MONTANA DEPARTMENT OF TRANSPORTATION
WETLAND MITIGATION MONITORING REPORT: YEAR 2009

DH Ranch
Edgar, Montana



Prepared for:

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

Prepared by:

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

December 2009

PBS&J Project No: 0B4308802.06.03

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1.0 INTRODUCTION

This report presents the results of the third year (2009) of wetland monitoring at the DH Ranch wetland mitigation project. This mitigation site was constructed during the spring of 2007 in the eastern portion of the Upper Yellowstone River watershed (Watershed #13). Approximately 17.4 acres of wetland credit at this site are to be provided to the Montana Department of Transportation (MDT) through a credit purchase agreement. It is anticipated that this site will compensate for wetland impacts resulting from MDT highway and bridge reconstruction projects in the watershed. The DH Ranch mitigation site was constructed on private property owned by Mr. George Duke. The goal of the project is to create wetland hydrology, and thereby ultimately provide up to 23 acres of palustrine emergent and scrub-shrub wetland within the confines of the site. Prior to construction, approximately 0.38 acre of palustrine emergent and scrub-shrub wetland had been incidentally created along irrigation ditches traversing the site.

The site occurs at an elevation of approximately 3,430 feet above mean sea level. It is located in Carbon County, Montana roughly three miles northeast of Edgar, on the eastern floodplain of the Clark's Fork of the Yellowstone River (**Figure 1**). The site can be found on the Silesia, MT U.S. Geologic Survey 7.5 minute topographic quadrangle in the SE ¼ of Section 1, Township 4 South, Range 23 East. Approximate universal transverse mercator (UTM) coordinates for the central portion of the site are in Zone 12 at 5,041,967 Northing and 669,792 Easting.

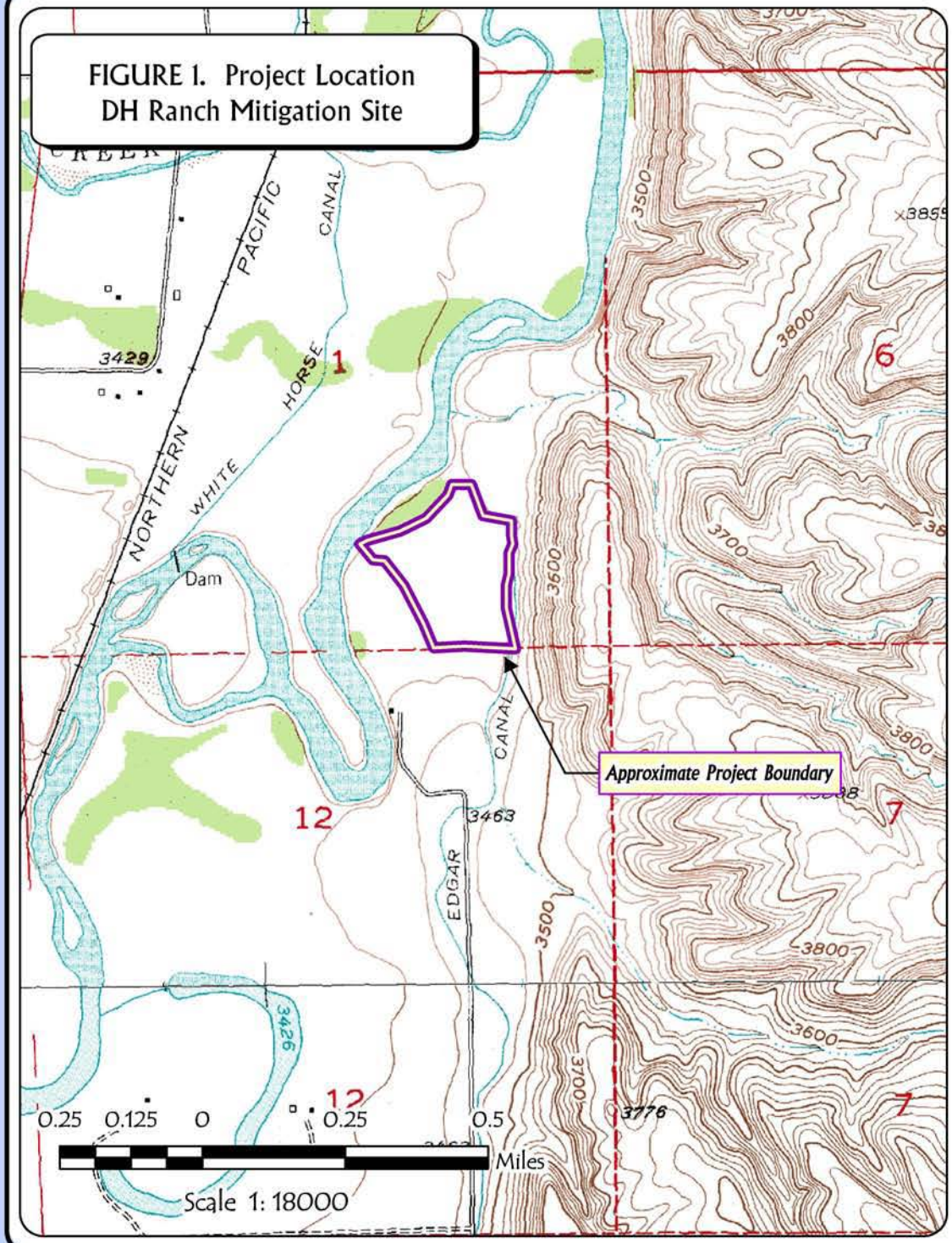
The approximate site boundary is illustrated on **Figure 2** (**Appendix A**) and on the plan sheet in **Appendix D**. The project is a wetland creation project and includes a series of wetland cells supplied primarily by irrigation return flow, with some minimal contributions from precipitation. Monitoring occurs on the site in mid-summer when all wetland data are collected. Wetland crediting ratios for the site are 1:1 for wetland creation areas and 4:1 for riparian buffers. The newly constructed jackleg fence around much of the site, combined with an existing barbwire fence, encompass roughly 27.78 acres.

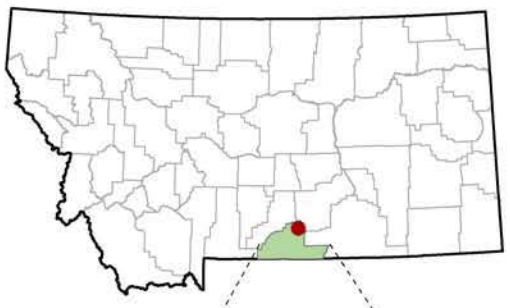
2.0 METHODS

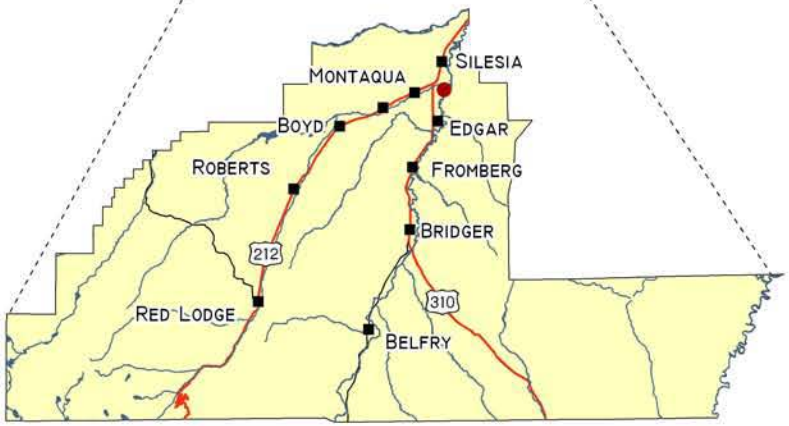
2.1 Monitoring Dates and Activities

The site was monitored on August 18, 2009 (mid-season visit). The mid-season visit was conducted to document vegetation, soil, and hydrologic conditions used to map jurisdictional wetlands. The majority of the information contained on the Wetland Mitigation Site Monitoring Form (**Appendix B**) was collected at this time. Activities and information conducted/collected included: wetland delineation; wetland/open water boundary mapping; vegetation community mapping; vegetation transects; soils data; hydrology data; bird and general wildlife use; photograph points; macroinvertebrate sampling; functional assessment; and survival of planted woody vegetation.

FIGURE 1. Project Location
DH Ranch Mitigation Site







N

PROJECT #: B43088.00 0516
DATE: September 2007
LOCATION: DH Ranch
PROJECT MANAGER: R. McEldowney
DRAWN BY: MSA

PBS&J
801 N. Last Chance Gulch, Ste. 101 Helena, MT 59601

2.2 Hydrology

Hydrologic indicators were evaluated during the mid-season visit. Wetland hydrology indicators were recorded using procedures outlined in the Corps of Engineers (COE) Wetlands Delineation Manual (Environmental Laboratory 1987) on COE Routine Wetland Delineation Data Forms (**Appendix B**). If located within 18 inches of the ground surface (soil pit depth for purposes of delineation), groundwater depths were documented on the routine wetland delineation data form at each data point.

All additional hydrologic data were recorded on the mitigation site monitoring form (**Appendix B**). The boundary between wetlands and open water (no rooted vegetation) aquatic habitats was mapped on the aerial photograph and an estimate of the average water depth at this boundary was recorded.

2.3 Vegetation

General dominant species-based vegetation community types (e.g., *Scirpus acutus/Mixed Graminoid*) were delineated on an aerial photograph. Standardized community mapping was not employed as many of these systems are geared towards climax vegetation and may not reflect yearly changes. Estimated percent cover of the dominant species in each community type was listed on the site monitoring form (**Appendix B**).

A 10-foot wide belt transect was established in 2007 and is monitored annually (**Figure 2** in **Appendix A**). Within the transect belt percent cover was estimated for each vegetative species for each vegetation community encountered within the "belt" using the following values: + (<1%); 1 (1-5%); 2 (6-10%); 3 (11-20%); 4 (21-50%); and 5 (>50%).

