MONTANA DEPARTMENT OF TRANSPORTATION
WETLAND MITIGATION MONITORING REPORT: YEAR 2007

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 2007

PBS&J Project No: B43088.00 - 0206

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PBS&J

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Cover Photo: *View is to the east looking at CT 2 and CT 3.*

1.0 INTRODUCTION

This annual report summarizes methods and the results of the 2007 (fourth 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 4889 to 4892 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.

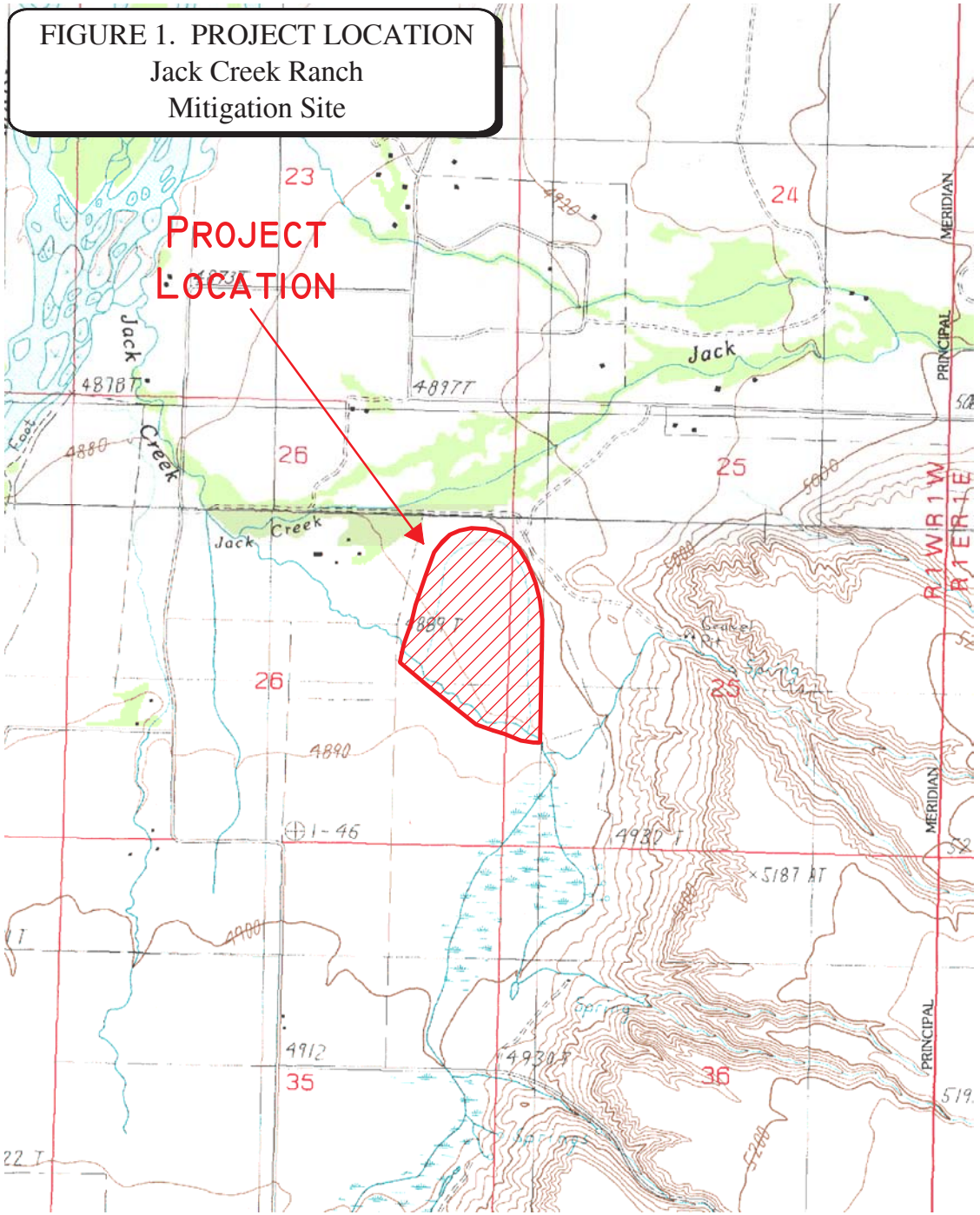
In the summer of 2003, the drainage systems along the perimeter of the Horseshoe pasture were filled. Selected areas within the Horseshoe field were graded to increase habitat diversity. Disturbed areas were seeded with a wetland seed mix and planted with containerized wetland species. Woody species 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 McKee Spring Creek and the over-widened areas (in-stream reservoirs) were filled. 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. The site boundary is illustrated on **Figure 2** in **Appendix A**.

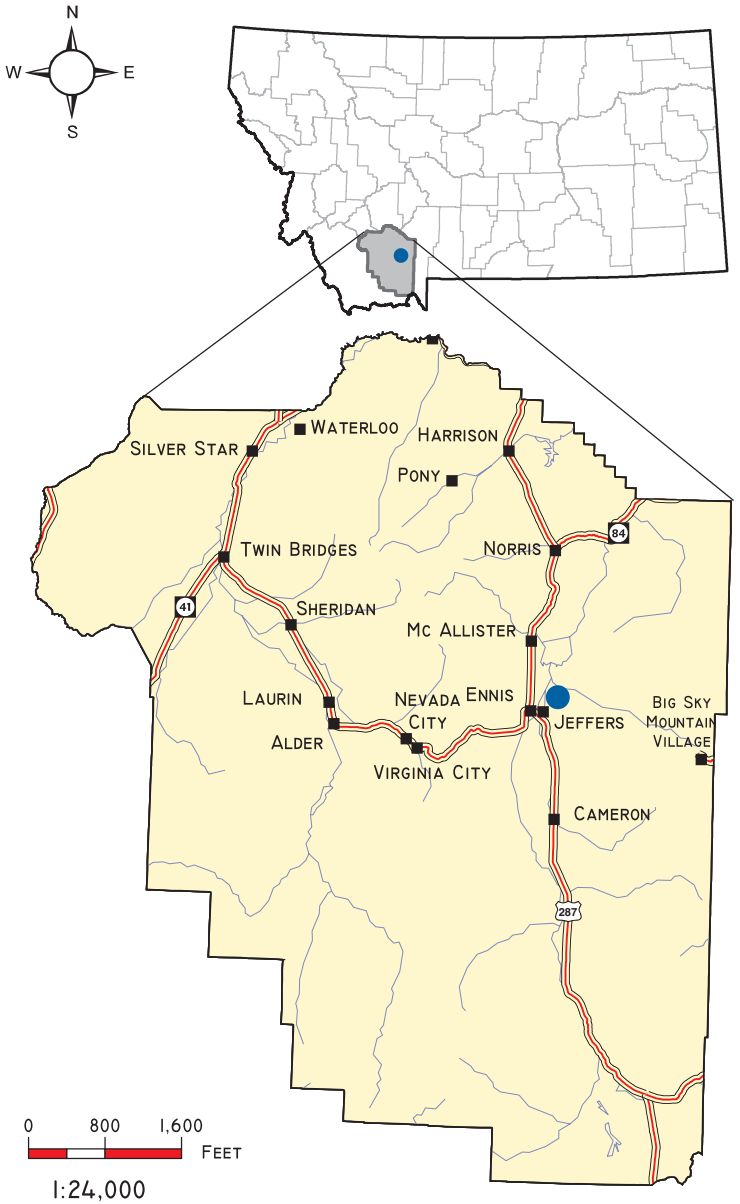
2.0 METHODS

2.1 Monitoring Dates and Activities

The transect was monitored and wetland boundaries were revised on July 10, 2007. The site was visited on July 11 to assess mid-season avian migration use, and on October 4, 2007 to assess fall-season use. Activities and information conducted/collected during the July 10 monitoring event included: wetland delineation; wetland/open water boundary mapping; vegetation

FIGURE 1. PROJECT LOCATION
Jack Creek Ranch
Mitigation Site





PROJECT #: 330054.210
DATE: JAN 2005
LOCATION:
PROJECT MANAGER:
DRAWN BY: B. STEINEBACH

LAND & WATER CONSULTING
PO Box 239
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A Division Of PBS&J

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 2007 were compared to the 1948-2007 average (WRCC 2007).

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. The USGS will most likely conduct future piezometer monitoring (Urban pers. comm.).

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 2007 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 is 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**). The most current terminology used by NRCS was used to describe hydric soils.

2.5 Wetland Delineation

A wetland delineation was conducted within the monitoring area according to the 1987 COE Wetland Delineation Manual. 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 1.99 acres of wetlands occurred at the mitigation site prior to project implementation.

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

A Functional Assessment Form was completed for the site using the 1999 MDT Montana Wetland Assessment Method (Berglund 1999). 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 each wetland or group of wetlands (that share similar functions and values) a Functional Assessment Form was completed (**Appendix B**).

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. 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 Geoexplorer 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. No additional GPS data were collected in 2007.

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 provide 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 2007 monitoring visit, approximately 25% 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, but there was significantly less surface water this year (2007) compared to previous years. 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 11.55 inches from 1948 through October 2007 (last updated file). The average precipitation through the month of July for that period was 8.24 inches. For the year 2007, precipitation through July was 9.59 inches or 116% of the mean indicating that the spring and summer (through July) were wetter compared to historic precipitation. However, Montana experienced record breaking hot temperatures in July and August 2007. Even with the increase of precipitation in May and June 2007, unseasonable hot temperatures likely resulted in reduced surface water across the project site.

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 seven community types. These include: Type 1 - *Agropyron repens/Bromus inermis/Festuca arundinacea*; Type 2 - Mixed Herbaceous Wetland; Type 3 - *Typha latifolia*/*Scirpus* sp.; Type 4 - *Hordeum jubatum*/Mixed Grass Upland; Type 5 - *Agrostis alba/*Alopecurus sp., Type 6 – *Typha latifolia/Eleocharis palustris*; and Type 7 - *Carex* sp./*Juncus* sp./*Typha latifolia*. Dominant species within each community are listed on the Monitoring Form (**Appendix B**). Because construction was conducted during 2003, 2007 represents the fourth growing season for the project site. Hydrophytic vegetation communities are increasing in size and diversity. Species noted in 2004 through 2007 are presented in **Table 2**.

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. Type 2 is expanding and is present in areas that are developing into a more complex wetland system. Surface water was present in 2007 across portions of this community primarily in the western quarter of the project. In 2006 and 2007, 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*), tufted hairgrass (*Deschampsia cespitosa*), alkali grass (*Puccinellia nuttalliana*), and three-square bulrush (*Scirpus pungens*) are becoming increasingly more abundant, especially on sparsely vegetation 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* sp.), and spikerush (*Eleocharis* sp.) which were common in areas of inundation. This community type is increasing in size throughout the project area. Several new areas were noted in 2007 in the southeastern and central portions of the Horseshoe pasture. Type 4, a transitional community, represents foxtail barley with a mix of primarily upland species and a few wetland species. A portion of this community type was inundated with shallow surface water along the western quarter of the project area. Primary upland species include quackgrass, tall fescue and

smooth brome. Other minor species noted in 2007 include creeping wildrye (*Elymus canadensis*) Kentucky bluegrass (*Poa pratensis*), slender wheatgrass (*Agropyron trachycaulum*), streambank wheatgrass (*Agropyron riparium*), meadow foxtail (*Alopecurus pratensis*), field horsetail (*Equisetum arvense*), redtop (*Agrostis alba*) and Canada thistle (*Cirsium arvense*). Many of these species are FAC or FACW.

