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**MONTANA DEPARTMENT OF TRANSPORTATION  
WETLAND MITIGATION MONITORING REPORT: YEAR 2008**

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*Jack Creek Ranch  
Ennis, Montana*



Prepared for:

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

Prepared by:

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

December 2008

PBS&J Project No: 0B4308801.03.03



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**Cover Photo:** *Lower reach of McKee Spring Creek. View is to the west.*

## 1.0 INTRODUCTION

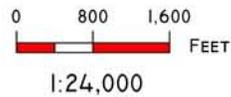
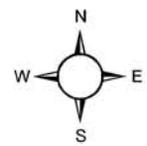
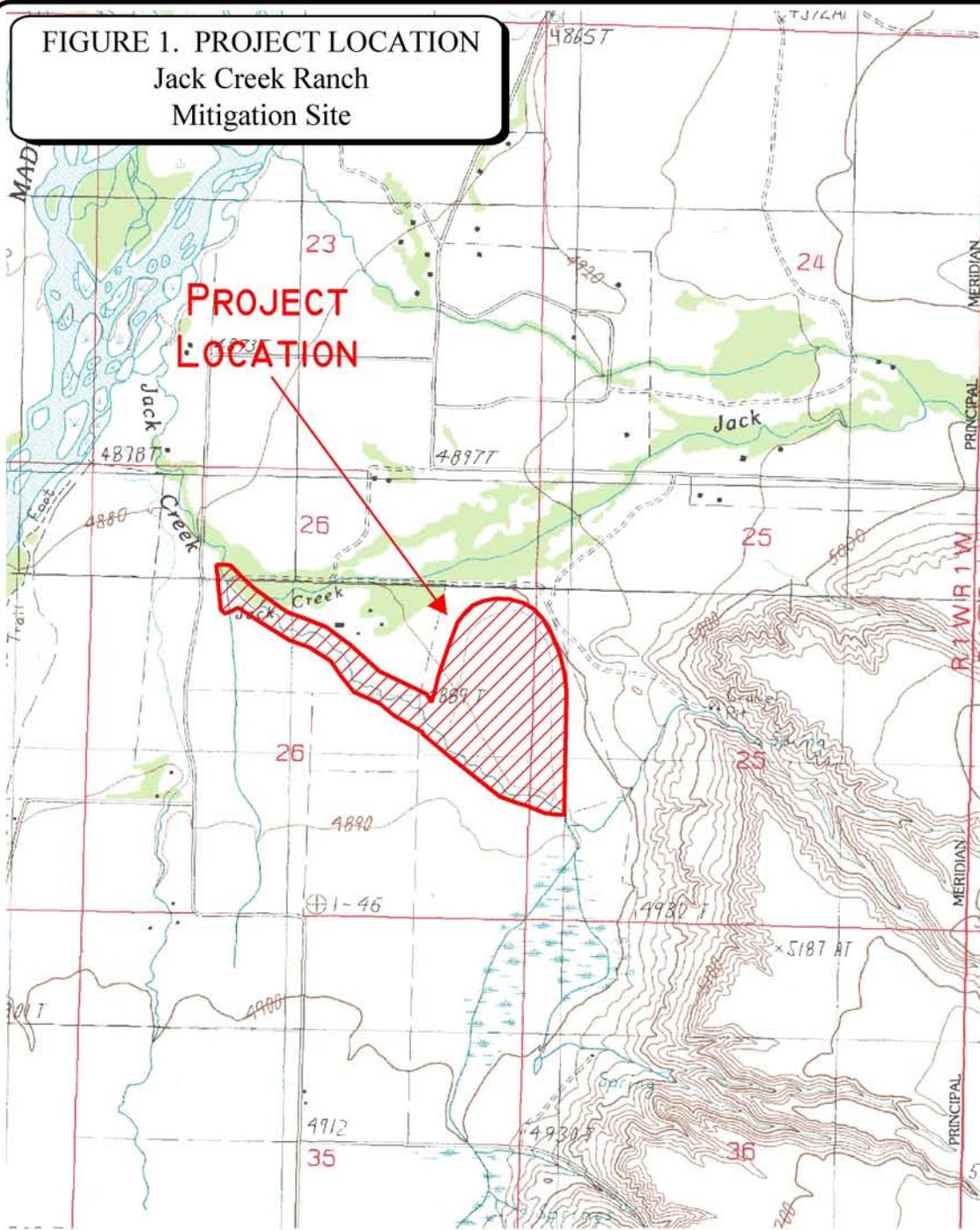
This annual report summarizes methods and the results of the 2008 (fifth year) monitoring for the Montana Department of Transportation (MDT) Jack Creek Ranch mitigation site. The Jack Creek Ranch stream and wetland restoration project was completed by Jack Creek Ranch LLC and Aquatic Design and Construction (ADC) in the summer and fall of 2003. The project was implemented to provide MDT with a wetland / stream mitigation reserve in watershed #6 (Upper Missouri River) of the MDT Butte District that will provide mitigation for current and future transportation projects. The site is located in Madison County approximately 2.5 miles northeast of the town of Ennis, Sections 25 and 26, Township 5 South, Range 1 West (**Figure 1**).

Elevations within the assessment area range from approximately 4,889 to 4,892 feet above sea level. The surrounding land uses include livestock pastures and hay production.

The project was intended to develop approximately 50 acres of wetlands within the 86-acre pasture owned by the Jack Creek Ranch LLC. The overall goal for restoration consists of two main areas: restoring wetland hydrology to the Horseshoe pasture and restoring a reach of McKee Spring Creek to naturally functioning stream channel. The objectives are consistent with historical conditions prior to the drainage of the Horseshoe pasture and the creation of in-stream reservoirs within the McKee Creek channel. During the 1940's, ditches were excavated in the Horseshoe pasture as recommend by the Soil Conservation Service (SCS) to lower groundwater. Field notes from SCS personnel describe the site as "very wet, hummocky with standing water, sedges and water loving plants." The final drainage system was a horseshoe shaped ditch that averaged 20 feet wide, 6 to 8 feet deep and nearly 1 mile long. In addition to draining wetland areas within the ranch, significant impacts occurred to McKee Spring Creek, such as widening as a result of prolonged cattle grazing and the mechanical excavation of ponds within the creek channel.

In the summer of 2003, the drainage systems along the perimeter of the Horseshoe pasture were filled. Selected areas within the Horseshoe field were graded to increase habitat diversity. Disturbed areas were seeded with a wetland seed mix and planted with containerized wetland species. Woody species were planted to restore a scrub-shrub wetland within portions of the pasture. Also, in the summer of 2003, a new channel was constructed for middle reach of the McKee Spring Creek and the over-widened areas (in-stream reservoirs) were filled. In the spring of 2003, a new channel was constructed for the lower reach of the McKee creek. The lower McKee Spring Creek construction began by shifting the confluence of McKee creek and Jack Creek west or downstream of the original confluence. Approximately 880 feet of new channel was created between the new confluence and the old confluence. From the original confluence upstream to the first of the middle creek ponds, the new channel was built within the old channel. New channel banks were created by stacking wetland sod mats until a specified finished bank height was achieved. This method allowed for the creation of a narrowed channel and a wide floodplain covering the full width of the old over-widened channel. Disturbed areas were revegetated with containerized wetland plants and wetland seed. Trees and shrubs were also planted along portions of the channel to restore a scrub shrub wetland community along the new stream corridor.

**FIGURE 1. PROJECT LOCATION**  
**Jack Creek Ranch**  
**Mitigation Site**



PROJECT #: 0B4308801  
 DATE: Nov 2008  
 LOCATION: MADISON CO  
 PROJECT MGR: J. BERGLUND  
 DRAWN BY: B. STEINEBACH

**PBS&J** 801 N. LAST CHANCE GULCH  
 SUITE 101  
 HELENA, MT 59601-3360

In 2008, per MDT request, the 2004-2007 monitoring area limits were extended to include the lower restored reach of McKee Spring Creek, as MDT and ADC (Oasis Engineering) had determined that this area was part of the credit purchase and eligible for credit (Urban pers. comm.). The site boundaries are illustrated on **Figure 2 (Appendix A)**.

## 2.0 METHODS

### 2.1 Monitoring Dates and Activities

The transect was monitored and wetland boundaries were revised on July 10/11, 2008. The site was visited on May 5 to assess the spring season avian migration use, on July 9 to assess mid-season avian migration use, and on October 28, 2008 to assess fall-season use. Activities and information conducted/collected during the July 10 and 11 monitoring event 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, maintenance needs (non-engineering) (**Appendix B**).

### 2.2 Hydrology

Wetland hydrology indicators were recorded using procedures outlined in the COE 1987 Wetland Delineation Manual (Environmental Laboratory 1987). Hydrology data were recorded on a COE Routine Wetland Delineation Data Form (**Appendix B**) at each wetland determination point. Precipitation data for the year 2008 were compared to the 1948-2008 average (WRCC 2008).

All additional hydrologic data were recorded on the mitigation site monitoring form (**Appendix B**). The boundary between emergent vegetation and open water was mapped on the aerial photograph (**Figure 3 in Appendix A**). There are two ground water monitoring piezometers within the wetland and stream corridor assessment area. ADC monitored the piezometers during wetland and stream channel construction. In 2008, an additional groundwater monitoring piezometer was noted within the lower reach of the McKee Spring Creek floodplain. Water depths were recorded and provided in **Appendix B**. The location of the piezometer is shown on **Figure 2 (Appendix A)**.

### 2.3 Vegetation

General vegetation types were delineated on the aerial photograph during the July site visit (**Figure 3 in Appendix A**). Coverage of the dominant species in each community type is listed on the Wetland Mitigation Site Monitoring Form (**Appendix B**). A comprehensive plant species list for the entire site was compiled. The assessment area is fenced and woody species were planted on portions of this site. Qualitative observations were used to assess the survival of the planted woody species. The visual assessment included written estimates of species survival along the entire transect length as well as the stream channel, floodplain and in concentrated planting areas within the Horseshoe field.

One transect was established during the 2004 monitoring event to represent the range of current vegetation conditions. This transect was re-evaluated in 2008 to reflect changes in species composition and changing wetland boundaries. The transect location is shown on **Figure 2** in **Appendix A**. Percent cover for each species was recorded on the vegetation transect form (**Appendix B**). The transect was used to evaluate changes over time, especially the establishment and increase of hydrophytic vegetation. Transect ends were marked with metal fence posts and their locations recorded with the GPS unit. Photographs of the transect were taken during the July visit.

## 2.4 Soils

Soils were evaluated during the mid-season visit according to the procedure outlined in the COE 1987 Wetland Delineation Manual. Soil data were recorded for each wetland determination point on the COE Routine Wetland Delineation Data Form (**Appendix B**).

## 2.5 Wetland Delineation

A wetland delineation was conducted within the monitoring area according to the 1987 COE Wetland Delineation Manual. In July 2008, consultation with the COE (Steinle pers. comm.) confirmed that, where the 1987 manual was used to establish baseline wetland conditions at MDT wetland mitigation sites, it should continue to be applied at such sites for the duration of the monitoring period. Consequently, application of the new *Interim Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys, and Coast Region* (COE 2008) was not required or undertaken at this site in 2008.

Wetland and upland areas within the monitoring area were investigated for the presence of wetland hydrology, hydrophytic vegetation and hydric soils. The information was recorded on the COE Routine Wetland Delineation Forms (**Appendix B**). The indicator status of vegetation was derived from the National List of Plant Species that Occur in Wetlands: Northwest Region 9 (Reed 1988). The wetland/upland and open water boundaries were used to calculate the wetland areas developed at the Jack Creek Ranch wetland. A pre-construction wetland map was completed by the ADC (2002) and is included in **Appendix D**. Approximately 11.40 acres of wetlands occurred at the mitigation site prior to project implementation. This includes 9.41 acres of existing wetlands within the lower reach of McKee creek, 0.69 acre within the middle reach of McKee creek and 1.30 acres within the horseshoe pasture.

## 2.6 Mammals, Reptiles, and Amphibians

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

## 2.7 Birds

Bird observations were recorded during the summer (mid-season) and fall migration according to the established Bird Survey Protocol (**Appendix E**). A general, qualitative bird list has been compiled using these observations.

## 2.8 Macroinvertebrates

Macroinvertebrate samples were collected during the mid-season site visit at two separate locations (**Figure 2** in **Appendix A**). Collection occurred using the Macroinvertebrate Sampling Protocol (**Appendix F**). Samples were preserved as outlined in the sampling procedure and sent to Rhithron Associates, Inc. in Missoula, Montana for analysis (**Appendix F**).

## 2.9 Functional Assessment

In 2008, the 2008 MDT Montana Wetland Assessment Method (Berglund and McEldowney 2008) was completed for the horseshoe wetland, the middle and lower reach of McKee Spring Creek (**Appendix B**). Field data necessary for this assessment were collected on a condensed data sheet. The remainder of the assessment was completed in the office. A pre-construction functional assessment was completed by ADC (2002) for the Horseshoe wetland and middle reach of McKee Spring Creek using the 1999 MDT Montana Wetland Assessment Method (Berglund 1999).

## 2.10 Photographs

Photographs were taken showing the current land use surrounding the site, the wetland buffer, the monitored area, changes in species composition and the vegetation transect (**Appendix C**). A description and compass direction for each photograph were recorded on the wetland monitoring form.

During the 2004 monitoring season, each photograph point was marked on the field map and the location recorded with a resource grade GPS. In 2008, three new photo points were surveyed on lower reach of McKee Spring Creek using a GPS. The approximate locations are shown on **Figure 2** in **Appendix A**. All photographs were taken using a digital camera.

## 2.11 GPS Data

During the 2004 monitoring season, survey points were collected using a resource grade Trimble Geoplotter III hand-held GPS unit (**Appendix E**). Points collected included: the beginning and end locations of the vegetation transects, the jurisdictional wetland boundary, and the sample point (SP) locations. In addition, GPS data were collected for four (4) landmarks recognizable on the air photo for purposes of line fitting to the topography. In 2008, wetlands associated with the lower reach of the McKee Spring Creek were surveyed using a resource grade Magellan Mobile Mapper GPS unit. Other GPS data included the monitoring well in the lower reach of McKee Spring Creek.

## 2.12 Maintenance Needs

The new culvert within McKee Spring Creek, the outflow channel from the horseshoe wetlands into the creek, evidence of bank erosion, habitat enhancement structures and other mitigation related structures were evaluated. Areas dominated by weed species were also noted. Minor maintenance needs and recommendations are provided in **Section 3.9**. This examination did not entail an engineering-level analysis.

## 3.0 RESULTS

### 3.1 Hydrology

The eastern edge of the project area is bordered by the Cedar Creek alluvial fan that extends from north to south as a terrace above the site. A number of springs providing hydrology to the Horseshoe pasture wetland and McKee Spring Creek emanate from this terrace.

Over the summer the water level gradually continued to rise, filling the ponds or depressions in the center of the field. During the past two years new ponded areas have been observed along the west and north portion of the field. Eventually water began to flow overland, pooling in areas and flowing into the creek. A small graveled channel was created to route the overland flow to McKee Spring Creek. During the July 2008 monitoring visit, approximately 90% of the assessment area within the Horseshoe pasture was inundated with 1-2 inches of standing water. Wetland sites that were not inundated were saturated in the upper 12 inches of the soil profile. Frequent small pools were observed in the previous years monitoring, and there was significantly more surface water this year (2008) compared to the previous year. Larger areas of open water or areas without emergent vegetation along the stream channel are depicted on **Figure 3** in **Appendix A**.

According to the Western Regional Climate Center (WRCC), the mean annual precipitation calculated at the Ennis weather station was 9.10 inches from 1948 through August 2008 (last updated file). The average precipitation through the month of August for that period was 8.55 inches. For the year 2008, precipitation through August was 95% of the mean indicating that the spring and summer (through August) were slighter drier compared to historic precipitation. However, in April 2008, Ennis received 2.88 inches of moisture which is the most ever recorded for this month over the past 60 years.

### 3.2 Vegetation

Vegetation species identified on the site are presented in **Table 1** and in the Monitoring Form (**Appendix B**). The upland communities are decreasing in size as a result of the increase in wetland acreage within the Horseshoe pasture and along the eastern portion of McKee Spring Creek (**Figure 3** in **Appendix A**). The Jack Creek Ranch vegetation types include eleven community types. These include: Type 1 - *Agropyron repens/Bromus inermis/Festuca arundinacea*; Type 2 - Mixed Herbaceous Wetland; Type 3 - *Typha latifolia/Scirpus*; Type 4 - *Hordeum jubatum*/Mixed Grass Upland; Type 5 - *Agrostis alba/Alopecurus*; Type 6 - *Typha latifolia/Eleocharis palustris*; Type 7 - *Carex/Juncus/Typha latifolia*; Type 8 - *Typha latifolia/Alopecurus pratensis*; Type 9 - *Scirpus pungens*/Mixed Herbaceous Wetland; Type 10 - *Alopecurus pratensis*/Mixed Herbaceous Wetland; and Type 11 - *Salix exigua*. There are approximately 43 known species of wetland plants with a FACW to OBL status within the assessment area (**Table 1**). Because construction was conducted during 2003, 2008 represents the fifth growing season for the project site (including the lower reach of McKee creek). Hydrophytic vegetation communities are increasing in size and diversity.

Community Type 1 occurs in the upland and consists primarily of typical pasture grasses such as quackgrass (*Agropyron repens*), smooth brome (*Bromus inermis*) and tall fescue (*Festuca arundinacea*). These areas appeared undisturbed during the wetland restoration activities. This community type is typically found in the western and northern half of the project area and represents the upland community type along McKee Spring Creek. In 2008, portions of this community type have evolved into Type 2 and or Type 10 wetland communities. Type 2 is present in areas that are developing into a more complex wetland system. Surface water was present in 2008 across most of this community. In 2006 through 2008, foxtail barley (*Hordeum jubatum*) represented a significantly lower percentage of this community type compared to 2004 and 2005. This community type represents a diverse mix of grass and grass-like species ranging from FAC to OBL. Species including Torrey's rush (*Juncus torreyi*), three-stamen rush (*J. ensifolius*), meadow foxtail (*Alopecurus pratensis*) and three-square bulrush (*Scirpus pungens*) are becoming increasingly more abundant, especially on sparsely vegetated soils noted in 2004 and 2005 and encroaching into the upland communities. Young cattails were also observed in portions of this community type.

Type 3 consists of aquatic species, such as cattail (*Typha latifolia*), bulrush (*Scirpus* sp.), sedges (*Carex* spp.), and spikerush (*Eleocharis* sp.) which were common in areas of inundation. Type 4, was a transitional community with foxtail barley and a mix of primarily upland species and a few wetland species. During the 2008 monitoring, this community type has primarily shifted to a Type 2 or Type 10.

Type 5 occurs along most of the middle reach of the constructed McKee Spring Creek channel and includes a diverse mix of FAC, FACW and OBL species. There are very few sparsely vegetated areas along the creek channel compared to 2004. Establishment from seeded species and desirable non-seeded species has improved vegetation cover. Type 6 is a community first mapped in 2006 to include areas with a dominance of cattails and creeping spikerush. Recently these areas have developed a taller more mature stand of cattails with an understory of creeping spikerush on the new developing wetland soils. Type 7 is a community first mapped in 2007 to include areas with a dominance of sedge, rush and young cattails.