The purpose of the transect is to evaluate changes over time, especially the establishment and increase of hydrophytic vegetation. The transect location was marked on the aerial photo and all data recorded on the mitigation site monitoring form. Transect endpoint locations were recorded with a global positioning system (GPS) unit. Existing fence posts were utilized to physically mark the transect ends. Photos of the transect were taken from both ends during the mid-season visit. A comprehensive plant species list for the site was compiled.

Several woody species were planted at this mitigation site. The number of live and dead plants were recorded for each species.

2.4 Soils

Soils were evaluated during the mid-season visit according to hydric soils determination procedures 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 (USDA – NRCS 2006).

2.5 Wetland Delineation

A wetland delineation of the mitigation site was conducted during the 2009 mid-season visit according to the 1987 Corps of Engineers (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: Great Plains 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 indicator status of vegetation was derived from the *National List of Plant Species that occur in Wetlands: Northwest (Region 9)* (Reed 1988).

The information was recorded onto COE Routine Wetland Delineation Data Forms (**Appendix B**). The wetland/upland boundary was delineated both with a resource grade GPS and on aerial photographs. The wetland/upland boundary in combination with the wetland/open water habitat boundary was used to calculate the wetland area that has developed within the monitoring area.

2.6 Mammals, Reptiles, and Amphibians

Mammal, reptile, and amphibian species observations and other positive indicators of use, such as vocalizations, were recorded on the wetland monitoring form. Indirect use indicators, including tracks; scat; burrows; eggshells; skins; bones; etc., were also recorded. Observations were recorded as the observer traversed the site while conducting other required activities. Direct sampling methods, such as snap traps, live traps, and pitfall traps, were not implemented. A comprehensive list of observed species was compiled. Observations from past monitoring is compared to this data.

2.7 Birds

Bird observations were recorded during the mid-season visit. No formal census plots, spot mapping, point counts, or strip transects were conducted. During the mid-season visit, bird observations were recorded incidental to other monitoring activities. Observations were categorized by species, activity code, and general habitat association (**Appendix B**).

2.8 Macroinvertebrates

One macroinvertebrate sample was collected during the mid-season visit in 2007 and 2008, but not in 2009.

2.9 Functional Assessment

In 2007, a functional assessment was conducted using the 1999 MDT Montana Wetland Assessment Method (Berglund 1999). In 2008 and 2009, the 2008 MDT Montana Wetland Assessment Method (Berglund and McEldowney 2008) was applied. Field data necessary for this assessment were collected during the mid-season site visit.

2.10 Photographs

Photographs were taken during the mid-season visit showing the current land use surrounding the site, the upland buffer, the monitored area, macroinvertebrate sampling location, and the vegetation transect (**Appendix C**). Each photograph point location was recorded with a GPS. All photographs were taken using a digital camera, with no optical zoom used. A description and compass bearing for each photograph was recorded on the wetland monitoring form.

2.11 GPS Data

During the 2007 monitoring season, data were collected with a resource grade Magellan Mobile Mapper unit at the vegetation transect beginning and ending locations, at all photograph locations, wetland sample points, and at aerial photograph reference points. In 2009, additional GPS data were collected as necessary, including locations of noxious weed infestations. Procedures used for GPS mapping and aerial photography referencing are included in **Appendix E.**

2.12 Maintenance Needs

Where encountered, current or potential future problems were documented and conveyed to MDT and reported in this document.

3.0 RESULTS

3.1 Hydrology

Irrigation return flow is the primary source of water at the DH Ranch mitigation site. Irrigation return flows enter the south end of the site and are diverted to inundate/saturate the majority of the site. An outfall structure is located in the northeastern corner of the site.

The Natural Resources Conservation Service (NRCS) estimates that the growing season in Joliet, Montana extends from May 5th through September 29th, and is approximately 147 days long (NRCS 2002). Therefore, wetland hydrology requirements are met if the site remains saturated to the soil surface for a minimum of seven consecutive days (5 percent of the growing season). The closest active weather station to the wetland monitoring area is Bridger, Montana station #241102. According to the Western Regional Climate Center (WRCC), mean annual precipitation at this station was approximately 11.49 inches; with the majority of precipitation occurring in April, May, June, September, and October (2008). Precipitation data from the Deer

Mountain (East) remote automated weather station (RAWS), the closest active weather station to DH Ranch with current precipitation data available for 2009, showed that 5.38 inches of precipitation has fallen in the area between January 1, 2009 and September 30, 2009 (BLM-RAWS 2009). This is below the 6.5 inches recorded for the same time period in 2007, or the 5.83 inches reported for 2008 at this weather station (BLM-RAWS 2009). To illustrate the amount of evapotranspiration in this area, the evapotranspiration rate (Penman equation) during the 2005 growing season (May – Sept) was calculated at approximately 35.59 inches from data obtained at the South Bridger, Montana remote automated weather station (BLM-RAWS 2007). (The South Bridger RAWS site was taken offline in 2006). This rate is more than three times the average yearly precipitation rate.

Inundation was present to various extents at all wetland cells within the monitoring area during the mid-season visit (**Figure 3** in **Appendix A**). Water depths ranged from zero to roughly three feet, with an average depth of approximately 1.0 foot.

3.2 Vegetation

Vegetation species identified on the site are presented in **Table 1** and on the **Monitoring Form** (**Appendix B**). Construction of the site was completed in July 2007; consequently, much of the site was dominated by invasive plant species. Cheatgrass (*Bromus tectorum*) is still dominant in several of the Primary Sere Upland communities but appears to have been all but drowned out of the Primary Sere Wetland areas. Though prevalent in 2009, the extent of foxtail barley (*Hordeum jubatum*) at the site has been substantially reduced over its extent in 2008.

A total of nine main community types were documented at the site in 2009, with the Primary Sere community type being divided into two subtypes – wetland and upland. Eight of these community types are vegetated wetland community types (**Figure 3** in **Appendix A**): *Scirpus acutus*/Mixed *Graminoid* (Bulrush), *Typha latifolia*/Mixed *Graminoid*s (Cattail), *Salix amygdaloides*, Primary Sere Wetland, *Sporobolus airoides* (alkali sacaton), *Hordeum jubatum* (foxtail barley), Mixed *Graminoid*s, and *Echinochloa muricata*. The alkali sacaton community type is called the 'Alkali Sacaton Southern Plains Grassland' community type by the Montana Natural Heritage Program and is classified as S2 - at risk because of very limited and/or declining numbers, range, and/or habitat, making it vulnerable to extirpation in the state (MTNHP 2008). Dominant species within each of these communities are listed on the **Monitoring Form** (**Appendix B**).

The bulrush and cattail community types occur as pockets throughout the site in slightly deeper, more permanently flooded areas. Cattail communities continue to expand into some areas mapped as bulrush in 2007 and 2008. Bulrush communities expanded in the large wetland cell in the northeast portion of the site. Primary Sere Wetland areas were just becoming established in 2007, and in 2009 continue to be dominated by a variety of species. Several of these wetland areas became dominated by foxtail barley in 2008, but in 2009 reverted to less of a monoculture and consequently were reclassified into the more general Primary Sere Wetland category. On the east-central portion of the site the *Scirpus maritimus*/Mixed Graminoid (Alkali Bulrush) community type identified in 2007 transitioned into the foxtail barley community type in 2008.

Table 1: ***2007 to 2009 vegetation species list for the DH Ranch Wetland Mitigation Site.***

Scientific Name[1]	1988 Region 9 (Northwest) Wetland Indicator Status	Scientific Name	1988 Region 9 (Northwest) Wetland Indicator Status
Achillea millefolium	FACU	*Panicum virgatum*	FAC+
Agropyron repens	FACU	*Phalaris arundinaceae*	FACW
Alopecurus arundinaceus	NI	*Plantago major*	FAC+
Ambrosia trifida	FAC	*Poa pratensis*	FACU+
Ambrosia spp.	--	*Polygonum sp.*	FACW
Artemisia cana	FAC	*Populus deltoides*	FAC
Asclepias spp.	--	*Potentilla anserina*	OBL
Asparagus officinalis	FACU	*Rhus trilobata* (planted)	NI
Aster spp.	--	*Rosa woodsii*	FACU
Atriplex canescens (planted)	UPL	*Rumex crispus*	FACW
Bromus inermis	--	*Salix amygdaloides*	FACW
Bromus tectorum	--	*Salix exigua* (planted)	OBL
Capsella bursa-pastoris	FAC-	*Salix* spp.	(FACW)
Carex spp.	(FACW)	*Sarcobatus vermiculatus*	FACU+
Chenopodium album	FAC	*Scirpus acutus*	OBL
Chrysothamnus nauseosus	--	*Scirpus maritimus*	OBL
Cirsium arvense	FACU+	*Scirpus microcarpus*	OBL
Convolvulus arvensis	--	***Scirpus pallidus***	**OBL**
Cynoglossum officinale	--	*Scirpus pungens*	OBL
Distichlis spicata	FACW	*Shepherdia argentea* (planted)	--
Echinochloa muricata	FACW	*Sisymbrium altissimum*	FACU-
Elaeagnus angustifolia	FAC	*Solanum* spp.	--
Eleocharis palustris	OBL	***Spartina pectinata***	**FACW**
Elymus trachycaulus	FAC	*Sporobolus airoides*	FAC-
Festuca pratensis	FACU+	*Symphoricarpos albus*	FACU
Grindelia squarrosa	FACU	*Taraxacum officinale*	FACU
Hordeum jubatum	FAC+	*Thlaspi arvense*	NI
Juncus balticus	OBL	*Tragopogon dubius*	--
Juncus bufonius	FACW+	*Trifolium hybridum*	FACU+
Juncus effusus	FACW+	*Trifolium pratense*	FACU
Juncus nevadensis	FACW	*Trifolium repens*	FACU+
Kochia scoparia	FAC	*Typha angustifolia*	OBL
Lactuca serriola	FACU	*Typha latifolia*	OBL
Lepidium perfoliatum	FACU+	*Verbascum thapsus*	--
Medicago sativa	--	*Verbena bracteata*	FACU+
Melilotus spp.	(FACU)	*Veronica* spp.	(FACW-OBL)

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

In 2009 this community type was classified simply as Mixed Graminoid to reflect the lack of dominance by any single species. The *Echinochloa muricata* community type is new in 2009 and occurs in three areas around the site. This species is an annual, so there is a reasonable chance that it will be replaced with a different community type in 2010.

