MONTANA DEPARTMENT OF TRANSPORTATION
WETLAND MITIGATION MONITORING REPORT: YEAR 2009

Cloud Ranch
Big Timber, Montana

Prepared for:

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

Prepared by:

POST, BUCKLEY, SCHUH & JERNIGAN
820 North Montana Avenue, Suite A
Helena, MT 59601

December 2009

PBS&J Project No: B4308802.06.02

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MDT Project Number STPX 49(21)
Control Number 5231

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Cover Photograph: Facing north at cottonwood recruitment on gravel bars along Big Timber Creek.

1.0 INTRODUCTION

The Big Timber Creek stream and wetland restoration was constructed in the spring of 2003 to mitigate wetland impacts associated with proposed Montana Department of Transportation (MDT) roadway improvement projects in the Billings District, Watershed #13. The site is located in Sweetgrass County approximately 12 miles northwest of Big Timber in Section 36 of Township 3 North and Range 13 East (**Figure 1**). Elevations within the assessment area range from approximately 4840 to 4900 feet above sea level. The surrounding land uses include pastures and residential areas. This report summarizes the methods and results of the sixth year of monitoring at the Cloud Ranch Wetland Mitigation Site.

The project is intended to develop approximately 5.5 acres of wetland credit within a 15.5 acre conservation easement on private property. The project included restoration of a degraded reach of Big Timber creek by narrowing the channel and revegetating the over-bank areas with riparian trees, shrubs, wetland grasses and forbs. Wetland restoration and creation activities at off-channel wetland sites included pond and embankment removal, with subsequent grading and revegetation. All disturbed areas were revegetated with native wetland species. The stream channel and off-channel wetland restoration sites are shown on **Figure 2** (**Appendix A**).

The 2003 baseline wetland delineation conducted by Aquatic Design and Construction Inc. (ADC) identified 1.00 acre of wetlands within the project area (**Appendix D**). The Corps of Engineers (COE 2002) approved allocation of a 1:1 credit ratio for creation and restoration, as well as a 4:1 ratio for the maintenance of a buffer zone around the wetland and riparian areas. More specifically, the wetland credit breakdown approved by the COE is as follows: 0.61 acre for off- channel wetland creation, 1.41 acres for off-channel wetland restoration, 2.0 acres for riparian wetland restoration along Big Timber Creek, 0.58 acre for emergent wetland restoration along Big Timber Creek, and a 0.89 acre upland buffer (4:1 ratio) for a total of 5.5 credit acres. The summary table of potential wetland credits available for the Cloud Ranch is outlined in the 2002 COE letter (**Appendix G**).

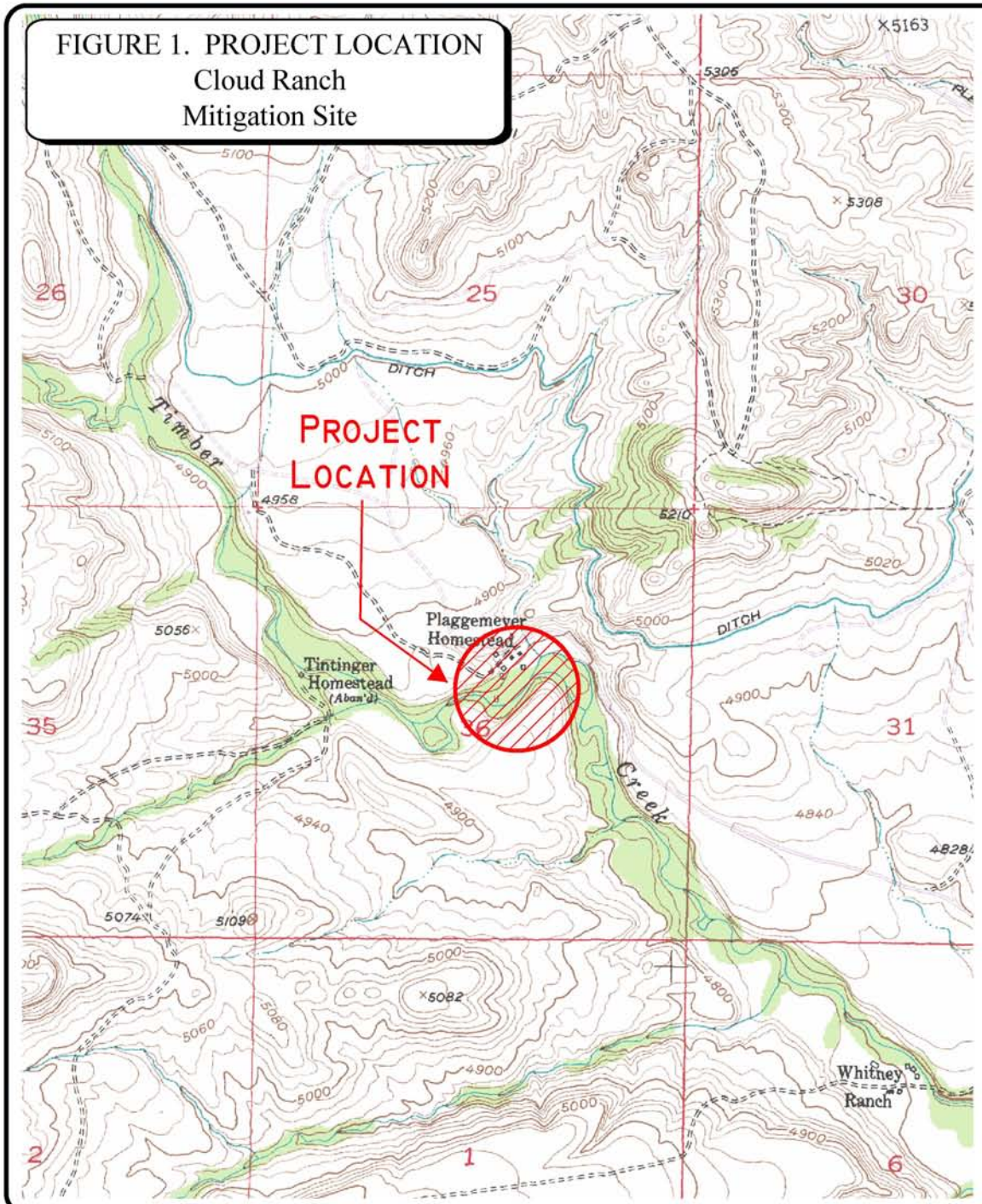
Wetland restoration and creation activities resulted in the temporary disturbance of 0.03 acre of existing wetlands. For the purposes of the report, each area (off-channel wetlands and Big Timber Creek) is addressed separately, but the acreages are tallied as one site.

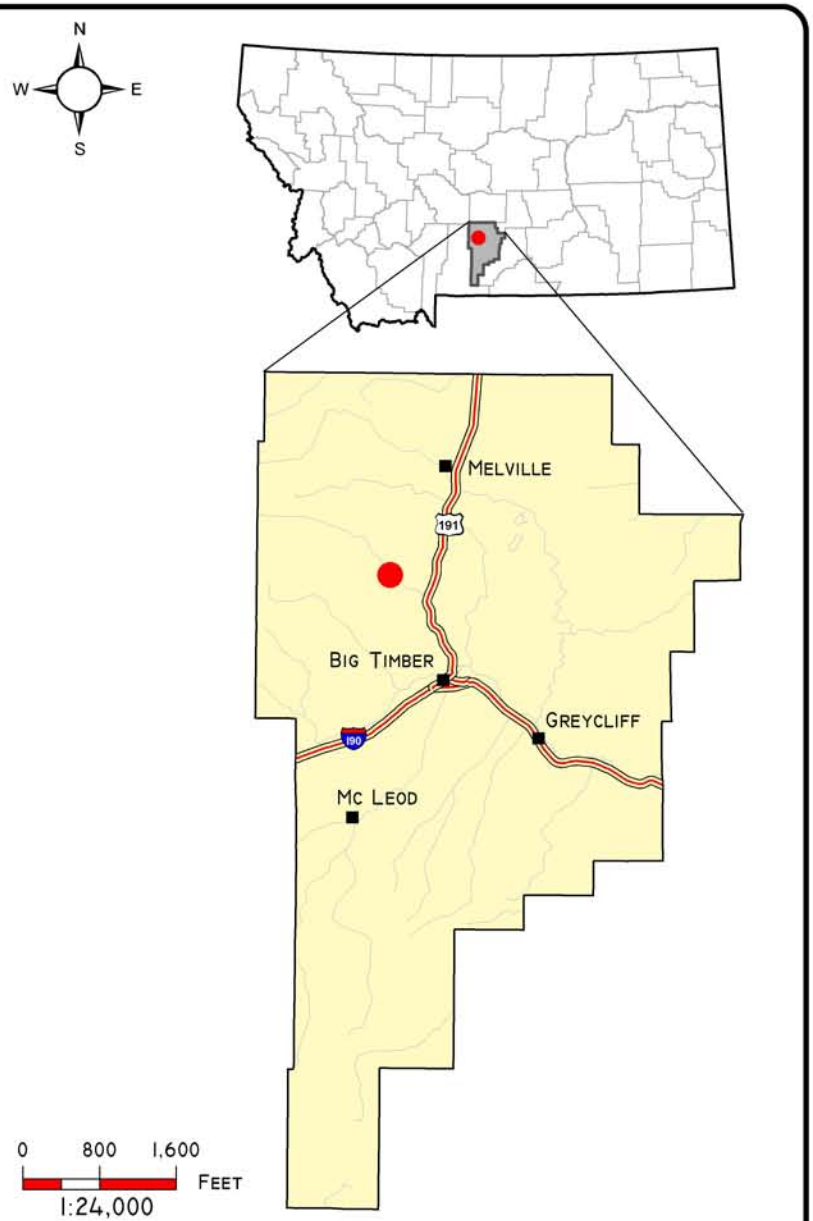
2.0 METHODS

2.1 Monitoring Dates and Activities

The project site was monitored on July 24, 2009. Activities and information conducted or collected during the monitoring event included: wetland delineation; wetland/open water boundary mapping; vegetation community mapping; survivorship data of planted woody vegetation; vegetation transect monitoring; soils investigation; hydrology investigation; birds and wildlife surveying; photographing; macroinvertebrate sampling; evaluation of functional assessment; and a non-engineering maintenance assessment (**Appendix B**).

FIGURE 1. PROJECT LOCATION
Cloud Ranch
Mitigation Site





PROJECT #: 0B430880I
DATE: Nov 2008
LOCATION: Sweet Grass CO
PROJECT MGR: J. Berglund
DRAWN BY: B. Steinebach

PBS&J
801 N. Last Chance Gulch
Suite 101
Helena, MT 59601-3360

2.2 Hydrology

Wetland hydrology indicators were recorded using procedures outlined in the COE 1987 Wetland Delineation Manual (Environmental Laboratory 1987). Hydrology data were recorded on the COE Routine Wetland Delineation Data Form at each wetland determination point (**Appendix B**). Precipitation data for the year 2009 were compared to the 1894-2009 average and all data was obtained from the Western Regional Climate Center (WRCC).

All additional hydrologic data were recorded on the Wetland Mitigation Site Monitoring Form (**Appendix B**). The boundary between emergent vegetation and open water was mapped onto the 2009 aerial photograph. There were no groundwater monitoring wells within the assessment area.

2.3 Vegetation

General vegetation types were delineated on the aerial photograph during the July site visit. Coverage of the dominant species in each community type was listed on the Wetland Mitigation Site Monitoring Form (**Appendix B**). A comprehensive plant species list for the entire site was compiled. Observations from past years were compared with new data to document vegetation changes over time. Qualitative observations were used to assess the survival of the planted woody species along the creek. The visual assessment included written estimates of species survival along the transect length as well as the stream channel and floodplain.

Two 10-foot wide belt transect was established during the 2004 monitoring year to represent the range of vegetation conditions (**Figure 2** in **Appendix A**). This transect was re-evaluated in 2009 to reflect changes in species composition and changing wetland boundaries. Percent cover for each species was estimated using the following values: + (<1%); 1 (1-5%); 2 (6-10%); 3 (11-20%); 4 (21-50%); and 5 (>50%). Transect ends are marked with metal fence posts and their locations recorded with a global positioning system (GPS) unit. Photos of each transect were taken during the July visit.

2.4 Soils

Soils were evaluated during the mid-season visit according to the procedure outlined in the COE 1987 Wetland Delineation Manual. Soil data were recorded for each wetland determination point on the COE Routine Wetland Delineation Data Form (**Appendix B**). The most current terminology used by NRCS was used to describe hydric soils.

2.5 Wetland Delineation

A wetland delineation was conducted within the assessment area according to the 1987 COE Wetland Delineation Manual. In July 2008, consultation with the COE (Steinle pers. comm.) confirmed that, where the 1987 manual was used to establish baseline wetland conditions at MDT wetland mitigation sites, it should continue to be applied at such sites for the duration of the monitoring period. Consequently, application of the new *Interim Regional Supplement to the*

Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys, and Coast Region (COE 2008) was not required or undertaken at this site in 2009.

Wetland and upland areas within the monitoring area were investigated for the presence of wetland hydrology, hydrophytic vegetation, and hydric soils. The information was recorded on the COE Routine Wetland Delineation Forms (**Appendix B**). The indicator status of vegetation was derived from the *National List of Plant Species that Occur in Wetlands: Northwest Region 9* (Reed 1988). The wetland/upland and open water boundaries were mapped onto the 2009 aerial photograph in the field and used to calculate the wetland area developing at the Cloud Ranch site. A pre-construction wetland map was completed by Aquatic Design and Construction in 2003 (**Appendix D**).

2.6 Fish and Wildlife

Observations of mammal, reptile, fish, and amphibian species were recorded on the Wetland Mitigation Site Monitoring Form during each site visit (**Appendix B**). Indirect use indicators (i.e., tracks, scat, and burrows) were also recorded including. A comprehensive wildlife species list for the entire site was compiled.

2.7 Birds

Bird observations were recorded on July 24, 2009 site visit using the Bird Survey Protocol (**Appendix E**)**.** A general, qualitative bird list has been compiled using these observations. During the site visit, bird observations were categorized by species, activity code, general habitat and recorded onto the Bird Survey Field Data Sheet (**Appendix B**).

2.8 Macroinvertebrates

Two macroinvertebrate samples were collected during the site visit using the Macroinvertebrate Sampling Protocol (**Appendix F**). Samples were collected from the existing wetland pond located in the northeast corner of the project site and from Big Timber Creek. The samples were preserved as outlined in the sampling procedure and sent to Rhithron Associates, Inc. in Missoula, Montana for analysis. The approximate sampling locations were recorded in the field with a GPS unit.

2.9 Functional Assessment

From 2004 to 2007, an annual functional assessment form was completed for the site using the 1999 MDT Montana Wetland Assessment Method (Berglund 1999). In 2008 and 2009 the 2008 MDT Montana Wetland Assessment Method form was completed for the site (Berglund and McEldowney 2008) (**Appendix B**). Pre-construction functional assessments were completed by ADC but to date have not been received and are not presented in this monitoring report.

2.10 Photographs

Photographs were taken showing Big Timber Creek riverine wetlands, the off-channel wetland areas, the monitoring area, and the vegetation transects (**Appendix C**). A description and compass direction for each photograph was recorded on the Wetland Mitigation Site Monitoring Form (**Appendix B**).

During the 2004 monitoring season, each photograph point was staked and the location recorded with a resource-grade GPS unit. All photographs were taken using a digital camera.

2.11 GPS Data

During the 2004 monitoring season, survey points were collected using a resource-grade Trimble Geoexplorer III hand-held GPS unit (**Appendix E**). Points collected included: the beginning and end locations of the vegetation transects, the wetland boundary, and the sample point (SP) locations. In addition, GPS data were collected at four landmarks that are recognizable on the aerial photograph and helped fit the GPS data to the topography. In 2009 a resource-grade Magellan Mobile Mapper GPS unit was used to map the off-channel wetland boundaries. Procedures for GPS mapping and aerial photography referencing are in **Appendix E.**

2.12 Maintenance Needs

The condition of water level control structures, weed infestation, and other mitigation structures were evaluated. This examination did not entail an engineering-level analysis.

3.0 RESULTS

3.1 Hydrology

The project area includes two distinct wetland areas: (1) the Big Timber Creek channel restoration area, and (2) the off-channel creation/restoration wetlands that occur in the upland terraces south of the stream channel. Information pertaining to each mitigation area is summarized separately.

3.1.1 Big Timber Creek

The Cloud Ranch reach of Big Timber Creek is located approximately one mile below the confluence of the South Fork of Big Timber Creek and the main stem of Big Timber Creek. The existing braided creek channel was reconstructed to a single channel consistent with an upstream reference reach. The over-bank areas of the new channel are beginning to revegetate with riparian shrubs and trees and herbaceous wetland plants. Herbaceous wetland plants initially dominated the topographically low areas within the reconstructed bars. The over-bank substrate is well-drained, very coarse textured alluvial material. In general, the riverine wetlands associated with the creek are in low point or side bars (**Figure 3** in **Appendix A**).

In 2006, channel movement was observed within the re-constructed creek and floodplain. High water marks, over-bank flows, and bank loss were noted. High water flows eroded depositional sediment (silts and clay) and organic matter from point bars of inside bends and wetlands (that were mapped during the 2004 and 2005 monitoring years). Many of these areas have been replaced with gravels and/or cobbles. The stream has created a new channel by cutting through a small point bar/wetland. Big Timber Creek channel migration resulted in bank loss found during the 2007 and 2008 monitoring. In 2009, small channels continued to develop and migrate across point bars on Big Timber Creek and have influenced changes in wetland and upland areas. There appears to be less bank loss in 2009 (compared to previous years) with the establishment of cottonwood and willow seedlings on banks and low terraces. Young willow seedlings and herbaceous cover is increasing (**Photo H** in **Appendix C**). Cottonwood seedlings (*Populus angustifolia*) were abundant on the gravel bars along the upper reach of the project area in 2007, 2008, and 2009. Cottonwoods are pioneering species that require moist, barren, newly deposited alluvium that is exposed to full sunlight. The erosional and depositional pattern of the creek helps maintain diversity of plant communities on the floodplain.

The lateral movement of the creek will continue to create terraces with varying levels and changes in vegetation. Primary hydrology indicators observed during the July 24, 2009 monitoring visit included saturation within the upper 12 inches, water marks, and sediment deposits. Water levels in 2009 were similar to 2008 but higher compared to 2007 (**Photo E** in **Appendix C**). Most of the smaller side-channels were flowing in 2009 compared to 2007 when the channels were dry. Minor bank loss was noted in 2009, primarily along the north, northeastern side of the creek.

According to USGS data collected on the Boulder River (Big Timber station) for 2009, high daily discharge flows in May through July 2009 were approximately 5,000 cubic per second (cfs) compared to daily flows of approximately 80 cfs in August through September 2009. In 2008, high daily discharge flows in May through June 2008 were approximately 6,000 cfs compared to daily flows of approximately 300 cfs in August through September 2008. In 2007, high daily discharge flows in May through June 2007 were approximately 3,000 cfs compared to daily flows of less than 60 cfs in August through September 2007. In 2006, flows in May through June were approximately 4,000 cfs with daily flows of less than 100 cfs in August through September 2006 (USGS 2008).

The project designer, Tom Coleman (Aquatic Design & Construction), commented in 2006 that the upper reach of channel has narrowed as a result of the 2006 high flows, and this is favorable. According to Mr. Coleman, the upper end of the lowest reach is likely to continue shifting before it stabilizes and some minor intervention in this area may be warranted. The 2004 aerial photograph was compared to the 2009 aerial photograph. Key differences between the years include the development of a new channel in the upper reach of the project area as well as a new channel in the lower reach. There has been some wetland and bank loss but subsequent development of point bars and wetlands. In 2008 and 2009, there is a notable increase and improvement in vegetation cover within the project area on wide depositional terraces in the upper, middle and lower reaches of the project area.

3.1.2 Off-channel Restored / Created Wetlands

A drained pond within an historic oxbow of Big Timber Creek was graded and revegetated with herbaceous wetland plants. The unnamed spring creek channel was originally ditched through most of the pond system. As part of the restoration activities, a new sinuous channel was developed through the wetland complex where a series of low structures were created to mimic a condition analogous to a series of abandoned beaver ponds. Three water level control structures were installed as well as several small dikes to promote inundation of the created and existing wetlands. An embankment was also removed from the pond to lower water surface levels consistent with the existing wetland area to the south. Several ponds or "over-widened" sections of the existing spring creek channel were filled and revegetated with herbaceous wetland plants.

During the July 24, 2009 monitoring visit, approximately 90% of the assessment area was inundated with shallow standing water. Average water depth ranged from 1 to 4 inches. Deeper water (greater than 4 inches) was noted in portions of the upland Community Type 7. Open water, or the area without emergent vegetation, is depicted on **Figure 3** (**Appendix A**).

According to the Western Regional Climate Center (WRCC), the Big Timber weather station has calculated a mean annual precipitation of 10.22 inches from 1894 through August 2009 (last updated file). The average precipitation through the month of July for that period was 8.95 inches. For the year 2009, precipitation through July was 8.19 inches or 92% of the mean (WRCC 2009).

3.2 Vegetation

Since 2004 a comprehensive plant list has been compiled for the Jack Creek Ranch Wetland Mitigation Site (**Table 1**); Plants found in 2009 were reported on the Monitoring Form (**Appendix B**). Hydrophytic vegetation communities are changing through time in size, diversity, and cover values. There are approximately 40 known wetland plants with a facultative-wet (FACW) to obligate-wet (OBL) status within the channel assessment area and off-channel wetlands.

A total of fourteen community types were documented at the site, of which twelve are vegetated wetland types. These vegetation community types were identified and mapped (**Figure 3** in **Appendix A**). The vegetation types along the Big Timber Creek include: Type 1 - *Bromus inermis/Agropyron repens*, Type 2 - *Populus angustifolia/Agrostis alba*, Type 8 - *Populus angustifolia seedlings*, and Type 11 - *Populus angustifolia/Salix exigua/Agrostis alba*. The vegetation types within the off-channel wetlands include: Type 3 - *Agrostis alba*, Type 4 - *Juncus/Mixed Herbaceous Species*, Type 5 - *Carex*/*Glyceria*, Type 6 - *Typha latifolia/Scirpus*, Type 7 - *Bromus/Agropyron*, Type 9 - *Typha latifolia/Carex*, Type 10 - *Agrostis alba/Carex*, Type 11 - *Populus anguistifolia/Salix exigua/Agrostis alba*, Type 12 - *Salix exigua/Carex*, Type 12A - *Salix exigua* transition, Type 13 - *Scirpus microcarpus*, and Type 14 - *Carex*. Dominant species found within each community are listed on the **Monitoring Form** (**Appendix B**).