**Table 1: 2004 to 2008 vegetation species list for Jack Creek Ranch Wetland Mitigation Site.**

Scientific Name	Region 9 (Northwest) Wetland Indicator Status <sup>1</sup>	Scientific Name	Region 9 (Northwest) Wetland Indicator Status <sup>1</sup>
<i>Agropyron dasystachyum</i>	FACU-	<i>Juncus longistylis</i>	FACW
<i>Agropyron repens</i>	FACU-	<i>Juncus mertensianus</i>	OBL
<i>Agropyron riparium</i>	(FACU)	<i>Juncus torreyi</i>	FACW
<i>Agropyron trachycaulum</i>	FAC	<i>Kochia scoparia</i>	FAC
<i>Agrostis alba</i>	FACW	<b><i>Lactuca serriola</i></b>	<b>FAC-</b>
<i>Alopecurus aequalis</i>	OBL	<i>Medicago lupulina</i>	FAC
<i>Alopecurus arundinacea</i>	NL	<i>Melilotus alba</i>	FACU
<i>Alopecurus pratensis</i>	FACW	<i>Melilotus officinalis</i>	FACU
<i>Astragalus spp.</i>	(FACU)	<i>Mentha arvensis</i>	FAC
<i>Beckmannia syzigachne</i>	OBL	<i>Mimulus spp.</i>	(OBL)
<i>Bromus inermis</i>	(UPL)	<i>Muhlenbergia spp.</i>	(FACU)
<i>Bromus marginatus</i>	(FACU)	<b><i>Najas spp.</i></b>	<b>OBL</b>
<i>Bromus tectorum</i>	NL	<i>Phalaris arundinacea</i>	FACW
<i>Bromus tectorum</i>	(UPL)	<i>Phleum pratense</i>	FAC-
<i>Calamagrostis canadensis</i>	FACW+	<i>Poa compressa</i>	FACU+
<b><i>Camassia quamash</i></b>	<b>FACW</b>	<i>Poa palustris</i>	FAC
<i>Carduus nutans</i>	(UPL)	<i>Poa pratensis</i>	FACU+
<i>Carex aquatilis</i>	OBL	<b><i>Polygonum amphibium</i></b>	<b>OBL</b>
<i>Carex lanuginosa</i>	OBL	<i>Populus angustifolia</i>	FACW
<i>Carex microptera</i>	FAC	<i>Potentilla anserina</i>	OBL
<i>Carex nebrascensis</i>	OBL	<i>Puccinellia nuttalliana</i>	OBL
<i>Carex utriculata</i>	OBL	<i>Ranunculus cymbalaria</i>	OBL
<i>Chenopodium album</i>	FAC	<b><i>Rorippa nasturtium-aquaticum</i></b>	<b>OBL</b>
<i>Cirsium arvense</i>	FACU+	<i>Rumex crispus</i>	FAC+
<i>Cynoglossum officinale</i>	FACU*	<b><i>Ruppia maritima</i></b>	<b>OBL</b>
<b><i>Dactylis glomerata</i></b>	<b>FACU</b>	<i>Salix bebbiana</i>	FACW
<i>Deschampsia cespitosa</i>	FACW	<i>Salix exigua</i>	OBL
<i>Distichlis spicata</i>	FAC+	<i>Salix lasiandra</i>	FACW+
<b><i>Eleocharis acicularis</i></b>	<b>OBL</b>	<i>Salsola kali</i>	UPL
<i>Eleocharis palustris</i>	OBL	<b><i>Scirpus microptera</i></b>	<b>OBL</b>
<i>Elymus canadensis</i>	FAC	<i>Scirpus pungens</i>	OBL
<i>Elymus cinereus</i>	(FACU)	<i>Scirpus validus</i>	OBL
<i>Epilobium ciliatum</i>	FACW	<b><i>Sismrinchium angustifolium</i></b>	<b>FACW-</b>
<i>Equisetum arvense</i>	FAC	<i>Sisymbrium altissimum</i>	FACU-
<b><i>Equisetum hyemale</i></b>	<b>FACW</b>	<b><i>Solidago spp.</i></b>	(FACU)
<i>Festuca arundinacea</i>	FACU-	<i>Spartina gracilis</i>	FACW
<i>Festuca pratensis</i>	FACU+	<b><i>Thermopsis montana</i></b>	(FACU)
<i>Glyceria grandis</i>	OBL	<i>Thlaspi arvense</i>	(UPL)
<i>Glycyrrhiza lepidota</i>	FAC+	<i>Tragopogon dubius</i>	(UPL)
<b><i>Hieracium aurantiacum</i></b>	<b>NL</b>	<b><i>Trifolium spp.</i></b>	(FACU)
<i>Hordeum jubatum</i>	FAC+	<b><i>Triglochin palustre</i></b>	<b>OBL</b>
<i>Hyoscyamus niger</i>	(UPL)	<i>Typha latifolia</i>	OBL
<b><i>Iris missouriensis</i></b>	<b>FACW+</b>	<i>Verbascum thapsus</i>	(UPL)
<i>Juncus balticus</i>	FACW+	<i>Verbena hastata</i>	FAC+
<i>Juncus ensifolius</i>	FACW	<i>Veronica americana</i>	OBL

<sup>1</sup> **Bolded** species indicate those documented within the analysis area for the first time in 2008.

<sup>2</sup> Parenthesized 'Indicator Status' are based only on the biologist's experience as they are not included in the *National List of Plant Species that Occur in Wetlands: Northwest (Region 9)* (Reed 1988).

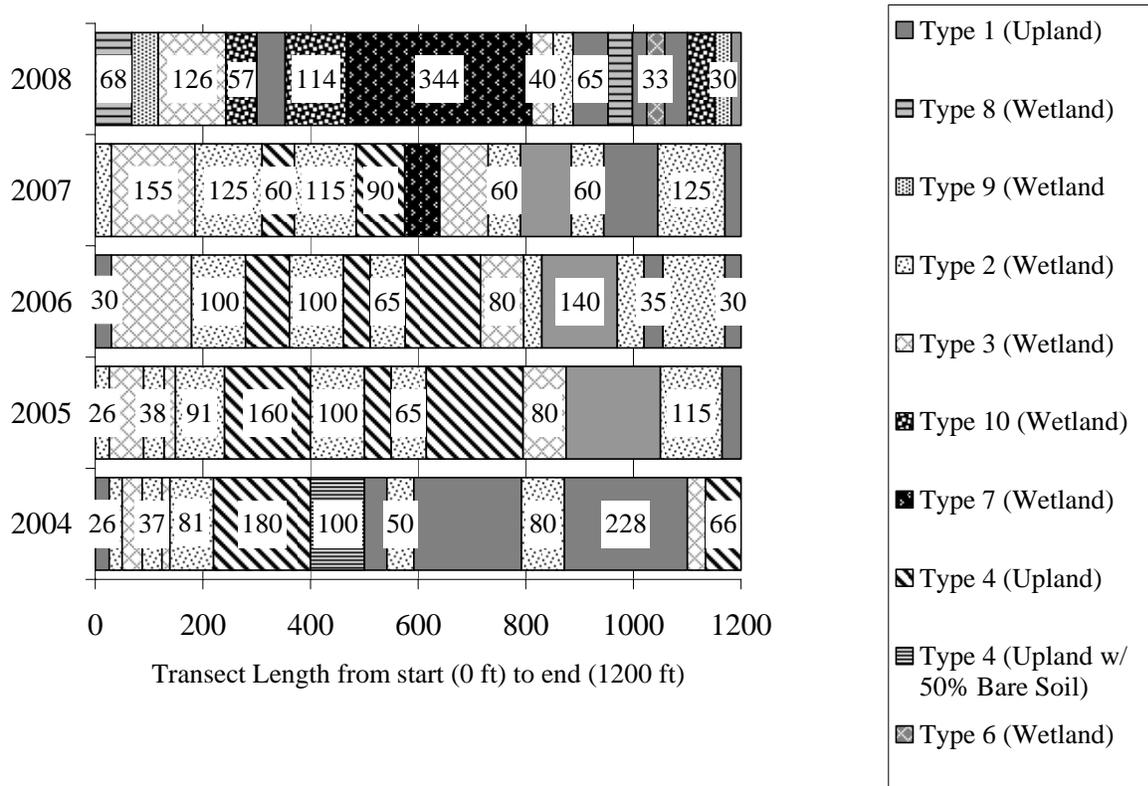
Type 8 is a small community mapped in 2008 to include areas with a dominance of cattails and meadow foxtail replacing portions of Type 2. Type 9 is also a small new community mapped this year (2008) that represents a dominance of three-square bulrush with mixed wetland species. Other common species include creeping spikerush (*Eleocharis palustris*), Torrey’s rush, beaked sedge (*Carex utriculata*), Nebraska sedge (*C. nebrascensis*) and meadow foxtail (*Alopecurus pratensis*). This community is found usually bordering or adjacent to a wetter community type such as Type 3 or Type 6. As mentioned earlier, Type 10 is replacing areas of uplands or replaced areas previously mapped as Type 2. This new community represents a transition toward wetter species (FACW) with a dominance of meadow foxtail, followed by reed canarygrass, horsetail (*Equistem arvense*), three-square bulrush and Baltic rush (*J. balticus*). Type 11 -*Salix exigua* is a small scrub-shrub community near the Jack Creek and McKee spring creek confluence. This type is dominated by sandbar willow with the herbaceous layer consisting of small-fruited bulrush (*Scirpus microptera*) and reed canarygrass.

The vegetation transect crosses the entire lower quarter of the project site, extending from southeast to northwest (**Figure 2** in **Appendix A**). The transect crosses eight vegetation communities with a total of 87 percent of the transect represented by wetland community types (**Table 2** and **Chart 1**). The number of hydrophytic species has increased from 25 to 43 species (2004 and 2008, respectively). There has been a significant decrease in uplands along the transect from 842 feet in 2004 to 358 feet in 2008 (**Chart 2**). There was a corresponding increase in wetlands to 995 feet in 2008 compared to 205 feet in 2004 (**Chart 2**).

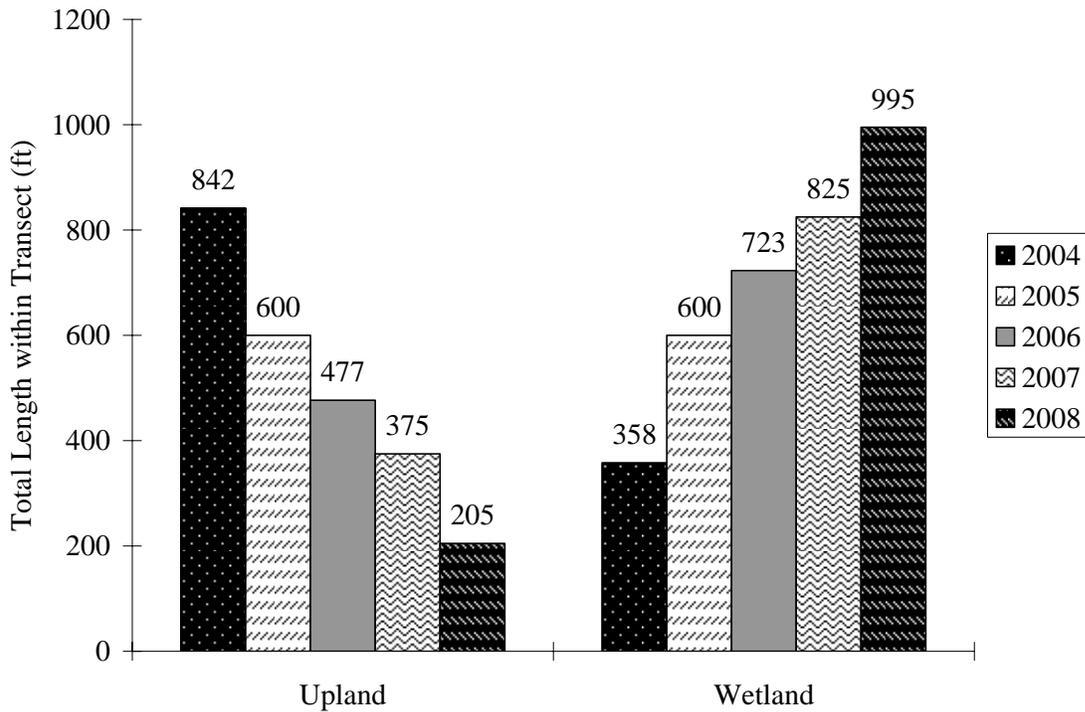
**Table 2: 2004 to 2008 Transect 1 data summary.**

Monitoring Year	2004	2005	2006	2007	2008
Transect Length (feet)	1200	1200	1200	1200	1200
# Vegetation Community Transitions along Transect	13	14	15	14	15
# Vegetation Communities along Transect	4	4	4	5	8
# Hydrophytic Vegetation Communities along Transect	3	3	2	3	7
Total Vegetative Species	45	44	40	39	38
Total Hydrophytic Species	25	31	31	31	31
Total Upland Species	20	13	9	8	7
Estimated % Total Vegetative Cover	82	90	87	84	85
% Transect Length Comprised of Hydrophytic Vegetation Communities	28	50	60	67.5	87
% Transect Length Comprised of Upland Vegetation Communities	70	48	39	32.5	13
% Transect Length Comprised of Unvegetated Open Water	1	1	<1	<1	<1
% Transect Length Comprised of Bare Substrate	1	1	<1	0	0

**Chart 1: Transect map showing vegetation types from start of transect (0 feet) to the end of transect (1,200 feet) for each year monitored.**



**Chart 2: Length of vegetation communities within Transect 1 during each year monitored.**



Noxious weeds are present at the site, including three species on the State of Montana list, Canada thistle (*Cirsium arvense*), hounds tongue (*Cynoglossum officinale*), and orange hawkweed (*Hieracium aurantiacum*). Weed spraying in 2004 and 2005 has been effective in the eradication of black henbane (*Hyoscyamus niger*) and the reduction of Canada thistle, summer cypress (*Kochia scoparia*), Russian thistle (*Salsola kali*), and the reduction of hounds tongue. Canada thistle is still present in the central portion of the horseshoe pasture in the upland areas and along the southern portions of the McKee Spring Creek channel. Infestation size and cover class for Canada thistle are shown on **Figure 3 (Appendix B)**. Only a few individual scattered plants of hounds tongue were noted near culverts or along the road and therefore were not mapped. A small isolated patch of orange hawkweed was noted in the lower reach of the McKee creek southern floodplain (**Figure 3 in Appendix B**).

Willow cuttings were installed along reaches of the McKee Spring Creek corridor in small clusters and in selected areas across the Horseshoe pasture. Planting areas along the creek appeared to be based on bank geometry, hydroperiod, and planform morphology. Species included sandbar (*Salix exigua*), Pacific (*S. lasiandra*) and Bebb's (*S. bebbiana*) willows. Willow cuttings were also installed in inundated areas across the Horseshoe pasture, typically in areas adjacent to low topographic areas (basins). Larger willows and cottonwoods (*Populus angustifolia*) were transplanted along the stream corridor and Horseshoe wetlands.

During the July 2008 monitoring visit, there were no viable willow cuttings observed along the stream channel. In 2006, approximately 25 percent survival was estimated during this monitoring period. Specific causes for this mortality may include lower stream flows thereby reduced soil moisture/saturation along the banks, damage from wildlife (muskrats, mice, or deer), or competition from the dense floodplain vegetation posed a problem for the sustained growth of the willow cuttings. Six live transplanted cottonwoods were counted within the floodplain during the 2008 monitoring. Volunteer cottonwood root suckers were observed within the floodplain. One live transplanted willow was alive along the channel. This plant was healthy with no visible insect damage compared to 2004 when grasshoppers defoliated the shrubs. In the Horseshoe pasture, less than 5 percent of the willow cuttings were alive in 2008. The areas for survival were adjacent to flowing water and / or along channels. The overall survival of the willow cuttings has decreased since 2006, possibly due to factors such as browse from deer, unexpected water levels, and/or transplanting cuttings into saturated clay muck. One live willow shrub remains in the pasture.

### 3.3 Soils

The site was mapped as part of the Madison County Soil Survey (USDA 1989). The upper half of the horseshoe-shaped drain field and the lower reach of McKee creek is Rivra-Ryell-Harve complex (107) and the lower half of the field is mapped as Fluvaquentic Haplaquolls (45). These soils are found on low stream terraces, flood plains and drainage ways in foothills and valleys. Rivra-Ryell-Harve is a deep, well-drained gravelly alluvium that is taxonomically classified as a Ustic Torrifluent. Neither of the mapped soil units are considered hydric, however, Fluvaquentic Haplaquolls is a poorly drained to very poorly drained soil which was likely a wetland area prior to the installation of the ditch drainage system.

Soils were sampled at three sample points (SP-1, SP-2, and SP-3) along Transect 1. Two additional soil pits (SP-4 and SP-5) were added in 2008 along the lower reach of the McKee Spring Creek to discern upland / wetland boundaries. All soil pits revealed hydric soils (except SP-5) based on low chroma values and /or mottles. Soils at SP-1 (approximately 50 east of the eastern transect stake) were a dark brown (10YR 3/3) silty loam from 0 to 4 inches and a very dark gray (10YR 3/1) silty clay loam from 4 to 14 inches. Soils were saturated to the surface.

SP-2 is located between community types 10 and 2, approximately 450 ft west of the eastern transect post. Soils included a grayish brown (10YR 5/2) silty clay loam from 0 to 5 inches and a dark gray (10YR 4/1) from 5 to 12 inches. Soils were saturated in the upper 12 inches. SP-3 is located approximately 75 feet west of the western transect post. Soils were a very dark gray (10YR 3/1) silt from 0 to 4 inches and a silt loam from 4 to 14 inches. Soils were saturated to the surface with pockets of surface water. SP-4 is located along the lower reach of McKee Spring Creek, approximately 25 feet north of the channel. Soils included a dark gray (10YR 4/1) clay loam from 0 to 12 inches. Dark brown mottles (7.5YR 4/4) were noted at 4 inches. Soils were saturated to the surface. Soils at SP-5 were a grayish brown (10YR 5/2) silt loam in the upper 4 inches and a pale brown (10YR 6/3) silty clay loam from 4 to 12 inches. Soils were saturated at the surface. SP-1, SP-2, SP-3, and SP-4 met the hydric soil criteria, while SP-5 did not.

### 3.4 Wetland Delineation

The delineated wetland boundary is depicted on **Figure 3 (Appendix A)**. The COE Forms are included in **Appendix B**. Emergent vegetation is developing along the east, west and north central portions of the Horseshoe pasture. Aquatic vegetation was common in topographic depressions, areas of open water within the Horseshoe pasture, and in backwater or low banks along McKee Spring Creek.

In 2008, per MDT request, the 2004-2007 monitoring area limits were extended to include the lower restored reach of McKee Spring Creek, as MDT and the designers had determined that the credit purchase included this area and it was therefore eligible for credit (Urban pers. comm.). In 2008, with the addition of the lower reach of the spring creek, the gross wetland boundary was 65.40 acres and included 2.51 acres of shallow open water (<4 feet deep).

During the July field visit, approximately 50 percent of the upland community type (CT-1) was inundated; primarily in the western quarter of the project area. Shallow surface water was apparent closer to the western transect stake. Community Type 4 has converted to wetland community types CT 2 or CT 10. Portions of CT 3 have transitioned into wetlands dominated by sedge, three-square bulrush or rush species. Wetlands bordering the middle and lower reach of McKee spring creek are typically sedge, rush and cattails (CT 7) transitioning to CT2 (mixed wetland species). The development of existing wetland species (seed bank), seeded species and site planting efforts are successful in germination and establishment. The saturated soils and increased surface water noted in July are good indicators that the wetland hydrology is recovering.

### 3.5 Wildlife

Species observed during the wildlife use assessment visits are listed in **Table 3**. Activities and densities associated with these observations are included on the monitoring form in **Appendix B**. Since 2004, a total of 50 avian species, 17 species of mammals, four fish and 1 amphibian species have been sighted within the project site. A dead crane, pelican, and swan (likely a Trumpeter) were observed by FWP during the summer of 2008 (Hines 2008) and the author in late October; the causes were unknown. In May, 2008 a dead white-tailed deer was observed caught in the south fenceline, apparently the result of jumping the fence during the winter months; this sighting is the second deer-kill noted in this manner.