Type 5 occurs along most 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 new community mapped in 2006 to include areas with a dominance of cattails and creeping spikerush. In 2005 these areas were mapped as community types 2 or 3. 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 new community mapped in 2007 to include areas with a dominance of sedge, rush and young cattails. In 2006, these areas were mapped as community type 2. There are approximately 33 known species of wetland plants with a FACW to OBL status within the assessment area.

The vegetation transect results are detailed in the Monitoring Form (**Appendix B**) and are summarized in **Table 2** and **Chart 1**. The transect crosses the entire lower quarter of the project site, extending from southeast to northwest. The transect crosses five vegetation communities (**Chart 1**). There is a significant decrease in uplands (community type 4) along the transect in 2007 with a subsequent increase in community types 2 and 3 represented by obligate and FACW species. The number of hydrophytic species has increased from 25 to 33 species (2004 and 2007, respectively).

Noxious weeds are present at the site, including two species on the State of Montana list, Canada thistle (*Cirsium arvense*), and hounds tongue (*Cynoglossum officinale*). Weed spraying in 2004 and 2005 has been effective in the eradication of black henbane (*Hyoscyanus niger*) and the reduction of Canada thistle, summer cypress (*Kochia scoparia*), Russian thistle (*Salsoli kali*), and the reduction of hounds tongue. Canada thistle is still present in the central portion of the horseshoe pasture in the upland/wetland transition areas. Canada thistle is common along the southern portions of the McKee Spring Creek channel with small scattered infestations of hounds tongue.

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 willow (*S. bebbiana*). 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 were also transplanted along the stream corridor and Horseshoe wetlands.

During the July monitoring visit, there were no viable willow cuttings were observed along the 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

Table 1: ***2004 to 2007 vegetation species list for Jack Creek Ranch Wetland Mitigation Site.***

Scientific Name	Region 9 (Northwest) Wetland Indicator Status [1]
Agropyron dasystachyum	FACU-
Agropyron repens	FACU-
Agropyron riparium	(FACU)
Agropyron trachycaulum	FAC
Agrostis alba	FACW
Alopecurus aequalis	OBL
Alopecurus arundinacea	NL
Alopecurus pratensis	FACW
Astragalus sp.	**(FACU)**
Beckmannia syzigachne	OBL
Bromus inermis	(UPL)
Bromus marginatus	(FACU)
Calamagrostis canadensis	FACW+
Bromus tectorum	**(UPL)**
Carduus nutans	(UPL)
Carex aquatilis	OBL
Carex lanuginosa	OBL
Carex microptera	FAC
Carex nebrascensis	OBL
Carex utriculata	OBL
Chenopodium album	FAC
Cirsium arvense	FACU+
Cynoglossum officinale	FACU*
Deschampsia cespitosa	FACW
Distichlis spicata	FAC+
Eleocharis palustris	OBL
Elymus canadensis	FAC
Elymus cinereus	**(FACU)**
Epilobium ciliatum	FACW
Equisetum arvense	FAC
Festuca arundinacea	FACU-
Festuca pratensis	FACU+
Glyceria grandis	OBL
Glycyrrhiza lepidota	FAC+
Hordeum jubatum	FAC+
Hyoscyamus niger	(UPL)
Juncus balticus	FACW+
Juncus bufonius	FACW
Juncus ensifolius	FACW
Juncus longistylis	FACW
Juncus mertensianus	OBL
Juncus torreyi	FACW
Kochia scoparia	FAC
Medicago lupulina	FAC
Melilotus alba	FACU
Melilotus officinalis	FACU
Mentha arvense	FAC
Mimulus sp.	(OBL)
Muhlenbergia sp.	(FACU)

[1] **Bolded** species indicate those documented within the analysis area for the first time in 2007.

[2] Species indicate those either not included or classified as "non-indicator" in the *National List of Plant Species that Occur in Wetlands: Northwest (Region 9)* (Reed 1988); status in parentheses are probable and based only on the biologist's experience.

Table 1 (continued): ***2004 to 2007 vegetation species list for the Jack Creek Ranch Wetland Mitigation Site.***

Scientific Name	Region 9 (Northwest) Wetland Indicator Status [1]
Phalaris arundinacea	FACW
Phleum pratense	FAC-
Poa compressa	FACU+
Poa palustris	FAC
Poa pratensis	FACU+
Populus angustifolia	FACW
Potentilla anserina	OBL
Puccinellia nuttalliana	OBL
Ranunculus cymbalaria	OBL
Rumex crispus	FAC+
Salix bebbiana	FACW
Salix exigua	OBL
Salix lasiandra	FACW+
Salsola kali	UPL
Scirpus pungens	OBL
Scirpus validus	OBL
Sisymbrium altissimum	FACU-
Spartina gracilis	FACW
Thlaspi arvense	(UPL)
Tragopogon dubius	(UPL)
Typha latifolia	OBL
Verbascum thapsus	(UPL)
Verbena hastata	**FAC+**
Veronica americana	OBL

[1] **Bolded** species indicate those documented within the analysis area for the first time in 2007.
[2] Species indicate those either not included or classified as "non-indicator" in the *National List of Plant Species that Occur in Wetlands: Northwest (Region 9)* (Reed 1988); status in parentheses are probable and based only on the biologist's experience.

Table 2: ***2004 to 2007 Transect 1 data summary.***

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

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

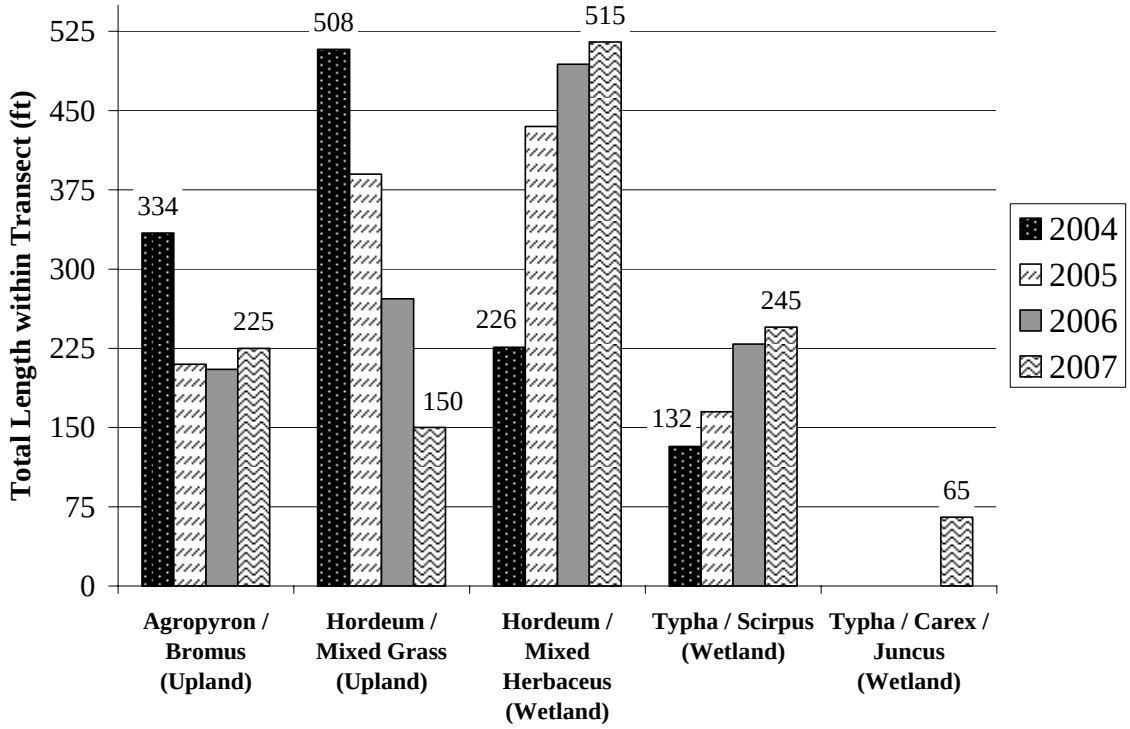
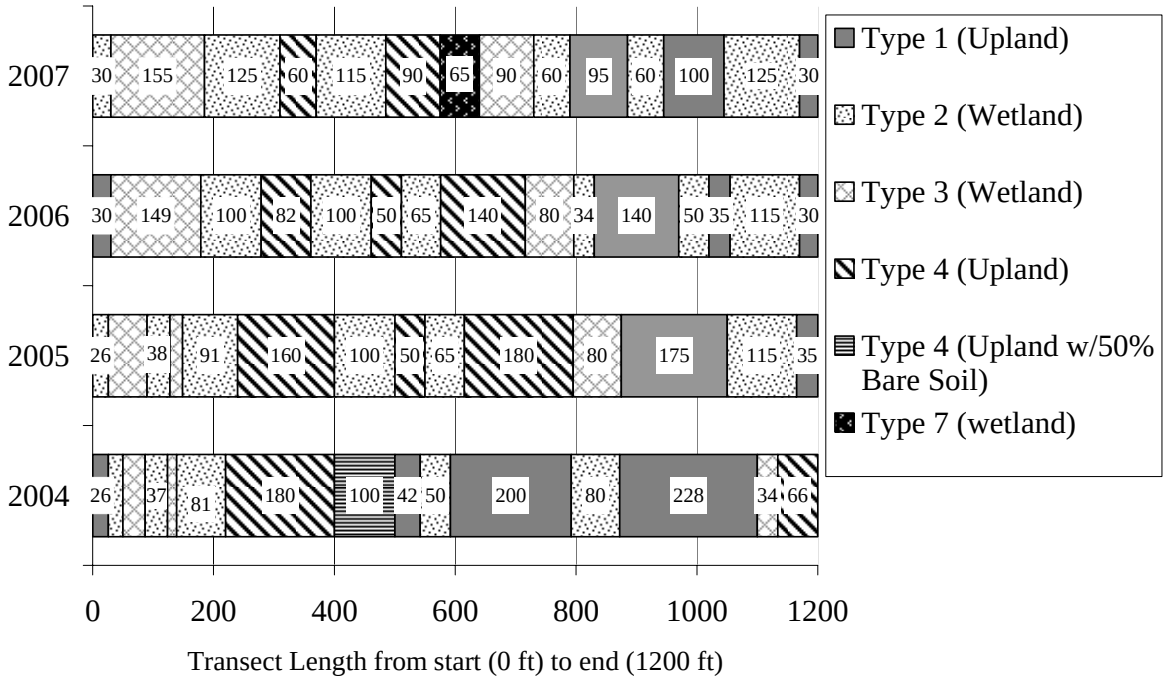


Chart 2: ***Transect map showing vegetation types from start of transect (0 feet) to the end of transect (1200 feet) for each year monitored.***



competition from the dense floodplain vegetation posed a problem for the sustained growth of the willow cuttings. Six live transplanted cottonwoods (*Populus angustifolia*) were counted within the floodplain during the 2007 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 10 percent of the willow cuttings were alive in 2007. 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 is Rivra-Ryell-Harve (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-Rynell-Harve is a deep, well-drained gravelly alluvium that is taxonomically classified as a Ustic Torrifluvents. 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. Soil pits 2 and 3 are within upland soils and SP-1 is a wetland soil. Soils at SP-1 (within 15 feet of eastern transect stake) were a grayish brown (10YR 5/2) silty loam from 0 to 6 inches and a dark gray (10YR 4/1) silty clay loam from 7 to 12 inches. Soils were saturated at 6 inches.