Table 1: ***Vegetation species observed from 2004 to 2009 at the Cloud Ranch Wetland Mitigation Site.***

Scientific Name	Region 9 (Northwest) Wetland Indicator Status [1, 2]	Scientific Name	Region 9 (Northwest) Wetland Indicator Status [1, 2]
Achillea millefolium	FACU	*Grindelia squarrosa*	FACU
Agropyron repens	FACU	*Helianthus annuus*	FACU
Agropyron riparium	(FACU)	*Hordum jubatum*	FAC+
Agropyron smithii	FACU	*Hyoscyamus niger*	(UPL)
Agropyron trachycaulum	FAC	*Juncus balticus*	FACW+
Agrostis alba	FACW	*Juncus ensifolius*	FACW
Alopecurus aequalis	FACW	*Juncus longistylis*	FACW
Alopecurus arundinaceus	(FACW)	*Juncus mertensianus*	OBL
Alopecurus pratensis	FACW	*Juncus tenuis*	FACW-
Ambrosia trifida	FACU+	*Juncus torreyi*	FACW
Arctium mimus	(FACU)	*Linaria vulgaris*	(FACU)
Artemisia dracunculus	(FACU)	*Lupinus* sp.	(FACU)
Beckmannia syzigachne	OBL	*Melilotus officinalis*	FACU
Betula occidentalis	FACW	*Mentha arvensis*	FACW-
Bromus ciliatus	FAC+	*Mimulus guttatus*	OBL
Bromus inermis	(UPL)	***Phacelia hastata***	**(FACU)**
Bromus japonicus	UPL	*Phalaris arundinacea*	FACW
Bromus marginatus	(FACU)	*Phleum pratense*	FACU
Calamagrosits canadensis	FACW+	*Populus angustifolia*	FACW
Carduus nutans	(FACU)	*Poa palustris*	FAC
Carex aquatilis	OBL	*Poa compressa*	FACU
Carex languinosa	OBL	*Poa pratensis*	FACU+
Carex microptera	FAC	*Primula parryi*	FAC
Carex nebrascensis	OBL	*Prunus virginiana*	FACU
Carex utriculata	OBL	*Puccinellia distans*	OBL
Carex vulpinoides	OBL	*Rumex crispus*	FAC+
Centaurea maculosa	(FACU)	*Salix bebbiana*	FACW
Chenopodium sp.	(UPL)	*Salix exigua*	OBL
Cirsium arvense	FACU+	*Scirpus acutus*	OBL
Cleome serrulata	**FACU**	*Scirpus microcarpus*	OBL
Crepis runinata	FACU	*Scirpus pallidus*	OBL
Cynoslossum officinale	(UPL)	*Scirpus pungens*	OBL
Dactylis glomerata	FACU	*Scirpus validus*	OBL
Deschampsia cespitosa	FACW	*Senecio integerimus*	FAC
Eleocharis palustris	OBL	*Solidago canadensis*	FACU
Elymus canadensis	FAC	*Solidago occidentalis*	FACW
Elymus cinereus	(FACU)	*Spartina pectinata*	OBL
Epilobium ciliatum.	FACW-	*Symphoricarpos albus*	FACU
Equisetum arvense	FAC	*Trifolium fragiferum*	FACU
Equisetum hymoides	FACW	*Trifolium hybridum*	FACU+
Festuca arundinacea	FACU	*Tragopogon dubius*	(FACU)
Glyceria elata	FACW+	*Typha latifolia*	OBL
Glyceria grandis	OBL	*Veronica americana*	OBL
Glycyrrhiza lepidota	FAC+	*Verbascum thapsus*	(UPL)

[1] **Bolded** species were documented for the first time in 2009.

[2] Parenthesized 'Indicator Status' are based only on the biologist's experience and are not included in the *National List of Plant Species that Occur in Wetlands: Northwest (Region 9)* (Reed 1988). Indicator Status: OBL=obligate-wet; FACW=facultative-wet; FAC=facultative; FACU=facultative upland; UPL= upland; NL=not listed.

Two transects evaluated trends in the vegetation communities and the effects of flows from the Big Timber creek within the project area. Transect 1 is located in the upper reach of Big Timber Creek and spans from upland, across the channel, across wetlands, and onto floodplain (**Figure 2** in **Appendix A**). The vegetation results for Transect 1 are provided in detail (**Monitoring Form** in **Appendix B**) and are summarized (**Table 2a**).

In 2009 there was a slight increase in open water and a decrease in Community Type 1 along the transect line (**Chart 1**). Factors influencing this shift in vegetation are attributed to higher flows in 2009, development of smaller side-channels, colonization of cottonwood and willows species. Wetland vegetation is colonizing on the newly deposited gravels. In 2008 there was a slight decrease in wetland Community Types 2 and 8, an increase in upland Community Type 1, and an increase in open water (**Chart 2**). Factors influencing the shifts in 2008 were attributed to the low flows in 2007, and wetland loss due to high flows in 2008.

Table 2: ***Data Summery for Transect 1 at the Cloud Ranch Wetland Mitigation Site.***

Monitoring Year	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**
Transect Length (feet)	195	195	195	195	195	195
# Vegetation Community Transitions along Transect	3	3	3	3	3	3
# Vegetation Communities along Transect	3	4	2	3	4	3
# Hydrophytic Vegetation Communities along Transect	1	2	1	2	2	2
Total Vegetative Species	19	18	15	12	16	16
Total Hydrophytic Species	11	8	7	6	7	8
Total Upland Species	9	10	8	6	9	8
Estimated % Total Vegetative Cover	60	71	73	67	74	77
% Transect Length Comprised of Hydrophytic Vegetation Communities	25	23	41	78	63	63
% Transect Length Comprised of Upland Vegetation Communities	40	36	15	12	18	16
% Transect Length Comprised of Unvegetated Open Water	25	15	8	8	13	15
% Transect Length Comprised of Bare Substrate	10	26	36	2	6	6

Chart 1: ***Transect maps showing vegetation types of Transect 1 from start (0 feet) to end (195 feet) from 2004 to 2009.***

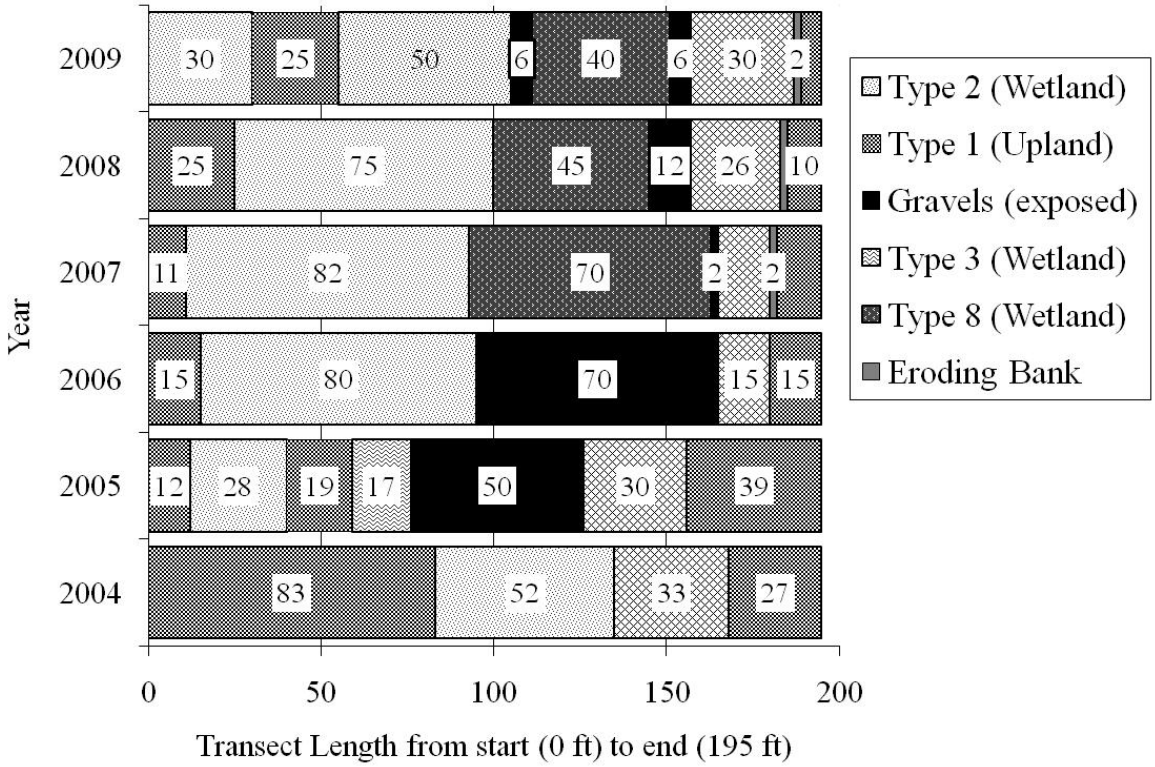
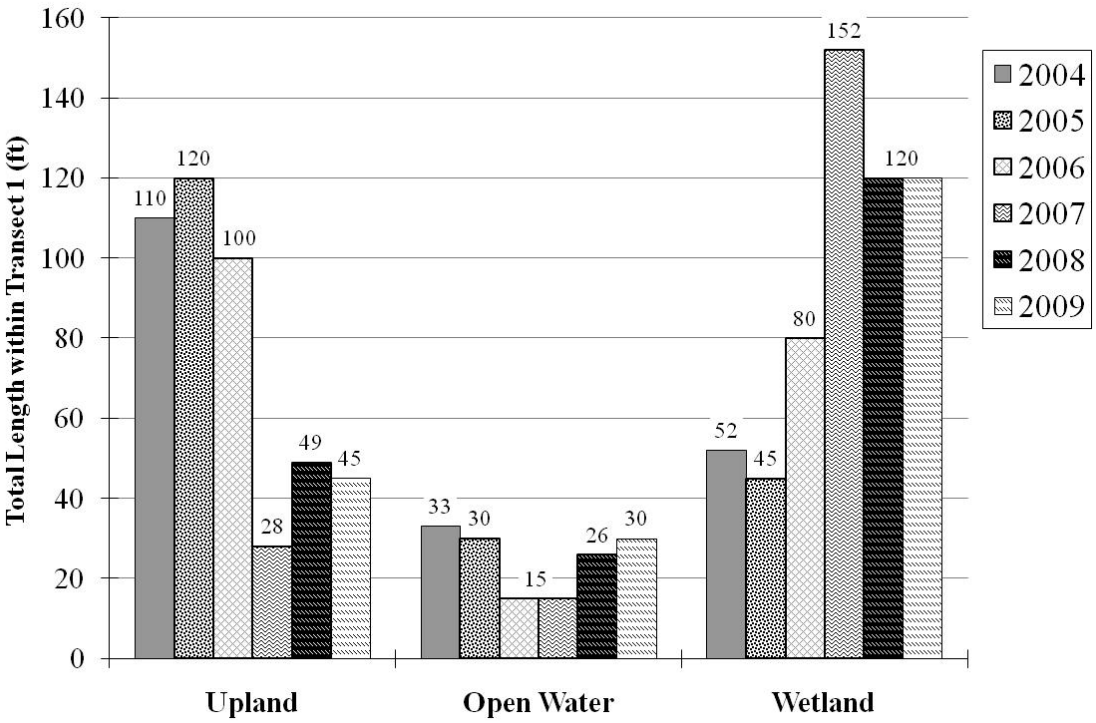


Chart 2: ***Length of vegetation communities along Transect 1 from 2004 to 2009.***



Transect 2 is located along the northern quarter of the off-channel restored wetlands (**Figure 2** in **Appendix A**). The vegetation results for Transect 2 are provided in detail (**Monitoring Form** in **Appendix B**) and are summarized (**Table 3**). **Chart 2** graphically shows the length of each vegetation community and compares the past six years. The wetland Community Type 10 represents 94% of the vegetative cover along Transect 2 (**Chart 3**). Wetland communities have gained 79 feet since 2004 (**Chart 4**). The upland Community Type 7 shows a steady reduction in the overall length from 2004 to 2007 (**Chart 4**) with little change in 2008 and 2009.

Community Type 6 continued to expand around the north, northeast and southern perimeter of the open water pond, replacing Community Type 5. *Populus angustifolia* seedlings were observed in Community Type 7 along the north and northwestern portions of the off-channel wetlands. *Salix exigua* was also noted along the border of the wetter Community Types 5 and 6 and this year (2009) a new Community Type 12 - *Salix exigua/Carex* sp. was mapped due to the abundance and cover of willows in this area. Type 12A – *Salix exigua transition* was also mapped as a new sub-type under Type 12; it includes an old oxbow with sandbar willow, no understory, and mucky soil with aquatic bed. This area has been extremely wet in the past two years and will likely transition into either cattails or sedges. Community Type 5 continued to be the most diverse wetland type, with a wide variety of wetland species. Community Type 10 was expanding into the southern and southeast areas of the project site.

Table 3: ***Data Summary for Transect 2 at the Cloud Ranch Wetland Mitigation Site.***

Monitoring Year	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**
Transect Length (feet)	200	200	200	200	200	200
# Vegetation Community Transitions along Transect	2	2	2	2	2	2
# Vegetation Communities along Transect	3	2	2	2	2	2
# Hydrophytic Vegetation Communities along Transect	1	1	1	1	1	1
Total Vegetative Species	12	15	19	23	21	18
Total Hydrophytic Species	7	10	9	14	13	10
Total Upland Species	3	5	10	9	8	8
Estimated % Total Vegetative Cover	60	70	83	87	90	95
% Transect Length Comprised of Hydrophytic Vegetation Communities	54	90	93	93.5	94	94
% Transect Length Comprised of Upland Vegetation Communities	21	8	6.5	6.5	6	6
% Transect Length Comprised of Unvegetated Open Water	0	2	0	0	0	0
% Transect Length Comprised of Bare Substrate	25	2	.5	0	0	0

Chart 3: ***Transect maps showing vegetation types of Transect 2 from start (0 feet) to end (200 feet) from 2004 to 2009.***

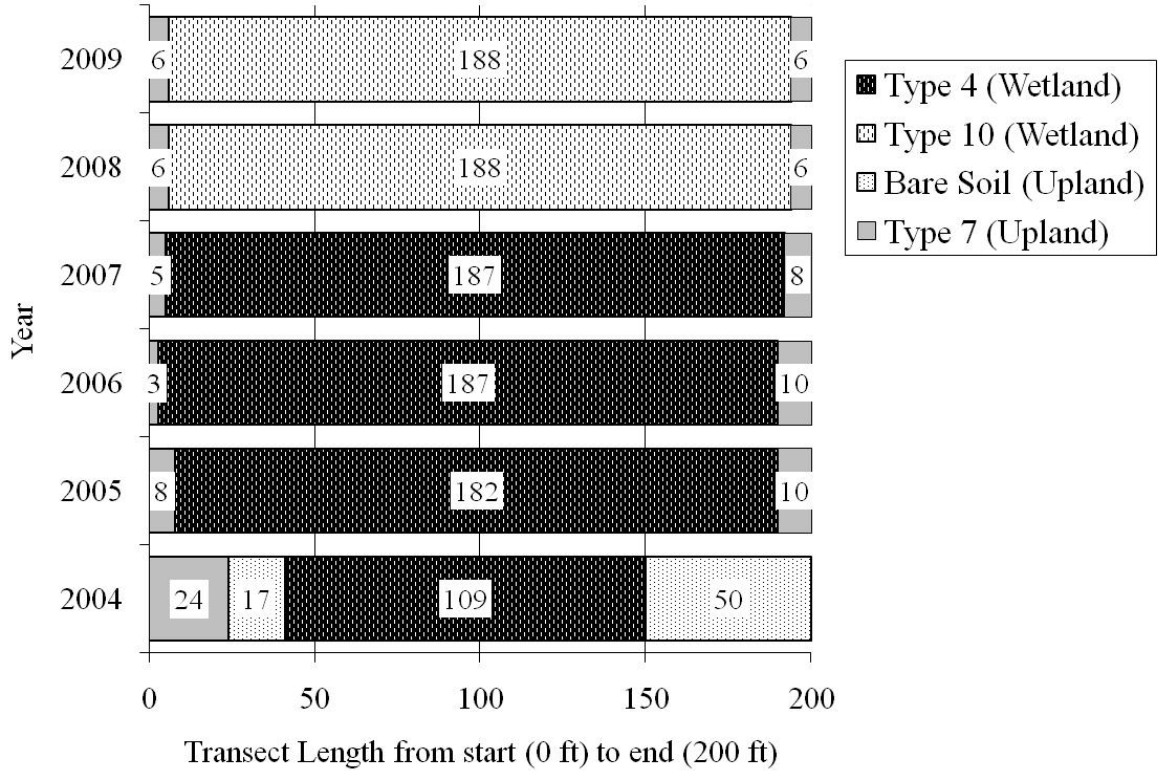
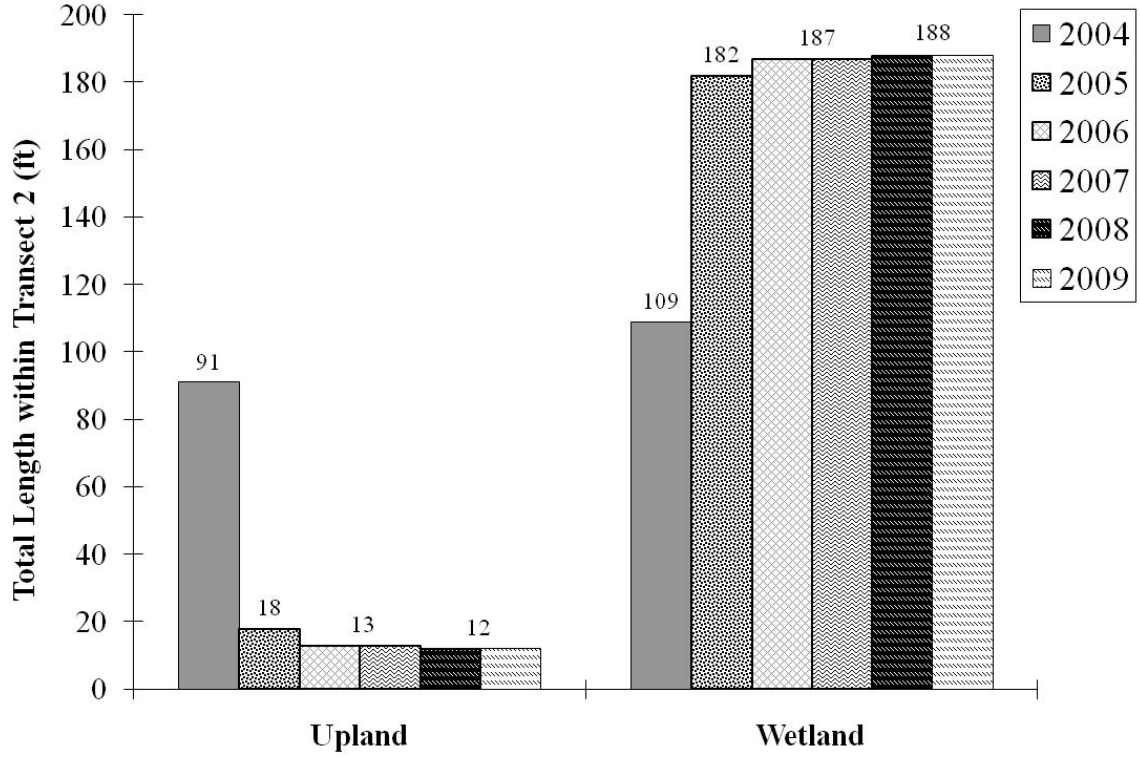


Chart 4: ***Length of vegetation communities along Transect 2 from 2004 to 2009.***



In 2008, Type 9 was a new community mapped to include areas with a dominance of cattails and sedge species. In 2007, these areas were mapped as Community Types 5 and 6. Type 13 is a new community mapped in 2009 to include a small area dominated by *Scirpus microcarpus* (small-fruited bulrush). In 2008, small-fruited bulrush plants were observed in this area but in 2009 the density and cover has increased significantly. Type 14 is also a new community (mapped in 2009) that has transitioned from a dominance of redtop (CT3, CT10) to a dominance of sedge species, especially south of the pond and in the far southeast corner of the project.

Changes in the vegetation along Big Timber Creek include the transition of the gravel bars to wetlands with *Populus angustifolia* seedlings, loss of upland and wetland banks due to channel migration, and improved vegetation cover and diversity in both riparian wetland and uplands in addition to the buffer areas. Young *Populus angustifolia* and *Salix exigua* seedlings are increasing in size and quantity. As these plants mature, there growth habit will eventually aid in reducing the energy of high water flows. In 2009, Type 11 – *Populus angustifolia/Salix exigua/Agrostis alba* was mapped on low banks and terraces bordering Big Timber Creek. This bank (**Figure 3** in **Appendix A**) has improved in stability and cover with the establishment of cottonwood and willow seedlings.

In 2004, the overall survival of the willow cuttings along Big Timber Creek was estimated between 40 to 45 percent. In 2005, primarily due to over-bank flows and bank loss, the overall survival of the willow cuttings was reduced. It was estimated that 25 to 30 percent of the original willow cuttings planted are still in place and alive. In 2006, the majority of the willow cuttings planted in the upper reaches of the reconstructed channel were gone due to high water flows. Cuttings were still present and viable in the lower reaches of the channel. It is estimated that approximately 10 percent of the original willow cuttings planted remain in place and alive. In 2008 and 2009, the cuttings were present and viable in the lower reaches of the channel (**Monitoring Form** in **Appendix B**). The estimated 10 percent survival has not changed.

In 2004, the estimated survival of transplanted cottonwood seedlings was approximately 60 to 65 percent. The cottonwoods were planted further inland and were not negatively affected by high water flows. Few dead or declining cottonwood seedlings were noted during the 2005-2009 field surveys. During the 2009 field survey, cottonwood seedlings were generally robust and healthy with new growth. Details of the plant survival along the stream channel are presented on **Page 7** in the **Monitoring Form** (**Appendix B**).

Natural recruitment of willows and cottonwoods was noted primarily on the two larger, more stable terraces along the creek. Numerous volunteer cottonwoods were noted on the terrace along the western side of the creek where the transect is located. The large inside curve on the southwestern side of the creek was growing numerous cottonwood root suckers and some young willows. Young willows were also observed on several side bars, also in the lower reaches of the channel. The volunteers are assisting in offsetting willow cutting mortality.

Two state listed Category I noxious weed species was present at the site in 2009: Canada thistle (*Cirsium arvense*) and hound's-tongue (*Cynoglossum officinale*) (**Figure 3** in **Appendix A**). Canada thistle and hound's-tongue were observed along Big Timber Creek as small (less than 0.1 acre) and sporadic (less than 1% cover) infestations. Both species were also observed within

the off-channel restored/created wetlands and adjacent uplands as small (less than 0.1 acre) and sporadic (less than 1% cover) infestations. Canada thistle had been sprayed in 2006, 2007, and 2008 but did not appear to have been sprayed prior to monitoring in 2009. However, MDT indicated this site was sprayed later in the year. Because Canada thistle is present, there is potential for this weed to increase and out-compete native plants that are desired by wildlife. Canada thistle, in particular, can colonize very moist areas.

3.3 Soils

The project site was mapped as part of the Sweetgrass County Soil Survey (USDA 1981). The dominant soil on the site is mapped as Nesda-Mcilwaine loam (107A). These soils are found on low stream terraces and flood plains. The Mesda-Mcilwaine soils are both well drained, non hydric soils with approximately 12 inches of loam over extremely gravelly coarse sand. The soil classification is a Fluventic Haploboroll. There are two small inclusions of Albicalis (5%) and Meadowcreek (5%). Albicalis is a loamy textured, hydric soil that is poorly drained. Meadowcreek is not listed as a hydric soil.

Soils were sampled at four soil points (SP-1 and SP-2 on Transect 1 and SP-3 and SP-4 on Transect 2). Soil pits 1 and 3 are in wetland while soil pits 2 and 4 are in upland. Soils at SP-1 were gray (10YR 5/1), gravelly loamy sand in the upper 6 inches and dark gray (10YR 4/1), silty clay from 6 to 14 inches. Primary hydrology indicators included water marks and sediment deposits. The soils at SP-3 were dark gray, silty clay in the upper 12 inches. Soils were saturated in the upper 12 inches and water marks were present. SP-2 met the wetland hydrology but not the vegetation and hydric soil parameters. SP-4 met the wetland hydrology and soil parameters but not the vegetation criteria.