**Table 3: 2004-2008 wildlife species observed at the Jack Creek Ranch Mitigation Site.**

<b>REPTILE</b>	
None	
<b>AMPHIBIAN</b>	
Spotted Frog ( <i>Rana luteiventris</i> )*	
<b>FISH</b>	
Brook trout ( <i>Salvelinus fontinalis</i> )	Rainbow trout ( <i>Oncorhynchus mykiss</i> )
Brown trout ( <i>Salmo trutta</i> )	Long nose dace ( <i>Rhinichthys cataractae</i> )
<b>CRUSTACEAN</b>	
Crayfish	
<b>BIRD</b>	
American Goldfinch ( <i>Carduelis psaltria</i> )	<b>Marsh Wren (<i>Cistothorus palustris</i>)</b>
American Kestrel ( <i>Falco sparverius</i> )	Northern Flicker ( <i>Colaptes auratus</i> )
<b>American Robin (<i>Turdus migratorius</i>)*</b>	Northern Harrier ( <i>Circus cyaneus</i> )
<b>American White Pelican (<i>Pelecanus erythrorhynchos</i>)*</b>	<b>Northern Shoveler (<i>Anas clypeata</i>)</b>
<b>American Wigeon (<i>Anas americana</i>)</b>	Northern Shrike ( <i>Lanius excubitor</i> )
Bald eagle ( <i>Haliaeetus leucocephalus</i> )	<b>Osprey (<i>Pandion haliaetus</i>)</b>
<b>Barn Swallow (<i>Hirundo rustica</i>)*</b>	Red-tailed hawk ( <i>Buteo jamaicensis</i> )
<b>Black-billed Magpie (<i>Pica pica</i>)</b>	<b>Red-winged Blackbird (<i>Agelaius phoeniceus</i>)</b>
<b>Blue-winged Teal (<i>Anas discors</i>)*</b>	<b>Ring-necked Duck (<i>Aythya collaris</i>)</b>
Brown-headed Cowbird ( <i>Molothrus ater</i> )	<b>Ring-necked Pheasant (<i>Phasianus colchicus</i>)</b>
<b>Canada Goose (<i>Branta canadensis</i>)</b>	<b>Rough-legged Hawk (<i>Buteo lagopus</i>)</b>
<b>Cinnamon Teal (<i>Anas cyanoptera</i>)</b>	<b>Sandhill Crane (<i>Grus canadensis</i>)*</b>
<b>Cliff Swallow (<i>Hirundo pyrrhonota</i>)</b>	<b>Savannah Sparrow (<i>Passerculus sandwichensis</i>)</b>
Common Goldeneye ( <i>Bucephala clanula</i> )	<b>Sora (<i>Porzana Carolina</i>)*</b>
<b>Common Merganser (<i>Mergus merganser</i>)*</b>	<b>Spotted Sandpiper (<i>Actitis macularia</i>)*</b>
Common Raven ( <i>Corvus corax</i> )	<b>Tree Swallow (<i>Tachycineta bicolor</i>)</b>
<b>Common Yellowthroat (<i>Geothlypis trichas</i>)</b>	<b>Trumpeter Swan (<i>Cygnus buccinator</i>)</b>
<b>Eastern Kingbird (<i>Tyrannus tyrannus</i>)</b>	Turkey Vulture ( <i>Cathartes aura</i> )
<b>Great Blue Heron (<i>Ardea herodias</i>)</b>	Vesper Sparrow ( <i>Pooecetes gramineus</i> )
<b>Great Horned Owl (<i>Bubo virginianus</i>)</b>	<b>Western Meadowlark (<i>Sturnella neglecta</i>)</b>
<b>Green-winged Teal (<i>Anas crecca</i>)*</b>	Wilson's Phalarope ( <i>Phalaropus tricolor</i> )
<b>House Wren (<i>Troglodytes aedon</i>)*</b>	<b>Wilson's Snipe (<i>Gallinago gallinago</i>)</b>
<b>Killdeer (<i>Charadrius vociferous</i>)*</b>	<b>Yellow-headed Blackbird (<i>Xanthocephalus xanthocephalus</i>)*</b>
Lesser Scaup ( <i>Aythya fuligula</i> )	Yellow-rumped Warbler ( <i>Dendroica coronata</i> )
<b>Mallard (<i>Anas platyrhynchos</i>)</b>	<b>Yellow Warbler (<i>Dendroica petechia</i>)</b>

**Table 3 (continued): 2004-2008 wildlife species observed at the Jack Creek Ranch Mitigation Site.**

MAMMAL	
<b>Beaver</b> ( <i>Castor canadensis</i> )*	Porcupine ( <i>Erethizon dorsatum</i> )
<b>Coyote</b> ( <i>Canis latrans</i> ) or <b>wolf</b> ( <i>Canis lupus</i> )	Pronghorn ( <i>Antilocarpa Americana</i> )
Eastern Cottontail ( <i>Sylvilagus floridanus</i> ) <sup>1</sup>	<b>Raccoon</b> ( <i>Procyon lotor</i> )*
<b>Elk</b> ( <i>Cervus canadensis</i> )	River otter ( <i>Lutra canadensis</i> )
Longtail weasel ( <i>Mustela frenata</i> )	Red fox ( <i>Vulpes fulva</i> )
Moose ( <i>Alces alces</i> )	Striped Skunk ( <i>Mephitis mephitis</i> )
Mountain cottontail ( <i>Sylvilagus nuttalli</i> )	Vole spp.
Mule deer ( <i>Odocoileus hemionus</i> )	<b>White-tailed deer</b> ( <i>Odocoileus virginianus</i> )*
<b>Muskrat</b> ( <i>Ondatra zibethicus</i> )*	

**Bolded** species indicate those documented within the analysis area in 2008.

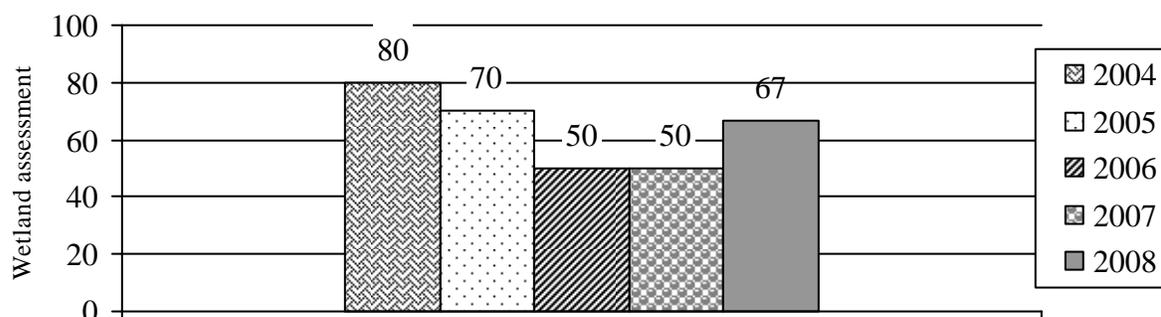
\* Species observed by MDT and/or MFWP.

### 3.6 Macroinvertebrates

Macroinvertebrate samples have been collected in shallow open water each year from 2004 through 2008. A macroinvertebrate sample was collected in the stream in 2006 for the first time and again in 2007 and 2008. The complete macroinvertebrate sampling results are provided in **Appendix F**. Rhithron Associates, Inc. has summarized the results in the italicized sections below (Bollman 2008). The bioassessment scores were graphically summarized for the pond (**Chart 3**) and the for the stream (**Chart 4**) (Bollman 2008).

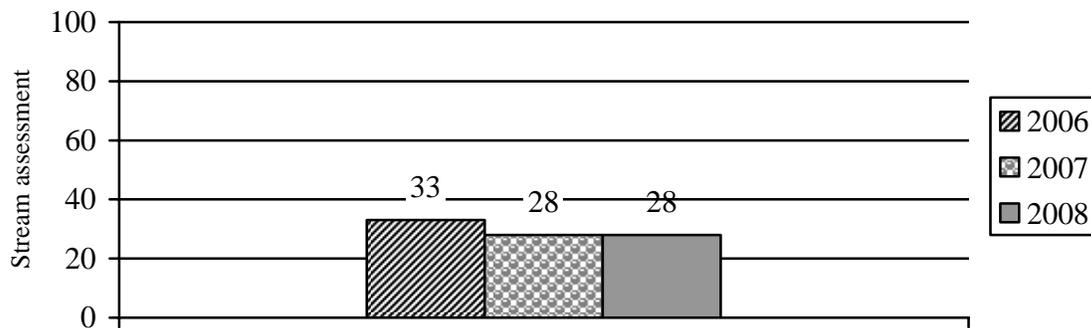
***Pond.** In 2008, the invertebrate assemblage collected at this site was more taxonomically and functionally diverse compared to 2007, resulting in an increase in the bioassessment score. The proportion of hemoglobin-bearing taxa (e.g. *Ablabesmyia* sp., *Chironomus* sp.) decreased since the previous year, but hypoxic water and sediment still appeared to characterize the aquatic habitat. Aquatic habitats appeared to be limited to hypoxic substrates and open water. Thermal preference of the invertebrate assemblage was calculated at 15.0°C.*

**Chart 3: Bioassessment scores using the wetland index for the pond at the Jack Creek Ranch Wetland Mitigation Site.**



*Stream.* Rheophilic taxa were prominent in the invertebrate assemblage at this site; scores indicated in the chart were derived by means of a metric battery and scoring criteria developed for lotic conditions (MVFP index: Bollman 1998). Low mayfly richness, high biotic index value, and abundant isopods (*Caecidotea* sp.) suggest that water quality may have been degraded at this site. The thermal preference of the invertebrate assemblage was calculated to be 16.3°C, warmer than expected for a stream environment. Nutrient enrichment and warm water temperatures apparently combined to render the substrates hypoxic; hemoglobin-bearing taxa accounted for 16% of collected animals. Moderate impairment is indicated.

**Chart 4: Bioassessment scores using the MVFP index scores for the stream segment at Jack Creek Ranch Wetland Mitigation Site.**



### 3.7 Functional Assessment

Pre-construction functional assessments were completed for the wetlands as well as the middle and lower reach of McKee Spring Creek by ADC (2002) using the 1999 MDT MWAM. In 2008, conditions were assessed using the 2008 MDT MWAM. Only general trends in wetland functional development can be determined from comparing the 1999 and 2008 MWAM results (**Table 4**). The site remains a Category II wetland and scores 510 functional units. Completed Functional Assessment Forms are included in **Appendix B** and summarized in **Table 4**.

**Table 4: Summary of 2002 and 2008 wetland function/value ratings and functional points at the Jack Creek Ranch Wetland Mitigation Project.**

Function and Value Parameters from the MDT Montana Wetland Assessment Method	Pre-construction 2002 <sup>1</sup>	Post-construction 2008 <sup>2</sup>
Listed/Proposed T&E Species Habitat	Low (0)	Low (0.1)
MNHP Species Habitat	Mod (0.6)	Mod (0.5)
General Wildlife Habitat	Low (0.3)	Exc (1.0)
General Fish/Aquatic Habitat	Mod (0.6)	Mod (0.6)
Flood Attenuation	NA	Mod (0.5)
Short/Long Term Surface Water Storage	NA	High (0.9)
Sediment/Nutrient/Removal	NA	High (0.9)
Sediment/Shoreline Stabilization	NA	High (1.0)
Production Export/Food Chain Support	Low (0.3)	High (0.8)
Groundwater Discharge/Recharge	Low (0.1)	High (1.0)
Uniqueness	Low (0.1)	Mod (0.4)
Recreation/Education Potential	Low (0.1)	Mod (0.1)
<b>Actual Points / Possible Points</b>	<b>2.7 / 9</b>	<b>7.8 / 11</b>
<b>% of Possible Score Achieved</b>	<b>30%</b>	<b>71%</b>
<b>Overall Category</b>	<b>III</b>	<b>II</b>
<b>Total Acreage of Assessed Wetland / Open Water Areas within Easement</b>	<b>11.40</b>	<b>65.40</b>
<b>Functional Units (acreage x actual points)</b>	<b>30.78</b>	<b>510.12</b>
<b>Net Acreage Gain in Mitigation Area</b>	NA	<b>54.00</b>
<b>Approximate Functional Unit Gain in Mitigation Area</b>	---	<b>479.34</b>

<sup>1</sup> The 2002 baseline assessment used the 1999 MWAM and included an additional 12.2 acres of wetlands and open water along McKee Spring Creek beyond the current assessment area (AA). The original acreage of wetlands and open water in this area (23.6 acres) and corresponding functional units were therefore approximated downward in order to match the baseline AA with the current AA.

<sup>2</sup> In 2008 the assessment area was expanded to include the horseshoe wetland and the lower and middle reaches of McKee Spring Creek. The 2008 MWAM is in **Appendix B**.

### 3.8 Photographs

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

### 3.9 Maintenance Needs/Recommendations

The culverts within McKee Spring Creek were functioning and were in good condition. No areas of erosion or sparse vegetation were noted along the channel. The outflow channel from the Horseshoe pasture to the creek was functioning and was in good condition. The fence around the wetland was intact.

The fence is not barbed, however the bottom strand does not appear to be high enough to allow the passage of ungulates. It is possible that snow depth would deter deer from traveling under the fence even if suspended 18 inches. There are special post attachments available that would allow the wire to be dropped one level prior to the winter months when snow depth and icy conditions hinder over-fence migration.

The site has three State of Montana Noxious Weeds, Canada thistle, hounds tongue, and orange hawkweed. Live hounds tongue plants were noted during the July 2008 monitoring visit within the McKee Spring Creek floodplain. Weed control efforts have been effective in reducing Canada thistle and hounds tongue. However, Canada thistle still continues to pose the greatest problem in the transition and upland areas. A small isolated patch of orange hawkweed was noted south of the monitoring well in the lower reach of McKee Spring Creek (**Figure 3 in Appendix B**). Spot spraying is recommended in 2008 primarily for Canada thistle, hounds tongue and orange hawkweed.

### 3.10 Current Credit Summary

In 2008, per MDT request, the 2004-2007 monitoring area limits were extended to include the lower restored reach of McKee Spring Creek, as MDT and the designers had determined that this area was part of the credit purchase and eligible for credit (Urban pers. comm.). In 2008, the gross wetland boundary increased to 65.40 acres with the addition of the lower reach of McKee Spring Creek.

MDT anticipates grossing at least 50 acres of wetland at this site (MDT 2002). The mitigation efforts have thus far resulted in 65.40 gross wetland acres or 130 percent of the goal (the 50 acre goal included the pre-existing wetlands and open water). Subtracting the original, pre-project wetland / open water acreage of 11.40 (**2002 Wetland Map in Appendix D**), the current net acreage of aquatic habitat totals 54 acres.

The monitoring area has gained substantive functional units since 2004 due to increase in shoreline stabilization, flood attenuation, surface water storage and gain of wetland acreage. The site is a Category II wetland and scores 510 functional units.

#### 4.0 REFERENCES

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## **Appendix A**

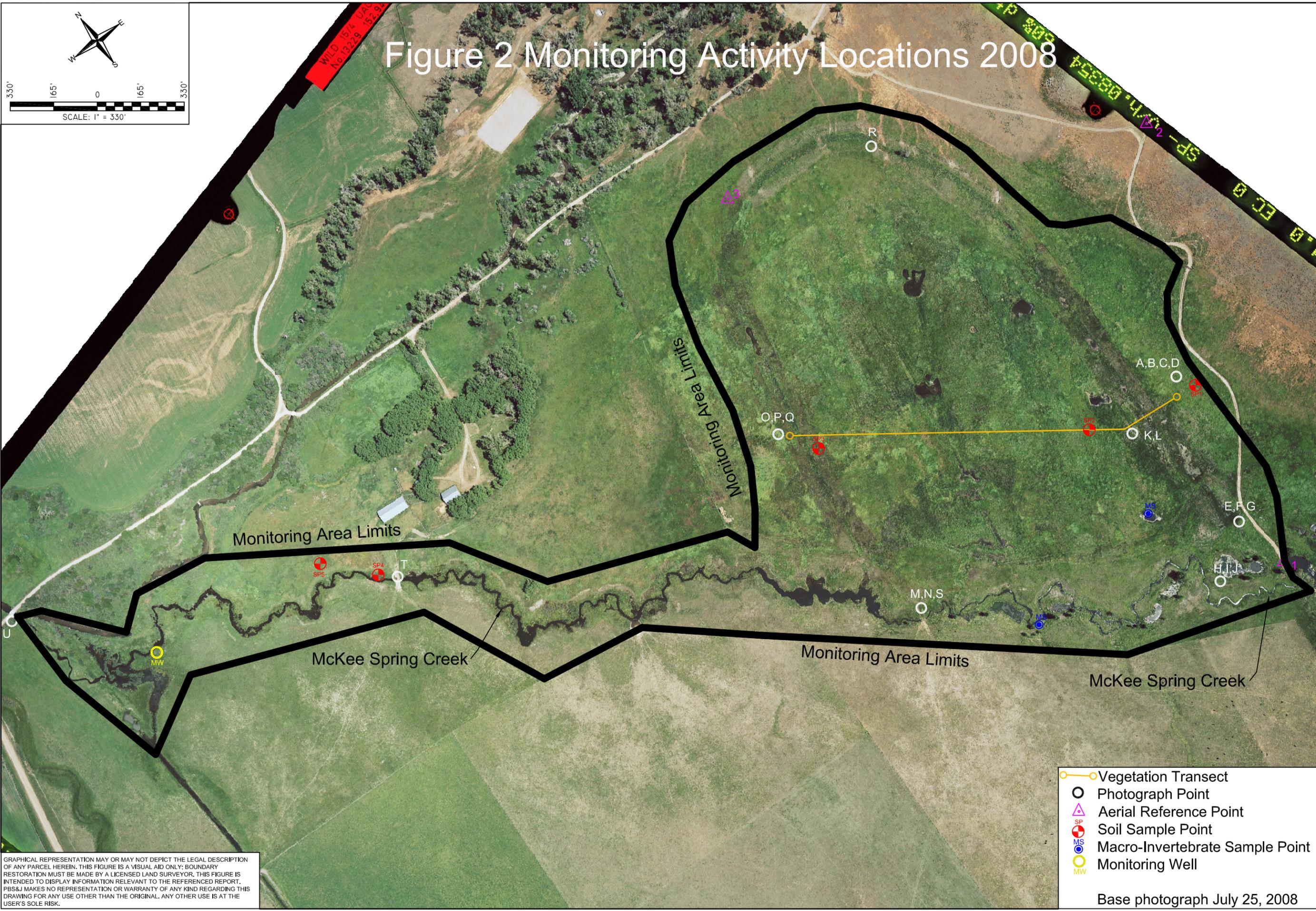
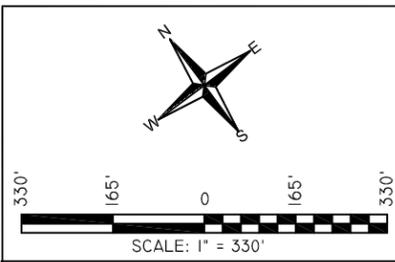
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### **FIGURES 2 & 3**

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*MDT Wetland Mitigation Monitoring  
Jack Creek Ranch  
Ennis, Montana*

# Figure 2 Monitoring Activity Locations 2008



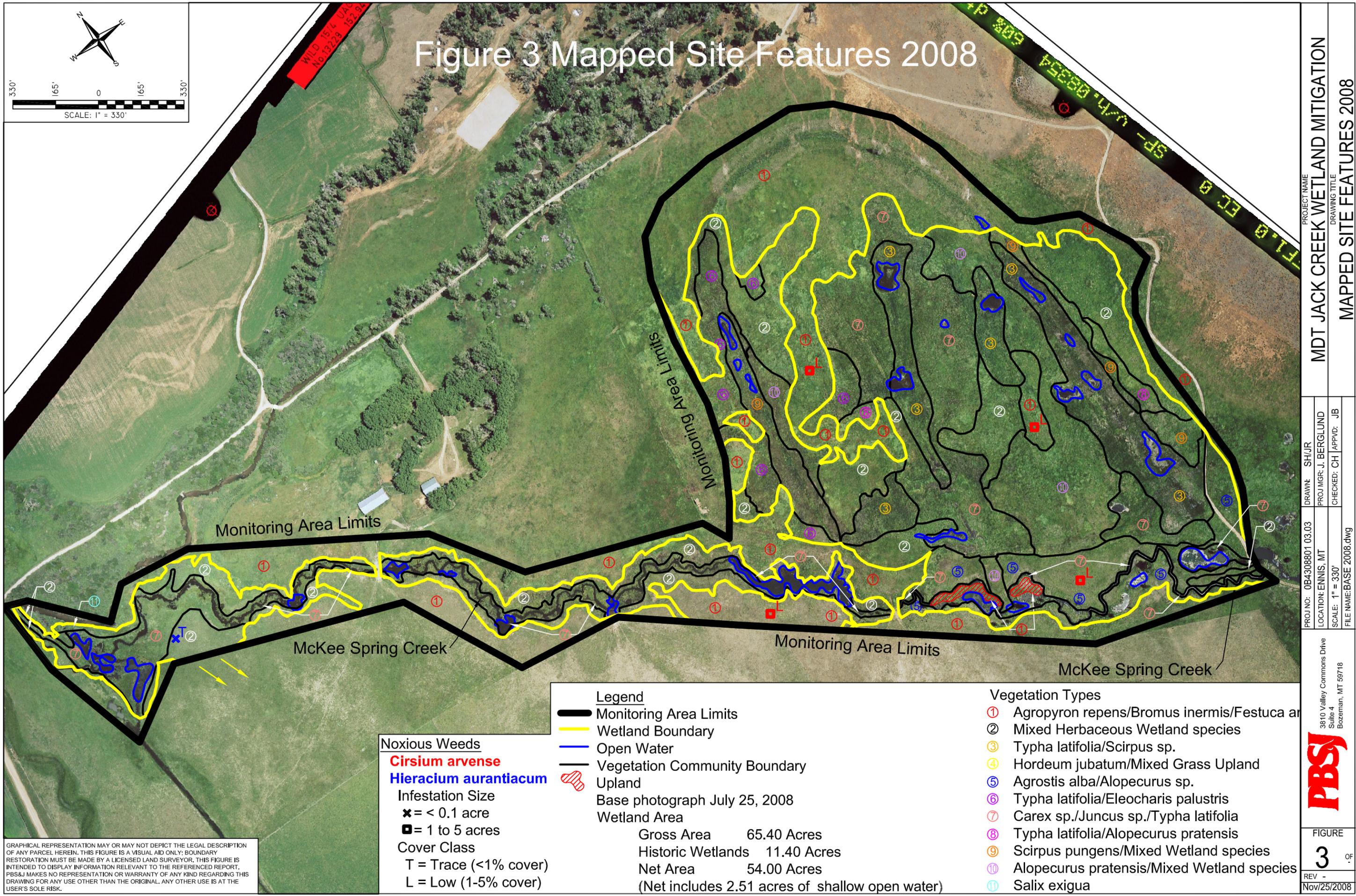
- Vegetation Transect
- Photograph Point
- Aerial Reference Point
- Soil Sample Point
- Macro-Invertebrate Sample Point
- Monitoring Well

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.