SP-2 is located on the between community types 2 and 4, approximately 750 ft west of the eastern transect post. Soils included a grayish brown (10YR 5/2) silty clay loam from 0 to 8 inches and a dark gray (10YR 4/1) from 9 to 12 inches. Soils were not saturated in the upper 12 inches. SP-3 is located approximately 300 feet west of historic wishbone shaped wetland in the center of the horseshoe pasture. Soils were a grayish brown (10YR 5/2) silty loam from 0 to 4 inches and light brownish gray (10YR 6/2) silty clay from 5 to 12 inches. Soils were not saturated in the upper 12 inches. SP-2 met the hydric soil parameters, but not the hydrology or vegetation parameters. SP-3 did not meet the wetland hydrology or the hydric soils parameters.

3.4 Wetland Delineation

The delineated wetland boundary is depicted on **Figure 3** in **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. The 2004 wetland boundary encompassed 21.51 acres of gross wetland area including 2.13 acres of shallow open water (<4 feet deep). In 2005, the gross

wetland boundary encompassed 33.44 acres and included 2.13 acres of shallow open water (<4 feet deep), an increase of 11.93 acres. In 2006, the gross wetland boundary encompassed 42.15 acres and included 2.13 acres of shallow open water (<4 feet deep). In 2007, the gross wetland boundary encompassed 46.43 acres and included 2.13 acres of shallow open water (<4 feet deep).

During the July field visit, approximately 25 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 types 2 and 3 are increasing in size and portions of community type 4 have converted to wetlands. It is anticipated that this transition of the upland community 4 to wetlands will continue. The development of existing wetland species (seed bank), seeded species and site planting efforts are successful in germination and establishment. The saturated soils 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 39 avian species, 15 species of mammals and four fish species have been sighted within the project site.

Table 3: ***2004 to 2007 wildlife species observed within the Jack Creek Ranch Wetland Mitigation Site.***

REPTILE None	
AMPHIBIAN None	
FISH Brook trout (*Salvelinus fontinalis*) Brown trout (*Salmo trutta*)	 Rainbow trout (*Oncorhynchus mykiss*) Long nose dace (*Rhinichthys cataractae*)
CRUSTACEAN Crayfish	

Bolded species indicate those documented within the analysis area in 2007
[1] Additional species observed by MDT

Table 3 (continued): ***2004 to 2007 wildlife species observed within the Jack Creek Ranch Wetland Mitigation Site.***

BIRD	
American Goldfinch (*Carduelis psaltria*)	**Mallard (*Anas platyrhynchos*)**
American Kestrel (*Falco sparerius*)	**Marsh Wren (*Cistothorus palustris*)**
American Robin (*Turdus migratorius*)	Northern Flicker (*Colaptes auratus*)
American Wigeon (*Anas americana*)	**Northern Harrier (*Circus cyaneus*)**
Bald eagle (*Haliaeetus leucocephalus*)	Northern Shrike (Lanius excubitor)
Blue-winged Teal (*Anas discors*)	Osprey (*Pandion haliaetus*)
Brown-headed Cowbird (*Molothrus ater*)	Red-tailed hawk (*Buteo jamaicensis*)
Canada Goose (*Branta canadensis*)	**Red-winged Blackbird (*Agelaius phoeniceus*)**
Cinnamon Teal (*Anas cyanoptera*)	Ring-necked Pheasant (*Phasianus colchicus*)
Common Goldeneye (*Bucephala clanula*)	Sandhill Crane (*Grus canadensis*)
Common Merganser (*Mergus merganser*)	**Savanah Sparrow (*Passerculus sandwichensis*)**
Common Raven (*Corvus corax*)	**Sora (*Porzana carolina*)**
Common Snipe (*Gallinago gallinago*)	Spotted Sandpiper (*Actitis macularia*)
Common Yellowthroat (*Geothlypis trichas*)	**Tree Swallow (*Tachycineta bicolor*)**
Cliff Swallow (*Hirundo pyrrhonota*)	Trumpeter swan (*Cygnus buccinator*)
Eastern Kingbird (*Tyrannus tyrannus*)	Turkey Vulture (*Cathartes aura*)
Great Blue Heron (*Ardea herodias*)	Vesper Sparrow (*Pooecetes gramineus*)[1]
Green-winged Teal (*Anas crecca*)	**Western Meadowlark (*Sturnella neglecta*)**
Killdeer (*Charadrius vociferous*)	Wilson's Phalarope (*Phalaropus tricolor*)
Lesser Scaup (*Aythya fuligula*)	Yellow-rumped Warbler (*Dendroica coronata*)
MAMMAL	
Antelope (*Antilocarpa Americana*)	Mule deer (*Odocoileus hemionus*)
Beaver (*Castor canadensis*)	Muskrat (*Ondatra zibethicus*)
Coyote *(Canis latrans)* or wolf *(Canis lupus)*	Porcupine (*Erethizon dorsatum*)
Eastern Cottontail (*Sylvilagus floridanus*)[1]	River otter (*Lutra canadensis*)
Elk (*Cervus canadensis*)	Red fox (*Vulpes fulva*)
Longtail weasel (*Mustela frenata*)	Striped Skunk (*Mephitis mephitis*)
Moose (*Alces alces*)	Vole spp.
Mountain cottontail (*Sylvilagus nuttalli*)	**White-tailed deer *(Odocoileus virginianus)***

Bolded species indicate those documented within the analysis area in 2007
[1] Additional species observed by MDT

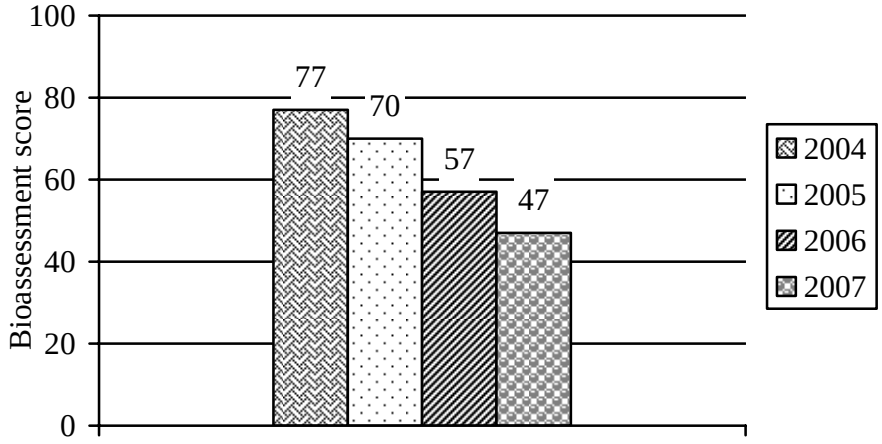
3.6 Macroinvertebrates

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

Pond*. A steady decline in bioassessment scores is apparent at this site. In 2007, poor biotic conditions are indicated. Although the abundance of invertebrates was apparently much higher in 2007 than in 2006, taxa richness remained very low. Aquatic habitats appeared to be limited*

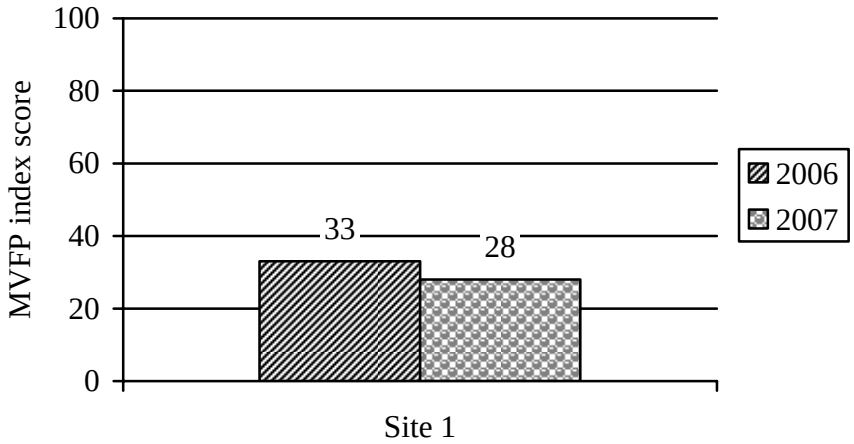
to hypoxic substrates, and open water, with some contribution from filamentous algae. Macrophyte-associated taxa were uncommon.

Chart 3: ***2004 to 2007 bioassessment scores for the pond at the Jack Creek Ranch Wetland Mitigation Site.***



Stream. *Rheophilic taxa were prominent in the invertebrate assemblage at this site; the MVFP (lotic) index was used to assess biotic integrity. Low mayfly richness and high biotic index value suggest that water quality may have been degraded at this site. The thermal preference of the invertebrate assemblage was calculated to be 16.8ºC, 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 27% of collected animals. Moderate impairment is indicated.*

Chart 4: ***2004 to 2007 MVFP index scores for the stream segment at Jack Creek Ranch Wetland Mitigation Site.***



3.7 Functional Assessment

Completed Functional Assessment Forms are included in **Appendix B** and summarized in **Table 4**. Pre-construction functional assessments were completed for the wetlands as well as the middle reach of McKee Spring Creek by ADC (2002). The results of that assessment are included in **Table 4.** The site remains a Category II wetland and scores 390 functional units.

