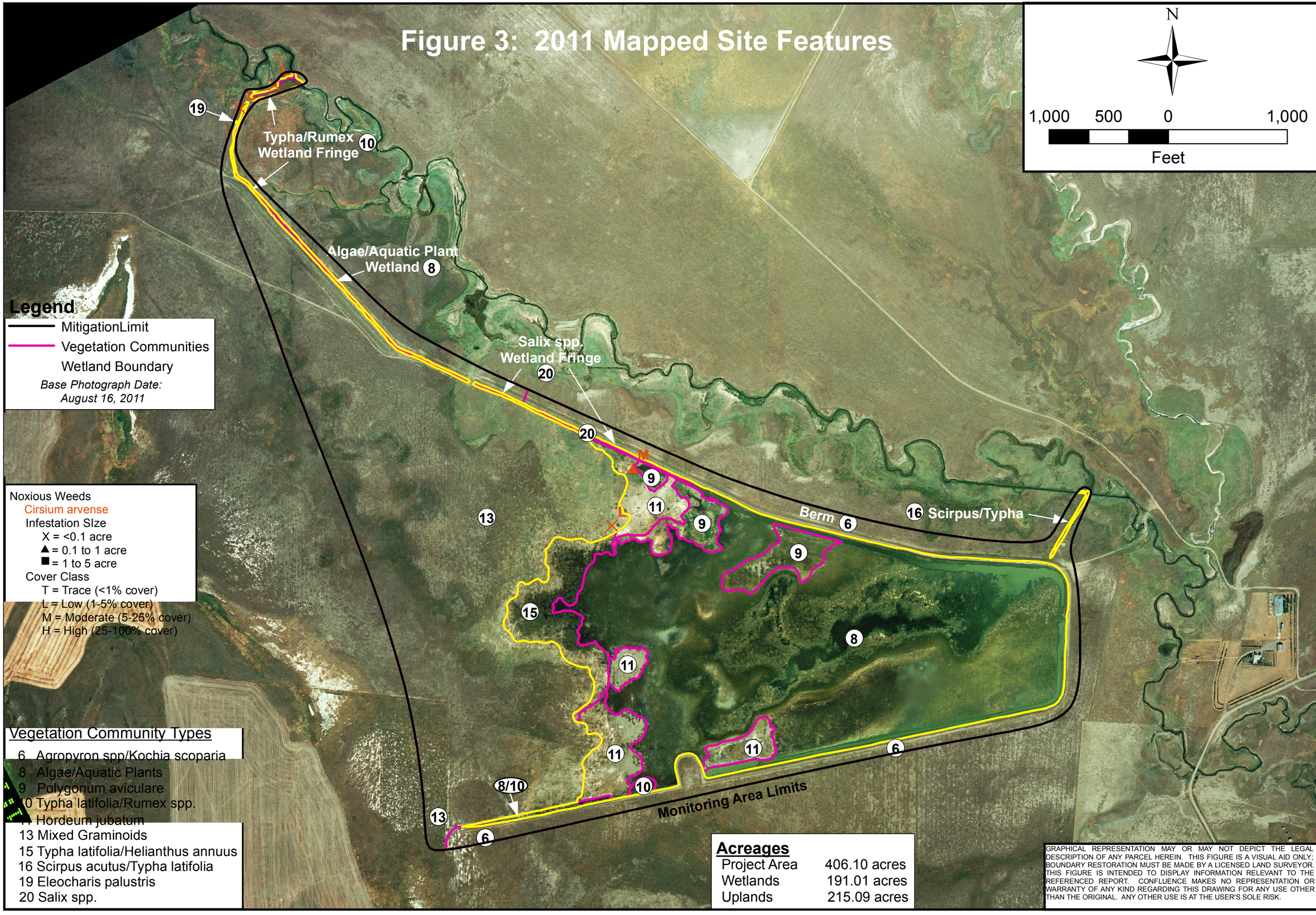
PROJ MGR: B Sandefur

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 WARRANTY OF ANY KIND REGARDING THIS DRAWING FOR ANY USE OTHER THAN THE ORIGINAL. ANY OTHER USE IS AT THE USER'S SOLE RISK.

Figure 2

Figure 3: 2011 Mapped Site Features



N

1,000 500 0 1,000

Feet

Legend

- MitigationLimit
- Vegetation Communities
- Wetland Boundary

Base Photograph Date: August 16, 2011

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)

Vegetation Community Types

6 Agropyron spp/Kochia scoparia
8 Algae/Aquatic Plants
9 Polygonum aviculare
10 Typha latifolia/Rumex spp.
11 Hordeum jubatum
13 Mixed Graminoids
15 Typha latifolia/Helianthus annuus
16 Scirpus acutus/Typha latifolia
19 Eleocharis palustris
20 Salix spp.

Acreages

Project Area	406.10 acres
Wetlands	191.01 acres
Uplands	215.09 acres

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 THAN THE ORIGINAL. ANY OTHER USE IS AT THE USER'S SOLE RISK.