Open water areas vary in depth but are relatively shallow and bulrush and cattails continue to encroach into deeper water. It is expected that if water levels are held relatively constant that open water areas will become smaller over time.

Primary Sere Upland communities differ from Primary Sere Wetland communities by having a distinctly different water regime and a prevalence of facultative, facultative-upland, and upland plant species. Without intervention, these areas are not expected to develop into wetlands. In 2009 much of these areas continue to be dominated by clasping pepperweed (*Lepidium perfoliatum*), a weedy winter annual, as well as cheatgrass and field bindweed (*Convolvulus arvensis*).

Vegetation community data were recorded from a 10-foot wide belt transect (**Monitoring Forms** in **Appendix B**) and summarized (**Table 2**). Vegetation continued to transition into hydrophytic dominated communities (**Charts 1** and **2**). If a similar hydrologic regime is perpetuated in future years as was observed on the site in 2009, it is expected that the total number of plant species will continue to decrease, the number of upland species will also decrease, but that the total vegetative cover will continue to increase.

Table 2: ***2007 to 2009 vegetation transect data summary.***

Monitoring Year	2007	2008	2009
Transect Length (feet)	645	645	645
# Vegetation Community Transitions along Transect	9	12	10
# Vegetation Communities along Transect	3	5	4
# Hydrophytic Vegetation Communities along Transect	2	4	3
Total Vegetative Species	39	47	34
Total Hydrophytic Species	20	15	18
Total Upland Species	19	32	16
Estimated % Total Vegetative Cover	50	66	78
% Transect Length Comprised of Hydrophytic Vegetation Communities	88.4	90	91
% Transect Length Comprised of Upland Vegetation Communities	11.6	10	9
% Transect Length Comprised of Unvegetated Open Water	0	0	0
% Transect Length Comprised of Bare Substrate	0	0	0

Percent vegetative cover within the transect increased substantially from previous years, but overall remains just below the ultimate 80 percent vegetative cover success criteria. Observed mortality of planted woody vegetation species is summarized in **Table 3**. In 2007 a total of 320 woody plantings were found onsite, whereas in 2008 only 103 were able to be located during the mid-season visit. In 2009 only one of the planted shrubs was located. This is thought to be primarily due to mortality; however, increased vegetative cover (i.e., field bindweed and kochia) may have hidden some of the small, planted shrubs from observation. The overall survival rate in 2008 was predicted to be relatively low (22 percent), so the lack of shrub plantings in 2009 is somewhat unsurprising. In previous years, the species with the highest level of survival was four-wing saltbush (*Atriplex canescens*).

Chart 1: ***Transect map showing vegetation types from the start of transect (0 feet) to the end of transect (645 feet) for 2007 through 2009.***

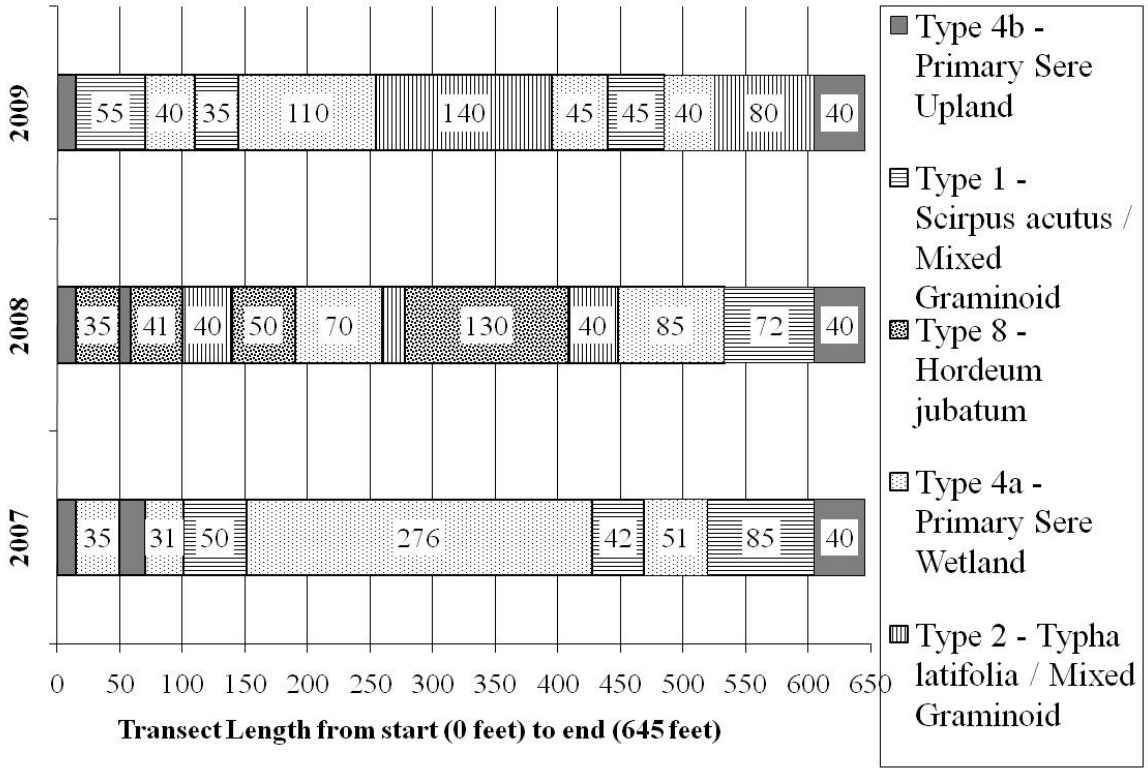


Chart 2: ***Length of vegetation communities within Transect 1 for 2007 to 2009.***

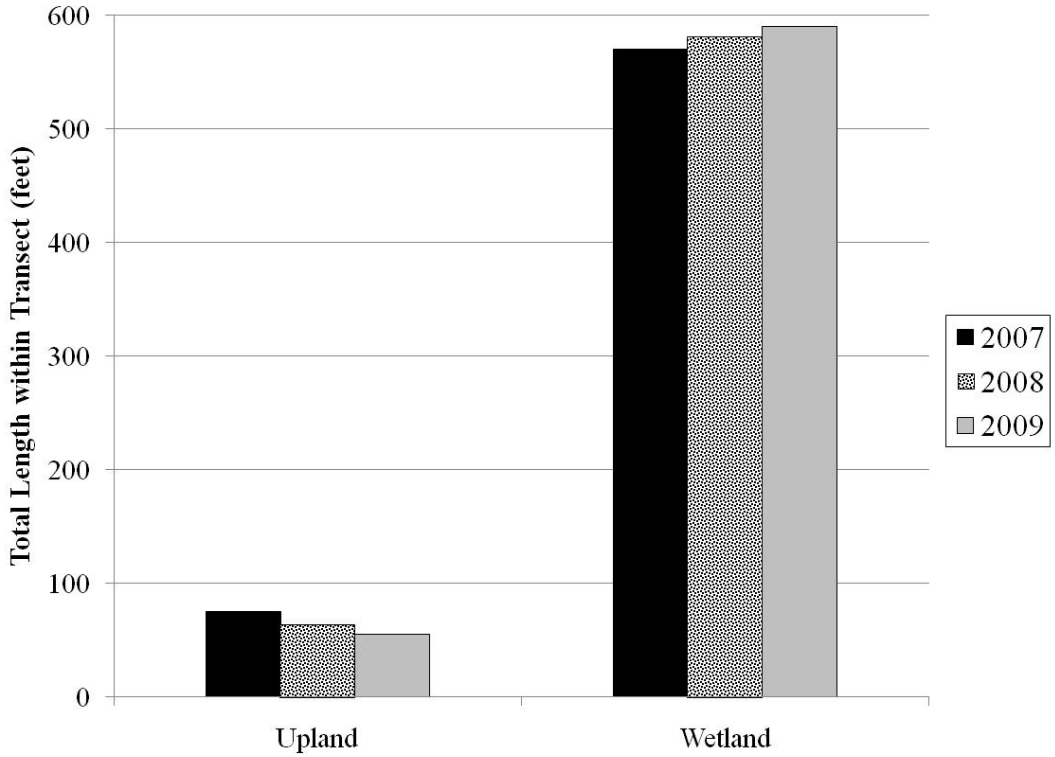


Table 3: ***2009 observed mortality of planted woody species for the DH Ranch Wetland Mitigation Site.***

SPECIES	LIVE	DEAD
Rhus trilobata	1	0
Shepherdia argentea	0	0
Atriplex canescens	0	0
Total Located*	**1**	**0**

*A total of 320 were found in 2007 versus 1 found in 2009.

3.3 Soils

Since the site was excavated and graded in spring/early summer 2007, soils are highly disturbed throughout the site. Soils sampled in wetland areas were inundated and comprised of silty clay. The matrix color was 10YR 5/1 and contained prominent mottles (7.5YR 5/8). A sulfidic odor was detected in the upper portion of the soil profile.

3.4 Wetland Delineation

Total aquatic habitat on the site in 2009 was 18.43 acres, up from 17.44 acres in 2008 (**Figure 3** in **Appendix A**). Open water comprised 3.18 acres of the 18.43-acre total, a decrease in open water of approximately 2.87 acres from 2008. The shallow open water habitat observed in 2009 is expected to continue to become vegetated with emergent hydrophytic species over time, though the rate of conversion may slow considerably from previous years due to deeper water depths found in some of the remaining open water areas. Wetlands comprised 15.25 acres of the 18.43-acre total, a substantial increase of 7.04 acres from 2008. Delineated wetland boundaries are illustrated on **Figure 3** (**Appendix A**). Soils, vegetation, and hydrology data for wetlands are found on the **COE Forms** (**Appendix B**). Credits that have developed to date are discussed in *Section 3.10.*

3.5 Wildlife

Though only constructed in 2007, the created wetland complex provides habitat for several wildlife and bird species. Six mammal, one amphibian, and six bird species were observed at the site during 2009 monitoring (**Table 4**). The habitat value of the site is expected to continue to increase as vegetation continues to establish and diversify.