3.4 Wetland Delineation

The delineated wetland boundary is depicted on **Figure 3** in **Appendix A**. The COE Forms are included in **Appendix B**. Riverine wetlands generally include low areas or portions of vegetated point or side bars. The vegetation within the off-channel wetlands consisted primarily of emergent vegetation, generally within topographically low areas where saturation occurred. Aquatic vegetation such as cattails and bulrush were more common along the perimeter of the spring creek channel and as wide bands south of the large open water pond. A total of 2.92 acres of wetlands and open water were delineated in the off-channel wetland development area within the defined monitoring area. This included 0.14 acre of shallow (less than 4 feet deep) open water and 0.72 acre of pre-existing wetlands. Approximately 1.85 acre of wetlands were delineated along Big Timber Creek (the Big Timber Creek open water channel is not included in this total).

Subtracting the pre-existing wetlands from the total yields a net gain of 4.05 aquatic habitat acres (2.06 wetland acres off-channel, 0.14 shallow open water acres off-channel, and 1.85 wetland acres along Big Timber Creek) at the monitoring sites. This is a 5% increase in aquatic habitat from 2008 (3.82 acres) to 2009 (4.05 acres). Crediting is discussed later in *Section 3.10*.

3.5 Fish and Wildlife

Since 2004, 27 bird species have been observed at the Cloud Ranch stream and wetland mitigation site. (**Table 4**). Activities and densities associated with the 2009 observations are included on the **Monitoring Form**s in **Appendix B**.

Table 4: ***Fish and wildlife species observed from 2004 to 2009 at the Cloud Ranch Mitigation Site.***

FISH	
Brook trout (*Salvelinus fontinalis*) Brown trout (*Salmo trutta*) [1]	Rainbow trout (*Oncorhynchus mykiss*) [1]
REPTILE	
Western terrestrial garter snake *(Thamnophis elegans)*	
AMPHIBIAN	
Western Chorus Frog (*Pseudacris triseriata*)[1]	
BIRD	
American Goldfinch (***Carduelis psaltria***) **American Robin** (***Turdus migratorius***) Bald Eagle (*Haliaeetus leucocephalus*) Belted Kingfisher (*Ceryle alcyon*) **Black-capped Chickadee (*Poecile atricapillus*)** Bullock's Oriole (*Icterus bullockii*) **Cedar Waxwing** (***Bombycilla cedrorum***) **Common Grackle (*Quiscalus quiscula*)** **Common Nighthawk** (***Chordeiles minor***) **Common Yellowthroat (*Geothylypis trichas*)** European Starling (*Sturnus vulgaris*) Gray Catbird (*Dumetella carolinensis*) **House Wren (*Troglodytes aedon*)** **Least Flycatcher** (***Empidonax minimus***)	**Northern Flicker (*Colaptes auratus*)** Red-naped Sapsucker (*Sphyrapicus nuchalis)* **Red-winged Blackbird** (***Agelaius phoeniceus***) **Song Sparrow *(Melospiza melodia)*** Sora (*Porzana Carolina*) Sparrow spp. **Spotted Sandpiper** (***Actitis macularia***) **Tree swallow** (***Tachycineta bicolor***) **Warbling Vireo (*Vireo gilvus*)** **Western Kingbird (*Tyrannus verticalis*)** **Western Wood Peewee** (***Contopus sordidulus***) **Yellow Warbler** (***Dendroica petechia***) Yellow-rumped Warbler (*Dendroica coronata*)
MAMMAL	
Black bear (*Ursus americanus*) [1] Mule deer (*Odocoileus hemionus*) [1]	**Raccoon (*Procyon lotor*)** White-tailed deer (*Odocoileus virginianus*)

[1] Observed by Aquatic Design & Construction, Inc.
Bolded species indicate those documented within the analysis area in 2009.

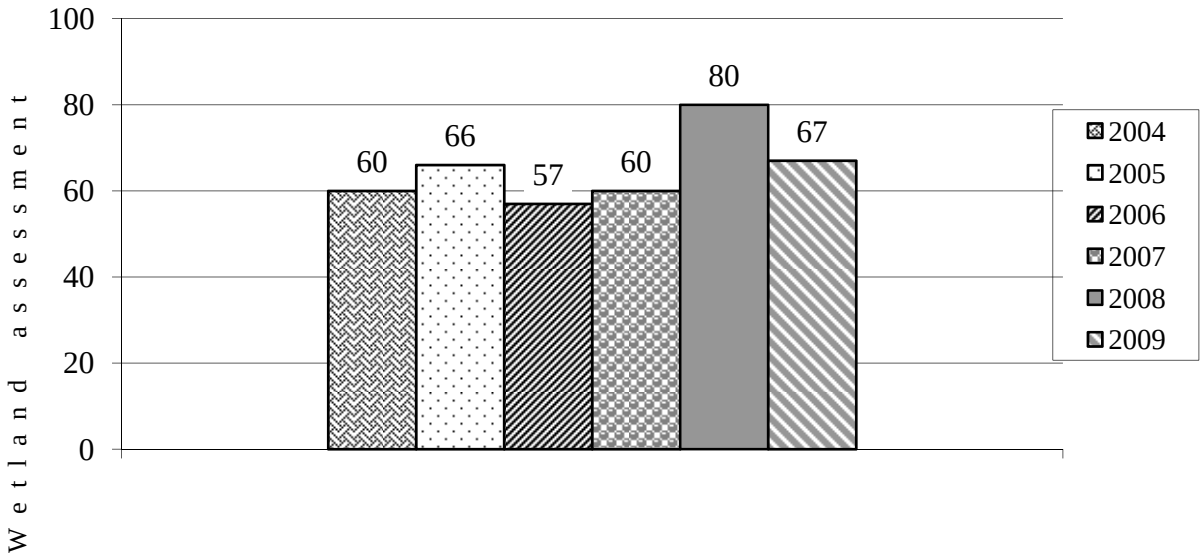
3.6 Macroinvertebrates

The 2009 macroinvertebrate sampling results are provided in **Appendix F** and were summarized by Rhithron Associates in the italicized sections below (Bollman 2009).

> ***Cloud Ranch Off-Channel (pond).*** *Similar to previous years, both lentic and lotic habitats were indicated by the fauna at the Cloud Ranch pond site in 2009. However, overall taxa richness was low, suggesting limited aquatic habitats. The most abundant animals in the sample were biting gnats in the family*

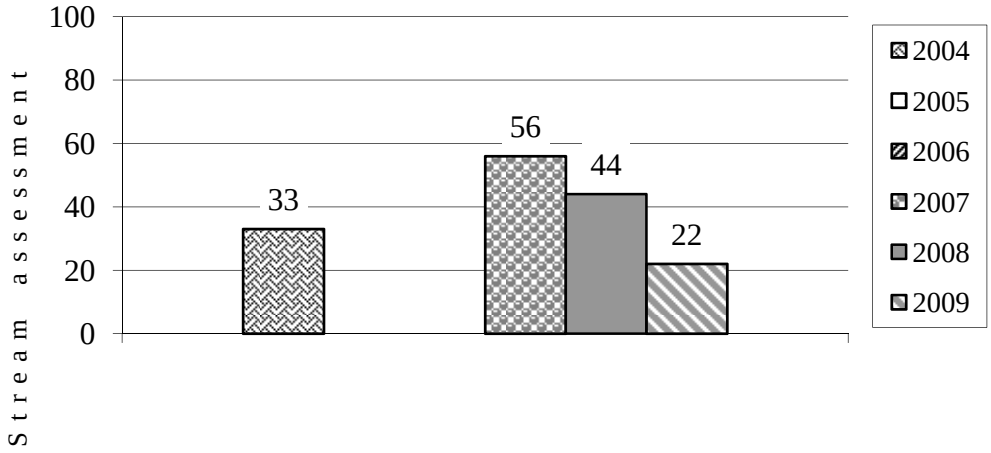
*Ceratopogonidae, and horsefly larvae were also present, suggesting that livestock inhabited nearby landscapes. Nearly 8% of invertebrates were hemoglobin-bearers (*Dicrotendipes *sp.,* Parachironomus *sp.,* Procladius *sp.), indicating hypoxic substrates. Increased nutrient availability may be indicated. The calculated thermal preference for the fauna here was 15.7ºC. The functional components were dominated by predators, especially the gnats. The wetland assessment index indicated "optimal" conditions (**Chart 5**).*

Chart 5: ***Off-Channel (pond) bioassessment scores using the wetland index from 2005 to 2009 at the Cloud Ranch Wetland Mitigation Site.***



Big Timber Creek. *The sampled site along Big Timber Creek supported a rheophilic taxa characteristic of flowing water and cool temperatures. Scores indicated in the chart were derived by means of a metric battery and scoring criteria developed for lotic conditions (MVFP index: Bollman 1998). Moderate impairment was indicated by the metric battery. Invertebrate abundance and diversity remained low at this site, suggesting that colonization potential was limited. However, moderately sensitive taxa were collected at the site, indicating good water quality. The shredding caddisfly* Lepidostoma *sp. dominated the sampled fauna: large organic material such as leaves and woody debris may limit the availability of substrates for other taxa and the bioassessment index estimated "moderate" impairment at the site (**Chart 6**). Faunal components were similar to those collected in 2008. Thermal preference could not be calculated due to the depauperate fauna.*

Chart 6: ***Big Timber Creek bioassessment scores using the stream index in 2004 and from 2007 to 2009 for the Cloud Ranch Wetland Mitigation Site.***



3.7 Functional Assessment

Pre-construction functional assessments were completed for the wetlands by ADC (2003) but have not been received for use in this monitoring report. From 2004 through 2007 conditions were assessed using the 1999 MDT Montana Wetland Assessment Method (MWAM). In 2008 and 2009 conditions were assessed using the 2008 MDT MWAM (**Functional Assessment Forms** in **Appendix B**). Functional assessments from 2004 to 2009 have been summarized (**Table 5**).

The creek corridor wetlands currently rated as a Category II community, while the off-channel wetlands were assigned a Category III rating (**Table 5**). The ratings have been fairly consistent over the monitoring period; although the 2007 Threatened and Endangered Species function decreased because the Bald Eagle was de-listed (**Table 5**).

3.8 Photographs

Representative photos taken from photo points and transect ends are included in **Appendix C.**

3.9 Maintenance Needs/Recommendations

The site supports two State of Montana-listed noxious weeds, Canada thistle and hound's-tongue. Canada thistle was observed along portions of Big Timber Creek and within the off-channel wetland assessment area (**Figure 3** in **Appendix A**). Some infestations of Canada thistle appeared to have been sprayed in 2008 in the upland and wetlands adjacent to the Big Timber Creek channel. Continued chemical or biological control measures are recommended for Canada thistle. Hound's-tongue was noted along the upper reach of Big Timber Creek uplands as a few scattered individual plants.

Table 5: ***Summary of the 2004 to 2009 wetland function/value ratings and functional points at the Cloud Ranch Wetland Mitigation Project.***

Function and Value Parameters from the MDT Montana Wetland Assessment Method	2004[1] Post-Construction Off-Channel Wetlands	2004[1] Post-Construction Big Timber Creek	2005[1] Off-Channel Wetlands	2005[1] Big Timber Creek	2006[1] Off-Channel Wetlands	2006[1] Big Timber Creek	2007[1] Off-Channel Wetlands	2007[1] Big Timber Creek	2008[2] Off-Channel Wetlands	2008[2] Big Timber Creek	2009[3] Off-Channel Wetlands	2009[3] Big Timber Creek
Listed/Proposed T&E Species Habitat	Low (0.3)	Low (0.3)	Low (0.3)	Low (0.3)	Low (0.3)	Low (0.3)	Low (0.0)	Low (0.0)	Low (0.0)	Low (0.0)	Low (0.0)	Low (0.0)
MTNHP Species Habitat	Low (0.1)	Mod (0.6)	Low (0.1)	Mod (0.6)	Low (0.1)	Mod (0.6)	Low (0.1)	Mod (0.6)	Low (0.1)	Mod (0.5)	Low (0.1)	Mod (0.5)
General Wildlife Habitat	Mod (0.7)	High (0.9)	Mod (0.7)	High (0.9)	Mod (0.7)	High (0.9)	Mod (0.7)	High (0.9)	Mod (0.7)	High (0.9)	Mod (0.7)	High (0.9)
General Fish/Aquatic Habitat	NA	Mod (0.7)	NA	Mod (0.7)	NA	Mod (0.7)	NA	Mod (0.7)	NA	Mod (0.6)	NA	Mod (0.6)
Flood Attenuation	Mod (0.5)	Mod (0.4)	Mod (0.5)	Mod (0.4)	Mod (0.5)	Mod (0.4)	Mod (0.5)	Mod (0.4)	Mod (0.5)	High (0.9)	Mod (0.5)	High (0.9)
Short and Long Term Surface Water Storage	Mod (0.6)	Mod (0.6)	Mod (0.6)	Mod (0.6)	Mod (0.6)	Mod (0.6)	Mod (0.6)	Mod (0.6)	Mod (0.6)	Mod (0.6)	Mod (0.6)	Mod (0.6)
Sediment/Nutrient/Toxicant Removal	High (1.0)	Mod (0.6)	High (1.0)	Mod (0.6)	High (1.0)	Mod (0.6)	High (1.0)	High (0.9)	High (1.0)	High (0.9)	High (1.0)	High (0.9)
Sediment/Shoreline Stabilization	High (1.0)	Mod (0.7)	High (1.0)	Mod (0.7)	High (1.0)	Mod (0.7)	High (1.0)	Mod (0.7)	High (1.0)	Mod (0.7)	High (1.0)	Mod (0.7)
Production Export/Food Chain Support	Mod (0.7)	Mod (0.7)	Mod (0.7)	Mod (0.7)	Mod (0.7)	Mod (0.7)	Mod (0.7)	High (0.8)	High (0.8)	High (0.6)	High (0.8)	High (0.6)
Groundwater Discharge/Recharge	High (1.0)	High (1.0)	High (1.0)	High (1.0)	High (1.0)	High (1.0)	High (1.0)	High (1.0)	High (1.0)	High (1.0)	High (1.0)	High (1.0)
Uniqueness	Mod (0.4)	Mod (0.4)	Mod (0.4)	Mod (0.4)	Mod (0.4)	Mod (0.4)	Mod (0.4)	Mod (0.4)	Mod (0.4)	Mod (0.4)	Mod (0.4)	Mod (0.4)
Recreation/Education Potential	Mod (0.7)	Mod (0.7)	Mod (0.7)	Mod (0.7)	Mod (0.7)	Mod (0.7)	Mod (0.7)	Mod (0.7)	Mod (0.1)	Mod (0.1)	Mod (0.1)	Mod (0.1)
Actual Points / Possible Points	**7 / 11**	**7.6 / 12**	**7 / 11**	**7.6 / 12**	**7 / 11**	**7.6 / 12**	**6.7 / 11**	**7.7 / 12**	**6.2 / 10**	**7.2 / 11**	**6.2 / 10**	**7.2 / 11**
% of Possible Score Achieved	**64%**	**63%**	**64%**	**63%**	**64%**	**63%**	**61%**	**64%**	**62%**	**66%**	**62%**	**66%**
Overall Category	**III**	**II**	**III**	**II**	**III**	**II**	**III**	**II**	**III**	**II**	**III**	**II**
Total Acreage of Assessed Wetlands and Open Water within Easement	**2.19**	**2.65**	**2.75**	**2.93**	**2.93**	**2.88**	**2.93**	**3.27**	**3.12**	**3.59**	**2.92**	**4.08**
Baseline Acreage of Assessed Wetlands and Open Water within Easement	**0.72**	**2.17** (open water)	**0.72**	**2.17** (open water)	**0.72**	**2.17** (open water)	**0.72**	**2.17** (open water)	**0.72**	**2.17** (open water)	**0.72**	**2.23** (open water)
Functional Units (acreage x actual points)	**15.33**	**20.14**	**19.25**	**22.27**	**20.51**	**21.89**	**19.63**	**25.18**	**19.34**	**25.8**	**18.10**	**29.37**
Net Acreage Gain	**1.47** (1.2 wetland, 0.27 open water)	**0.48** (wetland)	**2.03** (1.79 wetland, 0.24 open water)	**0.76** (wetland)	**2.21** (1.97 wetland, 0.24 open water)	**0.71** (wetland)	**2.21** (1.97 wetland, 0.24 open water)	**1.1** (wetland)	**2.40** (2.13 wetland, 0.27 open water)	**1.42** (wetland)	**2.20** (2.06 wetland, 0.14 open water)	**1.85** (wetland)
Net Functional Unit Gain (since 2004)	Unavailable[3]	Unavailable[3]	**3.92**	**2.13**	**5.18**	**1.75**	**4.3**	**5.04**	**4.01**	**5.7**	**2.77**	**9.23**
Total Functional Unit Gain (since 2004)	Unavailable[3]		**6.05**		**6.93**		**9.34**		**9.71**		**12.0**	

[1] 1999 MDT Montana Wetland Assessment Methods (MWAM).
[2] 2008 MDT MWAM.
[3] 2008 MDT MWAM. The completed form is in **Appendix B**.

The water level control structures within the off-channel wetlands were functioning and in good working order at the time of the July monitoring. Big Timber Creek channel migration resulted in minor bank loss in 2009. Gravel bars and new depositional areas will continue to be monitored to track riparian wetland gains or losses, development of the cottonwood communities, and negative or undesirable changes in vegetation. As mentioned earlier, the project designer commented in 2006 that the upper end of the lowest reach is likely to continue shifting before it stabilizes and some minor intervention in this area may eventually be warranted. Intervention does not appear warranted at this time as the stream appears to be adjusting naturally.

3.10 Current Credit Summary

MDT anticipated creation and restoration of this site to provide 5.5 acres of credit within a 15.5 acre conservation easement. A summary table from the COE of potential wetland credits is provided in a 2002 letter from the COE (**Appendix G**). The COE allows a 1:1 ratio for creation and restoration for Big Timber Creek and the off-channel wetlands as well as a 4:1 ratio for a buffer zone. **Table 6** outlines the target wetland credits and ratios from the COE (2002) and the net acres delineated during the 2009 wetland monitoring.

In 2009, the net off-channel wetland/open water acreage is 2.2 acres (2.78 acres total wetland +0.14 acre open water – 0.72 acre of pre-existing wetlands = 2.2 acres). The Big Timber Creek wetland acreage is 1.85 acre; an increase of 0.43 acre compared to 2008 due to the population of young cottonwood and willow seedlings along the creek. Riparian wetlands comprise 1.7 acres along Big Timber Creek with 0.15 acre of emergent wetlands. The Big Timber Creek channel itself is not included in acreage totals.

As of 2009, the mitigation efforts have resulted in a total of 3.91 wetland credit acres, 0.14 shallow open water credit acres, and 0.89 credit acre of wetland/upland buffer. The grand total for the Cloud Ranch to date is 4.94 credit acres or 90 percent of the 5.49-acre goal.

As of 2009, the site remains approximately 0.55 acre short of its credit goal. The stream migration in 2006 created a new channel by cutting through a small point bar wetland. Areas adjacent to this channel are developing into wetlands with the establishment of cottonwood and willow seedlings. Banks and high terraces along Big Timber Creek will likely take more time to establish wetland vegetation. In 2009, the open water was reduced due to the vegetation encroachment. Community Type 7 near the southern monitoring limits of the off-channel area could potentially add wetland acreage in this area if the inundation continues. It should also be noted that restored Big Timber Creek itself (approximately 2.23 acres) is not included in aquatic acreage totals as it was not included in the original credit scheme; however, perhaps a portion of this would be considered creditable by the COE.

Table 6. ***2009 credit acreages and ratios for the Cloud Ranch Wetland Mitigation Site.***

Wetland Mitigation	Current Net Acres	Ratio	2009 Credit Acres	Target Credit Acres	Comments
Off-channel [1] Creation and restoration wetlands and open water	2.2	1:1	2.2	2.02	none.
Big Timber Creek [2] Riparian wetland restoration	1.7	1:1	1.7	2.00	Riparian wetland community represented by Type 2.
Emergent wetland restoration	0.15	1:1	0.15	0.58	Riparian wetland community Type 2 has an emergent component at two small locations within mapped CT2. This acreage was calculated separately.
Upland and Wetland Buffer	3.56	4:1	0.89	0.89	Livestock grazing is prohibited on wetland sites.
TOTAL	**7.61**		**4.94**	**5.49**	**90% of goal**

[1.] This acreage correlates to lines 2 and 3 in the October 2, 2002 COE table (**Appendix G**).
[2.] This acreage correlates to lines 4, 5 and 6 respectively in the Oct 7, 2002 COE table (**Appendix G**).

4.0 REFERENCES

Berglund, J. and R. McEldowney. 2008. *MDT Montana Wetland Assessment Method*. Prepared for Montana Department of Transportation, Helena, Montana. Post, Buckley, Schuh, & Jernigan, Helena, Montana. 42pp.

Berglund, J. 1999. *MDT Montana Wetland Assessment Method*. Prepared for Montana Department of Transportation. May 1999.

Bollman, W. 2009. *MDT Mitigated Wetland Monitoring Project – Aquatic Invertebrate Monitoring Summary 2001-2009*. Rhithron Associates, Inc. Missoula, Montana.

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

Reed, P.B. 1988. *National list of plant species that occur in wetlands: North West (Region 9).* Biological Report 88(26.9), May 1988. U.S. Fish and Wildlife Service. Washington, D.C.

Steinle, A. 2008. Montana Program Manager, U.S. Army Corps of Engineers, Helena, Montana. July 14th telephone conversation.

U.S. Army Corps of Engineers (COE). 2008. *Interim Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys, and Coast Region*, ed. J. S. Wakeley, R. W. Lichvar, and C. V. Noble. ERDC/EL TR-08-13. U.S. Army Engineer Research and Development Center, Vicksburg, Missouri.

USDA Natural Resource Conservation Service. 1981. *Soil Survey of Sweetgrass County, Montana.*

USGS. 2009. Real Time Water Data for USGS 0620000 Boulder River at Big Timber, Montana. Obtained from http://waterdata. usgs.gov/mt/nwis/dv?site_no=0620000&agency_cd=USGS&referred.