LOCATION: Cascade Co., MT

PROJECT NO: STPX 7(38)

FILE: LittleMuddy/Veg2011.mxd

Project Name: Little Muddy Creek Wetland Mitigation

Drawing Title: 2011 Mapped Site Features

DRAWN BS | CHECKED BV | APPROVED JJ

SCALE: Noted

Drawn: September 8, 2011

PROJ MGR: B Sandefur

CONFLUENCE consulting incorporated

Figure 3

Appendix B

2011 Wetland Mitigation Site Monitoring Form
2011 USACE Wetland Delineation Form
2011 MDT Functional Assessment Form

MDT Wetland Mitigation Monitoring
Little Muddy Creek
Cascade County, Montana

MDT WETLAND MITIGATION SITE MONITORING FORM

Project Site: Little Muddy Creek Assessment Date/Time 8/17/2011 9:41:46 AM

Person(s) conducting the assessment: B. Sandefur, S. Fraizer

Weather: Warm & clear, mid 80s Location: 9 miles SW of Ulm

MDT District: Great Falls Milepost: NA

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

Initial Evaluation Date: 6/4/2004 Monitoring Year: 8 #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: 1.3 **(ft)** Range of Depths: 0-6 **(ft)**

Percent of assessment area under inundation: 35 %

Depth at emergent vegetation-open water boundary: 6 **(ft)**

If assessment area is not inundated then are the soils saturated within 12 inches of surface: Yes

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

Algal mats, soil cracks, surface water, saturation, drift deposits, aquatic fauna on soil surface, sparsely vegetated surfaces, stunted vegetation.

Groundwater Monitoring Wells

Record depth of water surface below ground surface, in feet.

Well ID	Water Surface Depth (ft)
No wells	

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:

Approximately 6-8 inches of freeboard on outlet control structure. Water levels appear to have been at the outflow level during the early part of the growing season.

VEGETATION COMMUNITIES

Site Little Muddy Creek

(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 **Acres:** 38.12

Species	Cover class	Species	Cover class
Agropyron intermedium	3	Agropyron smithii	2
Bromus tectorum	2	Elymus varnensis	3
Grindelia squarrosa	1	Helianthus annuus	0
Hordeum jubatum	2	Iva axillaris	1
Kochia scoparia	3	Sisymbrium altissimum	1

Comments:

Community # 8 **Community Type:** Algae / Aquatic Plants **Acres:** 145.7

Species	Cover class	Species	Cover class
Algae, green	4	Alisma gramineum	1
Eleocharis palustris	0	Myriophyllum spp.	2
Open water	5	Polygonum aviculare	1
Potamogeton spp.	2	Rumex crispus	0

Comments:

Community # 9 **Community Type:** Polygonum aviculare / **Acres:** 11.33

Species	Cover class	Species	Cover class
Alisma gramineum	2	Bare ground	4
Chenopodium album	1	Kochia scoparia	2
Polygonum aviculare	3		

Comments:

Community along margin of inundation, appears to be periodically inundated, nearly continuous saturation.

Community # 10 **Community Type:** Typha latifolia / Rumex spp. **Acres:** 1.44

Species	Cover class	Species	Cover class
Cirsium arvense	0	Eleocharis palustris	2
Glycyrrhiza lepidota	1	Helianthus annuus	1
Hordeum jubatum	2	Melilotus alba	1
Mentha arvensis	1	Plantago lanceolata	1
Polypogon monspeliensis	1	Rumex crispus	3
Rumex maritimus	1	Sagittaria cuneata	0
Scirpus acutus	2	Sonchus arvensis	1
Spartina pectinata	1	Typha latifolia	4

Comments:

Community primarily present as a narrow fringe along inlet channel.

Community # 11 **Community Type:** Hordeum jubatum / **Acres:** 18.12

Species	Cover class	Species	Cover class
Agropyron trachycaulum	1	Cirsium arvense	1
Helianthus annuus	0	Hordeum jubatum	4
Iva axillaris	1	Kochia scoparia	0
Rumex crispus	2	Scirpus acutus	0
Typha latifolia	2		

Comments:

Community located along water margin. Vegetation appears to be dictated by periodic saturation/drawdown cycles.

Community # 13 **Community Type:** Mixed Graminoids / **Acres:** 177

Species	Cover class	Species	Cover class
Achillea millefolium	1	Agropyron cristatum	2
Agropyron intermedium	1	Bromus carinatus	1
Bromus inermis	2	Bromus tectorum	3
Chenopodium album	0	Cirsium arvense	0
Elymus cinereus	1	Grindelia squarrosa	1
Helianthus annuus	1	Hordeum jubatum	3
Iva axillaris	2	Kochia scoparia	0
Lepidium perfoliatum	2	Melilotus officinalis	1
Sonchus arvensis	1		

Comments:

Community # 15 Community Type: Typha latifolia / Helianthus annuus **Acres:** 12.4

Species	Cover class	Species	Cover class
Alopecurus pratensis	1	Helianthus annuus	2
Hordeum jubatum	2	Iva axillaris	0
Myriophyllum sp	0	Polygonum aviculare	1
Rumex crispus	2	Typha latifolia	5

Comments:

Community # 16 Community Type: Scirpus acutus / Typha latifolia **Acres:** 0.35

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

Comments:

Community established along outlet channel.