Table 4: ***Summary of 2002 and 2004 to 2007 wetland function/value ratings and functional points at the Jack Creek Ranch Wetland Mitigation Project.***

Function and Value Parameters From the 1999 MDT Montana Wetland Assessment Method	Pre-construction	Post-construction			
	2002[1]	2004[2]	2005[2]	2006[2]	2007[2]
Listed/Proposed T&E Species Habitat	Low (0)	Low (0.3)	Low (0.3)	Low (0.3)	Low (0.3)
MNHP Species Habitat	Mod (0.6)	Mod (0.6)	Mod (0.6)	Mod (0.6)	Mod (0.6)
General Wildlife Habitat	Low (0.3)	Exc (1.0)	Exc (1.0)	Exc (1.0)	Exc (1.0)
General Fish/Aquatic Habitat	Mod (0.6)	Mod (0.7)	Mod (0.7)	Mod (0.7)	Mod (0.7)
Flood Attenuation	NA	Low (0.1)	Low (0.1)	Low (0.1)	Low (0.1)
Short / Long Term Surface Water Storage	NA	Mod (0.7)	Mod (0.7)	High (0.9)	High (0.9)
Sediment, Nutrient, Removal	NA	High (0.9)	High (0.9)	High (0.9)	High (0.9)
Sediment/Shoreline Stabilization	NA	Mod (0.7)	High (1.0)	High (1.0)	High (1.0)
Production Export/Food Chain Support	Low (0.3)	High (0.8)	High (0.8)	High (0.8)	High (0.8)
Groundwater Discharge/Recharge	Low (0.1)	High (1.0)	High (1.0)	High (1.0)	High (1.0)
Uniqueness	Low (0.1)	Mod (0.4)	Mod (0.4)	Mod (0.4)	Mod (0.4)
Recreation/Education Potential	Low (0.1)	Mod (0.7)	Mod (0.7)	Mod (0.7)	Mod (0.7)
Actual Points/Possible Points	2.7/9	7.9/12	8.2/12	8.4/12	8.4/12
% of Possible Score Achieved	30%	66%	68%	70%	70%
Overall Category	III	II	II	II	II
Total Acreage of Assessed Wetland / Open Water Areas within Easement	**23.60**	**21.51**	**33.44**	**42.15**	**46.43**
Functional Units (acreage x actual points) (fu)	**49.80**	**169.90**	**274.20**	**354.10**	**390.00**
Net Acreage Gain in Mitigation Area (ac)	NA	**19.52**	**31.45**	**40.16**	**44.44**
Approximate Functional Unit Gain in Mitigation Area (acreage gain x actual points) (fu)	---	**154.20**	**257.90**	**337.30**	**373.30**

[1] 2002 baseline assessment included the horseshoe wetland as well as the lower and middle reaches of McKee Spring Creek. Approximately 1.99 acres of wetlands occurred in the mitigation area pre-project.
[2] Assessment areas include the horseshoe wetlands and the middle reach of McKee Spring Creek (the mitigation area).

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 site has two State of Montana Noxious Weeds, Canada thistle and hounds tongue. Only a few live hounds tongue were noted during the July 2007 monitoring visit within the McKee Spring creek floodplain. Weed control efforts have been effective in significantly reducing these two species. Canada thistle still continues to pose the greatest problem in the transition and upland areas. Continued spot spraying is recommended in 2007 primarily for Canada thistle and hounds tongue.

3.10 Current Credit Summary

The gross wetland boundary increased to 46.43 acres in 2007. From 2006 to 2007, this one-year gain encompasses 4.28 acres and includes 2.13 acres of shallow open water (<4 feet deep). The monitoring area has gained over 206 functional units since 2004 due to the increase in shoreline stabilization and gain of wetland acreage. The site remains a Category II wetland and scores 390 functional units.
MDT anticipates creating at least 50 acres of wetland within the 86-acre conservation easement (MDT 2002). The mitigation efforts have thus far resulted in 46.43 gross wetland acres or 93% of the goal (the 50 acre goal included the pre-existing wetlands). Subtracting the original wetland acreage of 1.99 acres, the new net acreage of aquatic habitats totals 44.44 acres. Since construction, the site has gained 373 functional units.

4.0 REFERENCES

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Western Regional Climate Center (WRCC). 2007. Ennis Station: http://www.wrcc.dri.edu/cgi-bin/cliMONtpre.pl?mt2793.

Appendix A

FIGURES 2 & 3

MDT Wetland Mitigation Monitoring
Jack Creek Ranch
Ennis, Montana

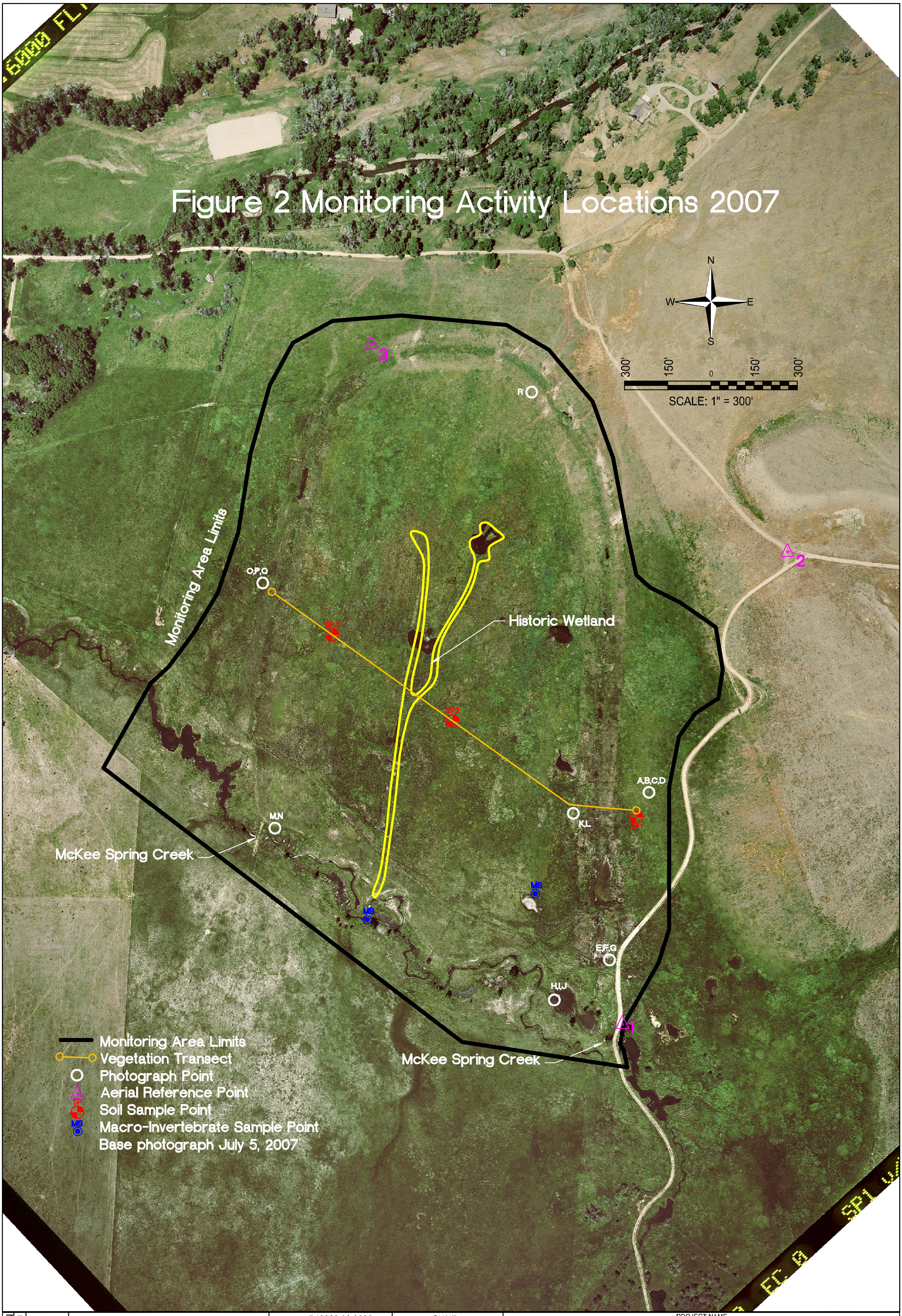


FIGURE 2 OF -	REV - Nov/19/2007	PBSJ 3810 Valley Commons Drive, Suite 4, Bozeman, MT 59718	
PROJ NO: B43088.00 0206	DRAWN: SH/JR	PROJECT NAME: MDT JACK CREEK WETLAND MITIGATION	
LOCATION: ENNIS, MT	PROJ MGR: J. BERGLUND		
SCALE: 1" = 300'	CHECKED: CH	APPVD: JB	DRAWING TITLE: MONITORING ACTIVITY LOCATIONS 2007
FILE NAME: Jack Creek 2007.dwg			

Figure 3 Mapped Site Features 2007

N
W E
S

300' 150' 0 150' 300'

SCALE: 1" = 300'

Monitoring Area Limits

McKee Spring Creek

McKee Spring Creek

Monitoring Area Limits
Wetland Boundary
Open Water/Stream
Vegetation Community Boundary
Upland
Base photograph July 5, 2007
Wetland Area
Gross Area 46.43 Acres
Historic Wetlands 1.99 Acres
Net Area 44.44 Acres
(Net includes 2.13 acres of shallow open water)

Vegetation Types
① Agropyron repens/Bromus inermis/Festuca arundinacea
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

REV - Nov/21/2007	FIGURE 3 OF	PBSJ 3810 Valley Commons Drive Suite 4 Bozeman, MT 59718	PROJECT NAME: MDT JACK CREEK WETLAND MITIGATION
		PROJ NO: B43088.00 0206 DRAWN: SH/JR	
		LOCATION: ENNIS, MT PROJ MGR: J. BERGLUND	
		SCALE: 1" = 300' CHECKED: CH APPVD: JB	DRAWING TITLE: MAPPED SITE FEATURES 2007
		FILE NAME: Jack Creek 2007.dwg	

Appendix B

2007 WETLAND MITIGATION SITE MONITORING FORM
2007 BIRD SURVEY FORMS
2007 COE WETLAND DELINEATION FORMS
2007 FUNCTIONAL ASSESSMENT FORMS

MDT Wetland Mitigation Monitoring
Jack Creek Ranch
Ennis, Montana

PBS&J / MDT WETLAND MITIGATION SITE MONITORING FORM

Project Name: **Jack Creek Ranch** Project Number: **B43054-0206**
Assessment Date: **July 10, 2007** 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: **3** # 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: **25%**
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

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

Well Number	Depth	Well Number	Depth	Well Number	Depth

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

COMMENTS / PROBLEMS:
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.