PROJECT NAME <b>MDT JACK CREEK WETLAND MITIGATION</b>	
DRAWING TITLE <b>MONITORING ACTIVITY LOCATIONS 2008</b>	
DRAWN: SH/JR	PROJ MGR: J. BERGLUND
CHECKED: CH	APPVD: JB
PROJ NO: 0B4308801 03.03	LOCATION: ENNIS, MT
SCALE: 1" = 330'	FILE NAME: BASE 2008.dwg
3810 Valley Commons Drive Suite 4 Bozeman, MT 59718	
<b>PBS&amp;J</b>	
FIGURE	OF
<b>2</b>	
REV -	Nov/22/2008

Base photograph July 25, 2008

# Figure 3 Mapped Site Features 2008



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.

**Noxious Weeds**  
**Cirsium arvense**  
**Hieracium aurantiacum**  
 Infestation Size  
 x = < 0.1 acre  
 ■ = 1 to 5 acres  
 Cover Class  
 T = Trace (<1% cover)  
 L = Low (1-5% cover)

**Legend**  
 — Monitoring Area Limits  
 — Wetland Boundary  
 — Open Water  
 — Vegetation Community Boundary  
 Upland  
 Wetland Area

Base photograph July 25, 2008  
 Gross Area 65.40 Acres  
 Historic Wetlands 11.40 Acres  
 Net Area 54.00 Acres  
 (Net includes 2.51 acres of shallow open water)

**Vegetation Types**  
 ① Agropyron repens/Bromus inermis/Festuca arvensis  
 ② Mixed Herbaceous Wetland species  
 ③ Typha latifolia/Scirpus sp.  
 ④ Hordeum jubatum/Mixed Grass Upland  
 ⑤ Agrostis alba/Alopecurus sp.  
 ⑥ Typha latifolia/Eleocharis palustris  
 ⑦ Carex sp./Juncus sp./Typha latifolia  
 ⑧ Typha latifolia/Alopecurus pratensis  
 ⑨ Scirpus pungens/Mixed Wetland species  
 ⑩ Alopecurus pratensis/Mixed Wetland species  
 ⑪ Salix exigua

PROJECT NAME <b>MDT JACK CREEK WETLAND MITIGATION</b>	
DRAWING TITLE <b>MAPPED SITE FEATURES 2008</b>	
PROJ NO: 084308801 03.03	DRAWN: SH/JR
LOCATION: ENNIS, MT	PROJ MGR: J. BERGLUND
SCALE: 1" = 330'	CHECKED: CH
FILE NAME: BASE 2008.dwg	APPV: JB
3810 Valley Commons Drive Suite 4 Bozeman, MT 59718 <b>PBS&amp;J</b>	
FIGURE <b>3</b> OF	
REV - Nov/25/2008	

## **Appendix B**

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**2008 WETLAND MITIGATION SITE MONITORING FORM**

**2008 BIRD SURVEY FORMS**

**2008 COE WETLAND DELINEATION FORMS**

**2008 FUNCTIONAL ASSESSMENT FORMS**

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*MDT Wetland Mitigation Monitoring*

*Jack Creek Ranch*

*Ennis, Montana*

**PBS&J / MDT WETLAND MITIGATION SITE MONITORING FORM**

Project Name: Jack Creek Ranch Project Number: B4308801-0303  
 Assessment Date: July 10 and 11, 2008 Person(s) conducting the assessment: CH/PBSJ  
 Location: 2.5 miles NE of Ennis MDT District: Butte Milepost: \_\_\_\_\_  
 Legal Description: T 5N R 1W Section 25 & 26  
 Weather Conditions: very warm, dry, sunny Time of Day: 8 AM  
 Initial Evaluation Date: August 12, 2004 Monitoring Year: 5 # Visits in Year: 1  
 Size of evaluation area: 86 + acres Land use surrounding wetland: grazing/hay/residential

**HYDROLOGY**

Surface Water Source: Groundwater springs and McKee Spring Creek  
 Inundation: Present Average Depth: 0.25 feet Range of Depths: 0 -.50 ft  
 Percent of assessment area under inundation: 90%  
 Depth at emergent vegetation-open water boundary: 0.25 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.):  
saturated mud flats, sediment deposits.

Groundwater Monitoring Wells: Present - monitored the well located in the lower reach of McKee Spring Creek. Record depth of water below ground surface (in inches):

Well Number	Depth	Well Number	Depth	Well Number	Depth
NA	8 inches				

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:**

Wells are present but damaged. Unable to record groundwater depths. PVC pipes were broken or pulled out of the ground - possibly during construction or revegetation efforts. However the well found in the lower reach of McKee Spring Creek floodplain was monitored on July 11 2008. Water levels were recorded 8 inches below the ground surface.

## VEGETATION COMMUNITIES

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

Dominant Species	% Cover	Dominant Species	% Cover
Agropyron repens	3 = 11-20%	Alopecurus pratensis	2 = 6-10%
Bromus inermis	3 = 11-20%	Hordum jubatum	1 = 1-5%
Festuca arundinacea	3 = 11-20%	Agrostis alba	1 = 1-5%
Poa pratensis	2 = 6-10%		
Phalaris arundinacea	2 = 6-10%		
Cirsium arvense	2 = 6-10%		

Comments / Problems: **Shallow surface water was noted throughout in this community type in 2008 with the exception of the far southwest corner, and the northern portion of the horseshoe. Noted an increase in surface water compared to 2007. Continue to see the encroachment of Alopecurus pratensis into this community type. Still some areas where weed control (Cirsium arvense) needs to be continued (south of McKee Creek and central horseshoe area).**

Community Number: **2** Community Title (main spp): **Mixed Herbaceous Wetland**

Dominant Species	% Cover	Dominant Species	% Cover
Scirpus pungens	3=11-20%	Phalaris arundinacea	2=6-10%
Deschampsia cespitosa	3=11-20%	Typha latifolia (young plants)	2=6-10%
Carex lanuginosa	3=11-20%	Potentilla anserina	1=1-5%
Juncus balticus	3=11-20%	Juncus torreyi	1=1-5%
Juncus ensifolius	2=6-10%	Hordeum jubatum	1=1-5%
Alopecurus pratensis	2=6-10%		
Carex nebrascensis	2=6-10%		

Comments / Problems: **Historically, Hordeum jubatum represented approximately 20% of the vegetation in this community. In 2006 and 2007, Hordeum jubatum is still present but represents a low percent of the total plant cover. In 2008, very little Hordeum jubatum persists. This community is a very diverse mix of grass and grass-like species ranging from FAC to OBL. Other minor species include Juncus mertensianus, Agrostis alba, Camassia quamash, Iris missouriensis, Alopecurus arundinacea, and Mentha arvense.**

Community Number: **3** Community Title (main spp): **Typha latifolia/Scirpus sp.**

Dominant Species	% Cover	Dominant Species	% Cover
Typha latifolia	4 = 21-50%	Open water	1 = 1-5%
Scirpus validus	3 = 11-20%	Eleocharis palustris	1 = 1-5%
Scirpus pungens	3 = 11-20%	Ranunculus cymbalaris	1 = 1-5%
Juncus torreyi	2 = 6-10%	Veronica americana	1 = 1-5%
Carex utriculutata	2 = 6-10%	Carex lanuginosa	1 = 1-5%
Carex aquatilis	2 = 6-10%	Beckmannia syziachne	+ = <1%

Comments / Problems: **This community type was typically found in areas of shallow water or around the perimeter of open water. Due to the lower water levels noted in 2007, portions of this community type are now (2008) dominated by Carex species, Scirpus pungens, Juncus species or have evolved into Community Type 7. CT 3 is still an impressive community closer along the eastern, southern and central portion of the horseshoe wetland.**

## VEGETATION COMMUNITIES (continued)

Community Number: **4** Community Title (main spp): **Hordeum jubatum/Mixed Grass Upland**

Dominant Species	% Cover	Dominant Species	% Cover
Hordeum jubatum	3 = 11-20%	Cirsium arvense	1 = 1-5%
Festuca arundinacea	3 = 11-20%	Agropyron trachycaulum	1 = 1-5%
Agropyron repens	2 = 6-10%	Agropyron riparium	1 = 1-5%
Bromus inermis	2 = 6-10%	Agrostis alba	1 = 1-5%
Elymus canadensis	1 = 1-5%	Alopecurus pratensis	1 = 1-5%
Poa pratensis	1 = 1-5%	Equisetum arvense	1 = 1-5%

Comments / Problems: **In 2008, this community type has primarily shifted to CT 2 (a mix of wetland species) or CT 10 (a dominance of Alopecurus pratensis –with mixed wetland species).**

Community Number: **5** Community Title (main spp): **Agrostis alba/Alopecurus sp.**

Dominant Species	% Cover	Dominant Species	% Cover
Agrostis alba	3 = 11-20%	Scirpus pungens	2 = 6-10%
Alopecurus pratensis	3 = 11-20%	Cirsium arvense	1 = 1-5%
Alopecurus arundinacea	2 = 6-10%	Carex nebrascensis	1 = 1-5%
Deschampsia cespitosa	2 = 6-10%	Juncus balticus	1 = 1-5%
Juncus torreyi	2 = 6-10%		
Carex lanuginosa	2 = 6-10%		

Comments / Problems: **This community type represents emergent vegetation along portions of McKee Spring creek. Other minor species include Mentha arvense, Distichis spicata, Astragalus sp. Trifolium sp. , and Juncus mertensianus.**

Community Number: **6** Community Title (main spp): **Typha latifolia/Eleocharis palustris**

Dominant Species	% Cover	Dominant Species	% Cover
Typha latifolia	4 = 21-50%	J. ensifolius	1 = 1-5%
Eleocharis palustris	4 = 21-50%		
Carex aquatilis	2 = 6-10%		
Scirpus pungens	2 = 6-10%		
Juncus torreyi	2 = 6-10%		
Carex utriculata	2 = 6-10%		

Comments / Problems: **This is a new community added in 2006 to note the communities along the western side of the horseshoe. In previous years young cattails were noted in these areas (CT 2 and CT 3). These wetlands include depressional areas with shallow surface water or saturated mud flats.**

**VEGETATION COMMUNITIES (continued)**

Community Number: **7** Community Title (main spp): **Carex sp./Juncus sp./Typha latifolia**

Dominant Species	% Cover	Dominant Species	% Cover
Carex lanuginosa	3=11-20%	Scirpus microptera	2 = 6-10%
Carex aquatilis	2 = 6-10%	Carex nebrascensis	1 = 1-5%
Juncus torreyi	3 = 1-20%	Triglochin palustre	1 = 1-5%
Juncus balticus	2 = 6-10%	Carex microptera	1 = 1-5%
Typha latifolia (young plants)	3=11-20%	Polygonum amphibium	1 = 1-5%
Carex utriculata	2 = 6-10%	Scirpus validus	1 = 1-5%

Comments / Problems: **This is a new community added in 2007 that represents a transition to dominant species within CT 2. Typha latifolia (young plants) represents a co-dominant species in some areas with shallow water. In 2008 this community type has increased primarily bordering or adjacent to community type 3.**

Community Number:**8** Community Title (main spp): **Typha latifolia/Alopecurus pratensis**

Dominant Species	% Cover	Dominant Species	% Cover
Typha latifolia	4=21-50%	Phalaris arundinacea	2 = 6-10%
Alopecurus pratensis	4=21-50%	Eleocharis palustris	1 = 1-5%
Scirpus pungens	2 = 6-10%	Poa pratensis	1 = 1-5%

Comments / Problems: **This is a small community added in 2008 that represents a transition within portions of CT 2. In areas of thick litter or thatch, typically young cattails were noted with a co-dominance of Alopecurus pratensis.**

Community Number:**9** Community Title (main spp): **Scirpus pungens/Mixed Wetland Species**

Dominant Species	% Cover	Dominant Species	% Cover
Scirpus pungens	4=21-50%	Juncus balticus	2 = 6-10
Eleocharis palustris	3=11-20%	Typha latifolia	1 = 1-5%
Juncus torreyi	2 = 6-10%		
Carex utriculata	2 = 6-10%		
Carex nebrascensis	2 = 6-10%		
Alopecurus sp.	2 = 6-10%		

Comments / Problems: **This is a new community type in 2008 that represents a transition of portions CT 3 and/or CT 6.**

Community Number:**10** Community Title (main spp): **Alopecurus pratensis /Mixed Wetland Species**

Dominant Species	% Cover	Dominant Species	% Cover
Alopecurus pratensis	4=21-50%	Poa pratensis	1=1-5%
Phalaris arundinacea	2 = 6-10%		
Scirpus pungens	2 = 6-10%		
Equistem arvense	2 = 6-10%		
Juncus balticus	2 = 6-10%		
Festuca arundinacea	1 = 1-5%		

Comments / Problems: **CT 10 is replacing areas of uplands, noting a stronger transition toward wetter species.**

**VEGETATION COMMUNITIES (continued)**

Community Number:**11** Community Title (main spp): **Salix exigua**

Dominant Species	% Cover	Dominant Species	% Cover
Salix exigua	5 = >50%		
Scirpus microptera	2 = 6-10%		
Phalaris arundinacea	2 = 6-10%		
Glycyrrhiza lepidota	1 = 1-5%		

Comments / Problems: **Scrub-shrub community near the Jack Creek and McKee creek confluence.**

**Additional Activities Checklist:**

- Record and map vegetative communities on aerial photograph.

## COMPREHENSIVE VEGETATION LIST

Plant Species	Vegetation Community Number (s)	Plant Species	Vegetation Community Number (s)
<i>Agropyron dasystachyum</i>	1	<i>Juncus mertensianus</i>	2, 5
<i>Agropyron repens</i>	1, 4	<i>Juncus torreyi</i>	2, 3, 5, 6, 7, 9
<i>Agropyron riparium</i>	4, 5	<i>Kochia scoparia</i>	1
<i>Agropyron trachycaulum</i>	1, 4, 5	<i>Lactuca serriola</i>	9
<i>Agrostis alba</i>	1, 2, 4, 5, 10	<i>Medicago lupulina</i>	5
<i>Alopecurus aequalis</i>	3, 5	<i>Melilotus alba</i>	1, 4
<i>Alopecurus arundinacea</i>	1, 2, 4, 5, 6, 8, 9	<i>Melilotus officinalis</i>	1
<i>Alopecurus pratensis</i>	1, 2, 3, 4, 5, 8, 9, 10	<i>Mentha arvensis</i>	2, 3, 5
<i>Astragalus sp.</i>	1, 5	<i>Muhlenbergia sp.</i>	1, 2, 4
<i>Beckmannia syzigachne</i>	2, 3, 5	<i>Mimulus sp.</i>	2, 5
<i>Bromus inermis</i>	1, 4	<i>Najas sp.</i>	stream
<i>Bromus marginatus</i>	5	<i>Phalaris arundinacea</i>	1, 2, 3, 8, 10, 11
<i>Bromus tectorum</i>	1	<i>Phleum pratense</i>	1
<i>Calamagrostis canadensis</i>	5	<i>Poa palustris</i>	4, 5
<i>Camassia quamash</i>	2, 5	<i>Ranunculus cymbalaria</i>	2, 3
<i>Carduus nutans</i>	5	<i>Poa pratensis</i>	1, 2, 4, 7, 8, 10
<i>Carex aquatilis</i>	2, 3, 6, 7, 9	<i>Poa compressa</i>	1, 4
<i>Carex lanuginosa</i>	2, 3, 5, 7	<i>Polygonum amphibium</i>	7
<i>Carex microptera</i>	2, 7	<i>Populus angustifolia</i>	5
<i>Carex nebrascensis</i>	2, 3, 5, 7, 9	<i>Potentilla anserina</i>	2, 6, 7, 9
<i>Carex utriculata</i>	3, 6, 7, 9	<i>Puccinellia nuttalliana</i>	2, 3
<i>Chenopodium album</i>	1	<i>Rorippa nasturtium-aquaticum</i>	7
<i>Cirsium arvense</i>	1, 2, 4, 5, 6	<i>Rumex crispus</i>	2
<i>Cynoglossum officinale</i>	1, 2, 5	<i>Ruppia maritima</i>	stream
<i>Dactylis glomerata</i>	2	<i>Salix bebbiana</i>	3
<i>Deschampsia cespitosa</i>	2, 5, 7	<i>Salix exigua</i>	3, 5, 11
<i>Distichlis spicata</i>	2, 5	<i>Salix lasiandra</i>	3, 5
<i>Eleocharis acicularis</i>	7	<i>Salsola kali</i>	1
<i>Eleocharis palustris</i>	2, 3, 6, 8, 9	<i>Scirpus microptera</i>	11
<i>Elymus canadensis</i>	1, 4	<i>Scirpus pungens</i>	2, 3, 5, 6, 8, 9, 10
<i>Elymus cinereus</i>	1	<i>Scirpus validus</i>	3, 7, 8
<i>Epilobium ciliatum</i>	2	<i>Sisymbrium altissimum</i>	1
<i>Equisetum arvense</i>	2, 3, 4, 9, 10	<i>Sisyrinchium angustifolium</i>	2
<i>Equisetum hyemale</i>	2	<i>Solidago sp.</i>	2
<i>Festuca arundinacea</i>	1, 2, 4, 6, 7, 10	<i>Spartina gracilis</i>	2
<i>Festuca pratensis</i>	1, 4	<i>Thermopsis montana</i>	2
<i>Glyceria grandis</i>	5	<i>Triglochin palustre</i>	7
<i>Glycyrrhiza lepidota</i>	1, 11	<i>Thlaspi arvense</i>	1
<i>Hieracium aurantiacum</i>	2	<i>Tragopogon dubius</i>	1
<i>Hordeum jubatum</i>	1, 2, 4, 5, 9	<i>Trifolium sp.</i>	5
<i>Hyoseyamus niger</i>	1	<i>Typha latifolia</i>	2, 3, 6, 7, 8, 9, 10
<i>Iris missouriensis</i>	2	<i>Verbascum thapsus</i>	1
<i>Juncus balticus</i>	2, 5, 6, 7, 8, 9, 10	<i>Veronica americana</i>	3, 9
<i>Juncus bufonius</i>	5	<i>Verbena hastata</i>	3
<i>Juncus ensifolius</i>	2, 3, 6, 7		
<i>Juncus longistylis</i>	2, 5		

**Comments / Problems:**



## WILDLIFE

### Birds

Were man-made nesting structures installed? **Yes**

If yes, type of structure: **birdhouse** How many? **1**

Are the nesting structures being used? **NA**

Do the nesting structures need repairs? **Yes**

### Mammals and Herptiles

Mammal and Herptile Species	Number Observed	Indirect Indication of Use			
		Tracks	Scat	Burrows	Other
Muskrat	several lodges	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
White-tailed deer	5 - May, UPL 4 - July, STR/MA 40 - October, MA	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	One winter-killed in fenceline
Elk	May	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Coyote	1 - October	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

#### 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 (°)
A		Transect 1 viewing wetland species moving into uplands north and east of transect	NE
B		Transect 1 eastern side diverse wetland species have replacing foxtail barley	West
C		Transect 1 historic mud flat - vegetated with cattails, bulrush, sedges and spikerush	South
D		Community types 10 and 3	North
E		At fence line – expansion of wetlands to E and S	West
F		Expansion of CT 5 east and southeast	NE
G		Muskrat lodge in cattail/bulrush wetlands	SE
H		Pond along McKee Spring Creek	SE
I		McKee Creek and floodplain vegetation	SE
J		Cottonwood root suckers within creek floodplain	South
K		Increased water levels in the shallow water pond	SE
L		Young cattails developing in litter	South
M		McKee Spring Creek - CT 7 immediately along the waters sedge and CT5 within the floodplain.	East
N		CT 1 and healthy young trees along the southern side of McKee Creek	SE
O		Transect 1 western stake, viewing CT 2.	SE
P		CT 6 and 8 developing in the northwestern portion of the horseshoe.	North
Q		Transect 1 at western stake looking east	East
R		Buffer along far northern project boundary	West
S		Lower reach of McKee Spring Creek	West
T		Lower reach of McKee Spring Creek	East
U		Above the Jack Creek confluence	SE

**Comments / Problems:** \_\_\_\_\_

## GPS SURVEYING

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

### GPS Checklist:

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

Comments / Problems: \_\_\_\_\_

## WETLAND DELINEATION

(attach COE delineation forms)

At each site conduct these checklist items:

- Delineate wetlands according to the 1987 Army COE manual.
  - Delineate wetland – upland boundary onto aerial photograph.
- Yes** Survey wetland – upland boundary with a resource grade GPS survey.