Community # 19 Community Type: Eleocharis palustris / **Acres:** 0.005

Species	Cover class	Species	Cover class
Agropyron smithii	1	Beckmannia syzigachne	2
Eleocharis palustris	5		

Comments:

Community includes a narrow depression just below inlet channel and appears to be an overflow swale of Little Muddy Creek. Wetland community not directly connected to inlet channel.

Community # 20 Community Type: Salix spp. / **Acres:** 0.65

Species	Cover class	Species	Cover class
Cirsium arvense	0	Eleocharis palustris	4
Hordeum jubatum	2	Populus deltoides	1
Ranunculus cymbalaria	1	Rumex crispus	1
Salix exigua	3	Salix lutea	3
Scirpus acutus	1	Scirpus maritimus	1
Typha latifolia	1		

Comments:

Community located along margin of inlet channel and includes the natural regeneration of willows.

Total Vegetation Community Acreage **405.105**

(Note: some area within the project bounds may be open water or other non-vegetative ground cover.)

VEGETATION TRANSECTS

Site: Little Muddy Creek Date: 8/17/2011 9:41:46 AM

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 intermedium	3	Agropyron smithii	2
Bromus tectorum	2	Elymus varnensis	2
Hordeum jubatum	2	Kochia scoparia	1

Ending Station 585 **Community Type:** Algae / Aquatic Plants

Species	Cover class	Species	Cover class
Algae, green	4	Myriophyllum sp	3
Open water	5	Polygonum aviculare	1
Potamogeton sp.	2	Rumex crispus	0

Transect Notes:

Transect consists of inundated aquatic macrophytes after first interval.

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	3	Chenopodium album	1
Hordeum jubatum	1	Kochia scoparia	2

Ending Station 310 **Community Type:** Algae / Aquatic Plants

Species	Cover class	Species	Cover class
Algae, green	4	Myriophyllum sp	2
Open water	5	Potamogeton sp.	3

Transect Notes:

Similar to T-1, most of transect covered in 1-2ft of water with algae and submerged aquatics.

PLANTED WOODY VEGETATION SURVIVAL

Little Muddy Creek

Planting Type	#Planted	#Alive	Notes
None planted			

Comments

Abundant natural sandbar and yellow willow recruitment along inlet canal.

Little Muddy Creek

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	4	F, FO, L	MA, MF, OW, WM
American White Pelican	12	F, FO, L	OW
American Wigeon	2	F, L	OW
Blue-winged Teal	5	F, FO	OW
Brewer's Blackbird	6	FO, L	UP, WM
Canada Goose	36	F, FO, L	MA, OW, UP
Double-crested Cormorant	3	F, FO, L	MA, OW, WM
Ferruginous Hawk	2	FO	UP, WM
Franklin's Gull	26	F, FO, L	MA, OW, WM, US
Great Blue Heron	2	F, FO, L	MA, MF, OW, UP, WM
Green-winged Teal	3	F, L	OW
Killdeer	10	F, L	US
Mallard	24	F, L	MA, OW, WM
Mourning Dove	4	BP, L	SS, UP, WM
Northern Harrier	1	F, FO	UP, WM
Northern Shoveler	3	L	OW
Red-winged Blackbird	22	FO, L	MA, OW, WM
Sandhill Crane	8	BD, L	MA, OW, UP
Spotted Sandpiper	12	F	US
Western Meadowlark	5	FO, L	SS, UP, WM
Wilson's Phalarope	3	F	US

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
Common Gartersnake	20	No	No	No	Numerous snakes observed along western wetland boundary
Coyote	1	No	No	No	
Muskrat	1	No	No	No	
Northern Leopard Frog	6	No	No	No	
Pronghorn	12	No	No	No	
Raccoon		Yes	Yes	No	
White-tailed Deer	10	Yes	No	No	Several large bucks observed on site

Wildlife Comments:

Little Muddy Creek

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
8678	47.370258	-111.658386	71	PP4
8679	47.370258	-111.658386	208	PP4
8686	47.369873	-111.659172	0	LM-1
8689	47.363831	-111.650398	130	PP-3
8690	47.361141	-111.6409	180	PP2
8691-8697	47.361141	-111.6409	40	PP2, pano
8699	47.360085	-111.630997	136	PP-1
8700	47.360085	-111.630997	210	PP-1
8701	47.360085	-111.630997	40	PP-1
8703	47.358845	-111.630234	265	T-2, start
8705	47.35672	-111.630844	317	PP6
8706-8710	47.356693	-111.630844		PP6 pano
8713	47.355415	-111.643005	10	T-1 Start
8714	47.355408	-111.64299	316	PP5
8717-8722	47.363918	-111.650238	180	PP3 pano
8723	47.356819	-111.646584	0	LM-3
8724	47.356602	-111.647293	10	LM-2
8725	47.35659	-111.64624	120	LM-4
8736	47.36306	-111.644928	280	LM-5
8737	47.361782	-111.645477	150	LM-6

Comments:

Little Muddy Creek

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?