Table 4: ***Fish and wildlife species observed from 2007 to 2009 at the DH Ranch Wetland Mitigation Site.***

AMPHIBIAN	
Northern leopard Frog (*Rana pipiens*)	Woodhouse's toad (*Bufo woodhousii*)
REPTILE	
Plains garter snake (*Thamnophis radix*)	
BIRD	
American White Pelican (*Pelecanus erythrorhynchos*) American Goldfinch (*Carduelis tristis*) American Robin (*Turdus migratorius*) Bald Eagle (*Haliaeetus leucocephalus*) **Barn Swallow (*Hirundo rustica*)** Blue-winged Teal (*Anas discors*) Canada Goose (*Branta canadensis*) **Common Snipe (*Gallinago gallinago*)** Eastern Kingbird (*Tyranus tyranus*) Golden Eagle (*Aquila chrysaetos*) Grasshopper Sparrow (*Ammodramus savannarum*) Greater Yellowlegs (*Tringa melanoleuca*)	Killdeer (*Charadrius vociferous*) Lesser Yellowlegs (*Tringa flavipes*) **Mallard (*Anas platyrhynchos*)** Mourning Dove (*Zenaida macroura*) **Red-winged Blackbird (*Agelaius phoeniceus*)** **Ring-necked Pheasant (*Phasianus colchicus*)** [1] **Sandhill Crane (*Grus canadensis*)** Solitary Sandpiper (*Tringa solitaria*) Spotted Sandpiper (*Actitis macularia*) Wild Turkey (*Meleagris gallopavo*)
MAMMAL	
Cottontail (*Sylvilagus* sp.) **Black-tailed prairie dog (*Cynomys ludovicianus*)** Black bear (*Ursus americanus*) [1]	**Raccoon *(Procyon lotor)*** **White-tailed Deer (*Odocoileus virginiana*)** **Moose (*Alces alces*)** [1] **Striped skunk (*Mephitis mephitis*)** [1]

Bolded species were observed in 2009.
[1] **Species observed by the landowner.**

3.6 Macroinvertebrates

As per MDT direction, no macroinvertebrate sampling was conducted in 2009.

3.7 Functional Assessment

Pre-construction and 2007 conditions were assessed using the 1999 MDT MWAM; conditions in 2008 and 2009 were assessed using the 2008 MDT MWAM. Although the methods differ slightly due to the 2008 updates, general trends in wetland development can still be determined. The 2005 baseline, 2007, 2008, and 2009 functional assessments were summarized for general comparison (**Table 5**). The complete 2009 functional assessment can be found in **Appendix B**. For comparative purposes, the functional assessment results for baseline conditions prepared by Oasis Environmental in 2005 are also included in **Table 5**.

Table 5: ***Summary of 2005 and 2007 to 2009 wetland function/value ratings and functional points at the DH Ranch Wetland Mitigation Site.***

Function and Value Parameters from the MDT Montana Wetland Assessment Method	2005 Baseline[1]	2007[1]	2008[2]	2009[2]
Listed/Proposed T&E Species Habitat	Low (0.0)	Low (0.0)	Low (0.0)	Low (0.0)
MTNHP Species Habitat	Low (0.1)	Low (0.1)	Mod (0.6)	High (1.0)
General Wildlife Habitat	Mod (0.5)	High (0.9)	High (0.9)	High (0.9)
General Fish/Aquatic Habitat	NA	NA	NA	NA
Flood Attenuation	NA	NA	NA	NA
Short and Long Term Surface Water Storage	Low (0.3)	High (1.0)	High (1.0)	High (1.0)
Sediment/Nutrient/Toxicant Removal	NA	Mod (0.7)	Mod (0.7)	Mod (0.7)
Sediment/Shoreline Stabilization	High (0.9)	Low (0.3)	Low (0.3)	Mod (0.7)
Production Export/Food Chain Support	Mod (0.5)	High (0.9)	High (1.0)	High (1.0)
Groundwater Discharge/Recharge	NA	Low (0.1)	Low (0.1)	Low (0.1)
Uniqueness	Mod (0.4)	Low (0.3)	Mod (0.5)	Mod (0.5)
Recreation/Education Potential	Low (0.1)	Low (0.1)	Low (0.05)	Low (0.05)
Actual Points / Possible Points	**2.8 / 8**	**4.4 / 10**	**5.15 / 9**	**5.95 / 9**
% of Possible Score Achieved	**35**	**44**	**57**	**66**
Overall Category	**III**	**II**	**II**	**II**
Total Acreage of Assessed Aquatic Habitat within AA Boundaries	**0.570**	**16.70**	**17.44**	**18.43**
Functional Units (acreage x actual points)	**1.596**	**73.50**	**89.82**	**109.66**
Net Acreage Gain	NA	**16.13**	**16.87**	**17.86**
Net Functional Unit Gain	NA	**71.90**	**88.22**	**108.06**

[1] Assessed using the 1999 MDT Montana Wetland Assessment Method (MWAM).
[2] Assessed using the 2008 MDT MWAM. The completed form is in **Appendix B**.

The created wetlands at DH Ranch were ranked as Category II wetlands in 2007, 2008, and 2009 as compared to a Category III in 2005. Functions that increased substantially over 2005 baseline conditions include MTNHP species habitat, general wildlife habitat, short and long term surface water storage, sediment/nutrient/ toxicant removal, and production export. Pre-project, the site provided about 1.596 functional units within the monitoring area, and in 2009 provides about 110 functional units, for a conservative gain of roughly 108 functional units.

3.8 Photographs

Representative photographs taken from photo-points and transect ends are provided in **Appendix C**.

3.9 Maintenance Needs/Recommendations

In order to maximize wetland establishment on the site, it may be worthwhile to adjust the distribution of water so that the southwestern corner of the site, between a berm and an inundated area, are wet for prolonged time periods during the growing season.

The mitigation design report designated berm areas as riparian scrub-shrub areas (ADC 2006) (**Appendix D**). In 2009 these areas continue to be dominated by a variety of weedy species and had not been planted with riparian shrubs prior to the mid-season visit. However, cottonwood seedlings have become established and are expected to continue to grow. If these berm areas are to be counted for credit in future years, it may be necessary to plant the upper portions of the berms with shrubby riparian species (see inset on figure in **Appendix D**).

Several infestations of Canada thistle (*Cirsium arvense*), field bindweed (*Convolvulus arvensis*) and musk thistle (*Carduus nutans*) were identified (**Figure 3** in **Appendix A**). The most problematic of these three weeds is Canada thistle. The extent of its infestations has increased since 2008. Cheatgrass, clasping pepperweed, and field bindweed are prevalent in the disturbed–upland community type. Control of all these weeds is recommended.

The occurrence of Garrison creeping foxtail has increased at the site since 2008, though it is still below the level that would affect crediting. It is mentioned in this report simply to make readers aware that this species may prove to be problematic in the future.

A lateral ditch conveys water from east to west across the southern end of the site. According to the landowner, the ditch itself and the openings off of this lateral ditch were cleaned out by Oasis at the beginning of the growing season. During the mid-season visit, it was noted that several of the ditch openings had silted in just enough to prevent water from flowing northward onto the site. Overall the consequences of this were minimal, however, it is suggested that these ditch openings be inspected periodically throughout each growing season, and cleaned out as needed. An alternative solution is to engineer a design that prevents these ditch openings from clogging.

3.10 Current Credit Summary

The wetland mitigation design for DH Ranch indicated that a maximum of 21.1 acres of wetland, 1.7 acres of shrub dominated riparian islands, and 0.8 acre of riparian buffer could be created on the site (ADC 2006). The status of all created wetland areas is compared against the success criteria in **Table 6** and **Tables 7** and **8** summarize the acreages and credits created as of the third year of wetland monitoring.

The COE will determine the final credits applicable to the site. However, using the credit ratios listed, **Table 8** summarizes compensatory mitigation credits developed to date at DH Ranch.

As no success criteria pertain to the upland buffer, credits for the upland buffer were assigned in 2009 despite its dominance by clasping pepperweed and that most of the planted shrubs have died. The wetland mitigation design report (ADC 2006) also includes a credit category for shrubby riparian islands located on the water diversion berms. These berms are generally vegetated by weedy species, such as cheatgrass, Canada thistle, and yellow sweetclover, and do not yet exhibit a woody component. Some natural recruitment of cottonwoods is occurring on their southern sides, at the base of the berms and will continue to be monitored. No credits were calculated for these berms in 2009.

Table 6. ***Success criteria for the DH Ranch Wetland Mitigation Site.***

Success Criteria[1]	2009 Status
Wetland Characteristics: Sites will develop hydrophytic vegetation, wetland hydrology, and hydric soils as outlined in the COE 1987 wetlands delineation manual.	*Criteria achieved.* Wetlands mapped within the project area have developed all three criteria, though there remain several areas that were mapped as uplands in 2009 but, based on the design, were intended to be wetlands.
Herbaceous Plants: Ocular coverage of desirable herbaceous wetland plant species will be at least 80 percent. Except for desirable native emergent wetland species, no species may comprise more than 25 percent of a vegetated layer in a wetland community. Aggressive non-preferred species (such as reed canarygrass) may comprise a maximum of 10 percent of any given wetland area.	*Criteria partially achieved.* Throughout most of the project area vegetative cover is below 80 percent. However, none of mapped emergent wetland communities contain any one non-native species in excess of 25% composition of a given vegetation layer.
Hydrology: Soil saturation will be present for at least 12.5 percent of the growing season (18 days). The requirement for monitoring wells was removed in December 2007.	*Criteria achieved.* Hydrology is met in wetlands mapped in 2009.
Open Water: At the conclusion of the monitoring period, open water (aquatic bed) wetlands will encompass ≤ 10 percent of the total wetland area and will remain saturated for more than 12.5 percent of the growing season.	*Criteria partially achieved.* Open water areas comprise more than 10 percent of the total wetland area, but do remain saturated for more than 12.5 percent of the growing season.
Woody Plants: Woody planting zones (berms) will have a minimum of 1,000 stems/acre	*Criteria partially achieved.* No stems have been observed to be planted on the berms, but natural recruitment of numerous cottonwood seedlings has occurred in some areas. The survival of these seedlings at the end of the monitoring period will ultimately determine success. As in 2008, the upper (drier) portions of the berms were weedy and had no planted woody stems during the mid-season visit.