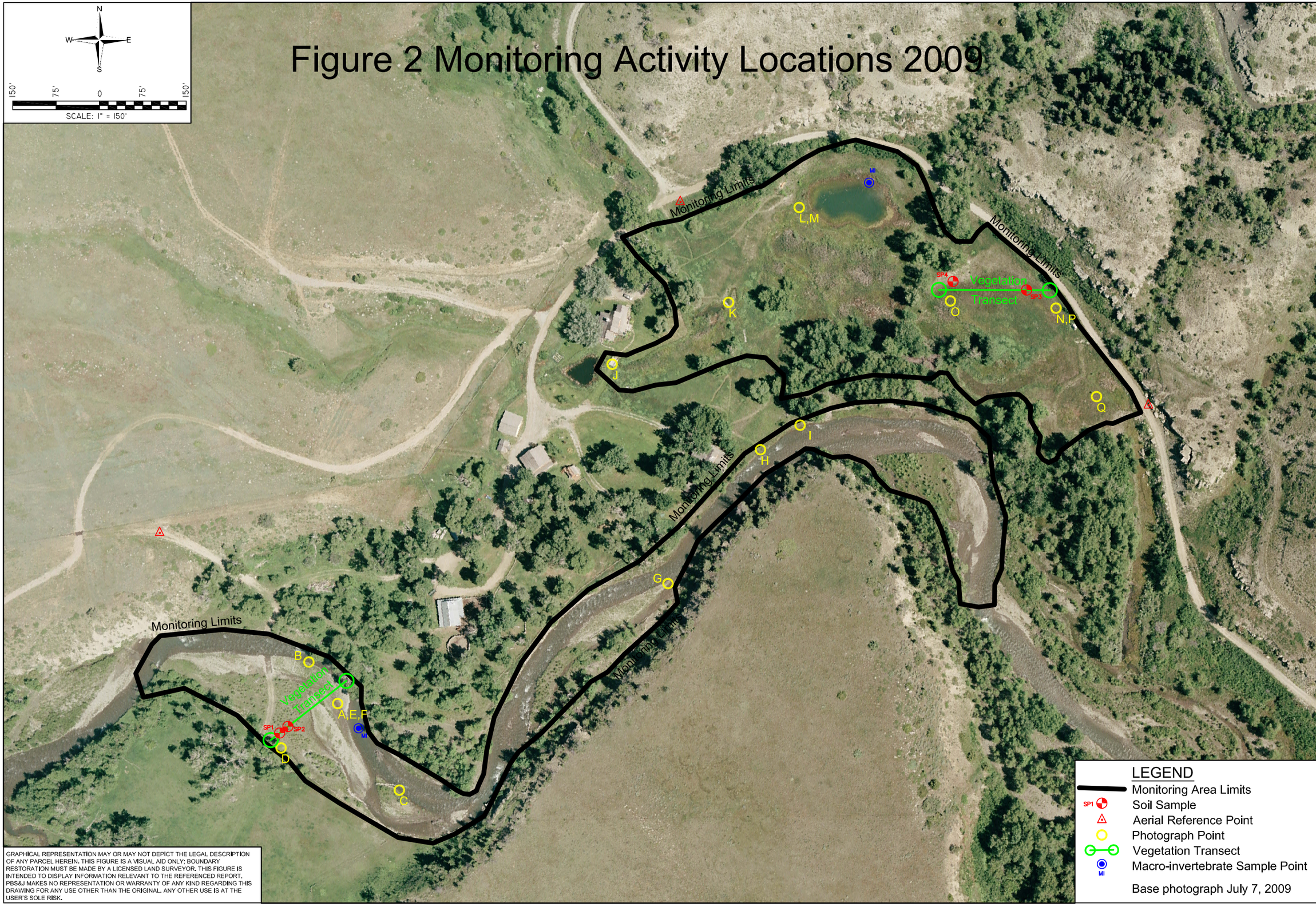
Western Regional Climate Center (WRCC). 2009. Climate data from the Big Timber Weather Station. Obtained from http://www.wrcc.dri.edu/cgi-bin/cliMONtpre.pl?mtbigt.

Appendix A

FIGURES 2 & 3

MDT Wetland Mitigation Monitoring
Cloud Ranch
Big Timber, Montana

Figure 2 Monitoring Activity Locations 2009



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PROJECT NAME
MDT CLOUD RANCH WETLAND MITIGATION

DRAWING TITLE
MONITORING ACTIVITY LOCATIONS 2009

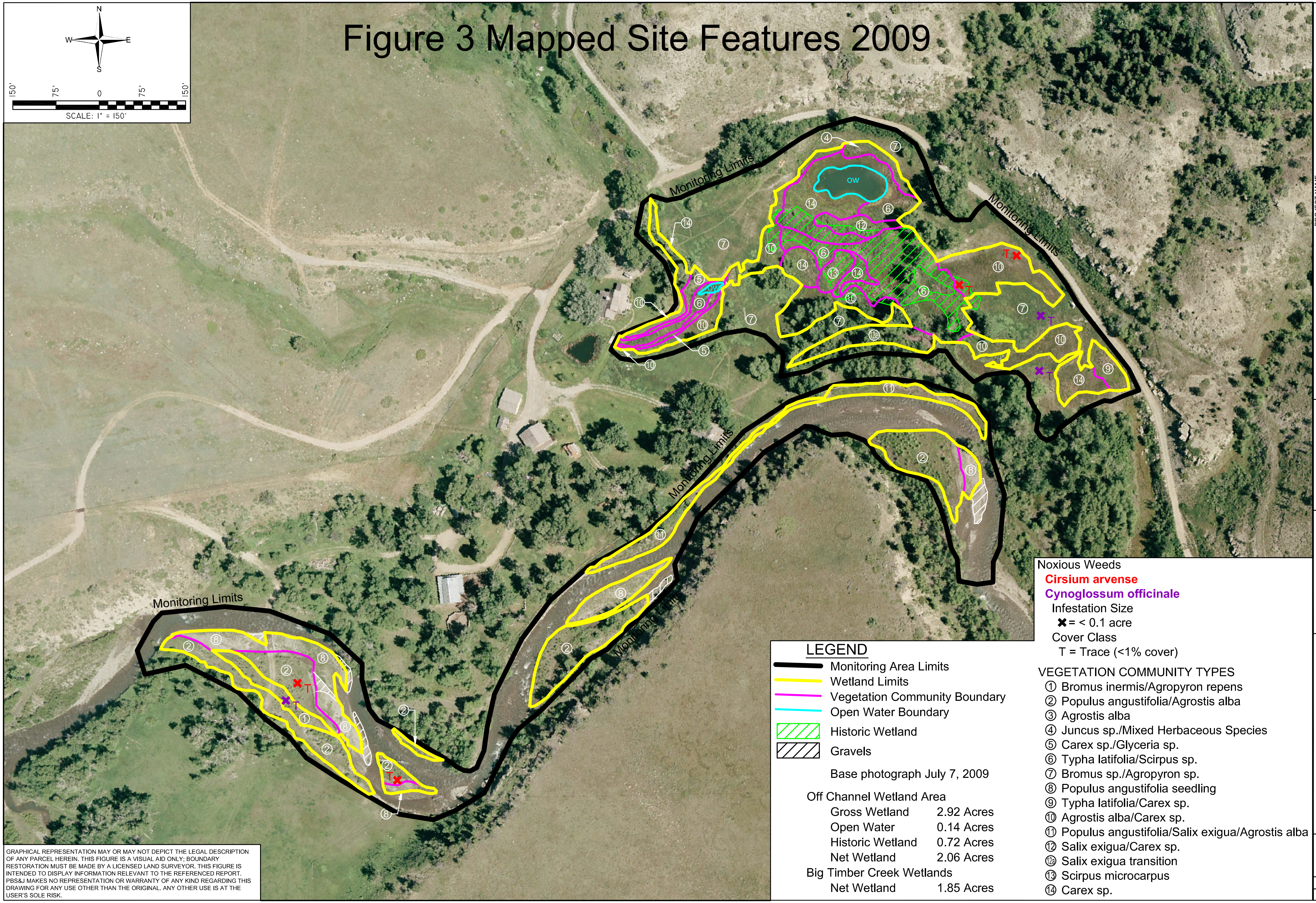
PROJ NO: 0B4308802 06.02	DRAWN: SH/JR		
LOCATION: BIG TIMBER, MT	PROJ MGR: J. BERGLUND		
SCALE: NOTED	CHECKED: CH	APPVD: JB	
FILE NAME:	PLOTTED:		

3810 Valley Commons Drive
Suite 4
Bozeman, MT 59718
PBSJ

FIGURE
2

REV -
10/27/2009

Figure 3 Mapped Site Features 2009



LEGEND

- Monitoring Area Limits
- Wetland Limits
- Vegetation Community Boundary
- Open Water Boundary
- Historic Wetland
- Gravels

Base photograph July 7, 2009

Off Channel Wetland Area

Gross Wetland	2.92 Acres
Open Water	0.14 Acres
Historic Wetland	0.72 Acres
Net Wetland	2.06 Acres

Big Timber Creek Wetlands

Net Wetland	1.85 Acres

Noxious Weeds

Cirsium arvense

Cynoglossum officinale

Infestation Size

✖ = < 0.1 acre

Cover Class

T = Trace (<1% cover)

VEGETATION COMMUNITY TYPES

① Bromus inermis/Agropyron repens
② Populus angustifolia/Agrostis alba
③ Agrostis alba
④ Juncus sp./Mixed Herbaceous Species
⑤ Carex sp./Glyceria sp.
⑥ Typha latifolia/Scirpus sp.
⑦ Bromus sp./Agropyron sp.
⑧ Populus angustifolia seedling
⑨ Typha latifolia/Carex sp.
⑩ Agrostis alba/Carex sp.
⑪ Populus angustifolia/Salix exigua/Agrostis alba
⑫ Salix exigua/Carex sp.
⑫a Salix exigua transition
⑬ Scirpus microcarpus
⑭ Carex sp.

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PROJECT NAME
MDT CLOUD RANCH WETLAND MITIGATION

DRAWING TITLE
MAPPED SITE FEATURES 2009

DRAWN: SH/JR
PROJ MGR: J. BERGLUND
CHECKED: CH APPVD: JB
PLOTTED:
PROJ NO: 0B4308802 06.02
LOCATION: BIG TIMBER, MT
SCALE: NOTED
FILE NAME:

PBS&J
3810 Valley Commons Drive
Suite 4
Bozeman, MT 59718

FIGURE
3

REV -
10/27/2009

Appendix B

2009 WETLAND MITIGATION SITE MONITORING FORM
2009 BIRD SURVEY FORM
2009 COE WETLAND DELINEATION FORMS
2009 FUNCTIONAL ASSESSMENT FORMS

MDT Wetland Mitigation Monitoring
Cloud Ranch
Big Timber, Montana

LWC / MDT WETLAND MITIGATION SITE MONITORING FORM

Project Name: **Cloud Ranch** Project Number: **0B4308802.0602**
Assessment Date: **July 24, 2009** Person(s) conducting the assessment: **CH**
Location: **12 miles north of Big Timber** MDT District: **Billings** Milepost: _____
Legal Description: T **3N** R **13E** Section **36**
Weather Conditions: **partly sunny/warm** Time of Day: **9 AM**
Initial Evaluation Date: **August 23, 2004** Monitoring Year: **6** # Visits in Year: **1**
Size of evaluation area: **5.5 acres** Land use surrounding wetland: **pasture/rangeland/residential**

HYDROLOGY

Surface Water Source: **Big Timber Creek and an unnamed spring creek**
Inundation: **Present** Average Depth: **2 inches** Range of Depths: **1 to 4 inches**
Percent of assessment area under inundation: **90%**
Depth at emergent vegetation-open water boundary: **0.5 feet**
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.):
Water marks, drift lines, sediment deposits and surface water

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

Well Number	Depth	Well Number	Depth	Well Number	Depth

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

COMMENTS / PROBLEMS:
Surface water was observed in approximately 90 percent of the off-channel assessment area during the July monitoring trip. In 2008 and 2009, surface water was present in new areas along the southern and western portion of the assessment area where surface water has not been noted in the past. The unnamed tributary supplying water to the off-channel wetlands and open water areas were bankfull.

VEGETATION COMMUNITIES

Community Number: **1** Community Title (main spp): **Bromus inermis/Agropyron repens**

Dominant Species	% Cover	Dominant Species	% Cover
Bromus inermis	3 = 11-20%	Phleum pratensis	1 = 1-5%
Agropyron repens	3 = 11-20%	Cirsium arvense	1 = 1-5%
Populus angustifolia	3 = 11-20%	Agropyron riparium	1 = 1-5%
Melilotus officinalis	3 = 11-20%	Bromus marginatus	1 = 1-5%
Equisetum hymoides	1 = 1-5%	Trifolium sp.	1 = 1-5%
Agrostis alba	1 = 1-5%	Cobbles/bare soil	1 = 1-5%
Solidago canadensis	1 = 1-5%		

Comments / Problems**:** Verbascum thapsus and Cynoglossum officinale were noticed in this community type. In 2008 and 2009 there is an increase in the percent cover by Melilotus officinalis compared to previous years.

Community Number: **2** Community Title (main spp): **Populus angustifolia/Agrostis alba**

Dominant Species	% Cover	Dominant Species	% Cover
Populus angustifolia-2 to 6 ft tall	4 = 21-50%	Juncus torreyi	1 = 1-5%
Agrostis alba	3 = 11-20%	Elymus canadensis	1 = 1-5%
Equisetum arvense	2 = 6-10%	Cirsium arvense	1 = 1-5%
Deschampsia cespitosa	2 = 6-10%	Alopecurus pratensis	1 = 1-5%
Bromus ciliatus	1 = 1-5%	Trifolium sp.	1 = 1-5%
Juncus ensifolius	1 = 1-5%	Melilotus officinalis	1 = 1-5%
Salix exigua (seedlings)	1 = 1-5%	Cobbles/rock	2 = 6-10%

Comments / Problems: Riverine wetland vegetation is dependent upon creek flows and periodic flooding. Weather (precipitation and flow events) influence the percent cover, species diversity and rate of wetland development along the creek. There continues to be an increase in the height and cover of Populus angustifolia. This wetland is continuing to develop and mature along this reach of Big Timber creek. In 2009 small overflow channels continue to develop across the larger point bars, influencing minor changes in wetlands and upland areas. Young cottonwoods continue to establish on new or older depositional areas as well as sandbar willow (Salix exigua) seedlings.

Community Number: **3** Community Title (main spp): **Agrostis alba**

Dominant Species	% Cover	Dominant Species	% Cover
Agrostis alba	4 = 21-50%	Phalaris arundinacea	1 = 1-5%
Salix exigua	2 = 6-10%	Poa palustris	1 = 1-5%
Alopecurus pratensis	1 = 1-5%	Epibolium ciliatum	1 = 1-5%
Deschampsia cespitosa	1 = 1-5%	Elymus canadensis	1 = 1-5%
Juncus torreyi	1 = 1-5%	Mentha arvensis	+ = < 1%
Glyceria elata	1 = 1-5%	Rocks/cobbles/gravels	2 = 6–10%

Comments / Problems: This community type seems to be evolving into a CT 2 or CT 10.

VEGETATION COMMUNITIES (continued)

Community Number: **4** Community Title (main spp): **Juncus sp./Mixed Herbaceous Species**

Dominant Species	% Cover	Dominant Species	% Cover
Juncus torreyi	2 = 6-10%	Carex nebrascensis	2 = 6-10%
Juncus mertensianus	1 = 1-5%	Carex aquatilis	1 = 1-5%
Juncus longistylis	2 = 6-10%	Glyceria sp.	1 = 1-5%
Juncus ensifolius	1 = 1-5%	Mentha arvsense	1 =1-5%
Typha latifolia	2 = 6-10%		
Agrostis alba	2 = 6-10%		
Carex utriculata	2 = 6-10%		

Comments / Problems: Juncus species represented the majority of the cover in this community type but noted in 2007, Carex, Typha and Agrostis alba are increasing in abundance. In 2008 and 2009, portions of this community type have evolved into a community type (CT 10) with a dominance of Agrostis alba and Carex species.

Community Number: **5** Community Title (main spp): **Carex sp./Glyceria sp.**

Dominant Species	% Cover	Dominant Species	% Cover
Carex utriculata	3 = 11-20%	Calamagrostis canadensis	1 = 1-5%
Glyceria grandis	3 = 11-20%	Juncus torreyi	1 = 1-5%
Carex aquatilis	3 = 11-20%	Juncus mertensianus	1 = 1-5%
Carex nebrascensis	2 = 6-10%	Juncus balticus	1 = 1-5%
Carex languinosa	1 = 1-5%	Scirpus pungens	1 = 1-5%
Scirpus pallidus	1 = 1-5%		
Typha latifolia	1 = 1-5%		

Comments / Problems: This community typically forms a distinct community adjacent to the Typha latifolia/Scirpus community. Glyceria is the co-dominant in areas with surface or flowing water. This community type continues to be diverse with a variety of species.

Community Number: **6** Community Title (main spp): **Typha latifolia/Scirpus sp.**

Dominant Species	% Cover	Dominant Species	% Cover
Typha latifolia	4 = 21-50%	Bechmannia syzigachne	1 = 1-5%
Scirpus validus	2 = 6-10%	Glyceria grandis	1 = 1-5%
Scirpus microcarpus	2 = 6–10%	Carex vulpinoidea	1 = 1-5%
Scirpus pallidus	1 = 1-5%	Scirpus pungens	1 = 1-5%
Carex utriculata	1 = 1-5%	Salix exigua	1 = 1-5%
Carex aquatilis	1 = 1-5%		

Comments / Problems: This community type was found along the unnamed spring creek channel or in areas where surface water persisted through most of the summer. There is an increase in the abundance and cover of Salix exigua along the edges of this community type and in 2009 a new scrub-shrub community was added (CT12).

VEGETATION COMMUNITIES (continued)

Community Number: **7** Community Title (main spp): **Bromus sp./Agropyron sp.**

Dominant Species	% Cover	Dominant Species	% Cover
Bromus inermis	4 = 21-50%	Populus angustifolia*	2 = 6-10%
Bromus marginatus	1 = 1-5%	Agrostis alba	1 = 1-5%
Agropyron repens	3 = 11-20%	Dactylis glomerata	1 = 1-5%
Agropyron riparium	1 = 1-5%	Phleum pratensis	1 = 1-5%
Agropyron trachycaulum	2 = 6-10%	Festuca arundinacea	1 = 1-5%
Elymus canadensis	1 = 1-5%		

Comments / Problems: *Populus angustifolia represents scattered mature trees within this community type. This community type represents the buffer area around the off-channel wetlands. Populus angustifolia seedlings/root suckers are becoming more abundant in the buffer area.

Community Number: **8** Community Title (main spp): **Populus angustifolia (<12 inches tall).**

Dominant Species	% Cover	Dominant Species	% Cover
Populus angustifolia	5 = >50%		
Agrostis alba, Poa palustris	2 = 6-10%		
Lupine sp., Melilotus officinalis	1 = 1-5%		

Comments / Problems: The migration of Big Timber creek has created new, unvegetated exposed gravel bars within the project area. In 2008 and 2009, Populus angustifolia seedlings were abundant on more than 50% of the gravel bars along Big Timber creek.

Community Number: **9** Community Title (main spp): **Typha latifolia/Carex sp.**

Dominant Species	% Cover	Dominant Species	% Cover
Typha latifolia	4 = 21-50%	Juncus ensifolius	1 = 1-5%
Carex nebrascensis	3 = 11-20%	Scirpus validus	1 = 1-5%
Carex utriculata	2 = 6-10%	Juncus balticus	1 = 1-5%
Carex aquatilis	2 = 6-10%	Eleocharis palustris	1 = 1-5%
Carex languinosa	1 = 1-5%		

Comments / Problems**:** This is a new community type mapped in 2008 found primarily in the eastern portion of the off-channel project area. This community evolved from CT 5 and CT 6.

Community Number: **10** Community Title (main spp): **Agrostis alba/Carex sp.**

Dominant Species	% Cover	Dominant Species	% Cover
Agrostis alba	4 = 21-50%	Juncus torreyi	1 = 1-5%
Carex nebrascensis	2 = 6-10%	Juncus longistylis	1 = 1-5%
Carex utriculata	1= 1-5%	Typha latifolia	1 = 1-5%

Comments / Problems: This is a new community type mapped in 2008 found mainly in the eastern portion of the off-channel project area and around the north/northwest edges of the large open water pond. This community evolved from CT 4.

Additional Activities Checklist: ☒ Record and map vegetative communities on aerial photograph.

VEGETATION COMMUNITIES (continued)

Community Number: **11** Community Title (main spp): **Populus angustifolia/Salix exigua/Agrostis alba**

Dominant Species	% Cover	Dominant Species	% Cover
Populus angustifolia (<18 inches)	4 = 21-50%		
Salix exigua (<18 inches)	4 = 21-50%		
Agrostis alba	3 = 11-20%		
Equisetum arvense	2 = 6-10%		

Comments / Problems: Banks and low terraces bordering Big Timber Creek are more stable with the establishment of cottonwood and willow seedlings.

Community Number: **12**** Community Title (main spp): **Salix exigua/Carex sp.**

Dominant Species	% Cover	Dominant Species	% Cover
Salix exigua	4 = 21-50%		
Carex utriculata	3 = 11-20%		
Carex aquatilis	3 = 11-20%		
Carex languinosa	2 = 6-10%		

Comments / Problems: A new community type mapped in 2009 bordering cattails and bulrush (CT6). **CT12A Salix exigua transition was also mapped in 2009 and includes a historic oxbow located in the southern portion of the off-channel wetlands. During the monitoring reconnaissance, Salix exigua was present in this area with mucky soils indicating a transition to either cattails or sedge.

Community Number: **13** Community Title (main spp): **Scirpus microcarpus**

Dominant Species	% Cover	Dominant Species	% Cover
Scirpus microcarpus	5 = >50%		
Populus angustifolia	2 = 6-10%		
Carex sp.	1 = 1-5%		

Comments / Problems: A small, very distinct community bordering cattails (CT6) and sedge communities (CT10).

Community Number: **14** Community Title (main spp): **Carex sp.**

Dominant Species	% Cover	Dominant Species	% Cover
Carex utriculata	4 = 21-50%		
Carex aquatilis	3 = 11-20%		
Carex languinosa	3 = 11-20%		

Comments / Problems: This new community type in 2009 has transitioned from a dominance of redtop (CT3 and CT10) to a dominance of sedge species.

Additional Activities Checklist: ☒ Record and map vegetative communities on aerial photograph.

COMPREHENSIVE VEGETATION LIST

Plant Species	Vegetation Community Number (s)	Plant Species	Vegetation Community Number (s)
Achillea millefolium	1	*Helianthis annuus*	1
Agropyron repens	1, 7	*Hordeum jubatum*	3, 4, 7
Agropyron riparium	1, 7	*Hyoscyamus niger*	7, 8
Agropyron smithii	7	*Juncus balticus*	5, 9, 10
Agropyron trachycaulum	7	*Juncus ensifolius*	2, 4, 9, 10
Agrostis alba	1, 2, 3, 4, 7, 8, 9, 10, 11	*Juncus longistylis*	4, 9, 10
Alopercurus aequalis	4	*Juncus mertensianus*	4, 5
Alopecurus arundinaceus	3	*Juncus tenuis*	2, 5
Alopecurus pratensis	2, 3, 7	*Juncus torreyi*	2, 3, 4, 5, 9, 10
Ambrosia trifida	1	*Linaria vulgaris*	8
Arctium minus	1, 2	*Lupine sp.*	8
Artemisia dracunculus	1, 2	*Melilotus officinalis*	1,8
Bechmannia syzigachne	4, 6	*Mentha arvensis*	2, 3, 4, 6
Betula occidentalis	1, 2	*Mimulus guttatus*	2
Bromus ciliatus	2	*Phacelia hastata*	1
Bromus inermis	1, 7	*Phalaris arundinacea*	3
Bromus marginatus	1, 7	*Phleum pratense*	1, 7
Bromus japonicus	7	*Populus angustifolia*	1, 2, 3, 7, 8, 11
Calamagrostis canadensis	5	*Poa compressa*	2
Carduus nutans	8	*Poa palustris*	2, 3, 4, 5, 8
Carex aquatilis	4, 5, 6, 9, 10, 12, 14	*Poa pratensis*	1, 7
Carex languinosa	5, 6, 9, 12, 14	*Primula parryi*	8
Carex microptera	2	*Prunus virginiana*	7
Carex nebrascensis	4, 5, 9, 10	*Puccinellia distans*	2
Carex utriculata	4, 5, 6, 9, 10, 12, 14	*Rumex crispus*	2
Carex vulpinoides	6	*Salix bebbiana*	5, 6
Centaurea maculosa	1	*Salix exigua*	2, 3, 5, 6, 11, 12
Chenopodium sp.	1	*Senecio integerrimus*	2
Cirsium arvense	1, 2, 7, 8	*Scirpus acutus*	4, 6
Cleome serrulata	1, 7	*Scirpus microcarpus*	6, 10, 13
Crepis runinata	1	*Scirpus validus*	4, 6, 9, 10
Cynoslossum officinale	1	*Scirpus pallidus*	5, 6
Dactylis glomerata	7	*Scirpus pungens*	5, 6
Deschampsia cespitosa	1, 2, 3, 5	*Solidago canadensis*	1
Eleocharis palustris	4, 5, 9, 10	*Solidago occidentalis*	1
Elymus canadensis	2, 3, 7	*Spartina pectinata*	4
Elymus cinereus	7	*Symphoricarpos albus*	1
Epilobium ciliatum	3	*Tragopogon dubois*	1
Equisetum arvense	1, 2, 11	*Trifolium hybridum*	1, 2
Equisetum hymoides	1, 2	*Trifolium fragiferum*	1, 2
Festuca arundinacea	7	*Typha latifolia*	4, 5, 6, 9, 10
Glyceria elata	3, 4, 5	*Veronica americana*	2
Glyceria grandis	4, 5, 6	*Veronica thapsus*	1, 7, 8
Glycyrrhiza lepidota	1, 7		
Grindelia squarrosa	1		

Comments / Problems: _____

PLANTED WOODY VEGETATION SURVIVAL

Plant Species	Number Originally Planted	Number of Live Plants Observed	Mortality Causes
Salix exigua cuttings	2500	250	Planted too close to the waters edge, mortality due to high flow, however the remaining cuttings are doing very well on large point bars within the Big Timber Creek project area.
Populus angustifolia	1310	851	Very few dead or declining seedlings noted along the channel.
Betula occidentalis	392	1	None were noted in 2005, 2006, 2007 and 2008. In 2009 one shrub was noted along Big Timber Creek.