Comments / Problems: **Survey was done in 2004 of the horseshoe wetland and the middle reach of McKee Spring Creek. The lower reach of the spring creek was surveyed in 2008.**

## FUNCTIONAL ASSESSMENT

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

(Also attach any completed abbreviated field forms, if used)

Comments / Problems: **form is completed and included in Appendix B.**

## MAINTENANCE

Were man-made nesting structure installed at this site? **Yes**

If yes, do they need to be repaired? **Yes**

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: **Only 2 wood duck boxes remain attached to the trees and one of these (north one) is hanging askew.**

## MDT WETLAND MONITORING – VEGETATION TRANSECT

Site: **Jack Creek Ranch** Date: **July 10, 2008** Examiner: **CH/PBSJ**

Transect Number: **1** Approximate Transect Length: **1200 feet** Compass Direction from Start: **44°** Note: **East to west**

Vegetation Type: <b>CT 8 (Wetland)</b>	
Length of transect in this type: 68 feet	
Plant Species	Cover
TYPLAT	4 = 21-50%
ALOPRA	4 = 21-50%
SCIPUN	2 = 6-10%
PHAARU	2 = 6-10%
SCIVAL	2 = 6-10%
ALOARU	1 = 1-5%
ELEPAL	1 = 1-5%
POAPRA	1 = 1-5%
PUCNUT	+ = <1%
Surface water	2 = 6-10%
Total Vegetative Cover:	95%

Vegetation Type: <b>CT 9 (Wetland)</b>	
Length of transect in this type: 49 feet	
Plant Species	Cover
SCIPUN	4 = 21-50%
ELEPAL	3 = 11-20%
JUNTOR	3 = 11-20%
CARNEB	1 = 1-5%
CARAQU	1 = 1-5%
CARUTR	1 = 1-5%
VERAME	1 = 1-5%
JUNBAL	1 = 1-5%
TYPLAT	1 = 1-5%
CARLAN	+ = <1
Litter	4 = 21-50%
Total Vegetative Cover:	80%

Vegetation Type: <b>CT 3 (Wetland)</b>	
Length of transect in this type: 126 feet	
Plant Species	Cover
TYPLAT	4 = 21-50%
SCIVAL	3 = 11-20%
SCIPUN	3=11-20%
ELEPAL	2 = 6-10%
CARNEB	1 = 1-5%
CARUTR	1 = 1-5%
EQUARV	1 = 1-5%
RANCYM	+ = <1%
MENARV	+ = <1%
JUNBAL	1 = 1-5%
Surface water (pockets 3 to 6 inches deep)	3 = 11-20%
Total Vegetative Cover:	85%

Vegetation Type: <b>CT10 (Wetland)</b>	
Length of transect in this type: 57 feet	
Plant Species	Cover
ALOPRA	5 = >50%
POAPRA	2 = 6-10%
AGRALB	2 = 6-10%
PHAARU	2 = 6-10%
Surface water	2 = 6-10%
Total Vegetative Cover:	80%

## MDT WETLAND MONITORING – VEGETATION TRANSECT

Site: **Jack Creek Ranch** Date: **July 10, 2008** Examiner: **CH**

Transect Number: **1** Approximate Transect Length: **1200 feet** Compass Direction from Start: **44°** Note: **east to west**

Vegetation Type: <b>CT 1 (Upland)</b>	
Length of transect in this type: 53 feet	
Plant Species	Cover
AGRREP	4 = 21-50%
CIRARV	4 = 21-50%
POAPRA	3 = 11-20%
BROINE	2 = 6-10%
ALOARU	2 = 6-10%
HORJUB	+ = <1%
PHAARU	+ = <1%
AGRTRA	+ = <1%
ELYCAN	+ = <1%
Total Vegetative Cover:	95%

Vegetation Type: <b>CT 10 (Wetland)</b>	
Length of transect in this type: 114 feet	
Plant Species	Cover
ALOPRA	5 = >50%
PHAARU	2 = 6-10%
CIRARV	2 = 6-10%
BROINE	1 = 1-5%
FESARU	1 = 1-5%
EPICIL	1 = 1-5%
Salix cuttings (5% survival)	1 = 1-5%
Litter	3 = 11-20%
Surface water	2 = 6-10%
Total Vegetative Cover:	80%

Vegetation Type: <b>CT 7 (Wetland)</b>	
Length of transect in this type: 344 ft	
Plant Species	Cover
CARSPP	4 = 21-50%
TYPLAT	2 = 6-10%
ALOPRA	2 = 6-10%
JUNENS	2 = 6-10%
JUNBAL	2 = 6-10%
DESCES	2 = 6-10%
POAPRA	2 = 6-10%
FESARU	2 = 6-10%
JUNTOR	1 = 1-5%
Surface water	2 = 6-10%
Total Vegetative Cover:	90%

Vegetation Type: <b>CT 3 (Wetland)</b>	
Length of transect in this type: 40 feet	
Plant Species	Cover
TYPLAT	5 = >50%
SCIVAL	3 = 11-20%
JUNBAL	3 = 11-20%
CARUTR	2 = 6-10%
ALOPRA	2 = 6-10%
JUNENS	1 = 1-5%
CARAQU	1 = 1-5%
ELOACI	1 = 1-5%
Surface water (12 to 18 inches deep)	3 = 11-20%
Total Vegetative Cover:	85%

## MDT WETLAND MONITORING – VEGETATION TRANSECT

Site: **Jack Creek Ranch** Date: **July 10, 2008** Examiner: **CH**

Transect Number: **1** Approximate Transect Length: **1200 feet** Compass Direction from Start: **44°** Note: **east to west**

Vegetation Type : <b>CT 2 (Wetland)</b>	
Length of transect in this type: 37 feet	
Plant Species	Cover
ALOPRA	4 = 21-50%
EQUHYM	2 = 6-10%
SCIPUN	2 = 6-10%
SCIVAL	2 = 6-10%
POAPRA	2 = 6-10%
FESARU	1 = 1-5%
EQUARV	1 = 1-5%
DACGLO	1 = 1-5%
Litter	3 = 11-20%
Total Vegetative Cover	85%

Vegetation Type: <b>CT 1 (Upland)</b>	
Length of transect in this type: 65 feet	
Plant Species	Cover
FESARU	4 = 21-50%
POAPRA	2 = 6-10%
ALOPRA	2 = 6-10%
Surface water	2 = 6-10%
CIRARV	1 = 1-5%
AGRDAS	1 = 1-5%
Total Vegetative Cover	75%

Vegetation Type: <b>CT 8 (Wetland)</b>	
Length of transect in this type: 45 feet	
Plant Species	Cover
TYPLAT	5 = >50%
ALOPRA	3 = 11-20%
JUNBAL	2 = 6-10%
POAPRA	2 = 6-10%
POTANS	1 = 1-5%
JUNTOR	1 = 1-5%
Total Vegetative Cover:	90%

Vegetation Type: <b>CT 1 (Upland)</b>	
Length of transect in this type: 27 feet	
Plant Species	Cover
FESARU	5 = >50%
POAPRA	2 = 6-10%
Litter	3 = 11-20%
Surface water	1 = 1-5%
Total Vegetative Cover:	80%





## MDT WETLAND MONITORING – VEGETATION TRANSECT

### Cover Estimate

+ = < 1%      3 = 11-20%  
1 = 1-5%      4 = 21-50%  
2 = 6-10%     5 = > 50%

### Indicator Class

+ = Obligate  
- = Facultative/Wet  
0 = Facultative

### Source

P = Planted  
V = Volunteer

Percent of perimeter developing wetland vegetation (excluding dam/berm structures): 90%

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 2008

Site: Jack Creek Ranch Date: See Below

Survey Time: 7 AM to 9 AM

Bird Species	#	Behavior	Habitat	Bird Species	#	Behavior	Habitat
<b>May 5, 2008</b>				<b>Species Observed by MDT and/or FWP in 2008:</b>			
Canada Goose	1	F	MA	American Robin			
Cinnamon Teal	2	F	Stream	American White Pelican	(Dead)*		
Mallard	8	F	MA/Stream	Barn Swallow			
Marsh Wren	5	BD	MA	Blue-winged Teal			
Northern Harrier	2	F	MA	Common Merganser			
Northern Shoveler	2	F	MA	Great Blue heron			
Ring-necked Duck	2	F	Stream	Great Horned Owl (and juvenile)			
Red-winged Blackbird	25	BD	MA /Stream/UP	Green-winged Teal			
Savannah Sparrow	3	BD	MA/UP	House Wren			
Wilson's Snipe	4	F	MA/Stream	Killdeer			
<b>July 9, 2008</b>				Mallard			
Cliff Swallow	1		Stream	Marsh Wren			
Common Yellowthroat	3	BD	MA/ Stream	Northern Harrier			
Eastern Kingbird	2	BD	UP/Stream	Osprey			
Great Blue Heron	3	F	Stream	Red-winged Blackbird			
Great Horned Owl (juv.)	2	L	Barn adj to Stream	Sandhill Crane	(Dead)*		
Mallard	25	F	Stream	Sora			
Marsh Wren	8	BD	MA/	Spotted Sandpiper			
Red-winged Blackbird	31	BD	MA/UP /Stream	Trumpeter Swan	(Dead)*	LB also noted on west end of stream: 10/28/08	
Ring-necked Pheasant	1	Flush	Stream	Tree Swallow			
Savannah Sparrow	22	BD	MA/UP /Stream	Wilson's Snipe			
Tree Swallow	4	FO	MA/Stream	Yellow Warbler			
Unident Duck	1	Flush	MA/	Yellow-headed Blackbird			
Western Meadowlark	1	BD	UP/	<b>October 28, 2008</b>			
Wilson's Snipe	4	F BD	MA /Stream	American Wigeon	2	Flushed	MA
Yellow Warbler	1	BD	MA/UP	Black-billed Magpie	2	F	MA
				Mallard	30	Flushed	MA/Stream
				Rough-legged Hawk	1	Flushed	Stream
				Trumpeter Swan	1	Dead-feather pile	
				Unidentified Teal	2	Flushed	Stream

**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  
 SS = Scrub/Shrub  
 UP = Upland buffer  
 WM = Wet meadow

MA = Marsh  
 MF = Mud Flat  
 US = Unconsolidated shore  
 OW = Open Water

Weather: Sunny all 3 observation days

Notes: Stream location indicates wetland fringe along stream.

\*Observed by Tom Hines, MTFWP, 6/10/2008 and Larry Urban, MDT.

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

Project / Site: <b>Jack Creek Ranch</b> Applicant / Owner: <b>MDT</b> Investigator: <b>CH/PBS&amp;J</b>	Date: <b>July 10, 2008</b> County: <b>Madison</b> State: <b>Montana</b>
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Do Normal Circumstances exist on the site? <b>Yes</b> Is the site significantly disturbed (Atypical Situation)? <b>No</b> Is the area a potential Problem Area? <b>No</b> (If needed, explain on reverse side)	Community ID: <b>Upland</b> Transect ID: <b>1</b> Plot ID: <b>SP-1</b>
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**VEGETATION**

Dominant Species	Stratum	Indicator	Dominant Species	Stratum	Indicator
1. <i>AGRREP</i>	Herb	FACU	11.		
2. <i>BROINE</i>	Herb	NI	12.		
3. <i>FESARU</i>	Herb	FACU+	13.		
4. <i>CIRARV</i>	Herb	FACU+	14.		
5. <i>POAPRA</i>	Herb	FACU+	15.		
6. <i>AGRALB</i>	Herb	FACW	16.		
7.			17.		
8.			18.		
9.			19.		
10.			20.		
Percent of Dominant Species that are OBL, FACW, or FAC (excluding FAC-): <b>1 / 6 = 17%</b>			FAC Neutral:     /     =     %		
Remarks: <b>a dominance of thick, tall upland vegetation with a few small patches of Alopecurus pratensis.</b>					

**HYDROLOGY**

<b>Yes</b> Recorded Data (Describe in Remarks): <u>N/A</u> Stream, Lake, or Tide Gauge <u>Yes</u> Aerial Photographs <u>N/A</u> Other  <b>No</b> No Recorded Data	Wetland Hydrology Indicators Primary Indicators: <u>NO</u> Inundated <u>YES</u> Saturated in Upper 12 Inches <u>NO</u> Water Marks <u>NO</u> Drift Lines <u>NO</u> Sediment Deposits <u>NO</u> Drainage Patterns in Wetland  Secondary Indicators (2 or more required): <u>NO</u> Oxidized Root Channels in Upper 12 inches <u>NO</u> Water-Stained Leaves <u>NO</u> Local Soil Survey Data <u>NO</u> FAC-Neutral Test <u>NO</u> Other (Explain in Remarks)
Field Observations: Depth of Surface Water <b>None</b> ____ (in.) Depth to Free Water in Pit <b>None</b> ____ (in.) Depth to Saturated Soil = <b>0</b> (in.)	
Remarks: <b>Soils saturated at the surface.</b>	

**SOILS**

Map Unit Name (Series and Phase): **Fluvaquentic Haplaquolls**  
 Map Symbol: **45** Drainage Class: **poorly drained** Mapped Hydric Inclusion? **\_**  
 Taxonomy (Subgroup): **Clay loam** Field Observations confirm Mapped Type? **Yes**

<b>Profile Description</b>					
<b>Depth (inches)</b>	<b>Horizon</b>	<b>Matrix Color (Munsell Moist)</b>	<b>Mottle Color(s) (Munsell Moist)</b>	<b>Mottle Abundance/Contrast</b>	<b>Texture, Concretions, Structure, etc.</b>
0-4	A	10 YR 3/3	/	N/A	Silt loam
			/	N/A	
4-14	A/B	10 YR 3/1	/	N/A	Silty clay loam
			/	N/A	
		/	/	N/A	
		/	/	N/A	
		/	/	N/A	
		/	/	N/A	

Hydric Soil Indicators:

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

Remarks: **low chroma values below 4 inches.**

**WETLAND DETERMINATION**

Hydrophytic Vegetation Present? <b><u>NO</u></b>	Is this Sampling Point within a Wetland? <b><u>NO</u></b>
Wetland Hydrology Present? <b><u>YES</u></b>	
Hydric Soils Present? <b><u>YES</u></b>	

Remarks: **More than 50% of dominant vegetation species are upland plants; it is likely this area will convert to wetland vegetation with time.**

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

Project / Site: <b>Jack Creek Ranch</b> Applicant / Owner: <b>MDT</b> Investigator: <b>CH/PBS&amp;J</b>	Date: <b>July 10, 2008</b> County: <b>Madison</b> State: <b>Montana</b>
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Do Normal Circumstances exist on the site? <b>Yes</b> Is the site significantly disturbed (Atypical Situation)? <b>No</b> Is the area a potential Problem Area? <b>No</b> (If needed, explain on reverse side)	Community ID: <b>Upland</b> Transect ID: <b>1</b> Plot ID: <b>SP-2</b>
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**VEGETATION**

Dominant Species	Stratum	Indicator	Dominant Species	Stratum	Indicator
1. <i>AGRREP</i>	Herb	FACU	11.		
2. <i>BROINE</i>	Herb	NI	12.		
3. <i>CIRARV</i>	Herb	FACU+	13.		
4. <i>POAPRA</i>	Herb	FACU+	14.		
5. <i>HORJUB</i>	Herb	FAC+	15.		
6. <i>PHLARU</i>	Herb	FACW	16.		
7. <i>ALOARU</i>	Herb	NI	17.		
8.			18.		
9.			19.		
10.			20.		
Percent of Dominant Species that are OBL, FACW, or FAC (excluding FAC-): <b>2 / 7 = 29%</b>			FAC Neutral:     /     =     %		
Remarks: <b>29 % hydrophytic vegetation</b>					

**HYDROLOGY**

<b>Yes</b> Recorded Data (Describe in Remarks): <u>N/A</u> Stream, Lake, or Tide Gauge <u>Yes</u> Aerial Photographs <u>N/A</u> Other  <b>No</b> No Recorded Data	Wetland Hydrology Indicators Primary Indicators: <u>NO</u> Inundated <u>YES</u> Saturated in Upper 12 Inches <u>NO</u> Water Marks <u>NO</u> Drift Lines <u>NO</u> Sediment Deposits <u>NO</u> Drainage Patterns in Wetland  Secondary Indicators (2 or more required): <u>NO</u> Oxidized Root Channels in Upper 12 inches <u>NO</u> Water-Stained Leaves <u>NO</u> Local Soil Survey Data <u>NO</u> FAC-Neutral Test <u>NO</u> Other (Explain in Remarks)
Field Observations:  Depth of Surface Water <u>N/A</u> ____ (in.)  Depth to Free Water in Pit > <u>8</u> (in.)  Depth to Saturated Soil = <u>0</u> (in.)	
Remarks: <b>In 2006, this area portion of the horseshoe was inundated. In 2007 soils were moist at 12 inches but not saturated. This year (2008) soils were saturated to the surface with water in the pit at 8 inches.</b>	

## SOILS

Map Unit Name (Series and Phase): <b>Fluvaquentic Haplaquolls</b>					
Map Symbol: <b>45</b> Drainage Class: <b>poorly-drained</b> Mapped Hydric Inclusion? <b>_</b>					
Taxonomy (Subgroup): <b>Silty clay</b> Field Observations confirm Mapped Type? <b>Yes</b>					
Profile Description					
Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Color(s) (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-5	A	10 YR 5/2	/ /	N/A N/A	Silty clay loam
5-12	A/B	10 YR 4/1	/ /	N/A N/A	Silty clay
		/	/ /	N/A N/A	
		/	/ /	N/A N/A	
		/	/ /	N/A N/A	
Hydric Soil Indicators:					
<b><u>NO</u></b> Histosol		<b><u>NO</u></b> Concretions			
<b><u>NO</u></b> Histic Epipedon		<b><u>NO</u></b> High Organic Content in Surface Layer in Sandy Soils			
<b><u>NO</u></b> Sulfidic Odor		<b><u>NO</u></b> Organic Streaking in Sandy Soils			
<b><u>NO</u></b> Aquic Moisture Regime		<b><u>NO</u></b> Listed on Local Hydric Soils List			
<b><u>NO</u></b> Reducing Conditions		<b><u>NO</u></b> Listed on National Hydric Soils List			
<b><u>YES</u></b> Gleyed or Low-Chroma Colors		<b><u>NO</u></b> Other (Explain in Remarks)			
Remarks: <b>Hydric soils - low chroma value</b>					

## WETLAND DETERMINATION

Hydrophytic Vegetation Present? <b><u>NO</u></b>	Is this Sampling Point within a Wetland? <b><u>NO</u></b>
Wetland Hydrology Present? <b><u>YES</u></b>	
Hydric Soils Present? <b><u>YES</u></b>	
Remarks: <b>More than 50% of dominant vegetation species are upland plants; it is likely this area will convert to wetland vegetation with time. Starting to see patches of wetland vegetation in this area.</b>	

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

Project / Site: <b>Jack Creek Ranch</b> Applicant / Owner: <b>MDT</b> Investigator: <b>CH/PBS&amp;J</b>	Date: <b>July 10, 2008</b> County: <b>Madison</b> State: <b>Montana</b>
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Do Normal Circumstances exist on the site? <b>Yes</b> Is the site significantly disturbed (Atypical Situation)? <b>No</b> Is the area a potential Problem Area? <b>No</b> (If needed, explain on reverse side)	Community ID: <b>Wetland</b> Transect ID: <b>1</b> Plot ID: <b>SP-3</b>
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**VEGETATION**

Dominant Species	Stratum	Indicator	Dominant Species	Stratum	Indicator
1. <i>ALOPRA</i>	Herb	FACW	11.		
2. <i>CARLAN</i>	Herb	OBL	12.		
3. <i>CARNEB</i>	Herb	OBL	13.		
4. <i>ELEPAL</i>	Herb	OBL	14.		
5. <i>CARUTR</i>	Herb	OBL	15.		
6. <i>TYPLAT</i>	Herb	OBL	16.		
7. <i>FESARU</i>	Herb	FACU-	17.		
8. <i>JUNBAL</i>	Herb	OBL	18.		
9. <i>I</i>			19.		
10.			20.		
Percent of Dominant Species that are OBL, FACW, or FAC (excluding FAC-): 7 / 8 = 88%			FAC Neutral:     /     =     %		
Remarks: <b>88% hydrophytic vegetation</b>					

**HYDROLOGY**

<b>Yes</b> Recorded Data (Describe in Remarks): <u>N/A</u> Stream, Lake, or Tide Gauge <u>Yes</u> Aerial Photographs <u>N/A</u> Other  <b>No</b> No Recorded Data	Wetland Hydrology Indicators Primary Indicators: <u>NO</u> Inundated <u>YES</u> Saturated in Upper 12 Inches <u>NO</u> Water Marks <u>NO</u> Drift Lines <u>NO</u> Sediment Deposits <u>NO</u> Drainage Patterns in Wetland Secondary Indicators (2 or more required): <u>NO</u> Oxidized Root Channels in Upper 12 inches <u>NO</u> Water-Stained Leaves <u>NO</u> Local Soil Survey Data <u>NO</u> FAC-Neutral Test <u>NO</u> Other (Explain in Remarks)
Field Observations: Depth of Surface Water = <u>1</u> (in.) Depth to Free Water in Pit = <u>6</u> (in.) Depth to Saturated Soil = <u>0</u> (in.)	
Remarks: <b>Pockets of surface water, soils saturated to the surface and water in the pit at 6 inches.</b>	

## SOILS

Map Unit Name (Series and Phase): **Fluvaquentic Haplaquolls**  
 Map Symbol: **45** Drainage Class: **poorly drained** Mapped Hydric Inclusion? **\_**  
 Taxonomy (Subgroup): **Clay loam** Field Observations confirm Mapped Type? **Yes**

Profile Description					
Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Color(s) (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-4		10 YR 3/1	/	N/A	Silt
			/	N/A	
4-14	A/B	10 YR 3/1	/	N/A	Silt loam
			/	N/A	
		/	/	N/A	
		/	/	N/A	
		/	/	N/A	
		/	/	N/A	