[1] *Source:* ADC 2006.

Table 7: ***Summary of aquatic habitat at the DH Ranch Wetland Mitigation Site in 2005 and 2007 to 2009.***

Period	Open Water (acre)	Wetland (acre)	Total Aquatic Habitat (acre)
2005 (pre-mitigation creation)	0.00	0.57	0.57
2007 -Monitoring Year 1 (post-construction)	5.39	11.31	16.70
2008 -Monitoring Year 2 (ongoing establishment)	6.05	11.39	17.44
2009 -Monitoring Year 3 (ongoing establishment)	**3.18**	**15.25**	**18.43**

Based on the above information and assumed credit ratios for wetlands, open water, and the upland buffer, approximately 16.98 acres of credit, or 98% of the 17.4-acre MDT credit purchase goal, are currently available at the DH Ranch mitigation site (**Table 8**). The credit total for 2009 represents an increase of 4.23 credits over 2008 credit totals. Credits for wetland creation and upland buffer areas may be negotiated between the COE and Oasis at their discretion.

The pre-project site provided about 1.596 functional units within the monitoring area, and the post-project site currently provides about 110 functional units, for a conservative gain of roughly 108 functional units.

Table 8: ***2009 mitigation credit summary for the DH Ranch Wetland Mitigation Site.***

Credit Category	Acre	Assumed Credit Ratio[a]	Credit [a]
Emergent wetland creation	15.25	1:1	15.25[c]
Open water	3.18	Up to 10% of wetland area	1.53
Shrubby riparian islands[b] (i.e. berms)	1.65	1:1	0.00[c]
Upland buffer[b]	0.80	4:1	0.20
TOTAL	**20.88**		**16.98**

[a] Approved by the Corps of Engineers.
[b]The shrubby riparian islands and upland/riparian buffer acreage was derived from the ADC (2006) report.
[c]Not all ultimate success criteria have been met. Credits for these areas may be negotiated between Oasis and the COE.

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Appendix A

FIGURES 2 & 3

MDT Wetland Mitigation Monitoring
DH Ranch
Edgar, Montana

Figure 2 Monitoring Activity Locations 2009



Legend

- Monitoring Area Limits
- Vegetation Transect
- Photograph Point
- Aerial Reference Point
- SP — Soil Sample Point

Base photograph July 7, 2009

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

10/14/2009	REV -	FIGURE 2	PBSJ

3810 Valley Commons Drive
Suite 4
Bozeman, MT 59718

PROJ NO: 0B4308802 06.03		DRAWN: JR	
LOCATION: EDGAR, MT		PROJ MGR: J. BERGLUND	
SCALE: NOTED		CHECKED: RM	APPVD: JB
FILE NAME:	PLOTTED:		

PROJECT NAME
MDT DH RANCH WETLAND MITIGATION

DRAWING TITLE
MONITORING ACTIVITY LOCATIONS 2009

Figure 3 Mapped Site Features 2009

Clark Fork of the Yellowstone River

N
W E
S

150' 75' 0 75' 150'
SCALE: 1" = 150'

Edgar Canal

Legend

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

Base photograph July 7, 2009

Wetland Area:

Gross Wetland	18.43 acres
Open Water Area	3.18 acres
Net Wetland	15.25 acres

Noxious Weeds

- **Carduus nutans**
- **Cirsium arvense**
- **Convolvulus arvensis**
- **Tamarisk**
  - Infestation Size
    - ✖ = < 0.1 acre
    - ▲ = 0.1 to 1 acre
  - Cover Class
    - M = Moderate (5-25% cover)
    - H = High (25-100% cover)

Vegetation Types

1. Scirpus acutus/Mixed graminoids
2. Typha latifolia/Mixed graminoids
3. Scirpus maritimus/Mixed graminoids
4a. Primary Sere Wetlands
4b. Primary Sere Uplands
5. Open water
6. Salix amygdaloides
7. Sporobolus airoides
8. Hordeum jubatum
9. Mixed graminoids
10. Echinochloa muricata

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

10/14/2009	REV -	FIGURE 3	PBS&J 3810 Valley Commons Drive Suite 4 Bozeman, MT 59718	PROJ NO: 0B4308802 06.03 · DRAWN: JR · LOCATION: EDGAR, MT · PROJ MGR: J. BERGLUND · SCALE: NOTED · CHECKED: RM · APPVD: JB · FILE NAME: · PLOTTED:

PROJECT NAME: MDT DH RANCH WETLAND MITIGATION

DRAWING TITLE: MAPPED SITE FEATURES 2009

Appendix B

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

MDT Wetland Mitigation Monitoring
DH Ranch
Edgar, Montana

PBS&J / MDT WETLAND MITIGATION SITE MONITORING FORM

Project Name: **DH Ranch** Project Number: **0B4308802**
Assessment Date: **August 18, 2009** Person(s) conducting the assessment: **McEldowney**
Location: **Edgar, MT** MDT District: **Billings** Milepost: **NA**
Legal Description: T **4S** R **23E** Section **1**
Weather Conditions: **Overcast, calm, 65 deg F** Time of Day: **8:30 am - 5 pm**
Initial Evaluation Date: **September 7, 2007** Monitoring Year: **3** # Visits in Year: **1**
Size of evaluation area: **27.8 acres** Land use surrounding wetland: **Natural, agricultural**

HYDROLOGY

Surface Water Source: **Irrigation return flow**
Inundation: **Present** Average Depth: **1.0 feet** Range of Depths: **0 - 3 ft**
Percent of assessment area under inundation: **18.43 ac/27.78 ac = 66%**
Depth at emergent vegetation-open water boundary: ~**2 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.):

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:

VEGETATION COMMUNITIES

Community Number: **1** Community Title (main spp): **Scirpus acutus/Mixed graminoids**

Dominant Species	% Cover	Dominant Species	% Cover
Scirpus acutus	3 = 11-20%	Polygonum sp.	+ = < 1%
Typha latifolia	2 = 6-10%	Echinochloa muricata	1 = 1-5%
Scirpus maritimus	1 = 1-5%		
Eleocharis palustris	+ = < 1%		
Juncus effusus	+ = < 1%		
Hordeum jubatum	+ = < 1%		

Comments / Problems: **Contains a significant component of open water.**

Community Number: **2** Community Title (main spp): **Typha latifolia/Mixed graminoids**

Dominant Species	% Cover	Dominant Species	% Cover
Typha latifolia	3 = 11-20%	Polygonum amphibium	1 = 1-5%
Scirpus acutus	1 = 1-5%		
Scirpus maritimus	1 = 1-5%		
Scirpus pungens	3 = 11-20%		
Eleocharis palustris	1 = 1-5%		
Echinochlow muricata	1 = 1-5%		

Comments / Problems: _____

Community Number: **3** Community Title (main spp): **Scirpus maritimus/Mixed graminoids**

Dominant Species	% Cover	Dominant Species	% Cover
Scirpus maritimus	5 = > 50%		
Hordeum jubatum	1 = 1-5%		
Echinochloa muricata	+ = < 1%		
Sporoblus airoides	1 = 1-5%		
Distichlis spicata	1 = 1-5%		

Comments / Problems: _____

Community Number: **4** Community Title (main spp): **Primary Sere**

Dominant Species	% Cover	Dominant Species	% Cover
Kochia scoparia	1 = 1-5%	Rumex crispus	1 = 1-5%
Hordeum jubatum	2 = 6-10%	Echinochloa muricata	2 = 6-10%
Scirpus pungens	+ = < 1%	Chenopodium sp.	1 = 1-5%
Populus deltoides	1 = 1-5%	Juncus balticus	+ = < 1%
Convovulus arvensis	1 = 1-5%	Plantago major	+ = < 1%
Cirsium arvense	+ = < 1%	Taraxacum officinale	+ = < 1%

Comments / Problems: **Contains a wide variety of species. Additional species include Trifolium alba, Trifolium pratense, Eleocharis palustris, Bromus inermis, Veronica sp., Purple aster, Typha angustifolia, Phalaris arundinaeae, Verbascum thapsus, Festuca pratensis, Bromus tectorum, and Lepidium perfoliatum.**

VEGETATION COMMUNITIES (continued)

Community Number: **5** Community Title (main spp): **Open water**

Dominant Species	% Cover	Dominant Species	% Cover
SCIACU	+ = < 1%		

Comments / Problems: _____

Community Number: **6** Community Title (main spp): **Salix amygdaloides**

Dominant Species	% Cover	Dominant Species	% Cover
Salix amygdaloides	5 = > 50%		
Populus deltoides	1 = 1-5%		

Comments / Problems: _____

Community Number: **7** Community Title (main spp): **Sporobolus airoides**

Dominant Species	% Cover	Dominant Species	% Cover
Sporobolus airoides	4 = 21-50%	Typha latifolia	1 = 1-5%
Chenopodium sp.	1 = 1-5%		
Hordeum jubatum	2 = 6-10%		
Scirpus maritimus	1 = 1-5%		
Scirpus acutus	1 = 1-5%		
Eleocharis palustris	1 = 1-5%		

Comments / Problems: _____

Community Number: **8** Community Title (main spp): **Hordeum jubatum**

Dominant Species	% Cover	Dominant Species	% Cover
Hordeum jubatum	5 = > 50%	Festuca pratensis	2 = 6-10%
Scirpus maritimus	1 = 1-5%	Kochia scoparia	1 = 1-5%
Typha latifolia	+ = < 1%		
Sporobolus airoides	+ = < 1%		
Alopecureus arundinaceus	+ = < 1%		
Trifolium repens	2 = 6-10%		

Comments / Problems: _____

Community Number: **9** Community Title (main spp): **Mixed graminoids**

Dominant Species	% Cover	Dominant Species	% Cover
Hordeum jubatum	4 = 21-50%		
Scirpus maritimus	4 = 21-50%		
Typha latifolia	1 = 1-5%		
Scirpus pungens	3 = 11-20%		
Alopecureus arundinaceus	4 = 21-50%		
Eleocharis palustris	4 = 21-50%		