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 in need of repair? No

If yes, describe the problems below.

Maintenance along levee completed in 2010 and intact. All water control structures in good working order.

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

Project/Site: Little Muddy | City/County: Cascade | Sampling Date: 8/17/2011

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

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

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

Subregion (LRR): LRR E | Lat: 47.369873 | Long: -111.658386 | Datum: WGS 84

Soil Map Unit Name: Lallie silty 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:
Data point located in overflow swale not connected directly to Little Muddy.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1.	0	☐	
2.	0	☐	
3.	0	☐	
4.	0	☐	
	0 = Total Cover		
Sapling/Shrub Stratum (Plot size:)			
1.	0	☐	
2.	0	☐	
3.	0	☐	
4.	0	☐	
5.	0	☐	
	0 = Total Cover		
Herb Stratum (Plot size: 5ft)			
1. Eleocharis palustris	70	☑	OBL
2. Beckmannia syzigachne	20	☑	OBL
3. Agropyron smithii	5	☐	FACU
4.	0	☐	
5.	0	☐	
6.	0	☐	
7.	0	☐	
8.	0	☐	
9.	0	☐	
10.	0	☐	
11.	0	☐	
	95 = Total Cover		
Woody Vine Stratum (Plot size:)			
1.	0	☐	
2.	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:

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
0-1	10YR 3/1	100					Clay Loam	
1-14	10YR 4/1	95	10YR 5/6	5	C	M	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
- ☐ Aquic 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: Evidence of surface inundation during early part of 2011 growing season. Other signs of hydrology included aquatic fauna and algal mat/crust on soil surface.

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

Project/Site: Little Muddy | City/County: Cascade | Sampling Date: 8/18/2011

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

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

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

Subregion (LRR): LRR E | Lat: 47.3565916666667 | Long: -111.647326666667 | Datum: WGS 84

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:
Abundant hydro indicators, comm may shift with increased frequency of inundation. Data point located along margin of inundation/saturation during high water levels.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1.	0	☐	
2.	0	☐	
3.	0	☐	
4.	0	☐	
	0 = Total Cover		
Sapling/Shrub Stratum (Plot size:)			
1.	0	☐	
2.	0	☐	
3.	0	☐	
4.	0	☐	
5.	0	☐	
	0 = Total Cover		
Herb Stratum (Plot size: 5ft)			
1. Bromus inermis	45	☑	NO
2. Hordeum jubatum	20	☑	FAC+
3. Agropyron smithii	20	☑	FACU
4.	0	☐	
5.	0	☐	
6.	0	☐	
7.	0	☐	
8.	0	☐	
9.	0	☐	
10.	0	☐	
11.	0	☐	
	85 = Total Cover		
Woody Vine Stratum (Plot size:)			
1.	0	☐	
2.	0	☐	
	0 = Total Cover		

% Bare Ground in Herb Stratum 5

Dominance Test worksheet:

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

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

Percent of Dominant Species That Are OBL, FACW, or FAC: 33 (A/B)

Dominance Test is >50% ☐

Hydrophytic Vegetation Present? Yes ☐ No ☑

Remarks:

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 3/1	100					Clay	
4-14	10YR 4/1	100					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
- ☐ Aquic 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 Leptic Torrertic Natrustalfs

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: Data point inundated during highest water levels. Other hydro indicators included surface soil cracks and algal mat/crust.

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

Project/Site: Little Muddy | City/County: Cascade | Sampling Date: 8/18/2011

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

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

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

Subregion (LRR): LRR E | Lat: 47.356615 | Long: -111.646651666667 | Datum: WGS 84

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:
Hydro and soils present, lacks hydrophytic vegetation.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1.	0	☐	
2.	0	☐	
3.	0	☐	
4.	0	☐	
	0 = Total Cover		
Sapling/Shrub Stratum (Plot size:)			
1.	0	☐	
2.	0	☐	
3.	0	☐	
4.	0	☐	
5.	0	☐	
	0 = Total Cover		
Herb Stratum (Plot size: 5ft)			
1. Agropyron smithii	60	☑	FACU
2. Typha latifolia	5	☐	OBL
3. Hordeum jubatum	15	☐	FAC+
4.	0	☐	
5.	0	☐	
6.	0	☐	
7.	0	☐	
8.	0	☐	
9.	0	☐	
10.	0	☐	
11.	0	☐	
	80 = Total Cover		
Woody Vine Stratum (Plot size:)			
1.	0	☐	
2.	0	☐	
	0 = Total Cover		

% Bare Ground in Herb Stratum 10

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:
Hydrophytic vegetation may become established with increased periods of wetland hydrology. Current veg com may reflect the drier conditions present during 2010 growing season as water level was significantly decreased for levee maintenance.