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

Comments / Problems: **Shallow surface water in this community type limited to the western portion of the horseshoe in 2007. Starting 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%	Puccinellia nuttalliana	2 = 6-10%
Deschampsia cespitosa	3=11-20%	Typha latifolia (young plants)	2 = 6-10%
Juncus torreyi	3=11-20%	Carex lanuginosa	1 = 1-5%
Juncus ensifolius	3=11-20%	Juncus balticus	1= 1-5%
Alopecurus pratensis	2 = 6-10%	Phalaris arundinacea	1 = 1-5%
Carex nebrascensis	2 = 6-10%	Hordeum jubatum	1 = 1-5%

Comments / Problems: **Historically, Hordeum jubatum represented approximately 20% of this community. In 2006 and 2007, Hordeum jubatum is still present but represents a low percent of the total plant cover. 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 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	2 = 6-10%	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%	Bechmannia syziachne	+ = <1%

Comments / Problems: **This community type was typically found in areas of shallow water or around the perimeter of open water but in 2007 there were fewer areas with shallow surface water. This is an impressive community that is expanding towards the creek (south) and to the east and west.**

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 inermus	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: **Hydrology ranged from shallow surface water along the western quarter of the project site to dry surface soil conditions.**

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

Dominant Species	% Cover	Dominant Species	% Cover
Agrostis alba	3 = 11-20%	Cirsium arvense	1 = 1-5%
Alopecurus pratensis	3 = 11-20%	Scirpus pungens	1 = 1-5%
Alopecurus arundinacea	2 = 6-10%	Carex nebrascensis	1 = 1-5%
Deschampsia cespitosa	2 = 6-10%		
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 and Agropyron riparium.**

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	3 = 11-20%		
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%	Alopecurus pratensis	2 = 6-10%
Carex aquatilis	2 = 6-10%	Carex microptera	1 = 1-5%
Juncus torreyi	2 = 6-10%	Carex nebrascensis	1 = 1-5%
Juncus balticus	2 = 6-10%		
Typha latifolia (young plants)	3=11-20%		
Carex utriculata	2 = 6-10%		

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.**

Community Number: ___ Community Title (main spp): _____

Dominant Species	% Cover	Dominant Species	% Cover

Comments / Problems: _____

Community Number: ___ Community Title (main spp): _____

Dominant Species	% Cover	Dominant Species	% Cover

Comments / Problems: _____

Community Number: ___ Community Title (main spp): _____

Dominant Species	% Cover	Dominant Species	% Cover

Comments / Problems: _____

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)
Agropyron dasystachyum	1	*Kochia scoparia*	1
Agropyron repens	1, 4	*Medicago lupulina*	5
Agropyron riparium	4, 5	*Melilotus alba*	1, 4
Agropyron trachycaulum	1, 4, 5	*Melilotus officinalis*	1
Agrostis alba	1, 2, 4, 5	*Mentha arvense*	2, 5
Alopecurus aequalis	3, 5	*Muhlenbergia sp.*	1, 2, 4
Alopecurus arundinacea	1, 2, 4, 5	*Mimulus sp.*	2, 5
Alopecurus pratensis	1, 2, 4, 5	*Phalaris arundinacea*	1, 2, 3
Astragalus sp.	1	*Phleum pratense*	1
Bechmannia syzigachne	2, 3, 5`	*Poa palustris*	4, 5
Bromus inermis	1, 4	*Poa pratensis*	1, 2, 4
Bromus marginatus	5	*Poa compressa*	1, 4
Bromus tectorum		*Populus angustifolia*	5
Calamagrostis canadensis	5	*Potentilla anserina*	2
Carduus nutans	5	*Puccinellia nuttalliana*	2, 3
Carex aquatilis	2, 3, 6, 7	*Ranunculus cymbalaria*	2, 3
Carex lanuginosa	2, 3, 5, 7	*Rumex crispus*	2
Carex microptera	2, 7	*Salix bebbiana*	3
Carex nebrascensis	2, 5, 7	*Salix exigua*	3, 5
Carex utriculata	3, 6, 7	*Salix lasiandra*	3, 5
Chenopodium album	1	*Salsola kali*	1
Cirsium arvense	1, 2, 4, 5	*Scirpus pungens*	2, 3, 5, 6
Cynoglossum officinale	1, 5	*Scirpus validus*	3
Deschampsia cespitosa	2, 5	*Sisymbrium altissimum*	1
Distichlis spicata	2, 5	*Spartina gracilis*	2
Eleocharis palustris	2, 3, 6	*Thlaspi arvense*	1
Elymus canadensis	1, 4	*Tragopogon dubuis*	1
Elymus cinereus	1	*Typha latifolia*	2, 3, 6, 7
Epilobium ciliatum	2	*Verbascum thapsus*	1
Equisetum arvense	2, 4	*Veronica americana*	3
Festuca arundinacea	1, 2, 4, 7	*Verbena hastata*	3
Festuca pratensis	1, 4		
Glyceria grandis	5		
Glycyrrhiza lepidota	1		
Hordeum jubatum	1, 2, 4, 5		
Hyoscyamus niger	1		
Juncus balticus	2, 3, 5		
Juncus bufonius	5		
Juncus ensifolius	2, 3, 6		
Juncus longistylis	2, 5		
Juncus mertensianus	2, 5		
Juncus torreyi	2, 3, 5, 6, 7		

Comments / Problems:

PLANTED WOODY VEGETATION SURVIVAL

Plant Species	Mortality Causes & General Information
McKee Spring Creek Sandbar willow cuttings Pacific willow cuttings Bebbs willow cuttings Transplanted cottonwoods Transplanted willow species Original planting number is NA.	Approximately 25 percent of the cuttings along the channel were alive in 2006. In 2007 no live willow cuttings were found along the channel. Mortality causes likely include: lower stream flows reducing soil moisture/saturation along the banks, possible damage from wildlife (muskrats, deer) or the competition from the dense floodplain vegetation posed a problem for the establishment and sustained growth of the willow cuttings. In 2007, six of the live transplanted cottonwoods (4 to 8 ft) within the floodplain are healthy and robust. Also volunteer cottonwood root suckers were observed within the floodplain (see photograph J). In 2007, one live transplanted willow remains along the channel. Willows were healthy with little insect damage compared to 2004 where grasshoppers defoliated the young plants.
Horseshoe Pasture Willow cuttings Transplanted willows Original planting number is NA.	Very few live willow cuttings were noted during the 2006 field survey. In 2005 the percent survival was estimated between 20 to 25 percent based on the number of dead cuttings vs the number of live cuttings. The survival percentage in 2006 was estimated between 15 to 20 percent, a reduction from 2005, possibly due to the amount of surface water across much of the project site. Browse from deer, and the soil texture (clay - muck) may have also contributed to the poor survival of the cuttings. In 2007, the survival percentage is estimated at 7 to 10 percent. Approximately one-half of the live willows noted in last year (2006) were alive this year (2007). Surface water was present where the transplanted willows were located. In 2006, two live (large) willow transplants were observed in the pasture. In 2007 only one live (large) willow transplant remains. It is likely that in a lentic wetland system, the lack of oxygenated water through a fine-textured inundated/saturated soil profile would likely restrict the development and growth of roots from cuttings.

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	5	☐	☐	☐	> 5 lodges
White-tailed deer	5	☐	☐	☐	5-10 animals
		☐	☐	☐	
		☐	☐	☐	
		☐	☐	☐	
		☐	☐	☐	
		☐	☐	☐	
		☐	☐	☐	

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 of transect	NE
B		Transect 1 eastern side cattails replacing foxtail barley	West
C		Transect 1 mud flat remnants - vegetated with cattails, bulrush and spikerush s	South
D		Transect 1 CT 3 and CT 2 wetlands	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	SW
H		Pond along McKee Spring Creek	SE
I		McKee Creek and floodplain vegetation	SE
J		Cottonwood root suckers within creek floodplain	SW
K		Educed water levels in the shallow water pond	SE
L		Increased litter accumulation in CT 2	South
M		McKee Spring Creek - CT 5 along channel	East
N		CT 1 and healthy young trees along the southern side of McKee Creek	SE
O		Wetlands expanding to west of transect	West
P		Developing wetlands in NW horseshoe	NE
Q		Transect 1 at western stake looking east	East
R		Buffer along far northern project boundary	West

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**

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, 2007** Examiner: **CH/PBSJ**
Transect Number: **1** Approximate Transect Length: **1200 feet** Compass Direction from Start: **44˚** Note: **East to west**

Vegetation Type A: **CT 2 (Wetland)**	
Length of transect in this type: 30 feet	
Plant Species	**Cover**
ALOPRA	3 = 11-20%
TYPLAT (young plants)	3 = 11-20%
RANCYM	3 = 11-20%
HORJUB	3 = 11-20%
AGRALB	2 = 6-10%
PHAARU	2 = 6-10%
ALOARU	2 = 6-10%
PUCNUT	1 = 1-5%
AGRREP	1 = 1-5%
Total Vegetative Cover:	90%

Vegetation Type B: **CT 3 (Wetland)**	
Length of transect in this type: 155 feet	
Plant Species	**Cover**
TYPLAT	4 = 21-50%
SCIPUN	3 = 11-20%
SCIVAL	3 = 11-20%
JUNTOR	2 = 6-10%
CARAQU	2 = 6-10%
CARLAN	2 = 6-10%
CARUTR	1 = 1-5%
VERAME	1 = 1-5%
RANCYM	1 = 1-5%
ELEPAL	1 = 1-5%
Open water	1 = 1-5%
Total Vegetative Cover:	90%

Vegetation Type C: **CT 2 (Wetland)**	
Length of transect in this type: 125 feet	
Plant Species	**Cover**
DESCES	3 = 11-20%
JUNBAL	2 = 6-10%
TYPLAT	2 = 6-10%
JUNTOR	2 = 6-10%
CARNEB	2 = 6-10%
SCIPUN	2 = 6-10%
CARLAN	2 = 6-10%
EQUARV	1 = 1-5%
RANCYM	1 = 1-5%
MENARV	1 = 1-5%
JUNMER	1 = 1-5%
HORJUB	1 = 1-5%
Total Vegetative Cover:	85%

Vegetation Type D: **CT 4 (Upland)**	
Length of transect in this type: 60 feet	
Plant Species	**Cover**
HORJUB	3 = 11-20%
BROINE	3 = 11-20%
FESARU	3 = 11-20%
AGRTRA	2 = 6-10%
POAPRA	2 = 6-10%
CIRARV	3 = 11-20%
ELYCAN	1 = 1-5%
MUHSPP	1 = 1-5%
surface water	1 = 1-5%
Total Vegetative Cover:	85%

MDT WETLAND MONITORING – VEGETATION TRANSECT

Site: **Jack Creek Ranch** Date: **July 10, 2007** Examiner: **CH**
Transect Number: **1** Approximate Transect Length: **1200 feet** Compass Direction from Start: **44˚** Note: **east to west**

Vegetation Type E: **CT 2 (Wetland)**	
Length of transect in this type: 115 feet	
Plant Species	**Cover**
SCIPUN	3 = 11-20%
AGRALB	3 = 11-20%
CARLAN	3 = 11-20%
HORJUB	2 = 6-10%
PHAARV	2 = 6-10%
FESARU	2 = 6-10%
JUNTOR	1 = 1-5%
EPICIL	1 = 1-5%
Litter	3 = 11-20%
Total Vegetative Cover:	75%

Vegetation Type F: **CT4 (Upland)**	
Length of transect in this type: 90 feet	
Plant Species	**Cover**
HORJUB	3 = 11-20%
FESARU	3 = 11-20%
AGRALB	3 = 11-20%
BROINE	3 = 11-20%
CIRARV	2 = 6-10%
POAPRA	2 = 6-10%
EQUARV	1 = 1-5%
AGRRIP	1 = 1-5%
Litter	3 = 11-20%
Total Vegetative Cover:	80%