Comments / Problems: Estimated overall survival of the Salix exigua cuttings along Big Timber creek is approximately 10% or 250 plants (2006 through 2008). In 2009, starting to notice small root suckers off established Salix exigua cuttings on two of the larger point bars.

The estimated survival of the transplanted Populus angustifolia seedlings is approximately 65% or 851 plants. The young plants are robust and thriving, ranging in height from 2 to 6 feet.

Approximately 392 Betula occidentalis plants were transplanted along Big Timber Creek following construction. In 2009, one shrub was observed, will continue to look for plants during future monitoring visits.

WILDLIFE

Birds

Were man-made nesting structures installed? **Yes**
If yes, type of structure: **Bluebird houses, Wood Duck boxes** How many? **several**
Are the nesting structures being used? **Bluebirds: Yes, Wood Duck: unknown**
Do the nesting structures need repairs? **No**

Mammals and Herptiles

Mammal and Herptile Species	Number Observed	Indirect Indication of Use			
		Tracks	Scat	Burrows	Other
White-tailed deer	1	☐	☐	☐	
Raccoon		☒	☐	☐	
		☐	☐	☐	
		☐	☐	☐	
		☐	☐	☐	
		☐	☐	☐	
		☐	☐	☐	
		☐	☐	☐	

Additional Activities Checklist:
Yes Macroinvertebrate Sampling (if required)

Comments / Problems: Collected a sample from the large open water pond and from Big Timber Creek (see Figure 2)

PHOTOGRAPHS

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

Photograph Checklist:

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

Location	Photograph Frame #	Photograph Description	Compass Reading (°)
A		Big Timber Creek - transect 1 looking west	West
B		Big Timber Creek - view of community type 8	South
C		Big Timber Creek - bank to bank view	North
D		Big Timber Creek - transect 1 looking east	East
E		Big Timber Creek 2009 water levels	South
F		Big Timber Creek point bar on left (west) side of channel	North
G		Big Timber Creek riverine wetland and side channels	West
H		Big Timber Creek - riverine wetland with cottonwood and willow seedlings	East
I		Big Timber Creek - community type 2 wetland	Southeast
J		Off-channel wetlands - two community types	East
K		Off-channel wetlands - unnamed tributary	East
L		Off-channel wetlands - embankment removal area	East
M		Open water pond, off-channel wetlands and buffer	Southeast
N		Off-channel wetlands - transect 2	West
O		Off-channel wetlands - transect 2	Southeast
P		Off-channel wetlands - reduction in bare soil	North
Q		Off-channel wetlands - far SE corner wetlands	Southeast

Comments / Problems: _____

GPS SURVEYING

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

GPS Checklist:

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

Comments / Problems: _____

WETLAND DELINEATION

(attach COE delineation forms)

At each site conduct these checklist items:

- ☒ Delineate wetlands according to the 1987 Army COE manual.
- ☒ Delineate wetland – upland boundary onto aerial photograph.

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

Comments / Problems: _____

FUNCTIONAL ASSESSMENT

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

Comments / Problems: **Completed the 2008 MDT MWAM**

MAINTENANCE

Were man-made nesting structure installed at this site? **Yes**
If yes, do they need to be repaired? **No**
If yes, describe the problems below and indicate if any actions were taken to remedy the problems.

Were man-made structures built or installed to impound water or control water flow into or out of the wetland? **Yes**
If yes, are the structures working properly and in good working order? **Yes**
If no, describe the problems below.

Comments / Problems: _____

MDT WETLAND MONITORING – VEGETATION TRANSECT

Site: **Cloud Ranch - Big Timber Creek** Date: **July 24, 2009** Examiner: **CH/PBS&J**
Transect Number: **1** Approximate Transect Length: **195 feet** Compass Direction from Start: **44˚** Note: **Perpendicular across bar**

Vegetation Type A: **CT 2 (Riverine wetland)**	
Length of transect in this type: **30 feet**	
Plant Species	**Cover**
POPANG	4 = 21-50%
AGRALB	3 = 11-20%
EQUARV	2 = 6-10%
DESCAE	2 = 6-10%
POAPAL	2 = 6-10%
TRIHYB	2 = 6-10%
MELOFF	1 = 1-5%
PHLPRA	1 = 1-5%
AGRREP	1 = 1-5%
Total Vegetative Cover:	85%

Vegetation Type B: **CT 1 (Transitional riparian floodplain)**	
Length of transect in this type: **25 feet**	
Plant Species	**Cover**
POPANG (2 to 5 feet tall)	3 =11-20%
BROINE	3 =11-20%
AGRREP	3 = 11-20%
MELOFF	2 = 6-10%
TRIHYB	2 = 6-10%
DACGLO	2 = 6-10%
Total Vegetative Cover:	80%

Vegetation Type C: **CT 2 (Riverine wetland)**	
Length of transect in this type: **50 feet**	
Plant Species	**Cover**
POPANG (seedlings <12 inches tall)	5 = >50%
AGRALB	2 = 6-10%
SALEXI (seedlings)	2 = 6-10%
JUNENS	1 = 1-5%
JUNTOR	1 = 1-5%
DESCAE	1 = 1-5%
EQUARV	1 = 1-5%
Total Vegetative Cover:	70%

Vegetation Type D: **Gravels**	
Length of transect in this type: **6 feet**	
Plant Species	**Cover**
Gravels (sparsely vegetated)	<5%
Total Vegetative Cover:	<5%

MDT WETLAND MONITORING – VEGETATION TRANSECT

Site: **Cloud Ranch - Big Timber Creek** Date: **July 24, 2009** Examiner: **CH/PBSJ**
Transect Number: **1** Approximate Transect Length: **195 feet** Compass Direction from Start: **44˚** Note: **Perpendicular across bar**

Vegetation Type E: **CT 8 (Riverine wetland)**	
Length of transect in this type: **40 feet**	
Plant Species	**Cover**
POPANG (seedlings)	5 = >50%
Saturated sand/gravels	
Total Vegetative Cover:	60%

Vegetation Type F: **Bare Gravels**	
Length of transect in this type: **6 feet**	
Plant Species	**Cover**
Gravels (un-vegetated)	5 = >50%
Total Vegetative Cover:	50%

Vegetation Type G: **Open water**	
Length of transect in this type: **30 feet**	
Plant Species	**Cover**
Open water channel	
Total Vegetative Cover:	0%

Vegetation Type H: **Eroding Bank**	
Length of transect in this type: **2 feet**	
Plant Species	**Cover**
Roots, bare soil, gravels	5 = >50%
Total Vegetative Cover:	50%

MDT WETLAND MONITORING – VEGETATION TRANSECT

Site: **Cloud Ranch - Big Timber Creek** Date: **July 24, 2009** Examiner: **CH/PBSJ**
Transect Number: **1** Approximate Transect Length: **195 feet** Compass Direction from Start: **44˚** Note: **Perpendicular across bar**

Vegetation Type E: **CT 1 (Transitional riparian floodplain)**	
Length of transect in this type: **6 feet**	
Plant Species	**Cover**
BROINE	4 = 21-50%
AGRREP	3 = 11-20%
PHLPRA	2 = 6-10%
SOLCAN	1 = 1-5%
SMYALB	1 = 1-5%
AGRALB	1 = 1-5%
Total Vegetative Cover:	85%

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

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

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

Site: **Cloud Ranch - Wetlands** Date: **July 24, 2009** Examiner: **CH/PBSJ**
Transect Number: **2** Approximate Transect Length: **200 feet** Compass Direction from Start: **75˚** Note: **SW**

Vegetation Type I: **CT 7 (Upland)**	
Length of transect in this type: 6 feet	
Plant Species	**Cover**
BROINE	4 = 21-50%
AGRREP	4 = 21-50%
PHLPRA	3 = 11-20%
AGRALB	2 = 6-10%
CIRARV	1 = 1-5%
BROMAR	1 = 1-5%
Total Vegetative Cover:	95%

Vegetation Type J: **CT 10 (Restored wetland)**	
Length of transect in this type: 188 feet	
Plant Species	**Cover**
AGRALB	4 = 21-50%
CARNEB	3 = 11-20%
TYPLAT	3 = 11-20%
SCIPUN	3 = 11-20%
CARUTR	2 = 6-10%
CARAQU	2 = 6-10%
JUNENS	2 = 6-10%
ELEPAL	1 = 1-5%
JUNTOR	1 = 1-5%
JUNBAL	1 = 1-5%
1 to 3 inches of surface water	
Total Vegetative Cover:	95%

Vegetation Type K: **CT 7 (Upland)**	
Length of transect in this type: 6 feet	
Plant Species	**Cover**
BROINE	3 = 11-20%
AGRREP	2 = 6-10%
AGRALB	2 = 6-10%
AGRTRA	2 = 6-10%
FESARU	2 = 6-10%
PHLRPA	1 =1-5%
POAPRA	1 = 1-5%
(signs of flooding, sediment, high water marks)	
Total Vegetative Cover:	95%

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

MDT WETLAND MONITORING – VEGETATION TRANSECT

Cover Estimate		**Indicator Class**	**Source**
+ = < 1%	3 = 11-20%	+ = Obligate	P = Planted
1 = 1-5%	4 = 21-50%	- = Facultative/Wet	V = Volunteer
2 = 6-10%	5 = > 50%	0 = Facultative	

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

Establish transects perpendicular to the shoreline (or saturated perimeter). The transect should begin in the upland area. Permanently mark this location with a standard metal fencepost. Extend the imaginary transect line towards the center of the wetland, ending at the 3 foot depth (in open water), or at the point where water depths or saturation are maximized. Mark this location with another metal fencepost.

Estimate cover within a 10 foot wide "belt" along the transect length. At a minimum, establish a transect at the windward and leeward sides of the wetland. Remember that the purpose of this sampling is to monitor, not inventory, representative portions of the wetland site.

Comments: Transect 1 was established perpendicular to the shoreline (or saturated perimeter). Initially, a 10-foot belt transect was used along this transect to count the number of tranplanted woody species along the restored stream channel to determine percent survival/mortality. However, the point where the transect crossed was not representative of the willow cuttings survival noted along the remaining portion of the restored stream channel. Because a complete inventory for woody species was not in the scope of work for this monitoring visit, an estimated percent survival or loss was recorded along the channel to determine an average survival.

BIRD SURVEY – FIELD DATA SHEET

Site: **Cloud Ranch** Date: **7/24/09**
Survey Time: **9 am to 1 pm**

Bird Species	#	Behavior	Habitat	Bird Species	#	Behavior	Habitat
American Goldfinch	5	BD FO	STR UP/MA				
Black-capped Chickadee	1	BD	STR UP				
Cedar Waxwing	5	F	STR UP				
Common Grackle	1	BD	STR UP/MA				
Common Nighthawk	2+	F	STR UP				
American Robin	1	BD	STR UP				
Common Yellowthroat	2	BD (def)	MA				
Least Flycatcher	3	BD (def)	STR UP/MA				
Red-winged Blackbird	10	BD	MA				
Song Sparrow	1	BD	MA				
Tree Swallow	2	F	STR UP				
Warbling Vireo	1	BD	STR UP				
Western Kingbird	1	BD	STR UP				
Western Wood Pewee	5	BD	STR UP/MA				
Spotted Sandpiper	1	F	STR				
Yellow Warbler	6	BD	STR UP/MA				

BEHAVIOR CODES
BP = One of a breeding pair
BD = Breeding display (Singing)
F = Foraging
FO = Flyover
L = Loafing
N = Nesting
Def = Defensive

HABITAT CODES
AB = Aquatic bed
FO = Forested
I = Island
MA = Marsh
MF = Mud Flat
OW = Open Water
STR = Stream Area
SS = Scrub/Shrub
UP = Upland buffer
WM = Wet meadow
US = Unconsolidated shore

Weather: **Sunny**

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

Project / Site: **Cloud Ranch**	Date: **July 24, 2009**
Applicant / Owner: **MDT**	County: **Sweetgrass**
Investigator: **CH/PBSJ**	State: **Montana**

Do Normal Circumstances exist on the site? **Yes** Is the site significantly disturbed (Atypical Situation)? **No** Is the area a potential Problem Area? **No** (If needed, explain on reverse side)	Community ID: **Wetland** Transect ID: **1** Plot ID: **SP-1**

VEGETATION

Dominant Species	Stratum	Indicator	Dominant Species	Stratum	Indicator
1. *POPANG*	Shrub	FACW	11.		
2. *AGRALB*	Herb	FACW+	12.		
3. *POAPAL*	Herb	FACW	13.		
4. *DESCAE*	Herb	FACW+	14.		
5. *PHLPRA*	Herb	FACU+	15.		
6. *EQUARV*	Herb	FAC	16.		
7. *TRIPRA*	Herb	FACU	17.		
8.			18.		
9.			19.		
10.			20.		
Percent of Dominant Species that are OBL, FACW, or FAC (excluding FAC-): **5** / **7** = **71**%			FAC Neutral: / = %		
Remarks:					

HYDROLOGY

Yes Recorded Data (Describe in Remarks): **N/A** Stream, Lake, or Tide Gauge **Yes** Aerial Photographs **N/A** Other **No** No Recorded Data	Wetland Hydrology Indicators Primary Indicators: **NO** Inundated **NO** Saturated in Upper 12 Inches **YES** Water Marks **NO** Drift Lines **YES** Sediment Deposits **NO** Drainage Patterns in Wetland
Field Observations: Depth of Surface Water **N/A** ____ (in.) Depth to Free Water in Pit **N/A** ____ (in.) Depth to Saturated Soil > **12** (in.)	Secondary Indicators (2 or more required): **NO** Oxidized Root Channels in Upper 12 inches **NO** Water-Stained Leaves **NO** Local Soil Survey Data **NO** FAC-Neutral Test **NO** Other (Explain in Remarks)
Remarks: **Soils were moist in the upper 12 inches but not saturated in the upper 12 inches, however, sediment/debris and water marks were present from high flows.**	

SOILS

Map Unit Name (Series and Phase): **Nesda-McIlwaine loams, 0-2% slopes**
Map Symbol: _____ Drainage Class: **well-drained** Mapped Hydric Inclusion? _
Taxonomy (Subgroup): _____ Field Observations confirm Mapped Type? **Yes**

Profile Description

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Color(s) (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-6	A	10 YR 5/1	/ /	N/A N/A	Loamy Sand Gravelly
6-14	A/B	10 YR 4/1	/ /	N/A N/A	Silty Clay
		/	/ /	N/A N/A	
		/	/ /	N/A N/A	
		/	/ /	N/A N/A	

Hydric Soil Indicators:

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

Remarks: **Gravelly sandy loam to a silty clay soils with a low chroma values.**

WETLAND DETERMINATION

Hydrophytic Vegetation Present? **YES**
Wetland Hydrology Present? **YES**
Hydric Soils Present? **YES**

Is this Sampling Point within a Wetland? **YES**

Remarks: **High water flows across portions of this point bar were evident in 2009 but less woody debris, sediment and scouring were noted compared to 2008.**

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

Project / Site: **Cloud Ranch**	Date: **July 24, 2009**
Applicant / Owner: **MDT**	County: **Sweetgrass**
Investigator: **CH/PBSJ**	State: **Montana**

Do Normal Circumstances exist on the site? **Yes**	Community ID: **Upland**
Is the site significantly disturbed (Atypical Situation)? **No**	Transect ID: **1**
Is the area a potential Problem Area? **No**	Plot ID: **SP-2**
(If needed, explain on reverse side)	

VEGETATION

Dominant Species	Stratum	Indicator	Dominant Species	Stratum	Indicator
1. POPANG (*seedlings*)	Tree	FACW	11.		
2. BROINE	Herb	NI	12.		
3. AGRREP	Herb	FACU	13.		
4. MELOFF	Herb	FACU	14.		
5. TRIHYB	Herb	FACU+	15.		
6. TRIFRA	Herb	FACU	16.		
7. AGRALB	Herb	FACW	17.		
8.			18.		
9.			19.		
10.			20.		

Percent of Dominant Species that are OBL, FACW, or FAC (excluding FAC-): **2 / 7 = 28%**	FAC Neutral: / = %
Remarks: **28% hydrophytic vegetation**	

HYDROLOGY

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

SOILS

Map Unit Name (Series and Phase): **Nesda-McIlwaine loams, 0-2% slopes**
Map Symbol: _____ Drainage Class: **well-drained** Mapped Hydric Inclusion? _
Taxonomy (Subgroup): _____ Field Observations confirm Mapped Type? **Yes**

Profile Description

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Color(s) (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-2		10 YR 5/2	/ /	N/A N/A	Sand and organics
2-12	A	10 YR 4/2	/ /	N/A N/A	Loamy Sand
		/	/ /	N/A N/A	
		/	/ /	N/A N/A	
		/	/ /	N/A N/A	

Hydric Soil Indicators:

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

Remarks:

WETLAND DETERMINATION

Hydrophytic Vegetation Present? **NO**
Wetland Hydrology Present? **YES**
Hydric Soils Present? **NO**

Is this Sampling Point within a Wetland? **NO**

Remarks: **This upland area is a small, slightly mounded area bordered by wetlands.**

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

Project / Site: **Cloud Ranch**	Date: **July 24, 2009**
Applicant / Owner: **MDT**	County: **Sweetgrass**
Investigator: **CH/PBSJ**	State: **Montana**

Do Normal Circumstances exist on the site? **Yes** Is the site significantly disturbed (Atypical Situation)? **No** Is the area a potential Problem Area? **No** (If needed, explain on reverse side)	Community ID: **Restored wetland** Transect ID: **2** Plot ID: **SP-3**

VEGETATION

Dominant Species	Stratum	Indicator	Dominant Species	Stratum	Indicator
1. *AGRALB*	Herb	FACW	11.		
2. *CARNEB*	Herb	OBL	12.		
3. *CARAQU*	Herb	OBL	13.		
4. *POPANG (seedlings)*	Herb	FACW	14.		
5. *AGRTRA*	Herb	FACU+	15.		
6. *ALOPRA*	Herb	FACW	16.		
7. *JUNBAL*	Herb	OBL	17.		
8. *SCIPUN*	Herb	OBL	18.		
9.			19.		
10.			20.		

Percent of Dominant Species that are OBL, FACW, or FAC (excluding FAC-): **7** / **8** = **87**%	FAC Neutral: / = %
Remarks:	

HYDROLOGY

Yes Recorded Data (Describe in Remarks): **N/A** Stream, Lake, or Tide Gauge **Yes** Aerial Photographs **N/A** Other **No** No Recorded Data	Wetland Hydrology Indicators Primary Indicators: **NO** Inundated **YES** Saturated in Upper 12 Inches **YES** Water Marks **NO** Drift Lines **NO** Sediment Deposits **NO** Drainage Patterns in Wetland
Field Observations: Depth of Surface Water **N/A** ____ (in.) Depth to Free Water in Pit **N/A** ____ (in.) Depth to Saturated Soil = **6** (in.)	Secondary Indicators (2 or more required): **NO** Oxidized Root Channels in Upper 12 inches **NO** Water-Stained Leaves **NO** Local Soil Survey Data **NO** FAC-Neutral Test **NO** Other (Explain in Remarks)
Remarks: **Soils were saturated at 6 inches and surface water was noted in low areas south of the transect. Also evidence of water marks were observed on upland slopes to the north.**	

SOILS

Map Unit Name (Series and Phase): **Nesda-McIlwaine loams, 0-2% slopes**
Map Symbol: _____ Drainage Class: **well-drained** Mapped Hydric Inclusion? _
Taxonomy (Subgroup): _____ Field Observations confirm Mapped Type? **No**

Profile Description

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Color(s) (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-2	A	10 YR 4/2	/ /	N/A N/A	Silty Clay
2-16	A/B	10 YR 5/1	/ /	N/A N/A	Silty Clay
		/	/ /	N/A N/A	
		/	/ /	N/A N/A	
		/	/ /	N/A N/A	

Hydric Soil Indicators:

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

Remarks: **Hydric soil indicators include low chroma values.**

WETLAND DETERMINATION

Hydrophytic Vegetation Present? **YES** Wetland Hydrology Present? **YES** Hydric Soils Present? **YES**	Is this Sampling Point within a Wetland? **YES**

Remarks: **Vegetation at this site is more constant in 2009, less changes in species compared to previous years. In 2008, maintenance had been performed on the wetland inlet and appears to have improved water flow and the duration of saturation in this area.**

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

Project / Site: **Cloud Ranch**	Date: **July 24, 2009**
Applicant / Owner: **MDT**	County: **Sweetgrass**
Investigator: **CH/PBSJ**	State: **Montana**

Do Normal Circumstances exist on the site? **Yes** Is the site significantly disturbed (Atypical Situation)? **No** Is the area a potential Problem Area? **No** (If needed, explain on reverse side)	Community ID: **Upland** Transect ID: **2** Plot ID: **SP-4**

VEGETATION

Dominant Species	Stratum	Indicator	Dominant Species	Stratum	Indicator
1. *BROINE*	Herb	NI	11.		
2. *AGRREP*	Herb	FACU-	12.		
3. *AGRALB*	Herb	FACW	13.		
4. *PHLPRA*	Herb	FACU	14.		
5. *FESARU*	Herb	FACU-	15.		
6. *POAPRA*	Herb	FACU+	16.		
7. *ALOPRA*	Herb	FACW	17.		
8.			18.		
9.			19.		
10.			20.		