Hydric Soil Indicators:

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

## WETLAND DETERMINATION

Hydrophytic Vegetation Present? <b><u>YES</u></b>	Is this Sampling Point within a Wetland? <b><u>YES</u></b>
Wetland Hydrology Present? <b><u>YES</u></b>	
Hydric Soils Present? <b><u>YES</u></b>	

Remarks: **New wetland community type in 2008**

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

Project / Site: <b>Jack Creek Ranch</b> Applicant / Owner: <b>MDT</b> Investigator: <b>CH/PBS&amp;J</b>	Date: <b>July 11, 2008</b> County: <b>Madison</b> State: <b>Montana</b>
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Do Normal Circumstances exist on the site? <b>Yes</b> Is the site significantly disturbed (Atypical Situation)? <b>No</b> Is the area a potential Problem Area? <b>No</b> (If needed, explain on reverse side)	Community ID: <b>Wetland</b> Transect ID: _____ Plot ID: <b>SP-4</b>
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**VEGETATION**

Dominant Species	Stratum	Indicator	Dominant Species	Stratum	Indicator
1. <i>SCIPUN</i>	Herb	OBL	11.		
2. <i>CARAQU</i>	Herb	OBL	12.		
3. <i>GLYELA</i>	Herb	FACW+	13.		
4. <i>POTANS</i>	Herb	OBL	14.		
5. <i>JUNBAL</i>	Herb	OBL	15.		
6. <i>CARNEB</i>	Herb	OBL	16.		
7. <i>FESARU</i>	Herb	FACU-	17.		
8. <i>ALOPRA</i>	Herb	FACW	18.		
9.			19.		
10.			20.		
Percent of Dominant Species that are OBL, FACW, or FAC (excluding FAC-): 7 / 8 = 88%			FAC Neutral:     /     =     %		
Remarks: <b>88% hydrophytic vegetation</b>					

**HYDROLOGY**

<b>Yes</b> Recorded Data (Describe in Remarks): <u>N/A</u> Stream, Lake, or Tide Gauge <u>Yes</u> Aerial Photographs <u>N/A</u> Other  <b>No</b> No Recorded Data	Wetland Hydrology Indicators Primary Indicators: <u>NO</u> Inundated <u>YES</u> Saturated in Upper 12 Inches <u>NO</u> Water Marks <u>NO</u> Drift Lines <u>NO</u> Sediment Deposits <u>NO</u> Drainage Patterns in Wetland  Secondary Indicators (2 or more required): <u>NO</u> Oxidized Root Channels in Upper 12 inches <u>NO</u> Water-Stained Leaves <u>NO</u> Local Soil Survey Data <u>NO</u> FAC-Neutral Test <u>NO</u> Other (Explain in Remarks)
Field Observations: Depth of Surface Water <u>N/A</u> ____ (in.) Depth to Free Water in Pit <u>N/A</u> ____ (in.) Depth to Saturated Soil = <u>0</u> (in.)	
Remarks: <b>Soil pit located approximately 25 feet north of channel. Low floodplain, soils saturated to the surface.</b>	

**SOILS**

Map Unit Name (Series and Phase): **Ustic Torrfluvents**  
 Map Symbol: **107** Drainage Class: **well-drained** Mapped Hydric Inclusion? **\_**  
 Taxonomy (Subgroup): **Gravelly alluvium** Field Observations confirm Mapped Type? **No**

<b>Profile Description</b>					
<b>Depth (inches)</b>	<b>Horizon</b>	<b>Matrix Color (Munsell Moist)</b>	<b>Mottle Color(s) (Munsell Moist)</b>	<b>Mottle Abundance/Contrast</b>	<b>Texture, Concretions, Structure, etc.</b>
0-12	A	10 YR 4/1	7.5 YR 4/4	Common Prominent	Clay loam
		/	/	N/A	
		/	/	N/A	
		/	/	N/A	
		/	/	N/A	
		/	/	N/A	
		/	/	N/A	

Hydric Soil Indicators:

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

Remarks: **low chroma values and mottles**

**WETLAND DETERMINATION**

Hydrophytic Vegetation Present? <b><u>YES</u></b>	Is this Sampling Point within a Wetland? <b><u>YES</u></b>
Wetland Hydrology Present? <b><u>YES</u></b>	
Hydric Soils Present? <b><u>YES</u></b>	

Remarks: **Floodplain wetland bordering the lower reach of McKee Spring Creek.**

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

Project / Site: <b>Jack Creek Ranch</b> Applicant / Owner: <b>MDT</b> Investigator: <b>CH/PBS&amp;J</b>	Date: <b>July 11, 2008</b> County: <b>Madison</b> State: <b>Montana</b>
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Do Normal Circumstances exist on the site? <b>Yes</b> Is the site significantly disturbed (Atypical Situation)? <b>No</b> Is the area a potential Problem Area? <b>No</b> (If needed, explain on reverse side)	Community ID: <b>Upland</b> Transect ID: _____ Plot ID: <b>SP-5</b>
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**VEGETATION**

Dominant Species	Stratum	Indicator	Dominant Species	Stratum	Indicator
1. <i>MELOFF</i>	Herb	FACU	11.		
2. <i>DESCES</i>	Herb	FACW	12.		
3. <i>ALOPRA</i>	Herb	FACW	13.		
4.			14.		
5.			15.		
6.			16.		
7.			17.		
8.			18.		
9.			19.		
10.			20.		
Percent of Dominant Species that are OBL, FACW, or FAC (excluding FAC-): 2 / 3 = 67%			FAC Neutral:     /     =     %		
Remarks: <b>67% hydrophytic vegetation</b>					

**HYDROLOGY**

<b>Yes</b> Recorded Data (Describe in Remarks): <u>N/A</u> Stream, Lake, or Tide Gauge <u>Yes</u> Aerial Photographs <u>N/A</u> Other  <b>No</b> No Recorded Data	Wetland Hydrology Indicators Primary Indicators: <u>NO</u> Inundated <u>YES</u> Saturated in Upper 12 Inches <u>NO</u> Water Marks <u>NO</u> Drift Lines <u>NO</u> Sediment Deposits <u>NO</u> Drainage Patterns in Wetland  Secondary Indicators (2 or more required): <u>NO</u> Oxidized Root Channels in Upper 12 inches <u>NO</u> Water-Stained Leaves <u>NO</u> Local Soil Survey Data <u>NO</u> FAC-Neutral Test <u>NO</u> Other (Explain in Remarks)
Field Observations: Depth of Surface Water <u>N/A</u> ____ (in.) Depth to Free Water in Pit <u>N/A</u> ____ (in.) Depth to Saturated Soil = <u>0</u> (in.)	
Remarks: <b>Soil pit located within the floodplain of the lower reach of McKee creek.</b>	

**SOILS**

Map Unit Name (Series and Phase): **Ustic Torrifuvents**  
 Map Symbol: **107** Drainage Class: **well-drained** Mapped Hydric Inclusion? **\_**  
 Taxonomy (Subgroup): **Gravelly alluvium** Field Observations confirm Mapped Type? **No**

<b>Profile Description</b>					
<b>Depth (inches)</b>	<b>Horizon</b>	<b>Matrix Color (Munsell Moist)</b>	<b>Mottle Color(s) (Munsell Moist)</b>	<b>Mottle Abundance/Contrast</b>	<b>Texture, Concretions, Structure, etc.</b>
0-4	A	10 YR 5/2	/	N/A	Silt Loam
			/	N/A	
4-12	A/B	10 YR 6/3	/	N/A	Silty Clay Loam
			/	N/A	
		/	/	N/A	
		/	/	N/A	
		/	/	N/A	
		/	/	N/A	

Hydric Soil Indicators:

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

Remarks: **hydric soils not present at this sampling point**

**WETLAND DETERMINATION**

Hydrophytic Vegetation Present? <b><u>YES</u></b>	Is this Sampling Point within a Wetland? <b><u>NO</u></b>
Wetland Hydrology Present? <b><u>YES</u></b>	
Hydric Soils Present? <b><u>NO</u></b>	

Remarks: **Floodplain bordering the lower reach of McKee Spring Creek.**

# MDT MONTANA WETLAND ASSESSMENT FORM (revised March 2008)

1. **Project Name:** MDT - Wetland Mitigation Monitoring 2. **MDT Project #:** STPX BR29(37) 3. **Control #:** 5229

3. **Evaluation Date:** 7/10/2008 4. **Evaluator(s):** CH (PBS&J) 5. **Wetland/Site #(s):** Jack Creek Ranch

6. **Wetland Location(s):** Township 5 N, Range 1 W, Section 25 & 26; Township     N, Range     E, Section    

**Approximate Stationing or Roadposts:**           

**Watershed:** 6 - Upper Missouri **County:**             Madison

7. **Evaluating Agency:** PBS&J

8. **Wetland Size (acre):** 65.40 (visually estimated)  
           (measured, e.g. GPS)

**Purpose of Evaluation:**

- Wetland potentially affected by MDT project
- Mitigation wetlands; pre-construction
- Mitigation wetlands; post-construction
- Other

9. **Assessment Area (AA) Size (acre):** 65.40 (visually estimated)  
(see manual for determining AA)            (measured, e.g. GPS)

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

HGM Class (Brinson)	Class (Cowardin)	Modifier (Cowardin)	Water Regime	% OF AA
Depressional	Emergent Wetland		Seasonal / Intermittent	80
Riverine	Unconsolidated Bottom	Excavated	Permanent / Perennial	20

**Comments:**           

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

**12. GENERAL CONDITION OF AA**

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

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

**Comments** (types of disturbance, intensity, season, etc.): Prior to mitigation work this site was heavily grazed - some residential development in area.

ii. **Prominent noxious, aquatic nuisance, and other exotic vegetation species:** Weeds include Canada thistle, hounds tongue and orange hawkweed.

iii. **Provide brief descriptive summary of AA and surrounding land use/habitat:** Livestock grazing and hay production

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

**Comments:** PEM and a few scatter cottonwood and willows.

Wetland/Site #(s): Jack Creek 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 Gray wolf
- 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	---	---	---	---	---	.1L	0L

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

**14B. HABITAT FOR PLANTS OR ANIMALS RATED S1, S2, OR S3 BY THE MONTANA NATURAL HERITAGE PROGRAM**

Do not include species listed in 14A above.

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

- Primary or critical habitat (list species)  D  S \_\_\_\_\_
- Secondary habitat (list species)  D  S Peregrine falcon
- Incidental habitat (list species)  D  S Arctic grayling, bald eagle (S3)
- No usable habitat  S

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

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

Sources for documented use (e.g. observations, records): Other species include a Trumpeter swan.

**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)	<input type="checkbox"/> High								<input checked="" type="checkbox"/> Moderate								<input type="checkbox"/> Low			
	<input type="checkbox"/> Even				<input type="checkbox"/> Uneven				<input checked="" type="checkbox"/> Even				<input type="checkbox"/> Uneven				<input type="checkbox"/> Even			
Class Cover Distribution (all vegetated classes)																				
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
<input type="checkbox"/> Low Disturbance at AA (see #12i)	---	---	---	---	---	---	---	---	E	---	---	---	---	---	---	---	---	---	---	---
<input type="checkbox"/> Moderate Disturbance at AA (see #12i)	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
<input type="checkbox"/> 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)			
	<input checked="" type="checkbox"/> Exceptional	<input type="checkbox"/> High	<input type="checkbox"/> Moderate	<input type="checkbox"/> Low
<input checked="" type="checkbox"/> Substantial	1E	---	---	---
<input type="checkbox"/> Moderate	---	---	---	---
<input type="checkbox"/> Minimal	---	---	---	---

Comments: \_

Wetland/Site #(s): Jack Creek 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	<input checked="" type="checkbox"/> Permanent / Perennial						<input type="checkbox"/> Seasonal / Intermittent						<input type="checkbox"/> Temporary / Ephemeral					
	<input type="checkbox"/> Optimal		<input checked="" type="checkbox"/> Adequate		<input type="checkbox"/> Poor		<input type="checkbox"/> Optimal		<input type="checkbox"/> Adequate		<input type="checkbox"/> Poor		<input type="checkbox"/> Optimal		<input type="checkbox"/> Adequate		<input type="checkbox"/> Poor	
Aquatic Hiding / Resting / Escape Cover	O	S	O	S	O	S	O	S	O	S	O	S	O	S	O	S	O	S
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	---	---	.6M	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
FWP Non-Game Tier IV or No fish species	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

Sources used for identifying fish spp. potentially found in AA: George Liknes FWP, Tom Coleman Oasis

**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  NO

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 **ia** 0.1 = \_\_\_ or  NO

**iii. Final Score and Rating:** .7M (both Tier II and III have been documented in McKee spring creek).

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

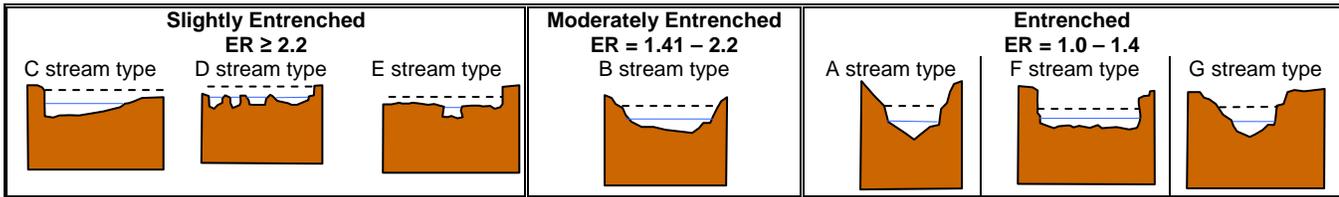
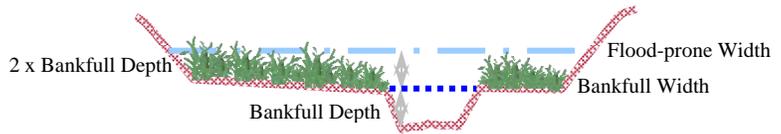
Applies only to wetlands that are subject to flooding via in-channel or overbank flow.

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)	<input checked="" type="checkbox"/> Slightly Entrenched C, D, E stream types			<input type="checkbox"/> Moderately Entrenched B stream type			<input type="checkbox"/> Entrenched A, F, G stream types		
Percent of Flooded Wetland Classified as Forested and/or Scrub/Shrub	<input type="checkbox"/> 75%	<input type="checkbox"/> 25-75%	<input checked="" type="checkbox"/> <25%	<input type="checkbox"/> 75%	<input type="checkbox"/> 25-75%	<input type="checkbox"/> <25%	<input type="checkbox"/> 75%	<input type="checkbox"/> 25-75%	<input type="checkbox"/> <25%
AA contains no outlet or restricted outlet	---	---	---	---	---	---	---	---	---
AA contains unrestricted outlet	---	---	.5M	---	---	---	---	---	---

**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): Jack Creek 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	<input checked="" type="checkbox"/> >5 acre feet			<input type="checkbox"/> 1.1 to 5 acre feet			<input type="checkbox"/> ≤1 acre foot		
	<input type="checkbox"/> P/P	<input checked="" type="checkbox"/> S/I	<input type="checkbox"/> T/E	<input type="checkbox"/> P/P	<input type="checkbox"/> S/I	<input type="checkbox"/> T/E	<input type="checkbox"/> P/P	<input type="checkbox"/> S/I	<input type="checkbox"/> T/E
Wetlands in AA flood or pond ≥ 5 out of 10 years	---	.9H	---	---	---	---	---	---	---
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.			
	<input checked="" type="checkbox"/> ≥ 70%		<input type="checkbox"/> < 70%		<input type="checkbox"/> ≥ 70%		<input type="checkbox"/> < 70%	
Evidence of Flooding / Ponding in AA	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Yes	<input type="checkbox"/> No
AA contains no or restricted outlet	---	---	---	---	---	---	---	---
AA contains unrestricted outlet	.9H	---	---	---	---	---	---	---

Comments: \_\_\_\_\_

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

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

% Cover of Wetland Streambank or Shoreline by Species with Stability Ratings of ≥6 (see Appendix F).	Duration of Surface Water Adjacent to Rooted Vegetation		
	<input checked="" type="checkbox"/> Permanent / Perennial	<input type="checkbox"/> Seasonal / Intermittent	<input type="checkbox"/> Temporary / Ephemeral
<input checked="" type="checkbox"/> ≥ 65%	1H	---	---
<input type="checkbox"/> 35-64%	---	---	---
<input type="checkbox"/> < 35%	---	---	---

Comments: Shoreline vegetation continues to become established.

**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)		
	<input checked="" type="checkbox"/> E/H	<input type="checkbox"/> M	<input type="checkbox"/> L
<input type="checkbox"/> E/H	---	---	---
<input checked="" type="checkbox"/> M	H	---	---
<input type="checkbox"/> L	---	---	---
<input type="checkbox"/> NA	---	---	---

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

A	<input checked="" type="checkbox"/> Vegetated Component >5 acres						<input type="checkbox"/> Vegetated Component 1-5 acres						<input type="checkbox"/> Vegetated Component <1 acre					
	<input type="checkbox"/> High		<input checked="" type="checkbox"/> Moderate		<input type="checkbox"/> Low		<input type="checkbox"/> High		<input type="checkbox"/> Moderate		<input type="checkbox"/> Low		<input type="checkbox"/> High		<input type="checkbox"/> Moderate		<input type="checkbox"/> Low	
C	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
P/P	---	---	---	.5M	---	---	---	---	---	---	---	---	---	---	---	---	---	---
S/I	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
T/E/A	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

Wetland/Site #(s): Jack Creek 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 = 0.80  **NO**

iv. **Final Score and Rating:** .8H **Comments:** \_\_\_\_\_

**14J. GROUNDWATER DISCHARGE / RECHARGE**

Check the appropriate indicators in i and ii below.

**i. Discharge Indicators**

- The AA is a slope wetland.
- Springs or seeps are known or observed.
- Vegetation growing during dormant season/drought.
- Wetland occurs at the toe of a natural slope.
- Seeps are present at the wetland edge.
- AA permanently flooded during drought periods.
- Wetland contains an outlet, but no inlet.
- Shallow water table and the site is saturated to the surface.
- Other: \_\_\_\_\_

**ii. Recharge Indicators**

- Permeable substrate present without underlying impeding layer.
- Wetland contains inlet but no outlet.
- Stream is a known 'losing' stream. Discharge volume decreases.
- Other: \_\_\_\_\_

iii. **Rating:** Use the information from i and ii above and the table below to select the functional point and rating.

Criteria	Duration of Saturation at AA Wetlands <i>FROM GROUNDWATER DISCHARGE</i> or <i>WITH WATER THAT IS RECHARGING THE GROUNDWATER SYSTEM</i>			
	<input checked="" type="checkbox"/> P/P	<input type="checkbox"/> S/I	<input type="checkbox"/> T	<input type="checkbox"/> None
<input checked="" type="checkbox"/> Groundwater Discharge or Recharge	1H	---	---	---
<input type="checkbox"/> Insufficient Data/Information			---	

Comments: \_\_\_\_\_

**14K. UNIQUENESS**

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

Replacement Potential	AA contains fen, bog, warm springs or mature (>80 yr-old) forested wetland OR plant association listed as "S1" by the MTNHP			AA does not contain previously cited rare types AND structural diversity (#13) is high OR contains plant association listed as "S2" by the MTNHP			AA does not contain previously cited rare types OR associations AND structural diversity (#13) is low-moderate		
	<input type="checkbox"/> Rare	<input type="checkbox"/> Common	<input type="checkbox"/> Abundant	<input type="checkbox"/> Rare	<input type="checkbox"/> Common	<input type="checkbox"/> Abundant	<input type="checkbox"/> Rare	<input checked="" type="checkbox"/> Common	<input type="checkbox"/> Abundant
<input checked="" type="checkbox"/> <b>Low Disturbance</b> at AA (#12i)	---	---	---	---	---	---	---	.4M	---
<input type="checkbox"/> <b>Moderate Disturbance</b> at AA (#12i)	---	---	---	---	---	---	---	---	---
<input type="checkbox"/> <b>High Disturbance</b> at AA (#12i)	---	---	---	---	---	---	---	---	---

Comments: The site currently has a low level of disturbance.

**14L. RECREATION / EDUCATION POTENTIAL**

NA (proceed to Overall Summary and Rating page)

Affords 'bonus' points if AA provides a recreational or educational opportunity.

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

ii. **Check categories that apply to the AA:**  Educational/Scientific Study  Consumptive Recreational  Non-consumptive recreational  Other: \_\_\_\_\_

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

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

Comments: wetland is located within an active cattle ranch.