Vegetation Type G: **CT 7 (Wetland)**	
Length of transect in this type: 65 feet	
Plant Species	**Cover**
TYPLAT (young plants)	3 = 11-20%
CARLAN	3 = 11-20%
CARAQU, CARUTR	3 = 11-20%
JUNTOR	2 = 6-10%
JUNBAL	2 = 6-10%
ALOPRA	2 = 6-10%
FESARU	1 = 1-5%
CARNEB	1 = 1-5%
CARMIC	1 = 1-5%
Total Vegetative Cover:	85%

Vegetation Type H: **CT 3 (Wetland)**	
Length of transect in this type: 90 feet	
Plant Species	**Cover**
TYPLAT	4 = 21-50%
SCIVAL	3 = 11-20%
SCIPUN	3 = 11-20%
JUNENS	2 = 6-10%
JUNBAL	1 = 1-5%
Salix cuttings (7 – 10% survival)	2 = 6-10%
PHAARU	1 = 1-5%
ELEPAL	1 = 1-5%
No surface water	
Total Vegetative Cover:	90%

MDT WETLAND MONITORING – VEGETATION TRANSECT

Site: **Jack Creek Ranch** Date: **July 10, 2007** Examiner: **CH**
Transect Number: **1** Approximate Transect Length: **1200 feet** Compass Direction from Start: **44˚** Note: **east to west**

Vegetation Type I: **CT 2 (Wetland)**	
Length of transect in this type: 45 feet	
Plant Species	**Cover**
SCIPUN	3 = 11-20%
HORJUB	3 = 11-20%
PUCNUT	3 = 11-20%
JUNENS	2 = 6-10%
DESCES	2 = 6-10%
EQUARV	1 = 1-5%
JUNTOR	1 = 1-5%
JUNBAL	1 = 1-5%
CIRARV	1 = 1-5%
litter	3 = 11-20%
Total Vegetative Cover:	80%

Vegetation Type J: **CT 1 (Upland)**	
Length of transect in this type: 110feet	
Plant Species	**Cover**
BROINE	3 = 11-20%
FESARU	3 = 11-20%
AGRREP	3 = 11-20%
HORJUB	2 = 6-10%
CIRARV	2 = 6-10%
POAPRA	2 = 6-10%
ALOPRA	2 = 6-10%
AGRDAS	+ = < 1%
Total Vegetative Cover:	75%

Vegetation Type K: **CT 2 (Wetland)**	
Length of transect in this type: 60 feet	
Plant Species	**Cover**
DESCES	3 = 11-20%
HORJUB	3 = 11-20%
AGRALB	2 = 6-10%
JUNENS	2 = 6-10%
CARLAN	2 – 6-10%
ALOPRA	2 = 6-10%
SCIPUN	2 = 6-10%
DISSPI	1 =1-5%
FESARU	1 = 1-5%
CIRARV	1 = 1-5%
Total Vegetative Cover:	85%

Vegetation Type L: **CT 1 (Upland)**	
Length of transect in this type: 100 feet	
Plant Species	**Cover**
AGRREP	3 = 11-20%
BROINE	3 = 11-20%
POAPRA	3 = 11-20%
HORJUB	2 = 6-10%
CIRARV	2 = 6-10%
FESARU	2 = 6-10%
Total Vegetative Cover:	85%

MDT WETLAND MONITORING – VEGETATION TRANSECT

Site: **Jack Creek Ranch** Date: **July 10, 2007** Examiner: **CH/LWC**
Transect Number: **1** Approximate Transect Length: **1200 feet** Compass Direction from Start: **44˚** Note: **east to west**

Vegetation Type M: **CT 2 (Wetland)**	
Length of transect in this type: 125 feet	
Plant Species	**Cover**
AGRALB	3 = 11-20%
SCIPUN	2 = 6-10%
ALOPRA	2 = 6-10%
JUNBAL	2 = 6-10%
POAPRA	1 = 1-5%
POTANS	1 = 1-5%
HORJUB	1 = 1-5%
EPICIL	1 = 1-5%
JUNTOR	1 = 1-5%
JUNENS	1 = 1-5%
FESARU	1 = 1-5%
Total Vegetative Cover:	85%

Vegetation Type N: **CT 1 (Upland)**	
Length of transect in this type: 30 feet	
Plant Species	**Cover**
AGRREP	4 = 21-50%
BROINE	4 = 21-50%
CIRARV	3 = 11-20%
EQUARV	1 = 1-5%
Total Vegetative Cover:	90%

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

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

MDT WETLAND MONITORING – VEGETATION TRANSECT

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

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

Site: **Jack Creek Ranch** Date: **See Below**
Survey Time: **7 AM** to **9 AM**

Bird Species	#	Behavior	Habitat	Bird Species	#	Behavior	Habitat
May 1, 2007				Sora	1	unknown	MA
Brown-headed Cowbird	1	BD	Stream	Tree Swallow	10	F/FO	MA
Canada Goose	2	F	MA	Western Meadowlark	1	BD	MA
Cinnamon Teal	2	F	MA	**October 4, 2007**			
Common Snipe	2	F	MA/Stream	Mallard	30	F	MA/Stream
Mallard	45	F	MA/Stream	Marsh Wren	2	F	MA/Stream
Marsh Wren	3	BD	MA	Red-winged Blackbird	20	F	MA/Stream
Northern Harrier	1	F O	MA	Unidentified Sparrow	1	F	Stream
Red-winged Blackbird	20	BD	MA/Stream				
Savannah Sparrow	6	BD	MA				
Tree Swallow	1	F O	MA				
Western Meadowlark	1	BD	MA				
July 11, 2007							
Common Snipe	1	F	MA				
Common Yellowthroat	15	BD	MA/Stream				
Mallard	10	F	Stream				
Marsh Wren	3	BD	MA /Stream				
Red-winged Balckbird	15	BD	MA				
Savanah Sparrow	30	BD	MA /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
MA = Marsh
MF = Mud Flat
OW = Open Water
SS = Scrub/Shrub
UP = Upland buffer
WM = Wet meadow
US = Unconsolidated shore

Weather: **varies**

Notes:

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

Project / Site: **Jack Creek Ranch** Applicant / Owner: **MDT** Investigator: **CH/PBS&J**	Date: **July 10, 2007** County: **Madison** State: **Montana**

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

VEGETATION

Dominant Species	Stratum	Indicator	Dominant Species	Stratum	Indicator
1. *RANCYM*	Herb	OBL	11.		
2. *PHAARU*	Herb	FACW	12.		
3. *TYPLAT*	Herb	OBL	13.		
4. *ALOPRA*	Herb	FACW	14.		
5. *POAPRA*	Herb	FACU+	15.		
6. *HORJUB*	Herb	FAC+	16.		
7.			17.		
8.			18.		
9. *I*			19.		
10.			20.		
Percent of Dominant Species that are OBL, FACW, or FAC (excluding FAC-): **5** / **6** = **83**%			FAC Neutral: / = %		
Remarks: **83% hydrophytic vegetation**					

HYDROLOGY

Yes Recorded Data (Describe in Remarks): **N/A** Stream, Lake, or Tide Gauge **Yes** Aerial Photographs **N/A** Other **No** No Recorded Data	Wetland Hydrology Indicators Primary Indicators: **NO** Inundated **YES** Saturated in Upper 12 Inches **NO** Water Marks **NO** Drift Lines **NO** Sediment Deposits **NO** Drainage Patterns in Wetland
Field Observations: Depth of Surface Water **None** ____ (in.) Depth to Free Water in Pit > **12** (in.) Depth to Saturated Soil = **6** (in.)	Secondary Indicators (2 or more required): **NO** Oxidized Root Channels in Upper 12 inches **NO** Water-Stained Leaves **NO** Local Soil Survey Data **NO** FAC-Neutral Test **NO** Other (Explain in Remarks)
Remarks: **Soils saturated in the upper 12 inches.**	

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.
0-6		10 YR 5/2	/ /	N/A N/A	 Silty loam
7-12	A/B	10 YR 4/1	/ /	N/A N/A	 Silty clay loam
		/	/ /	N/A N/A	
		/	/ /	N/A N/A	
		/	/ /	N/A N/A	

Hydric Soil Indicators:

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

Remarks: **low chroma valueS below 6 inches.**

WETLAND DETERMINATION

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

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

Remarks: **Sampling site meets the parameters for hydrophytic vegetation, hydric soils and wetland hydrology. Wetlands are expanding to the east.**

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

Project / Site: **Jack Creek Ranch**	Date: **July 10, 2007**
Applicant / Owner: **MDT**	County: **Madison**
Investigator: **CH/PBS&J**	State: **Montana**

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

VEGETATION

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

Percent of Dominant Species that are OBL, FACW, or FAC (excluding FAC-): **3** / **7** = **43**%	FAC Neutral: / = %
Remarks: **43% hydrophytic vegetation**	

HYDROLOGY

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

SOILS

Map Unit Name (Series and Phase): **Fluvaquentic Haplaquolls**
Map Symbol: **45** Drainage Class: **poorly-drained** Mapped Hydric Inclusion? _
Taxonomy (Subgroup): **Silty clay** 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.
0-8	A	10 YR 5/2	/ /	N/A N/A	Silty Clay Loam
9-12	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:

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

Remarks: **Hydric soils - low chroma value**

WETLAND DETERMINATION

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

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

Remarks: **Upland vegetation represents greater than 50% of the cover but it is likely this area will convert to wetland vegetation with time.**

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

Project / Site: **Jack Creek Ranch**	Date: **July 10, 2007**
Applicant / Owner: **MDT**	County: **Madison**
Investigator: **CH/PBS&J**	State: **Montana**

Do Normal Circumstances exist on the site? **Yes** Is the site significantly disturbed (Atypical Situation)? **No** Is the area a potential Problem Area? **No** (If needed, explain on reverse side)	Community ID: **Upland** Transect ID: **1** Plot ID: **SP-3**

VEGETATION

Dominant Species	Stratum	Indicator	Dominant Species	Stratum	Indicator
1. *BROINE*	Herb	NI	11.		
2. *AGRREP*	Herb	FACU	12.		
3. *POAPRA*	Herb	FACU+	13.		
4. *FESARU*	Herb	FACU-	14.		
5. *CIRARV*	Herb	FACU+	15.		
6. *JUNBAL*	Herb	OBL	16.		
7. *HORJUB*	Herb	FAC+	17.		
8.			18.		
9. *I*			19.		
10.			20.		