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
0-3	10YR 3/1	100					Clay	
3-17	10YR 4/1	95	10YR 2/2	3	D	M		

[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
- ☐ Aquic 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 Leptic Torrertic Natrustalfs

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: Data point appears to be periodically inundated when water levels are at the highest designed elevation. The presence of algal mats/crust, soil cracks, water marks and sediment deposit substantiate the presence of periodic inundation at this point.

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

Project/Site: Little Muddy | City/County: Cascade | Sampling Date: 8/18/2011

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

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

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

Subregion (LRR): LRR E | Lat: 47.356675 | Long: -111.646263333333 | Datum: WGS 84

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:
Point near edge of inundation.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1.	0	☐	
2.	0	☐	
3.	0	☐	
4.	0	☐	
	0 = Total Cover		
Sapling/Shrub Stratum (Plot size:)			
1.	0	☐	
2.	0	☐	
3.	0	☐	
4.	0	☐	
5.	0	☐	
	0 = Total Cover		
Herb Stratum (Plot size: 5ft)			
1. Hordeum jubatum	20	☑	FAC+
2. Typha latifolia	40	☑	OBL
3. Alopecurus pratensis	5	☐	FACW
4. Rumex crispus	5	☐	FACW
5. Agropyron trachycaulum	30	☑	FAC
6.	0	☐	
7.	0	☐	
8.	0	☐	
9.	0	☐	
10.	0	☐	
11.	0	☐	
	100 = Total Cover		
Woody Vine Stratum (Plot size:)			
1.	0	☐	
2.	0	☐	
	0 = Total Cover		

% Bare Ground in Herb Stratum 0

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:

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
0-4	5PB 3/1	100					Silty Clay Loam	
4-13	10YR 4/1	85	5PB 3/1	15	D	M	Silty Clay	Gleyed soil in cracks, epi-saturation.

[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
- ☐ Aquic 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 Leptic Torrertic Natrustalfs

Confirm Mapped Type?: ☐

Hydric Soil Present? Yes ☑ No ☐

Remarks:

Soil pit excavated within 15ft of edge of surface water to a depth below water level. Pit left open for approx 30 minutes and no water entered pit, indicating very low hydraulic conductivity.

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: Area inundated during times of high water levels.

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

Project/Site: Little Muddy | City/County: Cascade | Sampling Date: 8/18/2011

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

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

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

Subregion (LRR): LRR E | Lat: 47.3618966666667 | Long: -111.645266666667 | Datum: WGS 84

Soil Map Unit Name: Marvan clay

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:
Point in veg comm 11

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1.	0	☐	
2.	0	☐	
3.	0	☐	
4.	0	☐	
	0 = Total Cover		
Sapling/Shrub Stratum (Plot size:)			
1.	0	☐	
2.	0	☐	
3.	0	☐	
4.	0	☐	
5.	0	☐	
	0 = Total Cover		
Herb Stratum (Plot size: 5ft)			
1. Ranunculus cymbalaria	30	☑	OBL
2. Rumex crispus	25	☑	FACW
3. Hordeum jubatum	25	☑	FAC+
4. Cirsium arvense	15	☐	FACU+
5.	0	☐	
6.	0	☐	
7.	0	☐	
8.	0	☐	
9.	0	☐	
10.	0	☐	
11.	0	☐	
	95 = Total Cover		
Woody Vine Stratum (Plot size:)			
1.	0	☐	
2.	0	☐	
	0 = Total Cover		

% Bare Ground in Herb Stratum 0

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:

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
0-5	10YR 3/2	100					Silty Clay Loam	
5-16	10YR 4/1	90	7.5YR 3/4	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
- ☐ Aquic 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 Sodic Haplusterts

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: Other hydro indicators observed at data point included surface soil cracks and algal mat/crust.

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

Project/Site: Little Muddy | City/County: Cascade | Sampling Date: 8/18/2011

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

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

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

Subregion (LRR): LRR E | Lat: 47.3617833333333 | Long: -111.645458333333 | Datum: WGS 84

Soil Map Unit Name: Marvan clay

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:
Located along slight elevation rise from LM-5.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1.	0	☐	
2.	0	☐	
3.	0	☐	
4.	0	☐	
	0 = Total Cover		
Sapling/Shrub Stratum (Plot size:)			
1.	0	☐	
2.	0	☐	
3.	0	☐	
4.	0	☐	
5.	0	☐	
	0 = Total Cover		
Herb Stratum (Plot size: 5ft)			
1. Rumex crispus	20	☐	FACW
2. Hordeum jubatum	15	☐	FAC+
3. Agropyron intermedium	65	☑	NO
4. Taraxacum officinale	15	☐	FACU
5.	0	☐	
6.	0	☐	
7.	0	☐	
8.	0	☐	
9.	0	☐	
10.	0	☐	
11.	0	☐	
	115 = Total Cover		
Woody Vine Stratum (Plot size:)			
1.	0	☐	
2.	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: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 50 (A/B)