Comments / Problems: _____

Community Number: **10** Community Title (main spp): **Echinochloa muricata**

Dominant Species	% Cover	Dominant Species	% Cover
Echinichloa muricata	5 = > 50%		
Hordeum jubatum	2 = 6-10%		
Alopecureus arundinaceus	2 = 6-10%		
Polygonum amphibium	1 = 1-5%		
Polygonum arvensis	3 = 11-20%		

Comments / Problems: _____

COMPREHENSIVE VEGETATION LIST

Plant Species	Vegetation Community Number (s)	Plant Species	Vegetation Community Number (s)
Achillea millefolium	4	*Panicum virgatum*	4
Agropyron repens	2	*Phalaris arundinaceae*	4,8
Alopecurus arundinaceus	4,8,9	*Plantago major*	4
Ambrosia trifida	4	*Polygonum sp.*	1,5
Ambrosia sp.	4	*Populus deltoides*	4,6
Artemisia cana	4	*Potentilla anserina*	4
Asclepias sp.	4	*Purple aster*	4
Asparagus officinalis	4	*Rhus trilobata* (planted)	4
Atriplex canescens (planted)	4	*Rosa woodsii*	4
Bromus inermis	4	*Rumex crispus*	2,4,8
Bromus tectorum	4,8	*Salix amygdaloides*	4,6
Capsella bursa-pastoris	4	*Salix exigua (planted)*	4
Carduus nutans	4	*Salix sp.*	6
Carex sp.	4	*Sarcobatus vermiculatus*	4
Chenopodium album	4,8	*Scirpus acutus*	1,2,5,8
Chrysothamnus nauseosus	4	*Scirpus maritimus*	1,2,3,4,7,8,9
Cirsium arvense	4	*Scirpus microcarpus*	1,2,3,7,8
Convolvulus arvensis	4	*Scirpus pallidus*	9
Cynoglossum officinale	4	*Scirpus pungens*	1,2,3,8,9
Distichlis spicata	3,4	*Shepherdia argentea* (planted)	4
Echinochloa muricata	4	*Sisymbrium altissimum*	4,8
Elaeagnus angustifolia	4	*Solanum sp.*	4
Eleocharis palustris	1,2,3,4,5,8,9	*Spartina pectinata*	2
Elymus trachycaulus	4	*Sporobolus airoides*	3,7,8
Festuca pratensis	4,8	*Symphoricarpos albus*	4
Gaura sp.	4	*Taraxacum officinale*	4
Grindelia squarrosa	4	*Thlaspi arvense*	4
Hordeum jubatum	4,7,8,9	*Tragopogon dubius*	4
Juncus balticus	2,4	*Trifolium hybridum*	8
Juncus bufonius	4	*Trifolium pratense*	4
Juncus effusus	1,2,3	*Trifolium repens*	4,8
Juncus nevadensis	1,2,4	*Typha angustifolia*	1,2,4,8
Kochia scoparia	4,8	*Typha latifolia*	1,2,4,5,8,9
Lactuca serriola	4	*Verbascum thapsus*	4
Lepidium perfoliatum	4,8	*Verbena bracteata*	4
Medicago sativa	4	*Veronica sp.*	1,2
Melilotus sp.	4		

Comments / Problems: <u>Natural recruitment of numerous cottonwood and willow seedlings has occurred in some areas, especially on the north side of the site. Many of these naturally recruited seedlings are in their second year of growth. The upper (drier) portions of the berms were weedy and had no planted woody stems during the mid-season visit.</u>

PLANTED WOODY VEGETATION SURVIVAL

Plant Species	Number Originally Planted	Number Observed	Mortality Causes
Rhus trilobata	103	1	Mortality assumed to be due to lack of water.
Shepherdia argentea	172	0	Mortality assumed to be due to lack of water.
Atriplex canescens	40	0	Mortality assumed to be due to lack of water.
Unidentified	4	0	Mortality assumed to be due to lack of water.

Comments / Problems: _____

WILDLIFE

Birds

Were man-made nesting structures installed? **No**
If yes, type of structure: _____ How many? _____
Are the nesting structures being used? **NA**
Do the nesting structures need repairs? _____

Mammals and Herptiles

Mammal and Herptile Species	Number Observed	Indirect Indication of Use			
		Tracks	Scat	Burrows	Other
Black-tailed prairie dogs	2	☐	☐	☐	
Raccoon		☐	☒	☐	
Deer		☒	☐	☐	
N. leopard frog	2	☐	☐	☐	
		☐	☐	☐	
		☐	☐	☐	
		☐	☐	☐	
		☐	☐	☐	

Additional Activities Checklist:
Yes Macroinvertebrate Sampling (if required)

Comments / Problems: _____

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 (°)
Photopoint A	1	Lower marsh - cottonwood in center of photo.	188
Photopoint A	2	Lower marsh - Russian olive in center of photo	207
Photopoint A	3	Central portion of lower marsh	221
Photopoint A	4	West edge of lower marsh, berm	256
Photopoint B	1	Looking south along road.	179
Photopoint B	2	Lk across SE end of upper open water area	203
Photopoint B	3	Lk across main portion of open water area	238
Photopoint B	4	Lk along N end of open water area	264
Photopoint C	1	Lk at SE end of project area	212
Photopoint C	2	Lk toward house at S end of project area	239
Photopoint C	3	Lk toward river at south end of project area	272
Photopoint C	4	Lk diagonally across site toward NW corner	304
Photopoint C	5	Lk northward along road	334
Photopoint D	1	Lk toward NW corner of site.	337
Photopoint D	2	Lk toward N end of site.	354
Photopoint D	3	Lk toward NE corner of site.	42
Photopoint D	4	Lk along berm at E side of site.	75
Photopoint D	5	Lk E across open water area.	104
Photopoint D	6	Lk SE toward SE corner of site.	142
Photopoint D	7	Lk S along the SW side of the site.	165
Photopoint E	1	Lk N along vegetated berm at N end.	36
Photopoint E	2	Lk toward NE corner of site.	66
Photopoint E	3	Lk E along berm.	97
Photopoint E	4	Lk toward SE corner of site.	153
Photopoint E	5	Lk toward W side of site across open water area.	182
Photopoint E	6	Lk along berm toward W side of site.	221
Transect 1	1	Lk E	80
Transect 1	2	Lk W	260
Macro 1	1	Lk SE at macroinvertebrate sample location	

Comments / Problems: **None**

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.
- **NA** Survey wetland – upland boundary with a resource grade GPS survey.

Comments / Problems: _____

FUNCTIONAL ASSESSMENT

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

Comments / Problems: _____

MAINTENANCE

Were man-made nesting structure installed at this site? **NA**
If yes, do they need to be repaired? **NA**
If yes, describe the problems below and indicate if any actions were taken to remedy the problems.

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

Comments / Problems: Weed control of Canada thistle and musk thistle needs to be implemented.

MDT WETLAND MONITORING – VEGETATION TRANSECT

Site: **DH Ranch** Date: **August 18, 2009** Examiner: **McEldowney**
Transect Number: **1** Approximate Transect Length: **645 feet** Compass Direction from Start: **260˚** Note: **E to W**

Vegetation Type A: **PRIMARY SERE-UPLAND**	
Length of transect in this type: 15 feet	
Plant Species	**Cover**
KOCSCO	1 = 1-5%
SYSALT	1 = 1-5%
LEPPER	4 = 21-50%
HORJUB	1 = 1-5%
BROTEC	+ = < 1%
LATSER	1 = 1-5%
FESPRA	+ = < 1%
Unidentified forb	1 = 1-5%
Total Vegetative Cover:	67%

Vegetation Type B: **SCIACU/MIXED GRAMINOIDS**	
Length of transect in this type: 55 feet	
Plant Species	**Cover**
SCIACU	4 = 21-50%
HORJUB	1 = 1-5%
ALOARU	1 = 1-5%
SCIPUN	2 = 6-10%
TYPLAT	1 = 1-5%
FESPRA	1 = 1-5%
POPDEL	+ = < 1%
SCIMAR	1 = 1-5%
POLMON	+ = < 1%
ELEPAL	2 = 6-10%
Total Vegetative Cover:	85%

Vegetation Type C: **PRIMARY SERE - WETLAND**	
Length of transect in this type: 40 feet	
Plant Species	**Cover**
AGRALB	1 = 1-5%
RUMCRI	+ = < 1%
SCIPUN	1 = 1-5%
HORJUB	3 = 11-20%
FESPRA	3 = 11-20%
ALOARU	4 = 21-50%
SCIARU	1 = 1-5%
POPDEL	+ = < 1%
MELOFF	+ = < 1%
TRIREP	+ = < 1%
PLAMAJ	+ = < 1%
Total Vegetative Cover:	76%

Vegetation Type D: **SCIACU/MIXED GRAMINOIDS**	
Length of transect in this type: 35 feet	
Plant Species	**Cover**
SCIACU	3 = 11-20%
SCIPUN	3 = 11-20%
HORJUB	+ = < 1%
TYPLAT	1 = 1-5%
SCIMAR	1 = 1-5%
Scirpus sp.	+ = < 1%
TYPANG	+ = < 1%
ALOARU	1 = 1-5%
ELEPAL	1 = 1-5%
AGRALB	1 = 1-5%
Total Vegetative Cover:	49%

MDT WETLAND MONITORING – VEGETATION TRANSECT

Site: **DH Ranch** Date: **August 18, 2009** Examiner: **McEldowney**
Transect Number: **1** Approximate Transect Length: **645 feet** Compass Direction from Start: **260˚** Note: **E to W**

Vegetation Type E: **PRIMARY SERE - WETLAND**	
Length of transect in this type: 110 feet	
Plant Species	**Cover**
HORJUB	1 = 1-5%
KOSSCO	1 = 1-5%
ALOARU	4 = 21-50%
RUMCRI	+ = < 1%
FESPRA	4 = 21-50%
SCIACU	+ = < 1%
TYPLAT	+ = < 1%
MELOFF	+ = < 1%
EPILAC	+ = < 1%
AGRALB	+ = < 1%
ELEPAL	+ = < 1%
Total Vegetative Cover:	85%