15. **GENERAL SITE NOTES:** \_\_\_\_\_

Wetland/Site #(s): Jack Creek 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 0.10	1.00		
B. MT Natural Heritage Program Species Habitat	mod 0.50	1.00		
C. General Wildlife Habitat	exc 1.00	1.00		*
D. General Fish Habitat	mod 0.60	1.00		
E. Flood Attenuation	mod 0.50	1.00		
F. Short and Long Term Surface Water Storage	high 0.90	1.00		*
G. Sediment / Nutrient / Toxicant Removal	high 0.90	1.00		
H. Sediment / Shoreline Stabilization	high 1.00	1.00		*
I. Production Export / Food Chain Support	high 0.80	1.00		
J. Groundwater Discharge / Recharge	high 1.00	1.00		*
K. Uniqueness	mod 0.40	1.00		
L. Recreation / Education Potential (bonus point)	mod 0.10			
<b>Total Points</b>	<b>7.8</b>	<b>11</b>	<b>510.12 Total Functional Units</b>	
<b>Percent of Possible Score 71%</b> (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**

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### **2008 REPRESENTATIVE PHOTOGRAPHS**

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*MDT Wetland Mitigation Monitoring  
Jack Creek Ranch  
Ennis, Montana*

## JACK CREEK RANCH WETLAND MITIGATION SITE 2008



**Location A:** Transect 1, cattails, creeping foxtail and three-square bulrush encroaching into uplands north and east of transect. **Compass Reading:** NE



**Location B:** Transect 1, eastern stake, diverse wetland species have replaced foxtail barley. **Compass Reading:** West



**Location C:** Transect 1 historic mud flat vegetated with cattails, bulrush, sedges and spikerush. **Compass Reading:** South



**Location D:** Community type 10 and 3. **Compass Reading:** North



**Location E:** At fenceline, expansion of wetlands to east and south. **Compass Reading:** West



**Location F:** Community type 5 on both sides of the road. **Compass Reading:** Northeast

## JACK CREEK RANCH WETLAND MITIGATION SITE 2008



**Location G.** Muskrat lodge in cattails/bulrush wetlands created by low head berm. Increased water depths compared to 2007. **Compass Reading:** Southeast



**Location H:** Pond along McKee Spring Creek. Water levels approximately 6 inches higher in 2008 compared to 2007. **Compass Reading:** Southeast



**Location I.** McKee Spring Creek and floodplain. Note sedge and rush wetlands along waters edge and creeping foxtail litter in floodplain. **Compass Reading:** Southeast



**Location J:** Cottonwood seedlings within the McKee Spring Creek floodplain, photo taken approximately 100 ft from an existing tree. **Compass Reading:** South



**Location K.** Increased water levels in the shallow water pond compared to 2007. **Compass Reading:** Southeast



**Location L.** Young cattails developing within creeping foxtail plants and litter. **Compass Reading:** South

## JACK CREEK RANCH WETLAND MITIGATION SITE 2008



**Location M.** McKee Spring Creek at western project boundary – CT 7 along the waters edge and CT 5 represents the wetland vegetation within the floodplain.

**Compass Reading:** East



**Location N.** CT 1 and healthy young trees thrive along the south side of McKee Spring Creek.

**Compass Reading:** Southeast



**Location O.** Transect 1 western stake, viewing CT 2.

**Compass Reading:** Southeast



**Location P:** Wetland community types 6 and 8 developing in the northwestern portion of the Horseshoe.

**Compass Reading:** North



**Location Q:** Transect 1 western stake facing east.

**Compass Reading:** East



**Location R:** Buffer along far northern project boundary.

**Compass Reading:** West

## JACK CREEK RANCH WETLAND MITIGATION SITE 2008



**Location S:** New photo of the lower reach of the McKee Spring Creek. Photo taken at the fence.

**Compass Reading:** West



**Location T:** New photo of the lower reach of the McKee Spring Creek. Photo taken at the bridge crossing.

**Compass Reading:** East



**Location U:** New photo of the lower reach of McKee Spring Creek. Photo taken near the Jack Creek confluence.

**Compass Reading:** Southeast

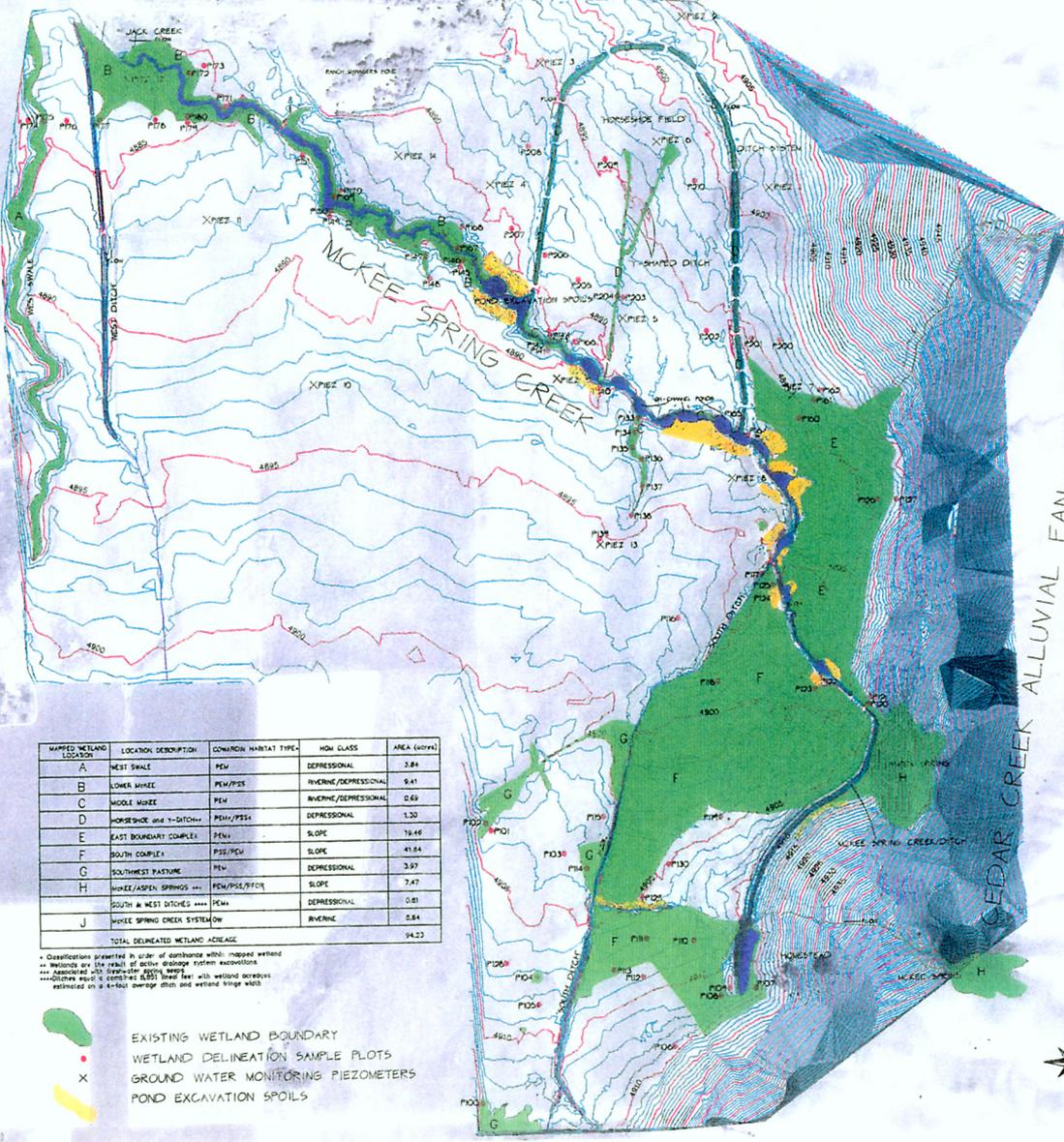
## **Appendix D**

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### **PROPOSED WETLAND MITIGATION SITE MAP**

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*MDT Wetland Mitigation Monitoring  
Jack Creek Ranch  
Ennis, Montana*



MAPPED WETLAND LOCATION	LOCATION DESCRIPTION	COMMON HABITAT TYPE	HOW CLASS	AREA (ACRES)
A	WEST SWALE	PEW	DEPRESSIONAL	3.84
B	LOWER MARSH	PEW/PSR	RIVERINE/DEPRESSIONAL	8.41
C	MIDDLE MARSH	PEW	RIVERINE/DEPRESSIONAL	0.69
D	HORSESHOE and T-DITCH	PEM/PSR	DEPRESSIONAL	1.50
E	EAST BOUNDARY COMPLEX	PEM	SLOPE	19.46
F	SOUTH COMPLEX	PSS/PEW	SLOPE	41.64
G	SOUTHWEST PASTURE	PEW	DEPRESSIONAL	3.97
H	MCKEE/ASPER SPRINGS	PEM/PSR/SFCR	SLOPE	7.47
	SOUTH & WEST DITCHES	PEM	DEPRESSIONAL	0.81
J	MCKEE SPRING CREEK SYSTEM	OW	RIVERINE	0.54
TOTAL DELINEATED WETLAND ACRES				94.23

\* Delineations presented by color of composite which mapped wetland  
 \*\* Wetlands are the result of sector discharge from excavations  
 \*\*\* Associated with contour ditch system  
 \*\*\*\* Inductive equal & contour ditch with wetland depression estimated on a 4-foot average ditch and wetland slope width

- EXISTING WETLAND BOUNDARY
- WETLAND DELINEATION SAMPLE PLOTS
- GROUND WATER MONITORING PIEZOMETERS
- POND EXCAVATION SPOILS

80 North Street, Island Dr.  
 Livingston, NJ 07047  
 Phone: 908.237.7700  
 Fax: 908.237.7700



JACK CREEK RANCH  
 SITE PLAN

EXISTING CONDITIONS  
 WETLAND DELINEATION

REVISIONS	DATE	BY

DATE: 8/15/02  
 SCALE: 1" = 700'  
 DRAWN BY: INTERVIEW, INC.  
 SHEET

## **Appendix E**

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### **BIRD SURVEY PROTOCOL GPS PROTOCOL**

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*MDT Wetland Mitigation Monitoring  
Jack Creek Ranch  
Ennis, Montana*

## BIRD SURVEY PROTOCOL

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

### Survey Area

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

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

### Survey Time

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

### Data Recording

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

## BIRD SURVEY PROTOCOL (continued)

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

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

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

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

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

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

### Other Fields

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

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

**Date:** Record the date of the bird survey.

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

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

## **GPS MAPPING AND AERIAL PHOTO REFERENCING PROCEDURE**

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

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

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

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

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

## **Appendix F**

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### **2008 MACROINVERTEBRATE SAMPLING PROTOCOL AND DATA**

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*MDT Wetland Mitigation Monitoring  
Jack Creek Ranch  
Ennis, Montana*

# AQUATIC INVERTEBRATE SAMPLING PROTOCOL

## Equipment List

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

## Site Selection

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

## Sampling Procedure

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

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

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

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

Photograph each macroinvertebrate sampling site.

## Sample Handling/Delivery

In the field, keep sample jars cool by placing in a cooler with a small amount of ice.

Deliver samples to the PBS&J office in Missoula, where they will be inventoried and delivered to Rhithron Associates, Inc.

**MDT Mitigated Wetland Monitoring Project: Aquatic Invertebrate Monitoring  
Summary 2001 – 2008**

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

## **INTRODUCTION**

This report summarizes data generated from eight years of mitigated wetland monitoring from sites throughout the State of Montana. Over all years of sampling, a total of 210 invertebrate samples have been collected. Table 1 lists the currently monitored sites at which aquatic invertebrates were collected in 2008, and summarizes the sampling history of each.

## **METHODS**

### **Sample processing**

Aquatic invertebrate samples were collected at mitigated wetland sites in the summer months of 2001, 2002, 2003, 2004, 2005, 2006, 2007, and 2008 by personnel of PBS&J (Table 1). Sampling procedures were based on the protocols developed by the Montana Department of Environmental Quality (MDEQ) for wetland sampling. Sampling consisted of D-frame net sweeps through emergent vegetation (when present), the water column, and over the water surface, and included disturbing and scraping substrates at each sampled site. These sample components were composited and preserved in ethanol at each wetland site. Samples were delivered to Rhithron Associates, Inc. for processing, taxonomic determinations, and data analysis.

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

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

### **Assessment**

The method employed to assess these wetlands is based on an index incorporating a battery of 12 bioassessment metrics or attributes (Table 2) tested and recommended by Stribling et al. (1995) in a report to the Montana Department of Health and Environmental Science. In that study, it was determined that some of the metrics were of limited use in some geographic regions, and for some wetland types. Despite that finding, all 12 metrics are used in this evaluation of mitigated wetlands, since detailed geographic information and wetland classifications were unavailable. Scoring criteria for the 12 metrics were developed specifically for this project, since mitigated wetlands were not included in original criteria development.

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

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

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

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

### **Bioassessment metrics – wetlands**

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

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

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

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

Two trophic measures (%Collector-gatherers and %Filterers) may be helpful in expressing functional integrity of the invertebrate assemblage, which can be impacted by poor water quality or habitat degradation. High proportions of filtering organisms suggest nutrient and/or organic enrichment, while abundant collectors suggest

more positive functional conditions and well-developed wetland morphology. These organisms graze periphyton growing on stable surfaces such as macrophytes.

Summary metric values and scores for the 2008 samples are given in Tables 4a-4c and 5. Thermal preference of invertebrate assemblages was calculated using Brandt 2001.

### **Bioassessment metrics – lotic habitats**

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

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

**Table 1.** Montana Department of Transportation Mitigated Wetlands Monitoring Project sites: sampling history. Only those sites sampled in 2008 are included. An asterisk indicates lotic sites.

Site Identifier	2001	2002	2003	2004	2005	2006	2007	2008
Roundup	+	+	+	+	+	+	+	+
Hoskins Landing MS-1		+	+	+	+	+	+	+
Peterson Ranch Pond 2		+		+	+	+	+	+
Peterson Ranch Pond 4		+	+	+	+	+	+	+
Perry Ranch		+			+			+
Camp Creek MS-1*		+	+	+	+	+	+	+
Camp Creek MS-2*						+	+	+
Cloud Ranch Pond				+	+		+	+
Cloud Ranch Stream*				+			+	+
Jack Creek – Pond				+	+	+	+	+
Jack Creek – McKee*							+	+
Norem				+	+	+	+	+
Rock Creek Ranch					+	+	+	+
Wagner Marsh					+	+	+	+
Alkali Lake 1						+	+	+
West Fork of Charley Creek							+	+
Woodson Pond MI 1							+	+
Woodson Stream MI 2*							+	+
Little Muddy Creek							+	+
Selkirk Ranch							+	+
DH Ranch							+	+
Jocko Spring Creek MS-1								+
Jocko Spring Creek MS-2								+
Sportsman’s Campground Site #1								+
Sportsman’s Campground Site #2								+
Sportsman’s Campground Site #3								+
Lonepine #1								+
Lonepine #2								+

**Table 2.** Aquatic invertebrate metrics employed for wetland (lentic) invertebrate assemblages in the MDT mitigated wetlands study, 2001 – 2008.

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

## **RESULTS**

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

**Table 4a.** Metric values and scores for wetland (lentic) sites in the MDT mitigated wetland study – 2008 sampling.

<b>METRIC</b>	<b>Roundup</b>	<b>Hoskins Landing MS 1</b>	<b>Peterson Ranch Pond 2</b>	<b>Peterson Ranch Pond 4</b>	<b>Perry Ranch</b>	<b>Cloud Ranch Pond</b>	<b>Jack Creek Pond</b>	<b>Norem</b>
Total taxa	9	18	13	25	11	27	21	14
POET	0	2	1	3	0	5	2	0
Chironomidae taxa	4	5	3	6	5	14	7	6
Crustacea + Mollusca	3	6	3	5	2	4	6	2
% Chironomidae	80.37%	17.00%	3.70%	13.21%	88.79%	49.53%	42.86%	34.69%
Orthocladinae/Chir	0.63	0.18	1.50	0.21	0.82	0.66	0.40	0.53
% Amphipoda	0.00%	8.00%	0.00%	0.00%	0.00%	6.54%	15.24%	0.00%
% Crustacea + % Mollusca	15.89%	48.00%	86.11%	43.40%	6.54%	10.28%	30.48%	26.53%
HBI	8.01	7.62	7.85	7.40	7.37	5.94	8.17	7.61
% Dominant taxon	50.47%	27.00%	84.26%	25.47%	62.62%	13.08%	19.05%	26.53%
% Collector-Gatherers	31.78%	54.00%	87.96%	20.75%	20.56%	56.07%	65.71%	44.90%
% Filterers	2.80%	10.00%	0.00%	1.89%	0.00%	3.74%	1.90%	0.00%
Total taxa	1	3	1	5	1	5	5	1
POET	1	1	1	3	1	5	1	1
Chironomidae taxa	3	3	3	3	3	5	5	3
Crustacea + Mollusca	1	5	1	3	1	3	5	1
% Chironomidae	1	5	5	5	1	1	1	3
Orthocladinae/Chir	5	1	5	3	5	5	3	5
% Amphipoda	5	3	5	5	5	3	3	5
% Crustacea + % Mollusca	5	3	1	3	5	5	5	5
HBI	1	1	1	3	3	5	1	1
% Dominant taxon	1	5	1	5	1	5	5	5
% Collector-Gatherers	1	3	5	1	1	3	3	1
% Filterers	3	1	3	3	3	3	3	3
<b>Total Score</b>	<b>28</b>	<b>34</b>	<b>32</b>	<b>42</b>	<b>30</b>	<b>48</b>	<b>40</b>	<b>34</b>
<b>Percent of Maximum Score</b>	<b>46.67%</b>	<b>56.67%</b>	<b>53.33%</b>	<b>70.00%</b>	<b>50.00%</b>	<b>80.00%</b>	<b>66.67%</b>	<b>56.67%</b>
<b>Impairment Classification</b>	<b>poor</b>	<b>sub-optimal</b>	<b>sub-optimal</b>	<b>good</b>	<b>poor</b>	<b>good</b>	<b>sub-optimal</b>	<b>sub-optimal</b>

**Table 4b.** Metric values and scores for wetland (lentic) sites in the MDT mitigated wetland study – 2008 sampling.

METRIC	Rock Creek Ranch	Wagner Marsh	Alkali Lake	West Fork of Charley Creek	Woodson Pond	Woodson Stream	Little Muddy Creek	Selkirk Ranch
Total taxa	23	11	10	9	13	7	14	17
POET	1	4	0	0	1	3	1	1
Chironomidae taxa	5	2	2	1	7	0	2	8
Crustacea + Mollusca	5	2	3	3	2	2	3	5
% Chironomidae	28.97%	2.83%	5.41%	0.91%	60.00%	0.00%	55.00%	23.38%
Orthoclaadiinae/Chir	0.97	0.00	0.00	0.00	0.52	0	0.64	0.33
% Amphipoda	0.00%	0.00%	0.00%	67.27%	0.00%	7.69%	0.00%	5.19%
% Crustacea + % Mollusca	28.97%	39.62%	32.43%	70.91%	25.45%	15.38%	17.00%	48.05%
HBI	6.91	7.45	8.57	8.19	8.14	4.62	6.97	7.76
% Dominant taxon	22.43%	48.11%	48.65%	67.27%	25.45%	30.77%	35.00%	32.47%
% Collector-Gatherers	30.84%	52.83%	21.62%	68.18%	86.36%	23.08%	29.00%	16.88%
% Filterers	1.87%	0.00%	0.00%	0.00%	0.00%	30.77%	0.00%	32.47%
Total taxa	5	1	1	1	1	1	1	3
POET	1	5	1	1	1	3	1	1
Chironomidae taxa	3	1	1	1	5	1	1	5
Crustacea + Mollusca	3	1	1	1	1	1	1	3
% Chironomidae	3	5	5	5	1	5	1	3
Orthoclaadiinae/Chir	5	1	1	1	5	Not Scored	5	3
% Amphipoda	5	5	5	1	5	3	5	3
% Crustacea + % Mollusca	5	3	5	1	5	5	5	3
HBI	3	3	1	1	1	5	3	1
% Dominant taxon	5	3	3	1	5	5	3	5
% Collector-Gatherers	1	3	1	3	5	1	1	1
% Filterers	3	3	3	3	3	1	3	1
<b>Total Score</b>	<b>42</b>	<b>34</b>	<b>28</b>	<b>20</b>	<b>38</b>	<b>31</b>	<b>30</b>	<b>32</b>
<b>Percent of Maximum Score</b>	<b>70.00%</b>	<b>56.67%</b>	<b>46.67%</b>	<b>33.33%</b>	<b>63.33%</b>	<b>56.36%</b>	<b>50.00%</b>	<b>53.33%</b>
<b>Impairment Classification</b>	<b>good</b>	<b>sub-optimal</b>	<b>poor</b>	<b>poor</b>	<b>sub-optimal</b>	<b>sub-optimal</b>	<b>poor</b>	<b>sub-optimal</b>