Dominance Test is >50% ☐

Hydrophytic Vegetation Present? Yes ☐ No ☑

Remarks:

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
0-6	10YR 3/2	100					Silty Clay Loam	
6-12	10YR 4/2	100					Silty Clay Loam	
12-14	10YR 4/2	95	7.5YR 4/6	3	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
- ☐ Aquic 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 Sodic Haplusterts

Confirm Mapped Type?: ☐

Hydric Soil Present? Yes ☐ No ☑

Remarks:

Hydric indicators below 12in

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 **2. MDT project#** STPX 7(38) **Control#** 5033

3. Evaluation Date 8/17/2011 **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 10030102 **Watershed/County** 7-Missouri-Sun-Smith, Cascade County

7. Evaluating Agency Confluence for MDT

8. Wetland size acres 191.01

Purpose of Evaluation

How assessed: Measured e.g. by GPS

☐ **Wetlands potentially affected by MDT project**

9. Assesssment area (AA) size (acres) 191.01

☐ **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	Seasonal/Intermittant	9
Riverine	Emergent Wetland	Impounded	Permanent/Perennial	10
Riverine	Unconsolidated Bottom	Impounded	Permanent/Perennial	5
Riverine	Aquatic Bed	Impounded	Permanent/Perennial	75
Riverine	Scrub-Shrub Wetland	Impounded	Seasonal/Intermittant	1

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)

AA managed for wildlife habitat, primarily waterfowl production. Some levee maintenance completed in 2010 and included armouring levee with rock and fabric. Water levels returned to normal following work. AA consist primarily of aquatic bed with emergent wetland habitat located along margin of water's edge.

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. Diversion on Little Muddy Creek provides surface water into the site via inlet channel.

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: Willows established along inlet canal (S/S), emergent and aquatic bed 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 USFWS database for Cascade Co.

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 MTNHP database, field observations of Bald Eagle and Great Blue Heron.

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]):

- ☑ 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 waterfowl use of AA documented during each site visit. CRP and open land surrounding AA with excellent upland habitat. AA provides an oasis in arid landscape.

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** .3L

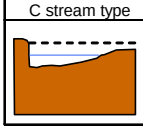
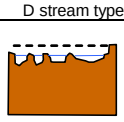
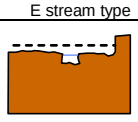
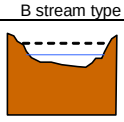
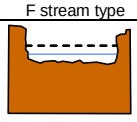
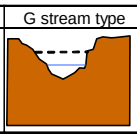
b) Does the AA contain a documented spawning area or other critical habitat feature (i.e., sanctuary pool, upwelling area, etc.- specify in comments) for native fish or introduced game fish? ( ) **Y** (●) **N** *If yes, add 0.1 to the adjusted score in* ***i*** *or* ***iia*** *above:*
Modifed Rating .3L

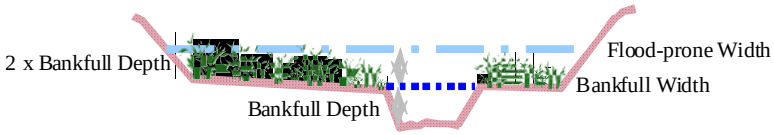
iii. Final Score and Rating: .3 L **Comments:** Increased development of aquatic macrophytes provide increased areas of cover and foraging opportunities.

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: Water into site controlled by headgate. Surface water within site recharged to capacity during spring runoff. Ranch infrastructure within 0.5 mile downstream of AA.

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: Mitigation site has potential to store a large quantity of surface water, approx 400 acre feet.

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: Greater than 70% cover of wetland vegetation in AA, ample evidence of flooding/ponding, AA with restricted outlet.

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: Vegetation along inlet channel consist of cattails, spike rush, willows, and bulrush. Some areas adjacent to open water sparsely vegetated due to periodic inundation.

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	.9	.6M	.7H	.4	.5M	.3L	.8H	.5M	.6M	.3L	.4M	.2L	.7H	.5M	.5M	.3L	.3L	.2L
T/E/A	.8	.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: Wetland with inlet, restricted outlet (stand pipe) with no flow leaving the wetland at time of field investigation. Very clayey soils.

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:

Mitigation site is used for hunting when permission is granted. Excellent site for bird watching.