Vegetation Type F: **TYPLAT/MIXED GRAMINOIDS**	
Length of transect in this type: 140 feet	
Plant Species	**Cover**
TYPLAT	4 = 21-50%
ALOARU	4 = 21-50%
RUMCRI	+ = < 1%
ELEPAL	2 = 6-10%
FESPRA	3 = 11-20%
HORJUB	1 = 1-5%
SCIMAR	1 = 1-5%
TRIREP	+ = < 1%
EPILAC	1 = 1-5%
BROINE	+ = < 1%
Total Vegetative Cover:	95%

Vegetation Type G: **PRIMARY SERE-WETLAND**	
Length of transect in this type: 45 feet	
Plant Species	**Cover**
FESPRA	4 = 21-50%
RUMCRI	1 = 1-5%
POAPRA	2 = 6-10%
ALOARU	4 = 21-50%
TRIREP	+ = < 1%
TYPANG	1 = 1-5%
HORJUB	1 = 1-5%
Total Vegetative Cover:	88%

Vegetation Type H: **SCIACU/MIXED GRAMINOIDS**	
Length of transect in this type: 45 feet	
Plant Species	**Cover**
SCIACU	3 = 11-20%
ELEPAL	2 = 6-10%
TYPANG	1 = 1-5%
TYPLAT	1 = 1-5%
ALOARU	+ = < 1%
POPDEL	+ = < 1%
Salix sp.	+ = < 1%
Open water = 65%	
Total Vegetative Cover:	35%

MDT WETLAND MONITORING – VEGETATION TRANSECT

Site: **DH Ranch** Date: **August 18, 2009** Examiner: **McEldowney**
Transect Number: **1** Approximate Transect Length: **645 feet** Compass Direction from Start: **260˚** Note: **E to W**

Vegetation Type I: **PRIMARY SERE - WETLAND**	
Length of transect in this type: 40 feet	
Plant Species	**Cover**
ALOARU	5 = > 50%
JUNTOR	1 = 1-5%
TYPLAT	+ = < 1%
SCIACU	1 = 1-5%
TYPANG	1 = 1-5%
POPDEL (SEEDLINGS)	1 = 1-5%
FESPRA	3 = 11-20%
HORJUB	+ = < 1%
POAPRA	1 = 1-5%
Salix sp.	+ = < 1%
Total Vegetative Cover:	80%

Vegetation Type J: **TYPLAT/MIXED GRAMINOIDS**	
Length of transect in this type: 80 feet	
Plant Species	**Cover**
TYPLAT	4 = 21-50%
SCIACU	1 = 1-5%
ELEPAL	2 = 6-10%
ALOARU	3 = 11-20%
HORJUB	+ = < 1%
FESPRA	+ = < 1%
CARSTI	+ = < 1%
Salix sp. (SEEDLING)	+ = < 1%
POPDEL (SEEDLING)	+ = < 1%
POAPRA	+ = < 1%
Total Vegetative Cover:	58%

Vegetation Type K: **PRIMARY SERE - UPLAND**	
Length of transect in this type: 40 feet	
Plant Species	**Cover**
AGRREP	4 = 21-50%
CIRARV	5 = > 50%
MELOFF	1 = 1-5%
Unidentified forb (chenopod?)	1 = 1-5%
FESPRA	1 = 1-5%
ALOARU	+ = < 1%
POPDEL	+ = < 1%
TRIREP	+ = < 1%
BROTEC	+ = < 1%
CONARV	+ = < 1%
END OF TRANSECT	
Total Vegetative Cover:	97%

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

MDT WETLAND MONITORING – VEGETATION TRANSECT

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

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

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

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

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

MDT WETLAND MONITORING – VEGETATION TRANSECT

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

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

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

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

Comments: _____

BIRD SURVEY – FIELD DATA SHEET

Site: **DH Ranch** Date: **8/18/09**
Survey Time: **8:30 am** to **5 pm**

Bird Species	#	Behavior	Habitat	Bird Species	#	Behavior	Habitat
Redwing Blackbird	3	FO	MA				
Sandhill crane	1	FO	MA				
Mallards	2	FO	AB				
Barn swallows	5	FO	AB MA				
Common snipe	1	L	MA				

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

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

Weather: **Overcast, calm, 65 deg F at 8:30 am**

Notes: _____

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

Project / Site: **DH Ranch MDT Mitigation Site** Applicant / Owner: **MDT/George Duke** Investigator: **PBS&J (RRM)**	Date: **August 18, 2009** County: **Carbon** State: **MT**

Do Normal Circumstances exist on the site? **Yes** Is the site significantly disturbed (Atypical Situation)? **Yes** Is the area a potential Problem Area? **No** (If needed, explain on reverse side)	Community ID: **Emergent** Transect ID: _____ Plot ID: **SP1**

VEGETATION

Dominant Species	Stratum	Indicator	Dominant Species	Stratum	Indicator
1. *Scirpus maritimus*	Herb	OBL	11.		
2. *Sporobolus airoides*	Herb	FAC-	12.		
3. *Hordeum jubatum*	Herb	FAC+	13.		
4. *Eleocharis palustris*	Herb	OBL	14.		
5. *Chenopodium sp.*	Herb		15.		
6.			16.		
7.			17.		
8.			18.		
9.			19.		
10.			20.		

Percent of Dominant Species that are OBL, FACW, or FAC (excluding FAC-): **3** / **5** = **60**%	FAC Neutral: **3** / **4** = **74**%

Remarks: **Wetland mitigation site constructed in 2007. Palustrine emergent.**

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: **YES** Inundated **YES** Saturated in Upper 12 Inches **NO** Water Marks **NO** Drift Lines **NO** Sediment Deposits **YES** Drainage Patterns in Wetland Secondary Indicators (2 or more required): **YES** Oxidized Root Channels in Upper 12 inches **NO** Water-Stained Leaves **NO** Local Soil Survey Data **YES** FAC-Neutral Test **NO** Other (Explain in Remarks)
Field Observations: Depth of Surface Water = **0.5** (in.) Depth to Free Water in Pit = **0** (in.) Depth to Saturated Soil = **0** (in.)	

Remarks: **Site is saturated to the surface. This area is saturated/inundated in the 2008 and 2009 aerial photographs.**

SOILS

Map Unit Name (Series and Phase): **Heldt silty clay loam, saline, 0- 6% slopes**
Map Symbol: **Hw** Drainage Class: **Well** Mapped Hydric Inclusion? **No**
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.
16	A	10YR 5/1	7.5 YR 5/8	Many Prominent	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
YES Sulfidic Odor	**NO** Organic Streaking in Sandy Soils
YES 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: **Soil is saturated to the surface, has a low chroma and has abundant, prominent mottles. Sulfidic odor in upper part of profile.**

WETLAND DETERMINATION

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

Remarks: **The wetland mitigation site was created in 2007. It is a palustrine emergent wetland that is saturated/inundated, has low chroma soils with mottling, and a sulfidic odor in the upper part of the soil profile.**

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

Project / Site: **DH Ranch MDT Mitigation Site** Applicant / Owner: **MDT/George Duke** Investigator: **PBS&J (RRM)**	Date: **August 18, 2009** County: **Carbon** State: **MT**

Do Normal Circumstances exist on the site? **Yes** Is the site significantly disturbed (Atypical Situation)? **Yes** Is the area a potential Problem Area? **No** (If needed, explain on reverse side)	Community ID: **Emergent** Transect ID: _____ Plot ID: **SP2**

VEGETATION

Dominant Species	Stratum	Indicator	Dominant Species	Stratum	Indicator
1. *Kochia scoparia*	Herb	FAC	6.		
2. *Chenopodium album*	Herb	FAC	7.		
3. *Lepidium perfoliatum*	Herb	FACU-	8.		
4.			9.		
5.			10.		

Percent of Dominant Species that are OBL, FACW, or FAC (excluding FAC-): **2** / **3** = **67**%	FAC Neutral: **0** / **3** = **0**%

Remarks: **Wetland mitigation site constructed in 2007. Bare ground is prevalent (~60%), and the plants that occur are stunted.**

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 **NO** 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 **N/A** ____ (in.)	Secondary Indicators (2 or more required): **YES** 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: **This area is not inundated or saturated in the either the 2008 or 2009 aerial photographs. This area appears to get wet occasionally, but is not staying wet long enough to meet hydrologic requirements.**

SOILS

Map Unit Name (Series and Phase): **Heldt silty clay loam, saline, 0- 6% slopes**
Map Symbol: **Hw** Drainage Class: **Well** Mapped Hydric Inclusion? **No**
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.
16	A	10 YR 4/1	5 YR 4/6 /	Few Distinct	Silty Clay
		/	/ /	N/A N/A	
		/	/ /	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: **Soil was moist ~4 inches below the soil surface. Mottles may be remnant . According to the landowner this area was an alkali flat prior to the mitigation project.**

WETLAND DETERMINATION

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

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

Remarks: **Site was disturbed during the construction of the mitigation site. The site has only stunted and weedy hydrophytic (FAC) vegetation, is mainly bare ground, does not have compelling evidence of wetland hydrology, and therefore is considered to be an upland.**

MDT MONTANA WETLAND ASSESSMENT FORM (revised March 2008)

1. Project Name: DH Ranch Wetland Mitigation Site **2. MDT Project #:** NH-STPP 5(39) **3. Control #:** _____

3. Evaluation Date: 8/18/2009 **4. Evaluator(s):** RRM (PBS&J) **5. Wetland/Site #(s):** DH Ranch

6. Wetland Location(s): Township 4 S, Range 23 E, Section 1; Township ___ N, Range ___ E, Section _____

Approximate Stationing or Roadposts: _____

Watershed: 13 - Upper Yellowstone **County:** Carbon _ _ _____

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)
15.25 (measured, e.g. GPS)

9. Assessment Area (AA) Size (acre): _____ (visually estimated)
(see manual for determining AA) 18.43 (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	Unconsolidated Bottom	Excavated	Permanent / Perennial	40
Depressional	Emergent Wetland	Excavated	Permanent / Perennial	58
Depressional	Scrub-Shrub Wetland	Impounded	Seasonal / Intermittent	2

Comments: MDT Mitigation wetland.