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

HYDROLOGY

Yes Recorded Data (Describe in Remarks): **N/A** Stream, Lake, or Tide Gauge **Yes** Aerial Photographs **N/A** Other **No** No Recorded Data	Wetland Hydrology Indicators Primary Indicators: **NO** Inundated **NO** Saturated in Upper 12 Inches **NO** Water Marks **NO** Drift Lines **NO** Sediment Deposits **NO** Drainage Patterns in Wetland
Field Observations: Depth of Surface Water **N/A** ____ (in.) Depth to Free Water in Pit **N/A** ____ (in.) Depth to Saturated Soil > **12** (in.)	Secondary Indicators (2 or more required): **NO** Oxidized Root Channels in Upper 12 inches **NO** Water-Stained Leaves **NO** Local Soil Survey Data **NO** FAC-Neutral Test **NO** Other (Explain in Remarks)
Remarks: **Soils not saturated in the upper 12 inches. Areas of uplands with surface water to the west but not along this portion of the transect.**	

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 5/2	/ /	N/A N/A	 Silty loam
5-12	A	10 YR 6/2	/ /	N/A N/A	 Silty clay
		/	/ /	N/A N/A	
		/	/ /	N/A N/A	
		/	/ /	N/A N/A	

Hydric Soil Indicators:

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

Remarks:

WETLAND DETERMINATION

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

Remarks: **Hydrophytic vegetation, wetland hydrology and hydric soils have not developed yet.**

MDT MONTANA WETLAND ASSESSMENT FORM (revised May 25, 1999)

1. Project Name: Jack Creek Ranch **2. Project #:** STPX BR29(37) **Control #:** 5229

3. Evaluation Date: 7/10/2007 **4. Evaluator(s):** CH/PBSJ **5. Wetland / Site #(s):** _____

6. Wetland Location(s) i. T: 5 N **R:** 1 W **S:** 25 and 26 **T:** __ N **R:** __ E **S:** _____

ii. Approx. Stationing / Mileposts: _____

iii. Watershed: 6 **GPS Reference No. (if applies):** _____

Other Location Information: _____

7. A. Evaluating Agency PBSJ

8. Wetland Size (total acres): 46.43 ac (visually estimated)
_____ (measured, e.g. GPS)

B. Purpose of Evaluation:

- ☐ Wetlands potentially affected by MDT project
- ☐ Mitigation wetlands; pre-construction
- ☒ Mitigation wetlands; post-construction
- ☐ Other

9. Assessment Area (total acres): 46.43 ac (visually estimated)
_____ (measured, e.g. GPS)

10. CLASSIFICATION OF WETLAND AND AQUATIC HABITATS IN AA

HGM CLASS [1]	SYSTEM [2]	SUBSYSTEM [2]	CLASS [2]	WATER REGIME [2]	MODIFIER [2]	% OF AA
Depression	Palustrine	None	Emergent Wetland	Seasonally Flooded	---	80
Riverine	Riverine	Lower Perennial	Unconsolidated Bottom	Permanently Flooded	Excavated	20
---	---	---	---	---	---	
---	---	---	---	---	---	

[1] = Smith et al. 1995. [2] = Cowardin et al. 1979.

11. ESTIMATED RELATIVE ABUNDANCE (of similarly classified sites within the same Major Montana Watershed Basin)
Common **Comments:** _____

12. GENERAL CONDITION OF AA

i. Regarding Disturbance: (Use matrix below to select appropriate response.)

Conditions Within AA	Predominant Conditions Adjacent (within 500 Feet) To AA		
	Land managed in predominantly natural state; is not grazed, hayed, logged, or otherwise converted; does not contain roads or buildings.	Land not cultivated, but moderately grazed or hayed or selectively logged or has been subject to minor clearing; contains few roads or buildings.	Land cultivated or heavily grazed or logged; subject to substantial fill placement, grading, clearing, or hydrological alteration; high road or building density.
AA occurs and is managed in predominantly a natural state; is not grazed, hayed, logged, or otherwise converted; does not contain roads or occupied buildings.	---	low disturbance	---
AA not cultivated, but moderately grazed or hayed or selectively logged or has been subject to relatively minor clearing, or fill placement, or hydrological alteration; contains few roads or buildings.	---	---	---
AA cultivated or heavily grazed or logged; subject to relatively substantial fill placement, grading, clearing, or hydrological alteration; high road or building density.	---	---	---

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

ii. Prominent weedy, alien, & introduced species: weeds include Canada thistle and houndstongue

iii. Briefly describe AA and surrounding land use / habitat: livestock grazing and hay production

13. STRUCTURAL DIVERSITY (Based on 'Class' column of #10 above.)

Number of 'Cowardin' Vegetated Classes Present in AA	≥3 Vegetated Classes or ≥ 2 if one class is forested	2 Vegetated Classes or 1 if forested	≤ 1 Vegetated Class
Select Rating	---	---	Low

Comments: _____

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

i. AA is Documented (D) or Suspected (S) to contain (check box):

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	☐ D ☐ S		

ii. **Rating** (Based on the strongest habitat chosen in 14A(i) above, find the corresponding rating of High (H), Moderate (M), or Low (L) for this function.

Highest Habitat Level	doc/primary	sus/primary	doc/secondary	sus/secondary	doc/incidental	sus/incidental	none
Functional Point and Rating	---	---	---	---	---	.3 (L)	0 (L)

If documented, list the source (e.g., observations, records, etc.)**:** _____

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

i. AA is Documented (D) or Suspected (S) to contain (check box):

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	☐ D ☐ S	_____

iii. **Rating** (Based on the strongest habitat chosen in 14B(i) above, find the corresponding rating of High (H), Moderate (M), or Low (L) for this function.

Highest Habitat Level:	doc/primary	sus/primary	doc/secondary	sus/secondary	doc/incidental	sus/incidental	none
Functional Point and Rating	---	---	---	.6 (M)	---	---	---

If documented, list the source (e.g., observations, records, etc.)**:** other species include Trumpeter swan

14C. General Wildlife Habitat Rating

i. **Evidence of overall wildlife use in the AA:** (Check either substantial, moderate, or low)

☒ **Substantial** (based on any of the following)
- ☒ observations of abundant wildlife #s or high species diversity (during any period)
- ☒ abundant wildlife sign such as scat, tracks, nest structures, game trails, etc.
- ☐ presence of extremely limiting habitat features not available in the surrounding area
- ☐ interviews with local biologists with knowledge of the AA

☐ **Low** (based on any of the following)
- ☐ few or no wildlife observations during peak use periods
- ☐ little to no wildlife sign
- ☐ sparse adjacent upland food sources
- ☐ interviews with local biologists with knowledge of AA

☐ **Moderate** (based on any of the following)
- ☐ observations of scattered wildlife groups or individuals or relatively few species during peak periods
- ☐ common occurrence of wildlife sign such as scat, tracks, nest structures, game trails, etc.
- ☐ adequate adjacent upland food sources
- ☐ interviews with local biologists with knowledge of the AA

ii. **Wildlife Habitat Features** (Working from top to bottom, select appropriate AA attributes to determine the exceptional (E), high (H), moderate (M), or low (L) rating. Structural diversity is from #13. For class cover to be considered evenly distributed, vegetated classes must be within 20% of each other in terms of their percent composition in the AA (see #10). Duration of Surface Water: P/P = permanent/perennial; S/I = seasonal/intermittent; T/E = temporary/ephemeral; A= absent.

Structural Diversity (from #13)	☐High								☐Moderate								☒Low			
Class Cover Distribution (all vegetated classes)	☐Even				☐Uneven				☐Even				☐Uneven				☒Even			
Duration of Surface Water in ≥ 10% of AA	P/P	S/I	T/E	A	P/P	S/I	T/E	A	P/P	S/I	T/E	A	P/P	S/I	T/E	A	P/P	S/I	T/E	A
Low disturbance at AA (see #12)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	E	--	--	--
Moderate disturbance at AA (see #12)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
High disturbance at AA (see #12)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

iii. **Rating** (Using 14C(i) and 14C(ii) above and the matrix below to arrive at the functional point and rating of exceptional (E), high (H), moderate (M), or low (L) for this function.)

Evidence of Wildlife Use from 14C(i)	**Wildlife Habitat Features Rating** from 14C(ii)			
	☒ Exceptional	☐ High	☐ Moderate	☐ Low
Substantial	1 (E)	--	--	--
Moderate	--	--	--	--
Low	--	--	--	--

Comments: _____

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

If the AA is not or was not historically used by fish due to lack of habitat, excessive gradient, then check the NA box above.

Assess if the AA is used by fish or the existing situation is "correctable" such that the AA could be used by fish [*e.g.* fish use is precluded by perched culvert or other barrier, etc.]. If fish use occurs in the AA but is not desired from a resource management perspective (*e.g.* fish use within an irrigation canal], then Habitat Quality [14D(i)] below should be marked as "Low", applied accordingly in 14D(ii) below, and noted in the comments.

i. **Habitat Quality** (Pick the appropriate AA attributes in matrix to pick the exceptional (E), high (H), moderate (M), or low (L) quality rating.

Duration of Surface Water in AA	☒Permanent/Perennial			☐Seasonal / Intermittent			☐Temporary / Ephemeral		
Cover - % of waterbody in AA containing cover objects (*e.g.* submerged logs, large rocks & boulders, overhanging banks, floating-leaved vegetation)	>25%	10-25%	<10%	>25%	10-25%	<10%	>25%	10-25%	<10%
Shading - >75% of streambank or shoreline of AA contains riparian or wetland scrub-shrub or forested communities	--	--	--	--	--	--	--	--	--
Shading – 50 to 75% of streambank or shoreline of AA contains riparian or wetland scrub-shrub or forested communities.	--	--	--	--	--	--	--	--	--
Shading - < 50% of streambank or shoreline of AA contains riparian or wetland scrub-shrub or forested communities.	--	M	--	--	--	--	--	--	--

ii. **Modified Habitat Quality:** Is fish use of the AA precluded or significantly reduced by a culvert, dike, other man-made structure or activity **or** is the waterbody included on the 'MDEQ list of waterbodies in need of TMDL development' with 'Probable Impaired Uses' listed as cold or warm water fishery or aquatic life support**?**
☐ **Y** ☒ **N** If yes, reduce the rating from 14D(i) by one level and check the modified habitat quality rating: ☐ E ☐ H ☐ M ☐ L

iii. **Rating** (Use the conclusions from 14D(i) and 14D(ii) above and the matrix below to pick the functional point and rating of exceptional (E), high (H), moderate (M), or low (L).)

Types of Fish Known or Suspected Within AA	**Modified Habitat Quality** from 14D(ii)			
	☐ Exceptional	☐ High	☒ Moderate	☐ Low
Native game fish	--	--	.7 (M)	--
Introduced game fish	--	--	--	--
Non-game fish	--	--	--	--
No fish	--	--	--	--

Comments: unknown if native game fish thrive in ponds

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

Applies only to wetlands subject to flooding via in-channel or overbank flow.
If wetlands in AA do not flooded from in-channel or overbank flow, check NA above.

i. **Rating** (Working from top to bottom, mark the appropriate attributes to arrive at the functional point and rating of high (H), moderate (M), or low (L) for this function.)