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	114.606	☐
C. General Wildlife Habitat	E	1	1	191.01	☑
D. General Fish Habitat	L	.3	1	57.303	☐
E. Flood Attenuation	M	.6	1	114.606	☐
F. Short and Long Term Surface Water Storage	H	1	1	191.01	☑
G. Sediment/Nutrient/Toxicant Removal	H	1	1	191.01	☑
H. Sediment/Shoreline Stabilization	H	1	1	191.01	☐
I. Production Export/Food Chain Support	H	.9	1	171.909	☑
J. Groundwater Discharge/Recharge	NA	0	0	0	☐
K. Uniqueness	M	.6	1	114.606	☐
L. Recreation/Education Potential (bonus points)	M	.1	NA	19.101	☐
Totals:		7.1	10	1356.171	
Percent of Possible Score			**71** %		

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

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 2* **Location:** Outlet
Bearing: 210 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 2010**



Photo Point 1 – *Photo 1* **Location:** Restored Berm Area
Bearing: 136 Degrees **Taken in 2011**



Photo Point 1 – *Photo 2* **Location:** Outlet
Bearing: 210 Degrees **Taken in 2011**



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



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



Photo Point 1 – *Photo 3* **Location:** Outlet canal
Bearing: 40 Degrees **Taken in 2011**



Photo Point 2 – *Photo 1* **Location:** PP2
Bearing: 180 Degrees **Taken in 2011**



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



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



Photo Point 3 – *Photo 1* **Location:** Inlet canal
Bearing: 130 Degrees **Taken in 2011**



Photo Point 4 – *Photo 1* **Location:** Inlet control
Bearing: 71 Degrees **Taken in 2011**



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



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



Photo Point 4 – *Photo 2*
Bearing: 208 Degrees
Location: Inlet canal
Taken in 2011



Photo Point 5 – *Photo 1*
Bearing: 316 Degrees
Location: PP5
Taken in 2011



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



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



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



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



Photo Point 6 – *Photo 1* **Location:** PP6
Bearing: 317 Degrees **Taken in 2011**



Transect 1 – *Photo 1* **Location:** T1 Start
Bearing: 10 Degrees **Taken in 2011**



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



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



Transect 2 – *Photo 1* **Location:** T2 Start
Bearing: 266 Degrees **Taken in 2011**



Panorama 1
Compass Bearing: Approx 180 Degrees

Location: PP3
Taken in 2010



Panorama 1
Compass Bearing: Approx 180 Degrees

Location: PP3
Taken in 2011



Panorama 2
Compass Bearing: Approx 180 Degrees

Location: PP2
Taken in 2010



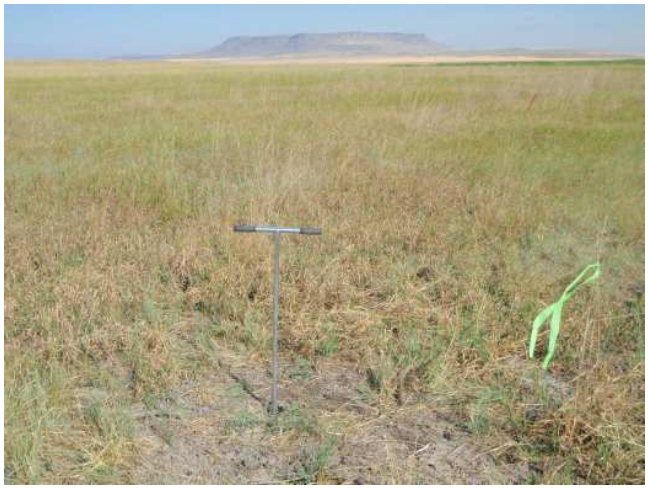
Panorama 2
Compass Bearing: Approx 180 Degrees

Location: PP2
Taken in 2011



Data Point: LM-1
Bearing: 0 Degrees

Location: Veg Com 19
Taken in 2011



Data Point: LM-2
Bearing: 10 Degrees

Location: Veg Com 13
Taken in 2011



Data Point: LM-3
Bearing: 0 Degrees
Location: Veg Com 13
Taken in 2011



Data Point: LM-4
Bearing: 120 Degrees
Location: Veg Com 11
Taken in 2011



Data Point: LM-5
Bearing: 280 Degrees
Location: Veg Com 11
Taken in 2011



Data Point: LM-6
Bearing: 150 Degrees
Location: Veg Com 20
Taken in 2011



Photo: Weir structure
Bearing: 150 Degrees
Location: Little Muddy Creek
Taken in 2011