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

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.)**:** Wetland mitigaiton site constructed in 2007.

ii. Prominent noxious, aquatic nuisance, and other exotic vegetation species: Some Canada thistle, musk thistle, and field bindweed.

iii. Provide brief descriptive summary of AA and surrounding land use/habitat: AA is a marsh on a terrace of the Clark's Fork of the Yellowstone River. Surrounding land to the west, north and south sides are grazed and/or hayed. To the east is a ranch road and a steep hillside comprised of native vegetation. Primary source of water is irrigation return flow that is directed onto the south end of the site.

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: Emergent with a small amount of scrub-shrub.

Wetland/Site #(s): DH Ranch

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): In Carbon County the USFWS (9/2009) lists the lynx, grizzly bear, and black-footed ferret as potentially occurring. None of the these species are expected to use the site. .

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 N. leopard frog (S1)
Secondary habitat (**list species**) ☒ D ☐ S Sandhill Crane (S2N), black-tailed prairie dogs (S3)
Incidental habitat (**list species**) ☐ D ☒ S Bald Eagle (S3), Peregrine Falcon
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	1H	---	---	---	---	---	---
S2 and S3 Species Functional Point/Rating	---	---	---	---	---	---	---

Sources for documented use (e.g. observations, records): N. leopard frogs observed onsite. Sandhill Crane tracks observed onsite. Bald Eagles observed in the vicinity. Suitable habitat for Peregrine Falcons exists just east of the site.

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): DH Ranch

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**

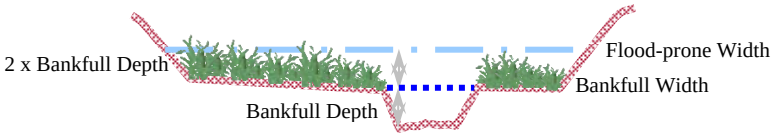
iii. Final Score and Rating: _ **Comments:** _____

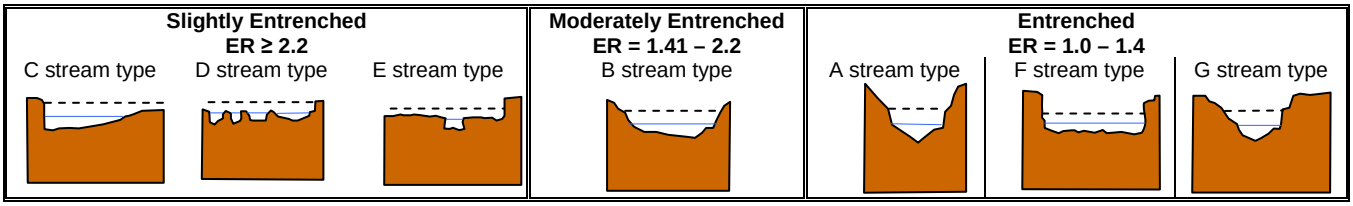
14E. FLOOD ATTENUATION ☒ **NA** (proceed to 14F)

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**	---	---	---	---	---	---	---	---	---
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): DH Ranch

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**	1H	---	---	---	---	---	---	---	---
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**	---	---	.7M	---	---	---	---	---
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%**	---	---	---
☒ **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**	---	---	---
☐ **L**	---	---	---
☒ **NA**	H	---	---

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	1H	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
S/I	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
T/E/A	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

Wetland/Site #(s): DH Ranch

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** = ___ ☐ **NO**

iv. Final Score and Rating: 1H **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**	---	---	---	.1L
☐ **Insufficient Data/Information**	---			

Comments: Site is supported by irrigation return flow. There is no evidence of a groundwater discharge component. The soils are clayey so groundwater recharge is unlikely.

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)	---	---	---	---	---	.5M	---	---	---
☐ **Moderate Disturbance** at AA (#12i)	---	---	---	---	---	---	---	---	---
☐ **High Disturbance** at AA (#12i)	---	---	---	---	---	---	---	---	---

Comments: Site contains the Alkali sacaton southern grasslands community type, which is rated as S2 in Montana.

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	---	.05L

Comments: _____

15. GENERAL SITE NOTES: _____

Wetland/Site #(s): DH Ranch

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	0	
B. MT Natural Heritage Program Species Habitat	high 1.00	1.00	18.43	
C. General Wildlife Habitat	high 0.90	1.00	16.59	*
D. General Fish Habitat	NA	NA	0	
E. Flood Attenuation	NA	NA	0	
F. Short and Long Term Surface Water Storage	high 1.00	1.00	18.43	*
G. Sediment / Nutrient / Toxicant Removal	mod 0.70	1.00	12.90	*
H. Sediment / Shoreline Stabilization	mod 0.70	1.00	12.9	
I. Production Export / Food Chain Support	high 1.00	1.00	18.43	*
J. Groundwater Discharge / Recharge	low 0.10	1.00	1.84	
K. Uniqueness	mod 0.50	1.00	9.22	
L. Recreation / Education Potential (bonus point)	low 0.05		0.92	
Total Points	**5.95**	**9**	**109.66 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**

Appendix C

2009 REPRESENTATIVE PHOTOGRAPHS

MDT Wetland Mitigation Monitoring
DH Ranch
Edgar, Montana

DH RANCH WETLAND MITIGATION SITE 2009



Photo Point A – *Photo 1* **Location:** North Side
Compass bearing: 188 degrees



Photo Point A – *Photo 2* **Location:** North Side
Compass bearing: 207 degrees



Photo Point A – *Photo 3* **Location:** North Side
Compass bearing: 221 degrees



Photo Point A – *Photo 4* **Location:** North
Compass bearing: 256 degrees



Photo Point B – *Photo 1* **Location:** Northeast corner
Compass bearing: 179 degrees



Photo Point B – *Photo 2* **Location:** Northeast corner
Compass bearing: 203 degrees

DH RANCH WETLAND MITIGATION SITE 2009



Photo Point B – *Photo3* **Location:** Northeast corner
Compass bearing: 238 degrees



Photo Point B – *Photo 4* **Location:** Northeast corner
Compass bearing: 264 degrees



Photo Point C – *Photo 1* **Location:** Southwest corner
Compass bearing: 212 degrees



Photo Point C – *Photo 2* **Location:** Southwest corner
Compass bearing: 239 degrees



Photo Point C – *Photo 3* **Location:** Southwest corner
Compass bearing: 272 degrees



Photo Point C – *Photo 4* **Location:** Southwest corner
Compass bearing: 304 degrees

DH RANCH WETLAND MITIGATION SITE 2009



Photo Point C – *Photo 5* **Location:** Southwest corner
Compass bearing: 334 degrees



Photo Point D – *Photo 1* **Location:** West side
Compass bearing: 42 degrees.



Photo Point D – *Photo 2* **Location:** West side
Compass bearing: 75 degrees



Photo Point D – *Photo 3* **Location:** West side
Compass bearing: 104 degrees



Photo Point D – *Photo 4* **Location:** West side
Compass bearing: 142 degrees



Photo Point D – *Photo 5* **Location:** West side
Compass bearing: 165 degrees



Photo Point D – *Photo 6* **Location:** West side
Compass bearing: 337 degrees



Photo Point D – *Photo 7* **Location:** West side
Compass bearing: 354 degrees



Photo Point E – *Photo 1* **Location:** Central area
Compass bearing: 36 degrees



Photo Point E – *Photo 2* **Location:** Central area
Compass bearing: 66 degrees



Photo Point E – *Photo 3* **Location:** Central area
Compass bearing: 97 degrees



Photo Point E – *Photo 4* **Location:** Central area
Compass bearing: 153 degrees



Photo Point E – *Photo 5* **Location:** Central area
Compass bearing: 182 degrees



Photo Point E – *Photo 6* **Location:** Central area
Compass bearing: 221 degrees



Transect 1 – *Photo 1* Looking west from east end.
Compass bearing: 260 degrees



Transect 1 – *Photo 2* Looking east from west end.
Compass bearing: 80 degrees



Wetland Sample Point 1: Looking northwest on east side of site. Shovel at sample point.



Wetland Sample Point 2: Looking northwest on east side of site. Shovel at sample point.

Appendix D

MITIGATION DESIGN PLAN SHEET

MDT Wetland Mitigation Monitoring
DH Ranch
Edgar, Montana



RIPARIAN ISLAND
TYPICAL DETAIL
SCALE: 1"=80'

REVEGETATION ZONES (23.45 ac.)

WETLAND PEM	15.90 ac.
WETLAND PEM DEPRESSION	*2.25 ac.
WETLAND SALINE PEM	6.75 ac.
RIPARIAN ISLAND SCRUB-SHRUB	*1.65 ac.
RIPARIAN BUFFER SCRUB-SHRUB SALINE	0.80 ac.

* SUB AREAS OF WETLAND PEM

RANCH ACCESS ROAD IMPROVED TO ACT AS LOW HEAD IMPOUNDMENT AND CONTINUED RANCH ACCESS

PROJECT BOUNDARY

BUFFER SWALE NARROWS BECOMES OVERFLOW DRAINAGE DITCH

INTERCEPTOR DITCH

INTERCEPTOR DITCH

NORTH

0 50 150 300

NOTES:

1> AERIAL PHOTO BACKGROUND – MDT Flight on 6/17/2005

2> FINISHED DESIGN CONTOUR INTERVAL = 1 foot

REVEGETATION PLAN
SCALE: 1"=150'

REVEGETATION PLAN & PROPOSED GRADING

DRAWING NO. FIGURE 5

REVISION 1

DH RANCH & Montana Department of Transportation

WETLAND MITIGATION PROJECT

Sec 1 T4N R23E CARBON COUNTY, MT

DHDESIGN.dwg

SCALE: AS NOTED

PROJECT NO. 251A

DRAWN bz

CHECK --

DATE 10/05/05

REV NO.	REVISION DESCRIPTION	BY	REVISION DATE

ADC SERVICES INC.
water resource consulting
Phone 406.222.7600 – Fax 406.222.7677

Appendix E

GPS PROTOCOL

MDT Wetland Mitigation Monitoring
DH Ranch
Edgar, Montana

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.