Percent of Dominant Species that are OBL, FACW, or FAC (excluding FAC-): **2** / **7** = **29**%	FAC Neutral: / = %
Remarks: **29% hydrophytic vegetation present**	

HYDROLOGY

Yes Recorded Data (Describe in Remarks): **N/A** Stream, Lake, or Tide Gauge **Yes** Aerial Photographs **N/A** Other **No** No Recorded Data	Wetland Hydrology Indicators Primary Indicators: **NO** Inundated **YES** Saturated in Upper 12 Inches **YES** Water Marks **NO** Drift Lines **NO** Sediment Deposits **NO** Drainage Patterns in Wetland
Field Observations: Depth of Surface Water **N/A** ____ (in.) Depth to Free Water in Pit **N/A** ____ (in.) Depth to Saturated Soil = **6** (in.)	Secondary Indicators (2 or more required): **NO** Oxidized Root Channels in Upper 12 inches **NO** Water-Stained Leaves **NO** Local Soil Survey Data **NO** FAC-Neutral Test **NO** Other (Explain in Remarks)
Remarks: **Soils were saturated at 6 inches and water marks were noted in this area as well as adjacent uplands to the north (slight upland slope).**	

SOILS

Map Unit Name (Series and Phase): **Nesda-McIlwaine loams, 0-2% slopes**
Map Symbol: _____ Drainage Class: **well-drained** Mapped Hydric Inclusion? _
Taxonomy (Subgroup): _____ Field Observations confirm Mapped Type? **No**

Profile Description

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Color(s) (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-12	A/B	10 YR 5/1	/ /	N/A N/A	Silty Clay
		/	/ /	N/A N/A	
		/	/ /	N/A N/A	
		/	/ /	N/A N/A	
		/	/ /	N/A N/A	

Hydric Soil Indicators:

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

Remarks: **Same soil texture and soil color as SP#3.**

WETLAND DETERMINATION

Hydrophytic Vegetation Present? **NO** Wetland Hydrology Present? **YES** Hydric Soils Present? **YES**	Is this Sampling Point within a Wetland? **NO**

Remarks: **This area is well vegetated. Improvements to the inlet were noted in 2008 and seems to have increased water flow and length of saturation. It is anticipated that with time, the remaining upland within this transect will shift to a wetland.**

MDT MONTANA WETLAND ASSESSMENT FORM (revised March 2008)

1. Project Name: Cloud Ranch Wetland Mitigation Site **2. MDT Project #:** STPX0049(021) **3. Control #:** 5231

3. Evaluation Date: 7/24/2009 **4. Evaluator(s):** CH (PBS&J) **5. Wetland/Site #(s):** Cloud Ranch Big Timber Creek

6. Wetland Location(s): Township 3 N, Range 13 E, Section 36; Township ___N, Range ___E, Section _____

Approximate Stationing or Roadposts: _____

Watershed: 13 - Upper Yellowstone **County:** _ _ Sweet Grass _

7. Evaluating Agency: PBS&J

Purpose of Evaluation:

- ☐ **Wetland potentially affected by MDT project**
- ☐ **Mitigation wetlands; pre-construction**
- ☒ **Mitigation wetlands; post-construction**
- ☐ **Other** _____

8. Wetland Size (acre): _____ (visually estimated)
1.85 (measured, e.g. GPS)

9. Assessment Area (AA) Size (acre): 4.08 (visually estimated)
(see manual for determining AA) _____ (measured, e.g. GPS)

10. CLASSIFICATION OF WETLAND AND AQUATIC HABITATS IN AA (See manual for definitions.)

HGM Class (Brinson)	Class (Cowardin)	Modifier (Cowardin)	Water Regime	% OF AA
Riverine	Rock Bottom		Permanent / Perennial	60
Riverine	Emergent Wetland	Excavated	Seasonal / Intermittent	20
Riverine	Scrub-Shrub Wetland		Seasonal / Intermittent	20

Comments: _____

11. ESTIMATED RELATIVE ABUNDANCE (of similarly classified sites within the same Major Montana Watershed Basin; see manual.)
common

12. GENERAL CONDITION OF AA

i. Disturbance: Use matrix below to select the appropriate response; see manual for Montana listed noxious weed and aquatic nuisance vegetation species 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	---
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%.	---	---	---
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%.	---	---	---

Comments (types of disturbance, intensity, season, etc.)**:** Low disturbance, contains a few roads and buildings.

ii. Prominent noxious, aquatic nuisance, and other exotic vegetation species: Canada thistle occurs within the wetlands and uplands along the creek. Houndstongue occurs within the uplands along the creek as a few scattered individual plants.

iii. Provide brief descriptive summary of AA and surrounding land use/habitat: The AA includes Big TImber Creek and adjacent wetland and uplands.

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 one is forested) classes	---	NA	NA	NA
2 (or 1 if forested) classes	mod	NA	NA	NA
1 class, but not a monoculture	---	←NO	YES→	---
1 class, monoculture (1 species comprises ≥90% of total cover)	---	NA	NA	NA

Comments: There are areas along the channel where cottonwoods have reached the height and density to qualify as a scrub-shrub wetland. It is likely that this community type will continue to develop and expand.

Wetland/Site #(s): Cloud Ranch Big Timber Creek

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

i. AA is Documented (D) or Suspected (S) to contain: Check box based on definitions in manual.

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: Based on the strongest habitat chosen in 14A(i) above, select the corresponding functional point and rating.

Highest Habitat Level	Doc/Primary	Sus/Primary	Doc/Secondary	Sus/Secondary	Doc/Incidental	Sus/Incidental	None
Functional Point/Rating	---	---	---	---	---	---	0L

Sources for documented use (e.g. observations, records): Bald eagle delisted in 2007

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

i. AA is Documented (D) or Suspected (S) to contain: Check box based on definitions in manual.

Primary or critical habitat (**list species**) ☐ D ☐ S _____
Secondary habitat (**list species**) ☐ D ☒ S yellowstone cutthroat
Incidental habitat (**list species**) ☐ D ☒ S Bald eagle
No usable habitat ☐ S

ii. Rating: Based on the strongest habitat chosen in 14A(i) above, select the corresponding functional point and rating.

Highest Habitat Level	Doc/Primary	Sus/Primary	Doc/Secondary	Sus/Secondary	Doc/Incidental	Sus/Incidental	None
S1 Species Functional Point/Rating	---	---	---	---	---	---	---
S2 and S3 Species Functional Point/Rating	---	---	---	.5M	---	---	---

Sources for documented use (e.g. observations, records): Yellowstone cutthroat documented upstream of site according to MDT.

14C. GENERAL WILDLIFE HABITAT RATING

i. Evidence of Overall Wildlife Use in the AA: Check substantial, moderate, or low based on supporting evidence.

☐ ***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
- ☐ interview with local biologist 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
- ☐ interview with local biologist with knowledge of 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
- ☐ interview with local biologist 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 manual 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	---	---	---	---	---	---	---
☐ **Moderate Disturbance** at AA (see #12i)	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
☐ **High Disturbance** at AA (see #12i)	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

iii. Rating: Use the conclusions from i and ii above and the matrix below to select the functional point and rating.

Evidence of Wildlife Use (i)	**Wildlife Habitat Features Rating (ii)**			
	☒ **Exceptional**	☐ **High**	☐ **Moderate**	☐ **Low**
☐ **Substantial**	---	---	---	---
☒ **Moderate**	.9H	---	---	---
☐ **Minimal**	---	---	---	---

Comments: _____

Wetland/Site #(s): Cloud Ranch Big TImber Creek

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

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 the NA box and proceed to 14E.

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].

Type of Fishery: ☒ Cold Water (**CW**) ☐ Warm Water (**WW**) **Use the CW or WW guidelines in the manual to complete the matrix.**

i. Habitat Quality and Known / Suspected Fish Species in AA: Use matrix to select the functional point 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	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
FWP Tier II or **Native Game** fish species	---	---	---	.6M	---	---	---	---	---	---	---	---	---	---	---	---	---	---
FWP Tier III or **Introduced Game** fish	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
FWP Non-Game Tier IV or **No** fish species	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

Sources used for identifying fish spp. potentially found in AA: Tom Coleman

ii. Modified Rating: NOTE: Modified score cannot exceed 1.0 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?* ☐ **YES**, reduce score in **i** by 0.1 = __ or ☒ **N0**

b) Does the AA contain a documented spawning area or other critical habitat feature (i.e., sanctuary pool, upwelling area; specify in comments) for native fish or introduced game fish? ☐ **YES**, add to score in **i** or **iia** 0.1 = __ or ☒ **N0**

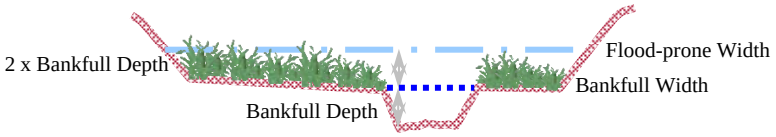
iii. Final Score and Rating: _ **Comments:** 0.6 Moderate

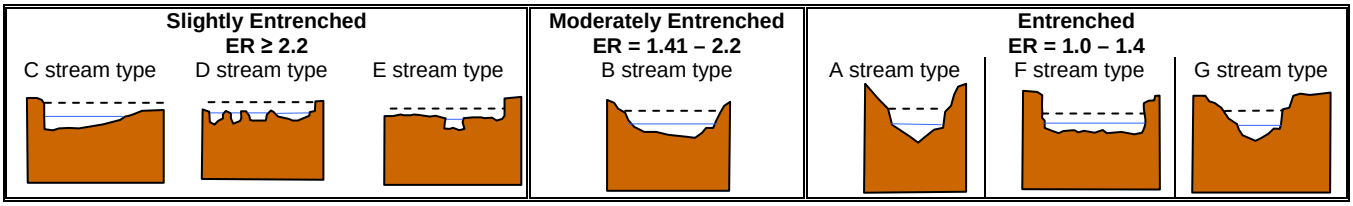
14E. FLOOD ATTENUATION ☐ **NA** (proceed to 14F)

Applies only to wetlands that are subject to flooding via in-channel or overbank flow.
If wetlands in AA are not flooded from in-channel or overbank flow, check the NA box and proceed to 14F.

Entrenchment Ratio (ER) Estimation (see manual for additional guidance). Entrenchment ratio = (flood-prone width) / (bankfull width).
Flood-prone width = estimated horizontal projection of where 2 X maximum bankfull depth elevation intersects the floodplain on each side of the stream.

_____ / _____ = _____
flood prone width / bankfull width = entrenchment ratio





i. Rating: Working from top to bottom, use the matrix below to select the functional point 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		
Percent 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**	---	.9H	---	---	---	---	---	---	---
AA contains **unrestricted outlet**	---	---	---	---	---	---	---	---	---

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? ☐ YES ☒ NO **Comments:** _____

Wetland/Site #(s): Cloud Ranch Big Timber Creek

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

Applies to wetlands that flood or pond from overbank or in-channel flow, precipitation, upland surface flow, or groundwater flow.
If no wetlands in the AA are subject to flooding or ponding, then check the NA box and proceed to 14G.

i. Rating: Working from top to bottom, use the matrix below to select the functional point and rating. Abbreviations for surface water durations are as follows: P/P = permanent/perennial; S/I = seasonal/intermittent; and T/E = temporary/ephemeral [see manual 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**	---	---	---	---	.6M	---	---	---	---
Wetlands in AA flood or pond **< 5 out of 10 years**	---	---	---	---	---	---	---	---	---

Comments: _____

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

Applies to wetland 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, check the NA box and proceed to 14H.

i. Rating: Working from top to bottom, use the matrix below to select the functional point and rating.

Sediment, Nutrient, and Toxicant Input Levels within AA	**AA receives or surrounding land use has potential to deliver 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 is on MDEQ list of waterbodies in need of TMDL development for "probable causes" related to sediment, nutrients, or toxicants or AA receives or surrounding land use has potential to deliver high levels of sediments, nutrients, or compounds such that other functions are substantially impaired. Major sedimentation, sources of nutrients or toxicants, or signs of eutrophication present.**			
% Cover of Wetland Vegetation in AA	☒ **≥ 70%**		☐ **< 70%**		☐ **≥ 70%**		☐ **< 70%**	
Evidence of Flooding / Ponding in AA	☒ **Yes**	☐ **No**	☐ **Yes**	☐ **No**	☐ **Yes**	☐ **No**	☐ **Yes**	☐ **No**
AA contains **no or restricted outlet**	---	---	---	---	---	---	---	---
AA contains **unrestricted outlet**	.9H	---	---	---	---	---	---	---

Comments: _____

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

Applies only if AA occurs on or within the banks of a river, stream, or other natural or man-made drainage, or on the shoreline of a standing water body which is subject to wave action.
If 14H does not apply, check the NA box and proceed to 14I.

% 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%**	---	---	---
☒ **35-64%**	.7M	---	---
☐ **< 35%**	---	---	---

Comments: _____

14I. PRODUCTION EXPORT / FOOD CHAIN SUPPORT

i. Level of Biological Activity: Synthesis of wildlife and fish habitat rates (select).

General Fish Habitat Rating (14Diii)	**General Wildlife Habitat Rating (14Ciii)**		
	☒ **E/H**	☐ **M**	☐ **L**
☐ **E/H**	---	---	---
☒ **M**	H	---	---
☐ **L**	---	---	---
☐ **NA**	---	---	---

ii. Rating: Working from top to bottom, use the matrix below to select the functional point and rating. Factor A = acreage of vegetated wetland component in the AA; Factor B = level of biological activity rating from above (14Ii); Factor C = whether or not the AA contains a surface or subsurface outlet; the final three rows pertain to the duration of surface water in the AA, where P/P, S/I, and T/E were previously defined, and A = "absent" [see manual 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	---	---	---	---	---	---	---	.6M	---	---	---	---	---	---	---	---	---	---
S/I	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
T/E/A	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

Wetland/Site #(s): Cloud Ranch Big Timber Creek

14I. PRODUCTION EXPORT / FOOD CHAIN SUPPORT (continued)

iii. Modified Rating: Note: Modified score cannot exceed 1.0 or be less than 0.1.

Vegetated Upland Buffer: 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).
Is there an average ≥ 50-foot wide vegetated upland buffer around ≥ 75% of the AA's perimeter? ☒ **YES**, add 0.1 to score in **ii** = 0.6 ☐ **NO**

iv. Final Score and Rating: .7M **Comments:** _____

14J. GROUNDWATER DISCHARGE / RECHARGE
Check the appropriate indicators in i and 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 select the functional point and rating.

Criteria	Duration of Saturation at AA Wetlands ***FROM GROUNDWATER DISCHARGE*** or ***WITH WATER THAT IS RECHARGING THE GROUNDWATER SYSTEM***			
	☒ **P/P**	☐ **S/I**	☐ **T**	☐ **None**
☒ **Groundwater Discharge or Recharge**	1H	---	---	---
☐ **Insufficient Data/Information**	---			

Comments: _____

14K. UNIQUENESS

i. Rating: Working from top to bottom, use the matrix below to select the functional point 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)	---	---	---	---	---	---	---	.4M	---
☐ **Moderate Disturbance** at AA (#12i)	---	---	---	---	---	---	---	---	---
☐ **High Disturbance** at AA (#12i)	---	---	---	---	---	---	---	---	---

Comments: Cottonwoods, alder and willows are found adjacent to the assessment area.

14L. RECREATION / EDUCATION POTENTIAL ☐ NA (proceed to Overall Summary and Rating page)
Affords 'bonus' points if AA provides a recreational or educational opportunity.

i. Is the AA a known or potential recreational or educational site? ☒ **YES**, go to ii. ☐ **NO**, check the NA box.

ii. Check categories that apply to the AA: ☐ Educational/Scientific Study ☒ Consumptive Recreational ☐ Non-consumptive recreational
☐ Other: _____

iii. Rating: Use the matrix below to select the functional point and rating.

Known or Potential Recreational or Educational Area	**Known**	**Potential**
Public ownership or public easement with general public access (no permission required)	---	---
Private ownership with general public access (no permission required)	---	---
Private or public ownership without general public access, or requiring permission for public access	.1M	---

Comments: Fishing

15. GENERAL SITE NOTES: _____

Wetland/Site #(s): Cloud Ranch Big Timber Creek

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	low 0.00	1.00		
B. MT Natural Heritage Program Species Habitat	mod 0.50	1.00		
C. General Wildlife Habitat	high 0.90	1.00		*
D. General Fish Habitat	mod 0.60	1.00		
E. Flood Attenuation	high 0.90	1.00		
F. Short and Long Term Surface Water Storage	mod 0.60	1.00		
G. Sediment / Nutrient / Toxicant Removal	high 0.90	1.00		*
H. Sediment / Shoreline Stabilization	mod 0.70	1.00		*
I. Production Export / Food Chain Support	mod 0.60	1.00		
J. Groundwater Discharge / Recharge	high 1.00	1.00		*
K. Uniqueness	mod 0.40	1.00		
L. Recreation / Education Potential (bonus point)	mod 0.10			
Total Points	**7.2**	**11**	**23.54 Total Functional Units**	
Percent of Possible Score 66% (round to nearest whole number)				

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; if not 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 (AA) RATING: Check the appropriate category based on the criteria outlined above.

☐ **I** ☒ **II** ☐ **III** ☐ **IV**

MDT MONTANA WETLAND ASSESSMENT FORM (revised March 2008)

1. Project Name: Cloud Ranch Wetland Mitigation Site **2. MDT Project #:** STPX0049(021) **3. Control #:** 5231

3. Evaluation Date: 7/24/2009 **4. Evaluator(s):** CH (PBS&J) **5. Wetland/Site #(s):** Cloud Ranch off-channel wetlands

6. Wetland Location(s): Township 3 N, Range 13 E, Section 36; Township ___N, Range ___E, Section _____

Approximate Stationing or Roadposts: _____

Watershed: 13 - Upper Yellowstone **County:** _ _ Sweet Grass _

7. Evaluating Agency: PBS&J

Purpose of Evaluation:

- ☐ **Wetland potentially affected by MDT project**
- ☐ **Mitigation wetlands; pre-construction**
- ☒ **Mitigation wetlands; post-construction**
- ☐ **Other** _____

8. Wetland Size (acre): _____ (visually estimated)
2.78 (measured, e.g. GPS)

9. Assessment Area (AA) Size (acre): _____ (visually estimated)
(see manual for determining AA) 2.92 (measured, e.g. GPS)

10. CLASSIFICATION OF WETLAND AND AQUATIC HABITATS IN AA (See manual for definitions.)

HGM Class (Brinson)	Class (Cowardin)	Modifier (Cowardin)	Water Regime	% OF AA
Depressional	Emergent Wetland	Impounded	Seasonal / Intermittent	95
Riverine	Unconsolidated Bottom		Permanent / Perennial	5
Depressional	Scrub-Shrub Wetland		Seasonal / Intermittent	5

Comments: As part of the creation/restoration activities, wetlands have been created by fill and shallow dikes to mimic beaver dams.

11. ESTIMATED RELATIVE ABUNDANCE (of similarly classified sites within the same Major Montana Watershed Basin; see manual.)
common

12. GENERAL CONDITION OF AA

i. Disturbance: Use matrix below to select the appropriate response; see manual for Montana listed noxious weed and aquatic nuisance vegetation species 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	---
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%.	---	---	---
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%.	---	---	---

Comments (types of disturbance, intensity, season, etc.)**:** Low disturbance, contains a few roads and buildings.

ii. Prominent noxious, aquatic nuisance, and other exotic vegetation species: Canada thistle occurs within the wetlands and uplands. Houndtongue occurs within the uplands

iii. Provide brief descriptive summary of AA and surrounding land use/habitat: The surrounding land use includes a residence, barn and out buidlings. Primary use of adjacent land is dryland pasture.

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 one is forested) classes	---	NA	NA	NA
2 (or 1 if forested) classes	mod	NA	NA	NA
1 class, but not a monoculture	---	←NO	YES→	---
1 class, monoculture (1 species comprises ≥90% of total cover)	---	NA	NA	NA

Comments: As young cottonwood and sandbar willows develop, the structural diversity rating will improve. In 2009, a sandbar community type was mapped near the open water pond and cattail communities.

Wetland/Site #(s): Cloud Ranch off-channel wetlands

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

i. AA is Documented (D) or Suspected (S) to contain: Check box based on definitions in manual.

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: Based on the strongest habitat chosen in 14A(i) above, select the corresponding functional point and rating.

Highest Habitat Level	Doc/Primary	Sus/Primary	Doc/Secondary	Sus/Secondary	Doc/Incidental	Sus/Incidental	None
Functional Point/Rating	---	---	---	---	---	---	0L

Sources for documented use (e.g. observations, records): Bald eagle delisted in 2007

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

i. AA is Documented (D) or Suspected (S) to contain: Check box based on definitions in manual.

Primary or critical habitat (**list species**) ☐ D ☐ S _____
Secondary habitat (**list species**) ☐ D ☐ S _____
Incidental habitat (**list species**) ☐ D ☒ S Peregrine Falcon, Bald eagle
No usable habitat ☐ S

ii. Rating: Based on the strongest habitat chosen in 14A(i) above, select the corresponding functional point and rating.

Highest Habitat Level	Doc/Primary	Sus/Primary	Doc/Secondary	Sus/Secondary	Doc/Incidental	Sus/Incidental	None
S1 Species Functional Point/Rating	---	---	---	---	---	---	---
S2 and S3 Species Functional Point/Rating	---	---	---	---	---	.1L	---

Sources for documented use (e.g. observations, records): _____

14C. GENERAL WILDLIFE HABITAT RATING

i. Evidence of Overall Wildlife Use in the AA: Check substantial, moderate, or low based on supporting evidence.

☐ ***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
- ☐ interview with local biologist 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
- ☐ interview with local biologist with knowledge of 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
- ☐ interview with local biologist 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 manual 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)	---	---	---	---	---	---	---	---	---	---	---	---	---	H	---	---	---	---	---	---
☐ **Moderate Disturbance** at AA (see #12i)	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
☐ **High Disturbance** at AA (see #12i)	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

iii. Rating: Use the conclusions from i and ii above and the matrix below to select the functional point and rating.

Evidence of Wildlife Use (i)	**Wildlife Habitat Features Rating (ii)**			
	☐ **Exceptional**	☒ **High**	☐ **Moderate**	☐ **Low**
☐ **Substantial**	---	---	---	---
☒ **Moderate**	---	.7M	---	---
☐ **Minimal**	---	---	---	---

Comments: _____

Wetland/Site #(s): Cloud Ranch off-channel wetlands

14D. GENERAL FISH HABITAT ☒ **NA** (proceed to 14E)

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 the NA box and proceed to 14E.

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].

Type of Fishery: ☐ Cold Water (**CW**) ☐ Warm Water (**WW**) **Use the CW or WW guidelines in the manual to complete the matrix.**

i. Habitat Quality and Known / Suspected Fish Species in AA: Use matrix to select the functional point 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	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
FWP Tier II or **Native Game** fish species	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
FWP Tier III or **Introduced Game** fish	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
FWP Non-Game Tier IV or **No** fish species	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

Sources used for identifying fish spp. potentially found in AA: _____

ii. Modified Rating: NOTE: Modified score cannot exceed 1.0 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?* ☐ **YES**, reduce score in **i** by 0.1 = __ or ☐ **N0**

b) Does the AA contain a documented spawning area or other critical habitat feature (i.e., sanctuary pool, upwelling area; specify in comments) for native fish or introduced game fish? ☐ **YES**, add to score in **i** or **iia** 0.1 = __ or ☒ **N0**

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

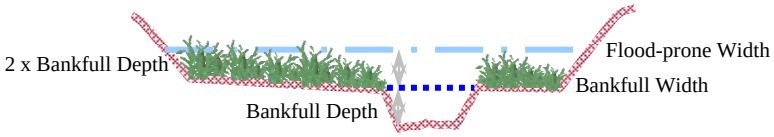
14E. FLOOD ATTENUATION ☐ **NA** (proceed to 14F)

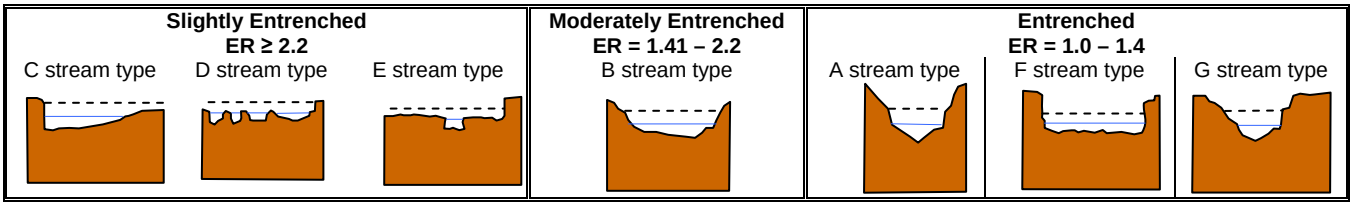
Applies only to wetlands that are subject to flooding via in-channel or overbank flow.
If wetlands in AA are not flooded from in-channel or overbank flow, check the NA box and proceed to 14F.