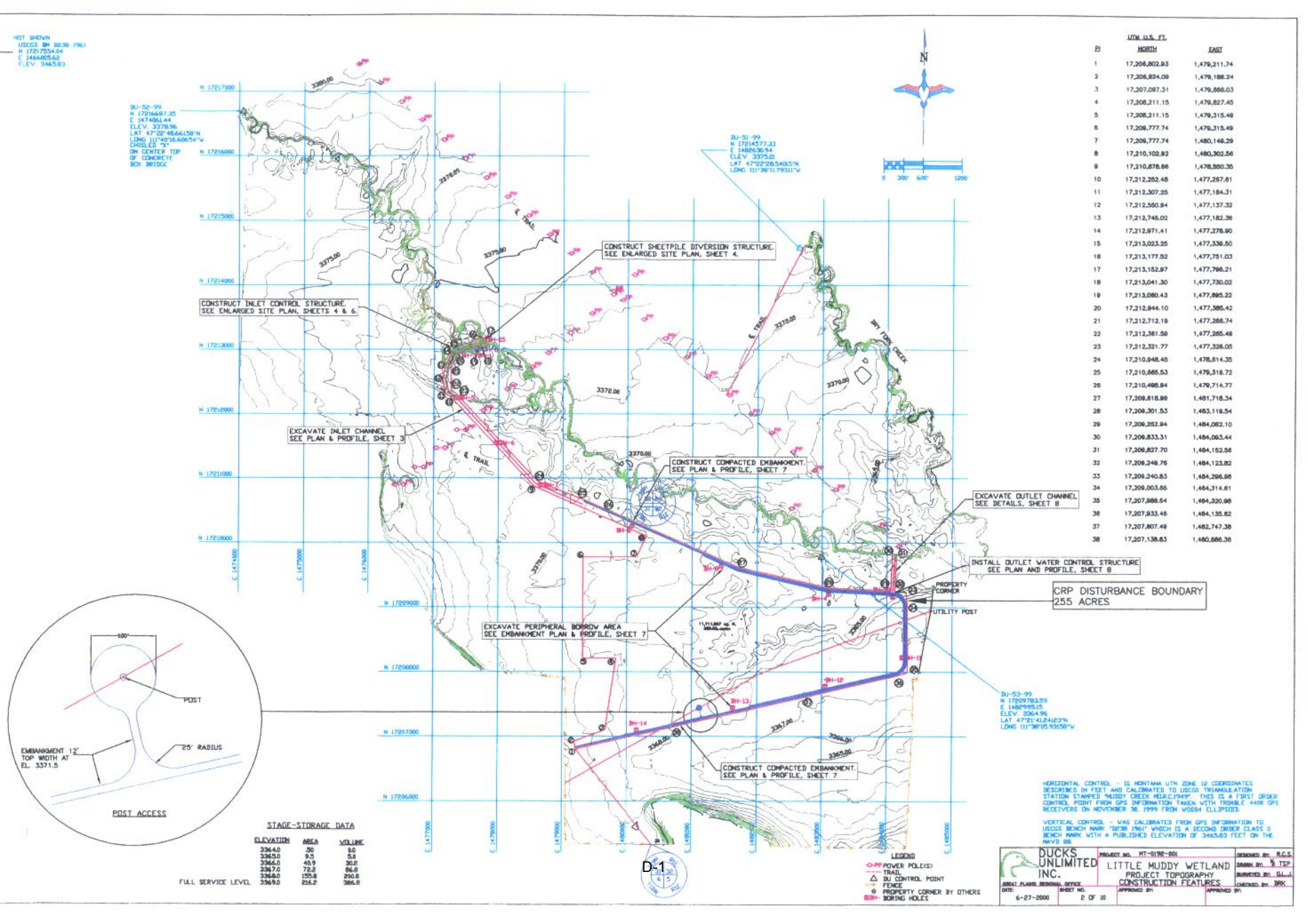


Photo: Rock toe
Bearing: 0 Degrees
Location: Restored eastern berm
Taken in 2011

Appendix D

Project Plan Sheet

MDT Wetland Mitigation Monitoring
Little Muddy Creek
Cascade County, Montana



PT	UTM U.S. FT. NORTH	EAST
1	17,206,802.93	1,479,211.74
2	17,206,824.09	1,479,186.24
3	17,207,097.31	1,479,866.03
4	17,208,211.15	1,479,827.45
5	17,208,211.15	1,479,315.49
6	17,209,777.74	1,479,315.49
7	17,209,777.74	1,480,148.29
8	17,210,102.92	1,480,302.56
9	17,210,878.86	1,478,550.35
10	17,212,252.48	1,477,267.81
11	17,212,307.25	1,477,184.31
12	17,212,550.94	1,477,137.32
13	17,212,746.02	1,477,182.38
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	17,212,361.59	1,477,265.48
23	17,212,321.77	1,477,326.05
24	17,210,948.45	1,478,514.35
25	17,210,665.53	1,479,316.72
26	17,210,498.84	1,479,714.77
27	17,209,818.99	1,481,718.34
28	17,208,301.53	1,483,119.54
29	17,209,252.94	1,484,082.10
30	17,208,833.31	1,484,093.44
31	17,208,827.70	1,484,152.56
32	17,208,249.76	1,484,123.82
33	17,208,240.83	1,484,296.98
34	17,208,003.66	1,484,314.61
35	17,207,988.54	1,484,320.98
36	17,207,933.46	1,484,135.62
37	17,207,807.48	1,482,747.38
38	17,207,138.83	1,480,886.36

STAGE-STORAGE DATA

ELEVATION	AREA	VOLUME
3364.0	.50	0.0
3365.0	9.5	5.0
3366.0	40.9	30.2
3367.0	72.2	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 HELIC 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
DATE: 6-27-2000
SHEET NO. 2 OF 10

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