**Table 4c.** Metric values and scores for wetland (lentic) sites in the MDT mitigated wetland study – 2008 sampling.

METRIC	DH Ranch	Sportsman's Campground Site # 1	Sportsman's Campground Site # 2	Sportsman's Campground Site # 3	Lonepine # 1	Lonepine # 2
Total taxa	15	16	9	12	18	4
POET	1	1	0	0	2	0
Chironomidae taxa	6	6	3	7	12	3
Crustacea + Mollusca	2	5	3	4	1	1
% Chironomidae	52.29%	10.91%	41.18%	69.09%	81.82%	57.14%
Orthoclaadiinae/Chir	0.09	0.17	0.00	0.25	0.13	0.00
% Amphipoda	0.00%	24.55%	5.88%	27.27%	0.00%	0.00%
% Crustacea + % Mollusca	30.28%	83.64%	23.53%	29.09%	7.27%	42.86%
HBI	7.33	7.55	8.76	7.55	7.60	8.14
% Dominant taxon	33.03%	56.36%	29.41%	25.45%	25.45%	42.86%
% Collector-Gatherers	49.54%	20.91%	11.76%	57.27%	55.45%	28.57%
% Filterers	0.92%	63.64%	11.76%	25.45%	22.73%	42.86%
Total taxa	3	3	1	1	3	1
POET	1	1	1	1	1	1
Chironomidae taxa	3	3	3	5	5	3
Crustacea + Mollusca	1	3	1	3	1	1
% Chironomidae	1	5	3	1	1	1
Orthoclaadiinae/Chir	1	1	1	3	1	1
% Amphipoda	5	1	3	1	5	5
% Crustacea + % Mollusca	5	1	5	5	5	3
HBI	3	3	1	3	3	1
% Dominant taxon	5	1	5	5	5	3
% Collector-Gatherers	3	1	1	3	3	1
% Filterers	3	1	1	1	1	1
<b>Total Score</b>	<b>34</b>	<b>24</b>	<b>26</b>	<b>32</b>	<b>34</b>	<b>22</b>
<b>Percent of Maximum Score</b>	<b>56.67%</b>	<b>40.00%</b>	<b>43.33%</b>	<b>53.33%</b>	<b>56.67%</b>	<b>36.67%</b>
<b>Impairment Classification</b>	<b>sub-optimal</b>	<b>poor</b>	<b>poor</b>	<b>sub-optimal</b>	<b>sub-optimal</b>	<b>poor</b>

**Table 5.** Metric values and scores for stream (lotic) sites in the MDT mitigated wetland study – 2008 sampling.

METRIC	Camp Creek MS-1	Camp Creek MS-2	Cloud Ranch Stream	Jack Creek – McKee Spring	Jocko Spring Creek MS-1	Jocko Spring Creek MS-2
<b>E Richness</b>	7	5	4	1	0	1
<b>P Richness</b>	2	2	0	0	0	1
<b>T Richness</b>	4	6	5	3	2	5
<b>Pollution Sensitive Richness</b>	0	1	0	0	0	0
<b>Filterer Percent</b>	29.00%	37.00%	5.00%	40.00%	15.00%	11.00%
<b>Pollution Tolerant Percent</b>	5.00%	3.00%	28.00%	1.00%	62.00%	15.00%
<b>E Richness</b>	3	2	2	0	0	0
<b>P Richness</b>	2	2	0	0	0	1
<b>T Richness</b>	2	3	3	2	1	3
<b>Pollution Sensitive Richness</b>	0	1	0	0	0	0
<b>Filterer Percent</b>	1	0	3	0	1	1
<b>Pollution Tolerant Percent</b>	3	3	0	3	0	1
<b>Total score</b>	<b>11</b>	<b>11</b>	<b>8</b>	<b>5</b>	<b>2</b>	<b>6</b>
<b>Percent of maximum score</b>	<b>61%</b>	<b>61%</b>	<b>44%</b>	<b>28%</b>	<b>11%</b>	<b>33%</b>
<b>Impairment classification</b>	<b>slight</b>	<b>slight</b>	<b>moderate</b>	<b>moderate</b>	<b>severe</b>	<b>moderate</b>

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

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

# Taxa Listing

Project ID: MDT08PBSJ  
RAI No.: MDT08PBSJ010

RAI No.: MDT08PBSJ010

Sta. Name: Jack Creek Ranch-Horseshoe wetland

Client ID:

Date Coll.: 7/11/2008

No. Jars: 1

STORET ID:

Taxonomic Name	Count	PRA	Unique	Stage	Qualifier	BI	Function
<b>Non-Insect</b>							
Cladocera	1	0.95%	Yes	Unknown		8	CF
Nematoda	1	0.95%	Yes	Unknown		5	PA
Ostracoda	5	4.76%	Yes	Unknown		8	CG
Asellidae							
<i>Caecidotea</i> sp.	3	2.86%	Yes	Unknown		8	CG
Erpobdellidae							
Erpobdellidae	12	11.43%	Yes	Immature	Damaged	8	PR
Hyalellidae							
<i>Hyalella</i> sp.	16	15.24%	Yes	Unknown		8	CG
Lymnaeidae							
Lymnaeidae	1	0.95%	Yes	Immature		6	SC
Planorbidae							
<i>Gyraulus</i> sp.	6	5.71%	Yes	Unknown		8	SC
<b>Odonata</b>							
Lestidae							
<i>Lestes</i> sp.	2	1.90%	Yes	Larva		9	PR
<b>Plecoptera</b>							
Chloroperlidae							
Chloroperlidae	1	0.95%	Yes	Larva	Damaged	1	PR
<b>Coleoptera</b>							
Dytiscidae							
Dytiscidae	2	1.90%	No	Larva		5	PR
<i>Rhantus</i> sp.	1	0.95%	Yes	Adult		5	PR
Haliplidae							
<i>Halipus</i> sp.	2	1.90%	No	Larva		5	PH
<i>Halipus</i> sp.	2	1.90%	Yes	Adult		5	PH
Hydrophilidae							
<i>Enochrus</i> sp.	1	0.95%	Yes	Adult		5	CG
Hydrophilidae	3	2.86%	No	Larva		5	PR
<b>Diptera</b>							
Simuliidae							
<i>Simulium</i> sp.	1	0.95%	Yes	Larva		6	CF
<b>Chironomidae</b>							
Chironomidae							
<i>Ablabesmyia</i> sp.	1	0.95%	Yes	Larva		8	CG
<i>Acricotopus</i> sp.	17	16.19%	Yes	Larva		10	CG
<i>Chironomus</i> sp.	20	19.05%	Yes	Larva		10	CG
<i>Glyptotendipes</i> sp.	1	0.95%	Yes	Larva		10	SH
<i>Paratanytarsus</i> sp.	4	3.81%	Yes	Larva		6	CG
<i>Pseudochironomus</i> sp.	1	0.95%	Yes	Larva		5	CG
<i>Pseudosmittia</i> sp.	1	0.95%	Yes	Larva		6	CG
	<b>Sample Count</b>	<b>105</b>					

# Metrics Report

Project ID: MDT08PBSJ  
 RAI No.: MDT08PBSJ010  
 Sta. Name: Jack Creek Ranch-Horseshoe wetland  
 Client ID:  
 STORET ID:  
 Coll. Date: 7/11/2008

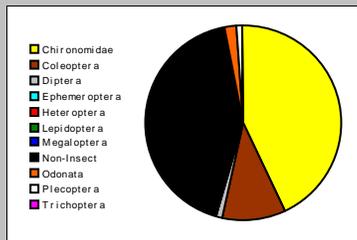
## Abundance Measures

Sample Count: 105  
 Sample Abundance: 121.15 86.67% of sample used

Coll. Procedure:  
 Sample Notes:

## Taxonomic Composition

Category	R	A	PRA
Non-Insect	8	45	42.86%
Odonata	1	2	1.90%
Ephemeroptera			
Plecoptera	1	1	0.95%
Heteroptera			
Megaloptera			
Trichoptera			
Lepidoptera			
Coleoptera	3	11	10.48%
Diptera	1	1	0.95%
Chironomidae	7	45	42.86%

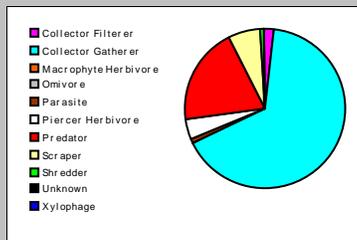


## Dominant Taxa

Category	A	PRA
Chironomus	20	19.05%
Acricotopus	17	16.19%
Hvalella	16	15.24%
Erpobdellidae	12	11.43%
Gyraulus	6	5.71%
Ostracoda	5	4.76%
Paratanytarsus	4	3.81%
Halipus	4	3.81%
Hdrophilidae	3	2.86%
Caecidotea	3	2.86%
Lestes	2	1.90%
Dytiscidae	2	1.90%
Rhantus	1	0.95%
Pseudosmittia	1	0.95%
Pseudochironomus	1	0.95%

## Functional Composition

Category	R	A	PRA
Predator	4	21	20.00%
Parasite	1	1	0.95%
Collector Gatherer	10	69	65.71%
Collector Filterer	2	2	1.90%
Macrophyte Herbivore			
Piercer Herbivore	1	4	3.81%
Xylophage			
Scraper	2	7	6.67%
Shredder	1	1	0.95%
Omnivore			
Unknown			

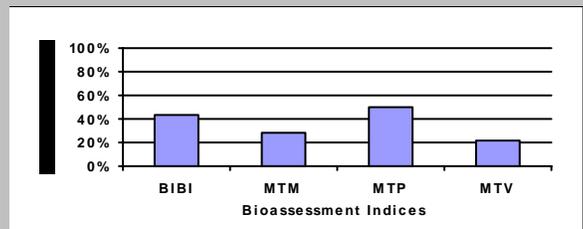


## Metric Values and Scores

Metric	Value	BIBI	MTP	MTV	MTM
<i>Composition</i>					
Taxa Richness	21	3	2		1
Non-Insect Percent	42.86%				
E Richness	0	1		0	
P Richness	1	1		1	
T Richness	0	1		0	
EPT Richness	1		0		0
EPT Percent	0.95%		0		0
Oligochaeta+Hirudinea Percent	11.43%				
Baetidae/Ephemeroptera	0.00%				
Hydropsychidae/Trichoptera	0.00%				
<i>Dominance</i>					
Dominant Taxon Percent	19.05%		3		3
Dominant Taxa (2) Percent	35.24%				
Dominant Taxa (3) Percent	50.48%	3			
Dominant Taxa (10) Percent	85.71%				
<i>Diversity</i>					
Shannon H (loge)	2.415				
Shannon H (log2)	3.484		3		
Margalef D	4.362				
Simpson D	0.115				
Evenness	0.077				
<i>Function</i>					
Predator Richness	4		2		
Predator Percent	20.00%	5			
Filterer Richness	2				
Filterer Percent	1.90%			3	
Collector Percent	67.62%		2		2
Scraper+Shredder Percent	7.62%		1		0
Scraper/Filterer	3.500				
Scraper/Scraper+Filterer	0.778				
<i>Habit</i>					
Burrower Richness	4				
Burrower Percent	21.90%				
Swimmer Richness	3				
Swimmer Percent	6.67%				
Clinger Richness	1	1			
Clinger Percent	0.95%				
<i>Characteristics</i>					
Cold Stenotherm Richness	0				
Cold Stenotherm Percent	0.00%				
Hemoglobin Bearer Richness	5				
Hemoglobin Bearer Percent	27.62%				
Air Breather Richness	2				
Air Breather Percent	6.67%				
<i>Voltinism</i>					
Univoltine Richness	7				
Semivoltine Richness	3	3			
Multivoltine Percent	49.52%		2		
<i>Tolerance</i>					
Sediment Tolerant Richness	2				
Sediment Tolerant Percent	6.67%				
Sediment Sensitive Richness	0				
Sediment Sensitive Percent	0.00%				
Metals Tolerance Index	3.833				
Pollution Sensitive Richness	0		1		0
Pollution Tolerant Percent	35.24%		3		0
Hilsenhoff Biotic Index	8.171		0		0
Intolerant Percent	0.95%				
Supertolerant Percent	80.00%				
CTQa	98.143				

## Bioassessment Indices

BioIndex	Description	Score	Pct	Rating
BIBI	B-IBI (Karr et al.)	22	44.00%	
MTP	Montana DEQ Plains (Bukantis 1998)	15	50.00%	Moderate
MTV	Montana Revised Valleys/Foothills (Bollman 1998)	4	22.22%	Moderate
MTM	Montana DEQ Mountains (Bukantis 1998)	6	28.57%	Moderate



# Taxa Listing

Project ID: MDT08PBSJ  
RAI No.: MDT08PBSJ013

RAI No.: MDT08PBSJ013

Sta. Name: Jack Creek Ranch McKee Spring

Client ID:

Date Coll.: 7/11/2008

No. Jars: 1

STORET ID:

Taxonomic Name	Count	PRA	Unique	Stage	Qualifier	BI	Function
<b>Non-Insect</b>							
Cladocera	1	0.91%	Yes	Unknown		8	CF
Asellidae							
<i>Caecidotea</i> sp.	17	15.45%	Yes	Unknown		8	CG
Hyalellidae							
<i>Hyalella</i> sp.	2	1.82%	Yes	Unknown		8	CG
Lymnaeidae							
<i>Stagnicola</i> sp.	2	1.82%	Yes	Unknown		6	SC
Physidae							
Physidae	4	3.64%	Yes	Unknown		8	SC
Planorbidae							
<i>Gyraulus</i> sp.	3	2.73%	Yes	Unknown		8	SC
<b>Ephemeroptera</b>							
Baetidae							
<i>Baetis tricaudatus</i>	1	0.91%	Yes	Larva		4	CG
<b>Heteroptera</b>							
Corixidae							
Corixidae	2	1.82%	Yes	Larva		10	PH
<b>Trichoptera</b>							
Helicopsychidae							
<i>Helicopsyche borealis</i>	1	0.91%	Yes	Pupa		3	SC
Hydroptilidae							
<i>Hydroptila</i> sp.	6	5.45%	Yes	Larva		6	PH
Lepidostomatidae							
<i>Lepidostoma</i> sp.	11	10.00%	Yes	Larva		1	SH
<b>Coleoptera</b>							
Halplidae							
<i>Halplus</i> sp.	1	0.91%	Yes	Larva		5	PH
Hydraenidae							
<i>Ochthebius</i> sp.	11	10.00%	Yes	Adult		4	SC
<b>Diptera</b>							
Ceratopogonidae							
Ceratopogoninae	3	2.73%	Yes	Larva		6	PR
Stratiomyidae							
<i>Euparyphus</i> sp.	1	0.91%	Yes	Larva		7	CG

# Taxa Listing

Project ID: MDT08PBSJ  
RAI No.: MDT08PBSJ013

RAI No.: MDT08PBSJ013

Sta. Name: Jack Creek Ranch McKee Spring

Client ID:

Date Coll.: 7/11/2008

No. Jars: 1

STORET ID:

Taxonomic Name	Count	PRA	Unique	Stage	Qualifier	BI	Function
<b>Chironomidae</b>							
Chironomidae							
<i>Acricotopus</i> sp.	12	10.91%	Yes	Larva		10	CG
<i>Brillia</i> sp.	1	0.91%	Yes	Larva		4	SH
Chironomidae	2	1.82%	No	Pupa		10	CG
Chironomini	2	1.82%	No	Larva	Early Instar	6	CG
<i>Chironomus</i> sp.	10	9.09%	Yes	Larva		10	CG
<i>Corynoneura</i> sp.	1	0.91%	Yes	Larva		7	CG
<i>Cricotopus (Isocladius)</i> sp.	3	2.73%	Yes	Larva		7	SH
<i>Glyptotendipes</i> sp.	4	3.64%	Yes	Larva		10	SH
<i>Micropsectra</i> sp.	1	0.91%	Yes	Larva		4	CG
<i>Pagastia</i> sp.	3	2.73%	Yes	Larva		1	CG
<i>Parametriocnemus</i> sp.	1	0.91%	Yes	Larva		5	CG
<i>Paratanytarsus</i> sp.	2	1.82%	Yes	Larva		6	CG
<i>Radotanypus</i> sp.	1	0.91%	Yes	Larva		7	PR
Tanypodinae	1	0.91%	Yes	Larva	Early Instar	7	PR
<b>Sample Count</b>	<b>110</b>						

# Metrics Report

Project ID: MDT08PBSJ  
 RAI No.: MDT08PBSJ013  
 Sta. Name: Jack Creek Ranch McKee Spring  
 Client ID:  
 STORET ID:  
 Coll. Date: 7/11/2008

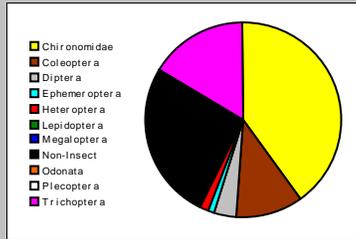
## Abundance Measures

Sample Count: 110  
 Sample Abundance: 2,200.00 5.00% of sample used

Coll. Procedure:  
 Sample Notes:

## Taxonomic Composition

Category	R	A	PRA
Non-Insect	6	29	26.36%
Odonata			
Ephemeroptera	1	1	0.91%
Plecoptera			
Heteroptera	1	2	1.82%
Megaloptera			
Trichoptera	3	18	16.36%
Lepidoptera			
Coleoptera	2	12	10.91%
Diptera	2	4	3.64%
Chironomidae	12	44	40.00%

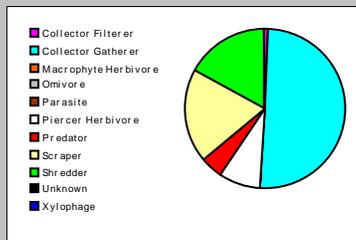


## Dominant Taxa

Category	A	PRA
Caecidotea	17	15.45%
Acricotopus	12	10.91%
Ochthebius	11	10.00%
Lepidostoma	11	10.00%
Chironomus	10	9.09%
Hydroptila	6	5.45%
Physidae	4	3.64%
Glyptotendipes	4	3.64%
Paqausia	3	2.73%
Gyraulus	3	2.73%
Cricotopus (Isocladus)	3	2.73%
Ceratopogoninae	3	2.73%
Hyaella	2	1.82%
Corixidae	2	1.82%
Chironomidae	2	1.82%

## Functional Composition

Category	R	A	PRA
Predator	3	5	4.55%
Parasite			
Collector Gatherer	11	55	50.00%
Collector Filterer	1	1	0.91%
Macrophyte Herbivore			
Piercer Herbivore	3	9	8.18%
Xylophage			
Scraper	5	21	19.09%
Shredder	4	19	17.27%
Omnivore			
Unknown			



## Metric Values and Scores

Metric	Value	BIBI	MTP	MTV	MTM
<i>Composition</i>					
Taxa Richness	27	3	3		2
Non-Insect Percent	26.36%				
E Richness	1	1		0	
P Richness	0	1		0	
T Richness	3	1		2	
EPT Richness	4		1		0
EPT Percent	17.27%		1		0
Oligochaeta+Hirudinea Percent					
Baetidae/Ephemeroptera	1.000				
Hydropsychidae/Trichoptera	0.000				
<i>Dominance</i>					
Dominant Taxon Percent	15.45%		3		3
Dominant Taxa (2) Percent	26.36%				
Dominant Taxa (3) Percent	36.36%	5			
Dominant Taxa (10) Percent	73.64%				
<i>Diversity</i>					
Shannon H (log)	2.830				
Shannon H (log2)	4.083		3		
Margalef D	5.575				
Simpson D	0.072				
Evenness	0.056				
<i>Function</i>					
Predator Richness	3		1		
Predator Percent	4.55%	1			
Filterer Richness	1				
Filterer Percent	0.91%			3	
Collector Percent	50.91%		3		3
Scraper+Shredder Percent	36.36%		3		1
Scraper/Filterer	21.000				
Scraper/Scraper+Filterer	0.955				
<i>Habit</i>					
Burrower Richness	4				
Burrower Percent	18.18%				
Swimmer Richness	3				
Swimmer Percent	3.64%				
Clinger Richness	4	1			
Clinger Percent	19.09%				
<i>Characteristics</i>					
Cold Stenotherm Richness	0				
Cold Stenotherm Percent	0.00%				
Hemoglobin Bearer Richness	4				
Hemoglobin Bearer Percent	16.36%				
Air Breather Richness	1				
Air Breather Percent	0.91%				
<i>Voltinism</i>					
Univoltine Richness	10				
Semivoltine Richness	2	1			
Multivoltine Percent	47.27%		2		
<i>Tolerance</i>					
Sediment Tolerant Richness	2				
Sediment Tolerant Percent	4.55%				
Sediment Sensitive Richness	0				
Sediment Sensitive Percent	0.00%				
Metals Tolerance Index	3.764				
Pollution Sensitive Richness	0				
Pollution Tolerant Percent	40.00%	1		0	
Hilsenhoff Biotic Index	6.709		1		0
Intolerant Percent	12.73%				
Supertolerant Percent	51.82%				
CTQa	94.500				

## Bioassessment Indices

BioIndex	Description	Score	Pct	Rating
BIBI	B-IBI (Karr et al.)	18	36.00%	
MTP	Montana DEQ Plains (Bukantis 1998)	21	70.00%	Slight
MTV	Montana Revised Valleys/Foothills (Bollman 1998)	5	27.78%	Moderate
MTM	Montana DEQ Mountains (Bukantis 1998)	9	42.86%	Moderate