Entrenchment Ratio (ER) Estimation (see manual for additional guidance). Entrenchment ratio = (flood-prone width) / (bankfull width).
Flood-prone width = estimated horizontal projection of where 2 X maximum bankfull depth elevation intersects the floodplain on each side of the stream.

_____ / _____ = _____

flood prone width / bankfull width = entrenchment ratio





i. Rating: Working from top to bottom, use the matrix below to select the functional point 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		
Percent 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**	---	---	---	---	---	.5M	---	---	---
AA contains **unrestricted outlet**	---	---	---	---	---	---	---	---	---

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? ☐ YES ☒ NO **Comments:** _____

Wetland/Site #(s): Cloud Ranch off-channel wetland

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

Applies to wetlands that flood or pond from overbank or in-channel flow, precipitation, upland surface flow, or groundwater flow.
If no wetlands in the AA are subject to flooding or ponding, then check the NA box and proceed to 14G.

i. Rating: Working from top to bottom, use the matrix below to select the functional point and rating. Abbreviations for surface water durations are as follows: P/P = permanent/perennial; S/I = seasonal/intermittent; and T/E = temporary/ephemeral [see manual 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**	---	---	---	---	.6M	---	---	---	---
Wetlands in AA flood or pond **< 5 out of 10 years**	---	---	---	---	---	---	---	---	---

Comments: _____

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

Applies to wetland 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, check the NA box and proceed to 14H.

i. Rating: Working from top to bottom, use the matrix below to select the functional point and rating.

Sediment, Nutrient, and Toxicant Input Levels within AA	**AA receives or surrounding land use has potential to deliver 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 is on MDEQ list of waterbodies in need of TMDL development for "probable causes" related to sediment, nutrients, or toxicants or AA receives or surrounding land use has potential to deliver high levels of sediments, nutrients, or compounds such that other functions are substantially impaired. Major sedimentation, sources of nutrients or toxicants, or signs of eutrophication present.**			
% Cover of Wetland Vegetation in AA	☒ **≥ 70%**		☐ **< 70%**		☐ **≥ 70%**		☐ **< 70%**	
Evidence of Flooding / Ponding in AA	☒ **Yes**	☐ **No**	☐ **Yes**	☐ **No**	☐ **Yes**	☐ **No**	☐ **Yes**	☐ **No**
AA contains **no or restricted outlet**	1H	---	---	---	---	---	---	---
AA contains **unrestricted outlet**	---	---	---	---	---	---	---	---

Comments: _____

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

Applies only if AA occurs on or within the banks of a river, stream, or other natural or man-made drainage, or on the shoreline of a standing water body which is subject to wave action.
If 14H does not apply, check the NA box and proceed to 14I.

% 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	---	---
☐ **35-64%**	---	---	---
☐ **< 35%**	---	---	---

Comments: _____

14I. PRODUCTION EXPORT / FOOD CHAIN SUPPORT

i. Level of Biological Activity: Synthesis of wildlife and fish habitat rates (select).

General Fish Habitat Rating (14Diii)	**General Wildlife Habitat Rating (14Ciii)**		
	☐ **E/H**	☒ **M**	☐ **L**
☐ **E/H**	---	---	---
☐ **M**	---	---	---
☐ **L**	---	---	---
☒ **NA**	---	M	---

ii. Rating: Working from top to bottom, use the matrix below to select the functional point and rating. Factor A = acreage of vegetated wetland component in the AA; Factor B = level of biological activity rating from above (14Ii); Factor C = whether or not the AA contains a surface or subsurface outlet; the final three rows pertain to the duration of surface water in the AA, where P/P, S/I, and T/E were previously defined, and A = "absent" [see manual 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	---	---	---	---	---	---	---	---	.7M	---	---	---	---	---	---	---	---	---
S/I	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
T/E/A	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

Wetland/Site #(s): Cloud Ranch off-channel wetland

14I. PRODUCTION EXPORT / FOOD CHAIN SUPPORT (continued)

iii. Modified Rating: Note: Modified score cannot exceed 1.0 or be less than 0.1.

Vegetated Upland Buffer: 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).
Is there an average ≥ 50-foot wide vegetated upland buffer around ≥ 75% of the AA's perimeter? ☒ **YES**, add 0.1 to score in **ii** = 0.70 ☐ **NO**

iv. Final Score and Rating: .8H **Comments:** _____

14J. GROUNDWATER DISCHARGE / RECHARGE
Check the appropriate indicators in i and 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 select the functional point and rating.

Criteria	Duration of Saturation at AA Wetlands ***FROM GROUNDWATER DISCHARGE*** or ***WITH WATER THAT IS RECHARGING THE GROUNDWATER SYSTEM***			
	☒ **P/P**	☐ **S/I**	☐ **T**	☐ **None**
☒ **Groundwater Discharge or Recharge**	1H	---	---	---
☐ **Insufficient Data/Information**	---			

Comments: _____

14K. UNIQUENESS

i. Rating: Working from top to bottom, use the matrix below to select the functional point 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)	---	---	---	---	---	---	---	.4M	---
☐ **Moderate Disturbance** at AA (#12i)	---	---	---	---	---	---	---	---	---
☐ **High Disturbance** at AA (#12i)	---	---	---	---	---	---	---	---	---

Comments: Cottonwoods, alder and willows are found adjacent to the assessment area.

14L. RECREATION / EDUCATION POTENTIAL ☐ NA (proceed to Overall Summary and Rating page)
Affords 'bonus' points if AA provides a recreational or educational opportunity.

i. Is the AA a known or potential recreational or educational site? ☒ **YES**, go to ii. ☐ **NO**, check the NA box.

ii. Check categories that apply to the AA: ☐ Educational/Scientific Study ☐ Consumptive Recreational ☒ Non-consumptive recreational
☐ Other: _____

iii. Rating: Use the matrix below to select the functional point and rating.

Known or Potential Recreational or Educational Area	**Known**	**Potential**
Public ownership or public easement with general public access (no permission required)	---	---
Private ownership with general public access (no permission required)	---	---
Private or public ownership without general public access, or requiring permission for public access	.1M	---

Comments: As the wetland features expand and develop, this area will provide excellent recreation and education opportunities.

15. GENERAL SITE NOTES: _____

Wetland/Site #(s): Cloud Ranch off-channel wetlands

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	low 0.00	1.00		
B. MT Natural Heritage Program Species Habitat	low 0.10	1.00		
C. General Wildlife Habitat	mod 0.70	1.00		*
D. General Fish Habitat	NA	---		
E. Flood Attenuation	mod 0.50	1.00		
F. Short and Long Term Surface Water Storage	mod 0.60	1.00		
G. Sediment / Nutrient / Toxicant Removal	high 1.00	1.00		*
H. Sediment / Shoreline Stabilization	high 1.00	1.00		*
I. Production Export / Food Chain Support	high 0.80	1.00		
J. Groundwater Discharge / Recharge	high 1.00	1.00		*
K. Uniqueness	mod 0.40	1.00		
L. Recreation / Education Potential (bonus point)	mod 0.10			
Total Points	**6.2**	**10**	**19.34 Total Functional Units**	
Percent of Possible Score 62% (round to nearest whole number)				

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; if not 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 (AA) RATING: Check the appropriate category based on the criteria outlined above.

☐ **I** ☐ **II** ☒ **III** ☐ **IV**

Appendix C

2009 REPRESENTATIVE PHOTOGRAPHS

MDT Wetland Mitigation Monitoring
Cloud Ranch
Big Timber, Montana

CLOUD RANCH WETLAND MITIGATION SITE 2009

Photo A. Transect #1, view from Big Timber Creek to the west. **Direction**: West

Photo B. Increase density of community type 8 on gravel bars. **Direction**: South

Photo C. Transect #1, bank to bank view. **Direction:** North.

Photo D. Transect #1, view is from the transect stake east toward Big Timber Creek. **Direction**: East

Photo E. Water levels similar to 2008 but higher than 2007. Banks and point bars stable with encroaching vegetation and woody seedlings. **Direction**: South

Photo F. Big Timber Creek point bar on left (west) side of the channel**. Direction:** North

CLOUD RANCH WETLAND MITIGATION SITE 2009

Photo G. Big Timber Creek riverine wetland and development of side channels. **Direction**: West

Photo H. Banks are stable with cottonwood and willow seedling, and wetland herbaceous establishment along the left bank. **Direction:** East

Photo I. Community type 2 near the downstream portion of the project area. **Direction:** Southeast

Photo J. Off-channel wetlands, viewing two community types (CT 5 and CT 6). **Direction:** East

Photo K. Off-channel wetland and unnamed tributary. **Direction**: East

Photo L. Embankment removal area, CT 12 (willows), CT 6 (cattails), and CT 14 (sedge). **Direction:** East

CLOUD RANCH WETLAND MITIGATION SITE 2009

Photo M. Open water pond, off -channel wetlands and buffer. **Direction**: Southeast

Photo N. Transect #2, viewing CT 7 (foreground), CT 10 (center of photo) and CT 6 (background). **Direction:** West

Photo O. Transect #2, CT 7 (uplands on left) and CT 10 (wetland). **Direction**: Southeast

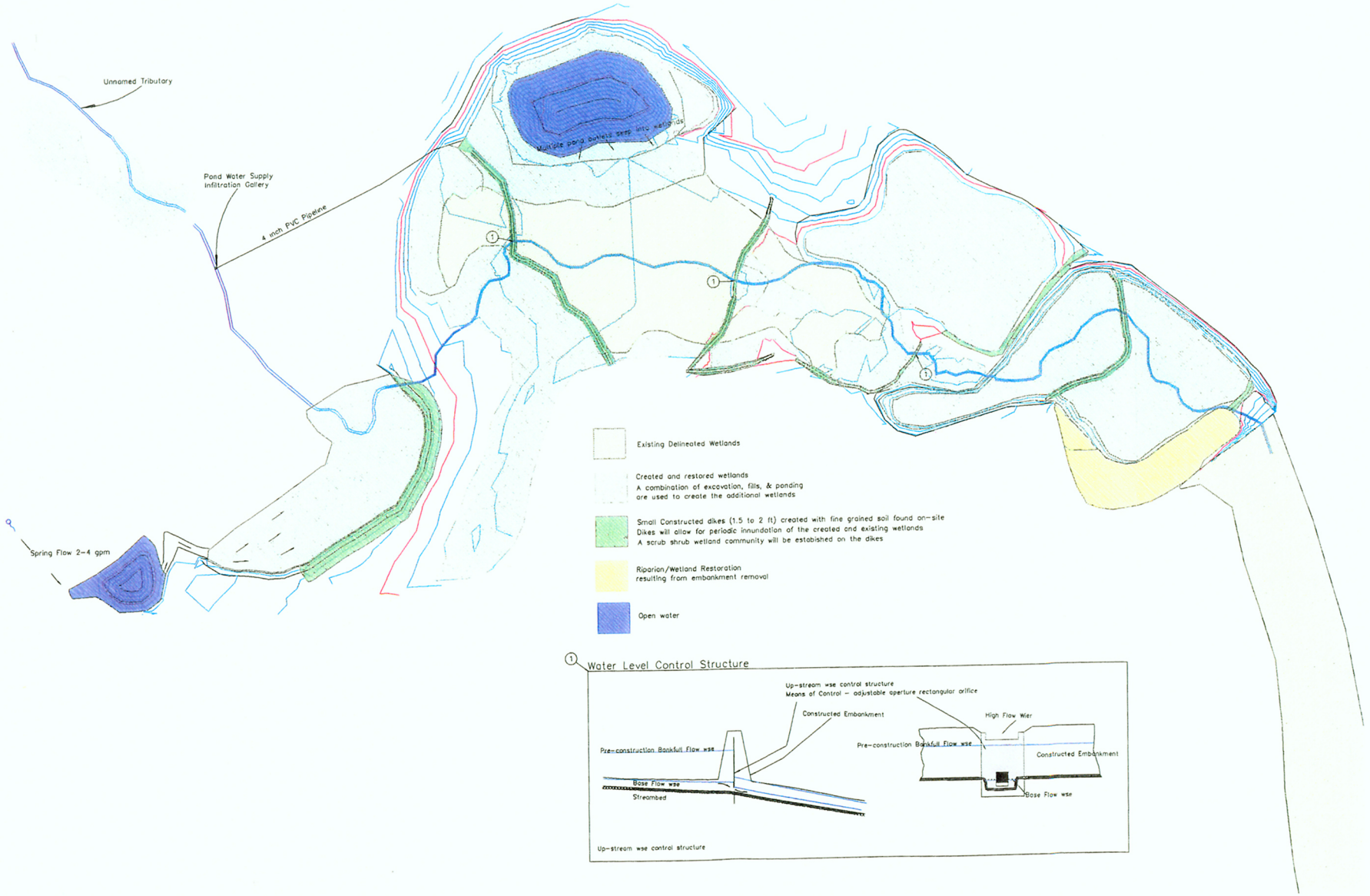
Photo P. Significant reduction of bare soil in the background. **Direction:** North

Photo Q. Wetlands in the southeastern corner of the project site. **Direction:** Southeast

Appendix D

WETLAND MITIGATION SITE MAP

MDT Wetland Mitigation Monitoring
Cloud Ranch
Big Timber, Montana



PROJECT Cloud Ranch

PROJECT NO. 140 | VIEW Proposed Wetland Creation Site Plan | REV 3/03

SCALE 1" = 80' | SHEET 1 of 1

ADC SERVICES INC.
water resource consulting

Appendix E

BIRD SURVEY PROTOCOL
GPS PROTOCOL

MDT Wetland Mitigation Monitoring
Cloud Ranch
Big Timber, Montana

BIRD SURVEY PROTOCOL

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

Survey Area

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

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

Survey Time

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

Data Recording

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

abbreviation at the bottom of the field data sheet. For example, unknown shorebird is UNSB; unknown brown bird is UNBR; unknown warbler is UNWA; and unknown waterfowl is UNWF. For a flyover of a flock of unknown species, use a term that describes the birds' general characteristics and include the approximate flock size in parenthesis; do not fill in the habitat column. For example, a flock of black, medium-sized birds could be coded as UNBB / FO (25).

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

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

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

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

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

Other Fields

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

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

Date: Record the date of the bird survey.

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

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

GPS MAPPING AND AERIAL PHOTO REFERENCING PROCEDURE

From 2001 through 2006, PBS&J mapped the vegetation community boundaries, photograph points, and other sampling locations in the field using the resource-grade Trimble GEO III GPS (Global Positioning System) unit. The data were collected with a minimum of three positions per feature using Course/Acquisition code. The collected data were then transferred to a personal computer (PC) and differentially corrected to the nearest operating Community Base Station. The corrected data were then exported to ACAD drawings in Montana State Plain Coordinates NAD 83 international feet. The Trimble GEO III GPS unit was also used for some sites in 2007.

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

In 2007 and 2008 sites were mapped using the resource-grade Magellan MobileMapper Office GPS unit. The Magellan GPS unit has a comparable accuracy level to the Trimble Geo III unit.

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

Any relationship of features located to easement or property lines are not to be construed from these figures. These relationships can only be determined with a survey by a licensed surveyor.

Appendix F

2009 MACROINVERTEBRATE SAMPLING PROTOCOL AND DATA

MDT Wetland Mitigation Monitoring
Cloud Ranch
Big Timber, Montana

AQUATIC INVERTEBRATE SAMPLING PROTOCOL

Equipment List

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

Site Selection

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

Sampling Procedure

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

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

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

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

Photograph each macroinvertebrate sampling site.

Sample Handling/Delivery

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

MDT Mitigated Wetland Monitoring Project: Aquatic Invertebrate Monitoring
Summary 2001 – 2009

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

INTRODUCTION

This report summarizes data generated from eight years of mitigated wetland monitoring from sites throughout the State of Montana. A total of 229 invertebrate samples have been collected over the study period. Table 1 lists the currently monitored sites at which aquatic invertebrates were collected in 2009, and summarizes the sampling history of each.

METHODS

Sampling and Sample Processing

Aquatic invertebrate samples were collected at mitigated wetland sites in the summer months of 2001, 2002, 2003, 2004, 2005, 2006, 2007, 2008, and 2009 by personnel of PBS&J. Sampling procedures were based on the protocols developed by the Montana Department of Environmental Quality (MDEQ) for wetland sampling. Sampling consisted of D-frame net sweeps through emergent vegetation (when present), the water column, and over the water surface, and included disturbing and scraping substrates at each sampled site. These sample components were composited and preserved in ethanol at each wetland site. Samples were delivered to Rhithron Associates, Inc. for processing, taxonomic determinations, and data analysis.

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

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

Assessment

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

Scoring criteria for wetland metrics were developed by generally following the tactic used by Stribling et al. (1995). Boxplots were generated using a statistical software package (Statistica™), and distributions, median values, ranges, and quartiles for each metric were examined. For the wetland sites, “good” scores were generally

those that fell above the 75th percentile (for those metrics that decrease in value in response to stress) or below the 25th percentile (for metrics that respond to stress by an increase in value) of all scores. Additional scoring ranges were established by bisecting the range below the 75th percentile for decreasing scores (or above the 25th percentile for increasing scores) into "sub-optimal" and "poor" assessment categories. A score of 5, 3, or 1 was assigned to good, sub-optimal, and poor metric performance, respectively. In this way, metric values were translated into normalized metric scores, and scores for all metrics were summed to produce a total bioassessment score, which is expressed as a percentage of the maximum possible score (60). Total bioassessment scores were classified according to a similar process, using the ranges and distributions of total scores for all sites studied between 2001 and 2007. Data from a total of 167 sites were used to develop criteria.

Six sites in this study supported aquatic fauna characteristic of lotic habitats rather than lentic wetland habitats; these sites were excluded from mitigated wetland scoring criteria development, and were evaluated with a metric battery specific to flowing water habitats. In 2008, the lotic sites were Camp Creek (2 sites), Cloud Ranch stream, Jack Creek – McKee Spring, and Jocko Spring Creek (2 sites). Invertebrate assemblages at these sites were generally characteristic of montane or foothill stream conditions and were assessed using the tested metric battery developed for montane streams of Western Montana (MVFP index: Bollman 1998).

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

Bioassessment metrics - wetlands

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

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

Four composition metrics (%Chironomidae, %Orthocladiinae of Chironomidae, %Crustacea + %Mollusca, and %Amphipoda) measure the relative contributions of certain taxonomic groups that may have significant responses to habitat and/or water quality impacts. For example, amphipods have been demonstrated to increase in abundance in alkaline conditions. Short-lived, relatively mobile taxa such as chironomids dominate ephemeral environments; many are hemoglobin-bearers capable of tolerating de-oxygenated conditions.

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

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

Summary metric values and scores for the 2009 samples are given in Tables 4a-4c and 5. Thermal preference of invertebrate assemblages was calculated using Brandt 2001.

Bioassessment metrics – lotic habitats

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

1. Ephemeroptera (mayfly) taxa richness. The number of mayfly taxa declines as water quality diminishes. Impairments to water quality which have been demonstrated to adversely affect the ability of mayflies to flourish include elevated water temperatures, heavy metal contamination, increased turbidity, low or high pH, elevated specific conductance and toxic chemicals. Few mayfly species are able to tolerate certain disturbances to instream habitat, such as excessive sediment deposition.

2. Plecoptera (stonefly) taxa richness. Stoneflies are particularly susceptible to impairments that affect a stream on a reach-level scale, such as loss of riparian canopy, streambank instability, channelization, and alteration of morphological features such as pool frequency and function, riffle development and sinuosity. Just as all benthic organisms, they are also susceptible to smaller scale habitat loss, such as by sediment deposition, loss of interstitial spaces between substrate particles, or unstable substrate.

3. Trichoptera (caddisfly) taxa richness. Caddisfly taxa richness has been shown to decline when sediment deposition affects habitat. In addition, the presence of certain case-building caddisflies can indicate good retention of woody debris and lack of scouring flow conditions.

4. Number of sensitive taxa. Sensitive taxa are generally the first to disappear as anthropogenic disturbances increase. The list of sensitive taxa used here includes organisms sensitive to a wide range of disturbances, including warmer water temperatures, organic or nutrient pollution, toxic pollution, sediment deposition, substrate instability and others. Unimpaired streams of western Montana typically support at least four sensitive taxa (Bollman 1998).

5. Percent filter feeders. Filter-feeding organisms are a diverse group; they capture small particles of organic matter, or organically enriched sediment material, from the water column by means of a variety of adaptations, such as silken nets or hairy appendages. In forested montane streams, filterers are expected to occur in insignificant numbers. Their abundance increases when canopy cover is lost and when water temperatures increase and the accompanying growth of filamentous algae occurs. Some filtering organisms, specifically the Arctopsychid caddisflies (*Arctopsyche* spp. and *Parapsyche* spp.) build silken nets with large mesh sizes that capture small organisms such as chironomids and early-instar mayflies. Here they are considered predators, and, in this study, their abundance does not contribute to the percent filter feeders metric.

6. Percent tolerant taxa. Tolerant taxa are ubiquitous in stream sites, but when disturbance increases, their abundance increases proportionately. The list of taxa used here includes organisms tolerant of a wide range of disturbances, including warmer water temperatures, organic or nutrient pollution, toxic pollution, sediment deposition, substrate instability and others.

Table 1. Montana Department of Transportation Mitigated Wetlands Monitoring Project sites: sampling history. Only sites sampled in 2009 are included. An asterisk indicates lotic sites.

Site identifier	2002	2003	2004	2005	2006	2007	2008	2009
Camp Creek MS-1*	+	+	+	+	+	+	+	+
Camp Creek MS-2*					+	+	+	+
Cloud Ranch Pond			+	+	+	+	+	+
Cloud Ranch Stream (Big Timber)*			+			+	+	+
Jack Creek – McKee Spring Creek*					+	+	+	+
Jack Creek – pond			+	+	+	+	+	+
Rock Creek Ranch				+	+	+	+	+
Wagner Marsh				+	+	+	+	+
Alkali Lake 1					+	+	+	+
West Fork of Charley Creek						+	+	+
Little Muddy Creek						+	+	+
Selkirk Ranch						+	+	+
Jocko Spring Creek MS1							+	+
Jocko Spring Creek MS2							+	+
Sportsman's Campground Site #1							+	+
Sportsman's Campground Site #2							+	+
Sportsman's Campground Site #3							+	+
Lonepine #1							+	+
Lonepine #2							+	+

Table 2. Aquatic invertebrate metrics employed for wetland (lentic) invertebrate assemblages in the MDT mitigated wetlands study, 2001 – 2009.

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

RESULTS

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

Table 4a. Metric values and scores for wetland (lentic) sites in the MDT mitigated wetland study – 2009 sampling.

METRIC	Cloud Ranch Pond	Jack Creek Pond	Rock Creek Ranch	Wagner Marsh	Alkali Lake	West Fork of Charley Creek	Little Muddy Creek
Total taxa	15	11	20	18	17	7	18
POET	2	0	2	3	1	0	1
Chironomidae taxa	6	3	3	5	10	2	6
Crustacea + Mollusca	0	5	6	7	1	1	6
% Chironomidae	14.47%	66.67%	43.75%	16.07%	61.00%	2.73%	42.40%
Orthocladiinae/Chir	45.45%	20.00%	57.14%	22.22%	52.46%	0.00%	86.79%
%Amphipoda	0.00%	3.33%	0.00%	1.79%	0.00%	91.82%	4.80%
%Crustacea + %Mollusca	0.00%	23.33%	32.14%	34.82%	1.00%	91.82%	34.40%
HBI	6.026666	9	7.045045	7.981652	6	7.90909	7.448
%Dominant taxon	40.79%	53.33%	23.21%	23.21%	30.00%	91.82%	36.00%
%Collector-Gatherers	21.05%	73.33%	61.61%	43.75%	51.00%	91.82%	37.60%
%Filterers	0.00%	0.00%	7.14%	4.46%	0.00%	0.00%	4.80%
Total taxa	3	1	3	3	3	1	3
POET	1	1	1	3	1	1	1
Chironomidae taxa	3	3	3	3	5	1	3
Crustacea + Mollusca	1	3	5	5	1	1	5
% Chironomidae	5	1	1	5	1	5	1
Orthocladiinae/Chir	5	3	5	3	5	1	5
%Amphipoda	5	5	5	5	5	1	3
%Crustacea + %Mollusca	5	5	5	3	5	1	3
HBI	5	1	3	1	5	1	3
%Dominant taxon	3	1	5	5	5	1	3
%Collector-Gatherers	1	3	3	1	3	5	1
%Filterers	3	3	1	3	3	3	3
Total score	**40**	**30**	**40**	**40**	**42**	**22**	**34**
Percent of maximum score	**66.67%**	**50.00%**	**66.67%**	**66.67%**	**70.00%**	**36.67%**	**56.67%**
Impairment classification	**optimal**	**sub-optimal**	**optimal**	**optimal**	**optimal**	**poor**	**sub-optimal**

Table 4b. Metric values and scores for wetland (lentic) sites in the MDT mitigated wetland study – 2009 sampling.

METRIC	Selkirk Ranch	Sportsman's Campground Site #1	Sportsman's Campground Site #2	Sportsman's Campground Site #3	Lonepine #1	Lonepine #2
Total taxa	17	19	11	23	22	19
POET	1	1	0	2	2	3
Chironomidae taxa	6	10	8	11	11	8
Crustacea + Mollusca	6	4	2	4	4	2
% Chironomidae	27.27%	38.46%	90.00%	41.82%	67.83%	25.86%
Orthocladiinae/Chir	43.33%	37.50%	3.33%	23.91%	7.69%	16.67%
%Amphipoda	5.45%	25.96%	2.00%	4.55%	0.00%	0.00%
%Crustacea + %Mollusca	62.73%	51.92%	5.00%	50.00%	6.96%	18.10%
HBI	8.245455	6.942309	6.9	7.345455	7.196427	7.191304
%Dominant taxon	30.00%	24.04%	45.00%	27.27%	51.30%	15.52%
%Collector-Gatherers	57.27%	50.00%	91.00%	83.64%	86.09%	63.79%
%Filterers	3.64%	25.96%	18.00%	29.09%	1.74%	6.03%
Total taxa	3	3	1	5	5	3
POET	1	1	1	1	1	3
Chironomidae taxa	3	5	5	5	5	5
Crustacea + Mollusca	5	3	1	3	3	1
% Chironomidae	3	3	1	1	1	3
Orthocladiinae/Chir	3	3	1	3	1	1
%Amphipoda	3	1	5	3	5	5
%Crustacea + %Mollusca	3	3	5	3	5	5
HBI	1	3	3	3	3	3
%Dominant taxon	5	5	3	5	1	5
%Collector-Gatherers	3	3	5	5	5	3
%Filterers	3	1	1	1	3	1
Total score	**36**	**34**	**32**	**38**	**38**	**38**
Percent of maximum score	**60.00%**	**56.67%**	**53.33%**	**63.33%**	**63.33%**	**63.33%**
Impairment classification	**sub-optimal**	**sub-optimal**	**sub-optimal**	**sub-optimal**	**sub-optimal**	**sub-optimal**

Table 5. Metric values and scores for stream (lotic) sites in the MDT mitigated wetland study – 2009 sampling.

METRIC	Camp Creek MS-1	Camp Creek MS-2	Cloud Ranch Stream	Jack Creek McKee	Jocko Spring Creek MS-1	Jocko Spring Creek MS-2
E Richness	2	4	1	1	2	1
P Richness	1	0	0	0	0	0
T Richness	2	4	4	1	3	2
Pollution Sensitive Richness	1	1	0	0	1	0
Filterer Percent	11.88%	22.02%	18.18%	25.23%	27.36%	10.91%
Pollution Tolerant Percent	13.86%	12.84%	15.15%	8.41%	12.26%	32.73%
E Richness	1	2	0	0	1	0
P Richness	1	0	0	0	0	0
T Richness	1	2	2	0	2	1
Pollution Sensitive Richness	1	1	0	0	1	0
Filterer Percent	1	1	1	0	0	1
Pollution Tolerant Percent	1	1	1	2	1	1
Total score	**6**	**7**	**4**	**2**	**5**	**3**
Percent of maximum score	**33.33%**	**38.89%**	**22.22%**	**11.11%**	**27.78%**	**16.67%**
Impairment classification	**moderate**	**moderate**	**moderate**	**severe**	**moderate**	**severe**

LITERATURE CITED

Bollman, W. 1998. Montana Valleys and Foothill Prairies Ecoregion. Master's Thesis. (M.S.) University of Montana. Missoula, Montana.

Brandt, D. 2001. Temperature Preferences and Tolerances for 137 Common Idaho Macroinvertebrate Taxa. Report to the Idaho Department of Environmental Quality, Coeur d' Alene, Idaho.

Caton, L. W. 1991. Improving subsampling methods for the EPA's "Rapid Bioassessment" benthic protocols. Bulletin of the North American Benthological Society. 8(3): 317-319.

Stribling, J.B., J. Lathrop-Davis, M.T. Barbour, J.S. White, and E.W. Leppo. 1995. Evaluation of environmental indicators for the wetlands of Montana: the multimetric approach using benthic macroinvertebrates. Report to the Montana Department of Health and Environmental Science. Helena, Montana.

Taxa Listing

Project ID: MDT09PBSJ
RAI No.: MDT09PBSJ004

RAI No.: MDT09PBSJ004 **Sta. Name:** Cloud Ranch-Big Timber
Client ID:
Date Coll.: 7/24/2009 **No. Jars:** 1 **STORET ID:**

Taxonomic Name	Count	PRA	Unique	Stage	Qualifier	BI	Function
Ephemeroptera							
Ephemerellidae							
Drunella flavilinea	1	3.03%	Yes	Larva		2	SC
Trichoptera							
Brachycentridae							
Brachycentrus americanus	5	15.15%	Yes	Larva		1	CF
Lepidostomatidae							
Lepidostoma sp.	15	45.45%	Yes	Larva		1	SH
Leptoceridae							
Oecetis sp.	3	9.09%	Yes	Larva		8	PR
Uenoidae							
Neophylax rickeri	5	15.15%	Yes	Larva		3	SC
Coleoptera							
Elmidae							
Optioservus sp.	1	3.03%	Yes	Adult		5	SC
Optioservus sp.	1	3.03%	No	Larva		5	SC
Chironomidae							
Chironomidae							
Pagastia sp.	1	3.03%	Yes	Larva		1	CG
Rheotanytarsus sp.	1	3.03%	Yes	Larva		6	CF
Sample Count	**33**						

Metrics Report

Project ID: MDT09PBSJ
RAI No.: MDT09PBSJ004
Sta. Name: Cloud Ranch-Big Timber
Client ID:
STORET ID:
Coll. Date: 7/24/2009

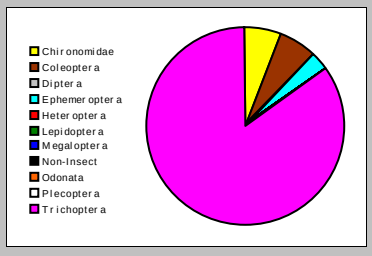
Abundance Measures

Sample Count: 33
Sample Abundance: 33.00 100.00% of sample used

Coll. Procedure:
Sample Notes:

Taxonomic Composition

Category	R	A	PRA
Non-Insect			
Odonata			
Ephemeroptera	1	1	3.03%
Plecoptera			
Heteroptera			
Megaloptera			
Trichoptera	4	28	84.85%
Lepidoptera			
Coleoptera	1	2	6.06%
Diptera			
Chironomidae	2	2	6.06%

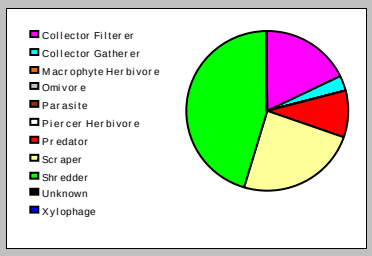


Dominant Taxa

Category	A	PRA
Lepidostoma	15	45.45%
Neophylax rickeri	5	15.15%
Brachycentrus americanus	5	15.15%
Oecetis	3	9.09%
Optioservus	2	6.06%
Rheotanytarsus	1	3.03%
Pagastia	1	3.03%
Drunella flavilinea	1	3.03%

Functional Composition

Category	R	A	PRA
Predator	1	3	9.09%
Parasite			
Collector Gatherer	1	1	3.03%
Collector Filterer	2	6	18.18%
Macrophyte Herbivore			
Piercer Herbivore			
Xylophage			
Scraper	3	8	24.24%
Shredder	1	15	45.45%
Omivore			
Unknown			

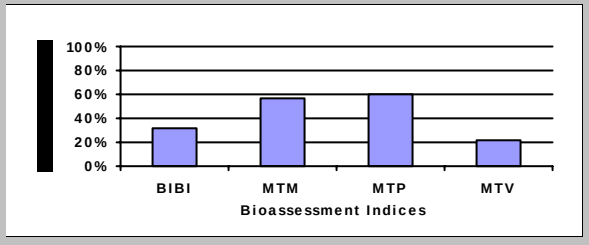


Metric Values and Scores

Metric	Value	BIBI	MTP	MTV	MTM
Composition					
Taxa Richness	8	1	0		0
Non-Insect Percent	0.00%				
E Richness	1	1		0	
P Richness	0	1		0	
T Richness	4	1		2	
EPT Richness	5		1		0
EPT Percent	87.88%		3		3
Oligochaeta+Hirudinea Percent					
Baetidae/Ephemeroptera	0.000				
Hydropsychidae/Trichoptera	0.000				
Dominance					
Dominant Taxon Percent	45.45%		1		0
Dominant Taxa (2) Percent	60.61%				
Dominant Taxa (3) Percent	75.76%	1			
Dominant Taxa (10) Percent	100.00%				
Diversity					
Shannon H (loge)	1.590				
Shannon H (log2)	2.294		1		
Margalef D	2.020				
Simpson D	0.258				
Evenness	0.140				
Function					
Predator Richness	1		0		
Predator Percent	9.09%	1			
Filterer Richness	2				
Filterer Percent	18.18%			1	
Collector Percent	21.21%		3		3
Scraper+Shredder Percent	69.70%		3		3
Scraper/Filterer	1.333				
Scraper/Scraper+Filterer	0.571				
Habit					
Burrower Richness	0				
Burrower Percent	0.00%				
Swimmer Richness	0				
Swimmer Percent	0.00%				
Clinger Richness	5	1			
Clinger Percent	42.42%				
Characteristics					
Cold Stenotherm Richness	0				
Cold Stenotherm Percent	0.00%				
Hemoglobin Bearer Richness					
Hemoglobin Bearer Percent					
Air Breather Richness	0				
Air Breather Percent	0.00%				
Voltinism					
Univoltine Richness	3				
Semivoltine Richness	3	3			
Multivoltine Percent	6.06%		3		
Tolerance					
Sediment Tolerant Richness	0				
Sediment Tolerant Percent	0.00%				
Sediment Sensitive Richness	0				
Sediment Sensitive Percent	0.00%				
Metals Tolerance Index	2.286				
Pollution Sensitive Richness	0	1		0	
Pollution Tolerant Percent	15.15%	5		1	
Hilsenhoff Biotic Index	2.364		3		3
Intolerant Percent	66.67%				
Supertolerant Percent	9.09%				
CTQa	69.333				

Bioassessment Indices

BioIndex	Description	Score	Pct	Rating
BIBI	B-IBI (Karr et al.)	16	32.00%	
MTP	Montana DEQ Plains (Bukantis 1998)	18	60.00%	Slight
MTV	Montana Revised Valleys/Foothills (Bollman 1998)	4	22.22%	Moderate
MTM	Montana DEQ Mountains (Bukantis 1998)	12	57.14%	Slight



Taxa Listing

Project ID: MDT09PBSJ
RAI No.: MDT09PBSJ003

RAI No.: MDT09PBSJ003 **Sta. Name:** Cloud Ranch-Pond
Client ID:
Date Coll.: 7/24/2009 **No. Jars:** 1 **STORET ID:**

Taxonomic Name	Count	PRA	Unique	Stage	Qualifier	BI	Function
Non-Insect							
Nematoda	2	2.63%	Yes	Unknown		5	PA
Glossiphoniidae							
Glossiphoniidae	2	2.63%	Yes	Immature		9	PR
Ephemeroptera							
Caenidae							
Caenis sp.	10	13.16%	Yes	Larva		7	CG
Trichoptera							
Lepidostomatidae							
Lepidostoma sp.	3	3.95%	Yes	Larva		1	SH
Lepidostomatidae	3	3.95%	No	Pupa		1	SH
Coleoptera							
Elmidae							
Optioservus sp.	2	2.63%	No	Larva		5	SC
Optioservus sp.	2	2.63%	Yes	Adult		5	SC
Haliplidae							
Haliplus sp.	2	2.63%	Yes	Larva		5	PH
Hydrophilidae							
Helophorus sp.	1	1.32%	Yes	Adult		11	SH
Diptera							
Ceratopogonidae							
Ceratopogonidae	6	7.89%	No	Pupa		6	PR
Ceratopogoninae	31	40.79%	Yes	Larva		6	PR
Tabanidae							
Tabanidae	1	1.32%	Yes	Larva		6	PR
Chironomidae							
Chironomidae							
Acricotopus sp.	1	1.32%	Yes	Larva		10	CG
Cricotopus (Isocladius) sp.	1	1.32%	Yes	Larva		7	SH
Dicrotendipes sp.	2	2.63%	Yes	Larva		8	CG
Orthocladius sp.	3	3.95%	Yes	Larva		6	CG
Parachironomus sp.	3	3.95%	Yes	Larva		10	PR
Procladius sp.	1	1.32%	Yes	Larva		9	PR
Sample Count	**76**						

Metrics Report

Project ID: MDT09PBSJ
RAI No.: MDT09PBSJ003
Sta. Name: Cloud Ranch-Pond
Client ID:
STORET ID:
Coll. Date: 7/24/2009

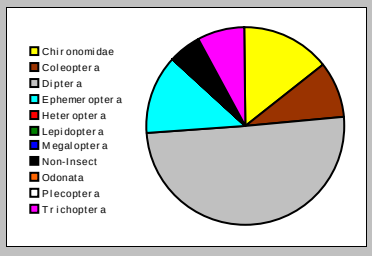
Abundance Measures

Sample Count: 76
Sample Abundance: 76.00 100.00% of sample used

Coll. Procedure:
Sample Notes:

Taxonomic Composition

Category	R	A	PRA
Non-Insect	2	4	5.26%
Odonata			
Ephemeroptera	1	10	13.16%
Plecoptera			
Heteroptera			
Megaloptera			
Trichoptera	1	6	7.89%
Lepidoptera			
Coleoptera	3	7	9.21%
Diptera	2	38	50.00%
Chironomidae	6	11	14.47%

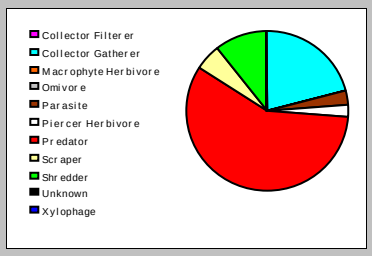


Dominant Taxa

Category	A	PRA
Ceratopogoninae	31	40.79%
Caenis	10	13.16%
Ceratopogonidae	6	7.89%
Optioservus	4	5.26%
Parachironomus	3	3.95%
Orthocladius	3	3.95%
Lepidostomatidae	3	3.95%
Lepidostoma	3	3.95%
Nematoda	2	2.63%
Haliplus	2	2.63%
Glossiphoniidae	2	2.63%
Dicrotendipes	2	2.63%
Tabanidae	1	1.32%
Cricotopus (Isocladius)	1	1.32%
Acricotopus	1	1.32%

Functional Composition

Category	R	A	PRA
Predator	5	44	57.89%
Parasite	1	2	2.63%
Collector Gatherer	4	16	21.05%
Collector Filterer			
Macrophyte Herbivore			
Piercer Herbivore	1	2	2.63%
Xylophage			
Scraper	1	4	5.26%
Shredder	3	8	10.53%
Omivore			
Unknown			

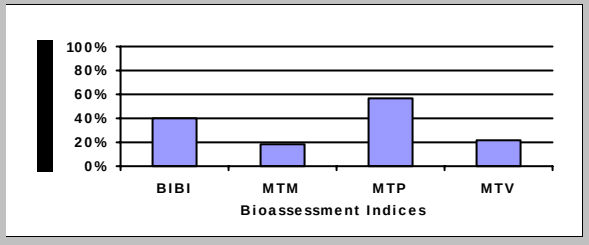


Metric Values and Scores

Metric	Value	BIBI	MTP	MTV	MTM
Composition					
Taxa Richness	15	1	1		0
Non-Insect Percent	5.26%				
E Richness	1	1		0	
P Richness	0	1		0	
T Richness	1	1		0	
EPT Richness	2		0		0
EPT Percent	21.05%		1		0
Oligochaeta+Hirudinea Percent	2.63%				
Baetidae/Ephemeroptera	0.000				
Hydropsychidae/Trichoptera	0.000				
Dominance					
Dominant Taxon Percent	40.79%		2		1
Dominant Taxa (2) Percent	53.95%				
Dominant Taxa (3) Percent	61.84%	3			
Dominant Taxa (10) Percent	88.16%				
Diversity					
Shannon H (loge)	1.924				
Shannon H (log2)	2.775		2		
Margalef D	3.354				
Simpson D	0.252				
Evenness	0.094				
Function					
Predator Richness	5		2		
Predator Percent	57.89%	5			
Filterer Richness	0				
Filterer Percent	0.00%			3	
Collector Percent	21.05%		3		3
Scraper+Shredder Percent	15.79%		2		0
Scraper/Filterer	0.000				
Scraper/Scraper+Filterer	0.000				
Habit					
Burrower Richness	2				
Burrower Percent	43.42%				
Swimmer Richness	1				
Swimmer Percent	2.63%				
Clinger Richness	2	1			
Clinger Percent	6.58%				
Characteristics					
Cold Stenotherm Richness	0				
Cold Stenotherm Percent	0.00%				
Hemoglobin Bearer Richness	3				
Hemoglobin Bearer Percent	7.89%				
Air Breather Richness	1				
Air Breather Percent	1.32%				
Voltinism					
Univoltine Richness	5				
Semivoltine Richness	3	3			
Multivoltine Percent	17.11%		3		
Tolerance					
Sediment Tolerant Richness	0				
Sediment Tolerant Percent	0.00%				
Sediment Sensitive Richness	0				
Sediment Sensitive Percent	0.00%				
Metals Tolerance Index	3.971				
Pollution Sensitive Richness	0	1		0	
Pollution Tolerant Percent	30.26%	3		1	
Hilsenhoff Biotic Index	6.027		1		0
Intolerant Percent	7.89%				
Supertolerant Percent	11.84%				
CTQa	93.538				

Bioassessment Indices

BioIndex	Description	Score	Pct	Rating
BIBI	B-IBI (Karr et al.)	20	40.00%	
MTP	Montana DEQ Plains (Bukantis 1998)	17	56.67%	Slight
MTV	Montana Revised Valleys/Foothills (Bollman 1998)	4	22.22%	Moderate
MTM	Montana DEQ Mountains (Bukantis 1998)	4	19.05%	Severe



Appendix G

U.S. ARMY CORP OF ENGINEERS
PRELIMINARY WETLAND CREDIT ASSESSMENT

MDT Wetland Mitigation Monitoring
Cloud Ranch
Big Timber, Montana

RECEIVED
OCT 31 2002
ENVIRONMENTAL
REPLY TO
ATTENTION OF:

U.S. ARMY CORPS OF ENGINEERS
HELENA REGULATORY OFFICE
10 WEST 15TH STREET, SUITE 2200
HELENA, MONTANA 59626

October 7, 2002

Helena Regulatory Office
Phone (406) 441-1375
Fax (406) 441-1380

Subject: Corps File Number 2002-90-578
Heminway Property Wetland Project
Preliminary Wetland Credit Assessment

Mr. Tom Coleman
Aquatic Design & Construction, Inc.
PO Box 582
Livingston, Montana 59047

Dear Mr. Coleman:

This letter is a response to your request that the US Army Corps of Engineers (Corps) concur with the crediting methods used to estimate the amount of wetland mitigation credit that may be generated by a proposed wetland project. The proposed work will occur on the Heminway property adjacent to the Big Timber Creek. The project is located near the community of Big Timber in Section 36, Township 3 North, Range 13 East, Sweetgrass County, Montana.

It is your intention to develop or restore, and then protect, wetlands at the site to provide compensatory wetland mitigation credit to the Montana Department of Transportation. It is required that all creditable areas be protected by a perpetual conservation easement or other encumbrance that ensures the continued existence of the aquatic lands and suitable buffers developed at the site. The following table summarizes the general amounts and types of wetland credit that the Corps will commit to, assuming that the site is constructed and develops as presented in your August 29, 2002 letter to this office.

Type of Mitigation Effort	Total Acres	Acres of Credit
Enhancement of Existing Wetland, 3:1 ratio	none	none
Creation of wetlands resulting from grading adjacent to restored or existing wetlands, 1:1 ratio	0.61 acres created	0.61 acres credit
Wetland restoration at sites of pond removal and pond embankment removals, 1:1 ratio	1.41 acres restored	1.41 acres credit
Riparian wetland restoration along Big Timber Creek channel project, 1:1 ratio	2.0 acres restored	2.0 acres credit
Emergent wetland restoration along Big Timber Creek channel project, 1:1 ratio	0.58 acres restored	0.58 acres credit
Allowable Buffer Zone, 4:1 ratio	3.58 acres upland buffer	0.89 acres credit
Summary of Potential Wetland Credit Available:	--	**5.49 acres**

You will note that the amount of credit agreed to at this time was determined using ratios of compensation to impact rather than functional assessment. If necessary, the Corps will adjust the amount of mitigation credit acreage after the conclusion of the monitoring period.

Credit for wetland and upland buffer areas will only be awarded if livestock grazing is prohibited in those areas as a condition of the protective easement.

The monitoring period for this project will be five complete growing seasons after completion of construction and planting. If there are no appreciable changes expected after the fourth year of monitoring, the Corps may, upon request, waive the fifth year. Monitoring must be done in accordance with the protocols established under the MDT Wetland Mitigation Monitoring Program, with annual reports supplied to this office either as part of that program or as stand-alone submittals.

If you have any questions please contact me by phone at (406) 441-1375 or by e-mail at todd.n.tillinger@usace.army.mil, and reference Corps File Number 2002-90-578.

Sincerely,

Todd N. Tillinger, P.E.
Project Manager

CC: Larry Urban, Montana Department of Transportation - Environmental Services