Estimated wetland area in AA subject to periodic flooding	☐ ≥ 10 acres			☐ <10, >2 acres			☒ ≤2 acres		
% of flooded wetland classified as forested, scrub/shrub, or both	75%	25-75%	<25%	75%	25-75%	<25%	75%	25-75%	<25%
AA contains **no outlet or restricted outlet**	--	--	--	--	--	--	--	--	--
AA contains **unrestricted outlet**	--	--	--	--	--	--	--	--	.1 (L)

ii. **Are residences, businesses, or other features which may be significantly damaged by floods located within 0.5 miles downstream of the AA?** (check)
☐**Y** ☒**N** **Comments:** _____

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, check NA above.

i. Rating (Working from top to bottom, use the matrix below to arrive at the functional point and rating of high (H), moderate (M), or low (L) for this function.)
Abbreviations: P/P = permanent/perennial; S/I = seasonal/intermittent; T/E = temporary/ephemeral.

Estimated maximum acre feet of water contained in wetlands within the AA that are subject to periodic flooding or ponding.	☒ >5 acre feet			☐ <5, >1 acre feet			☐ ≤1 acre foot		
Duration of surface water at wetlands within the AA	P/P	S/I	T/E	P/P	S/I	T/E	P/P	S/I	T/E
Wetlands in AA flood or pond **≥ 5 out of 10 years**	--	.9 (H)	--	--	--	--	--	--	--
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 wetlands with potential to receive excess 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 NA above.

i. **Rating** (Working from top to bottom, use the matrix below to arrive at the functional point and rating of high (H), moderate (M), or low (L) for this function.)

Sediment, Nutrient, and Toxicant Input Levels Within AA	AA receives or surrounding land use has potential to deliver low to moderate levels of sediments, nutrients, or compounds such that other functions are not substantially impaired. Minor sedimentation, sources of nutrients or toxicants, or signs of eutrophication present.				Waterbody on MDEQ list of waterbodies in need of TMDL development for "probable causes" related to sediment, nutrients, or toxicants **or** AA receives or surrounding land use has potential to deliver high levels of sediments, nutrients, or compounds such that other functions are substantially impaired. Major sedimentation, sources of nutrients or toxicants, or signs of eutrophication present.			
% cover of wetland vegetation in AA	☒ ≥ 70%		☐ < 70%		☐ ≥ 70%		☐ < 70%	
Evidence of flooding or ponding in AA	☒ Yes	☐ No	☐ Yes	☐ No	☐ Yes	☐ No	☐ Yes	☐ No
AA contains **no or restricted outlet**	--	--	--	--	--	--	--	--
AA contains **unrestricted outlet**	.9 (H)	--	--	--	--	--	--	--

Comments: _____

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

Applies only if AA occurs on or within the banks or a river, stream, or other natural or man-made drainage, or on the shoreline of a standing water body that is subject to wave action. If this does not apply, check NA above.

i. **Rating** (Working from top to bottom, use the matrix below to arrive at the functional point and rating exceptional (E), high (H), moderate (M), or low (L) for this function.

% Cover of wetland streambank or shoreline by species with deep, binding rootmasses.	Duration of Surface Water Adjacent to Rooted Vegetation		
	☒Permanent / Perennial	☐Seasonal / Intermittent	☐Temporary / Ephemeral
≥ 65 %	1 (H)	--	--
35-64 %	--	--	--
< 35 %	--	--	--

Comments:

14I. PRODUCTION EXPORT / FOOD CHAIN SUPPORT

i. **Rating** (Working from top to bottom, use the matrix below to arrive at the functional point and rating of high (H), moderate (M), or low (L) for this function.
A = acreage of vegetated component in the AA. **B** = structural diversity rating from #13. **C** = Yes (Y) or No (N) as to whether or not the AA contains a surface or subsurface outlet; **P/P** = permanent/perennial; **S/I** = seasonal/intermittent; **T/E/A**= temporary/ephemeral/absent.

A	☒ Vegetated component >5 acres						☐ Vegetated component 1-5 acres						☐ Vegetated component <1 acre					
B	☐ High		☐ Moderate		☒ Low		☐ High		☐ Moderate		☐ Low		☐ High		☐ Moderate		☐ Low	
C	☐Y	☐N	☐Y	☐N	☒Y	☐N	☐Y	☐N	☐Y	☐N	☐Y	☐N	☐Y	☐N	☐Y	☐N	☐Y	☐N
P/P	--	--	--	--	.8H	--	--	--	--	--	--	--	--	--	--	--	--	--
S/I	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
T/E/A	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Comments:

14J. GROUNDWATER DISCHARGE/RECHARGE (D/R) (Check the indicators in i & ii below that apply to the AA)

i. ☒ **Discharge Indicators**
- ☒ Springs are known or observed.
- ☐ Vegetation growing during dormant season/drought.
- ☐ Wetland occurs at the toe of a natural slopes.
- ☐ Seeps are present at the wetland edge.
- ☐ AA permanently flooded during drought periods.
- ☐ Wetland contains an outlet, but no inlet.
- ☐ Other

ii. ☐ **Recharge Indicators**
- ☐ Permeable substrate presents without underlying impeding layer.
- ☐ Wetland contains inlet but not outlet.
- ☐ Other

iii. **Rating:** Use the information from 14J(i) and 14j(ii) above and the table below to arrive at the functional point and rating of high (H) or low (L) for this function.

Criteria	Functional Point and Rating
AA has known Discharge/Recharge area or one or more indicators of D/R present	1 (H)
No Discharge/Recharge indicators present	--
Available Discharge/Recharge information inadequate to rate AA D/R potential	--

Comments:

14K. UNIQUENESS

i. Rating (Working from top to bottom, use the matrix below to arrive at the functional point and rating of high (H), moderate (M), or low (L) for this function.

Replacement Potential	AA contains fen, bog, warm springs or mature (>80 yr-old) forested wetland or plant association listed as "S1" by the MTNHP.			AA does not contain previously cited rare types and structural diversity (#13) is high or contains plant association listed as "S2" by the MTNHP.			AA does not contain previously cited rare types or associations and structural diversity (#13) is low-moderate.		
Estimated Relative Abundance from #11	☐rare	☐common	☐abundant	☐rare	☐common	☐abundant	☐rare	☒common	☐abundant
Low disturbance at AA (#12i)	--	--	--	--	--	--	--	.4M	--
Moderate disturbance at AA (#12i)	--	--	--	--	--	--	--	--	--
High disturbance at AA (#12i)	--	--	--	--	--	--	--	--	--

Comments:

14L. RECREATION / EDUCATION POTENTIAL

i. Is the AA a known recreational or educational site? ☐ **Yes (Rate** ☐ **High (1.0)**, then proceed to 14L(ii) only] ☒ **No** [Proceed to 14L(iii)]

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

iii. Based on the location, diversity, size, and other site attributes, is there a strong potential for recreational or educational use?
☒ **Yes** [Proceed to 14L (ii) and then 14L(iv).] ☐ **No** [Rate as low in 14L(iv)]

iv. Rating (Use the matrix below to arrive at the functional point and rating of high (H), moderate (M), or low (L) for this function.

Ownership	Disturbance at AA from #12(i)		
	☒ Low	☐ Moderate	☐ High
Public ownership	--	--	--
Private ownership	.7(M)	--	--

Comments: _____

FUNCTION, VALUE SUMMARY, AND OVERALL RATING

Function and Value Variables	Rating	Actual Functional Points	Possible Functional Points	Functional Units (Actual Points x Estimated AA Acreage)
A. Listed/Proposed T&E Species Habitat	L	0.30	1	
B. MT Natural Heritage Program Species Habitat	M	0.60	1	
C. General Wildlife Habitat	E	1.00	1	
D. General Fish/Aquatic Habitat	M	0.70	1	
E. Flood Attenuation	L	0.10	1	
F. Short and Long Term Surface Water Storage	H	0.90	1	
G. Sediment/Nutrient/Toxicant Removal	H	0.90	1	
H. Sediment/Shoreline Stabilization	H	1.00	1	
I. Production Export/Food Chain Support	H	0.80	1	
J. Groundwater Discharge/Recharge	H	1.00	1	
K. Uniqueness	M	0.40	1	
L. Recreation/Education Potential	M	0.70	1	
	Totals:	8.40	12.00	376
	Percent of Total Possible Points:		**70%** (Actual / Possible) x 100 [rd to nearest whole #]	

Category I Wetland: (Must satisfy **one** of the following criteria. If not proceed 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 total Possible Points is > 80%.

Category II Wetland: (Criteria for Category I not satisfied **and** meets any **one** of the following Category II criteria. If not satisfied, proceed to Category IV.)
- ☐ Score of 1 functional point for Species Rated S1, S2, or S3 by the MT Natural Heritage Program; **or**
- ☒ Score of .9 or 1 functional point for General Wildlife Habitat; **or**
- ☐ Score of .9 or 1 functional point for General Fish/Aquatic 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 total possible points is > 65%.

☐ **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 satisfied, proceed to Category III.)
- ☐ "Low" rating for Uniqueness; **and**
- ☐ "Low" rating for Production Export / Food Chain Support; **and**
- ☐ Percent of total possible points is < 30%.

OVERALL ANALYSIS AREA (AA) RATING: (Check appropriate category based on the criteria outlined above.)

☐ **I** ☒ **II** ☐ **III** ☐ **IV**

Appendix C

2007 REPRESENTATIVE PHOTOGRAPHS

MDT Wetland Mitigation Monitoring
Jack Creek Ranch
Ennis, Montana

JACK CREEK RANCH WETLAND MITIGATION SITE 2007

Location: A Cattails & creeping foxtail encroaching into uplands north of transect. **Compass Reading:** NE

Location: B Transect 1 eastern side. Cattails replacing foxtail barley. **Compass Reading:** West

Location: C Development of wetland vegetation on remaining mud flat. C**ompass Reading:** South

Location: D Community type 3 (cattails- bulrush) and CT 2 (mixed herbaceous wetland). **Compass Reading:** N

Location: E Cattails and bulrush expanding to the south and east. **Compass Reading:** West

Location: F The expansion of CT 5 east and southeast. **Compass Reading:** Northeast

JACK CREEK RANCH WETLAND MITIGATION SITE 2007

Location: G Muskrat lodge in cattails/bulrush wetlands created by low head berm. **Compass Reading:** Southwest

Location: H Pond along McKee Spring Creek. **Compass Reading:** Southeast

Location: I McKee Spring Creek and floodplain. **Compass Reading:** Southeast

Location: J Cottonwood root suckers within the McKee Spring Creek floodplain. **Compass Reading:** SW

Location: K Reduced water levels in 2007 compared to 2006 in shallow water pond. **Compass Reading:** Southeast

Location: L Increased litter accumulation in CT 2. **Compass Reading:** South

Location: M McKee Spring Creek at western project boundary – CT 5 along channel. **Compass Reading:** East

Location: N CT 1 and healthy young trees along south side of McKee Spring Creek. **Compass Reading:** SE

Location: 0 Transect 1 – wetlands expanding west of transect. **Compass Reading**: West

Location: P Developing wetlands in northwest portion of the Horseshoe. **Compass Reading:** NE

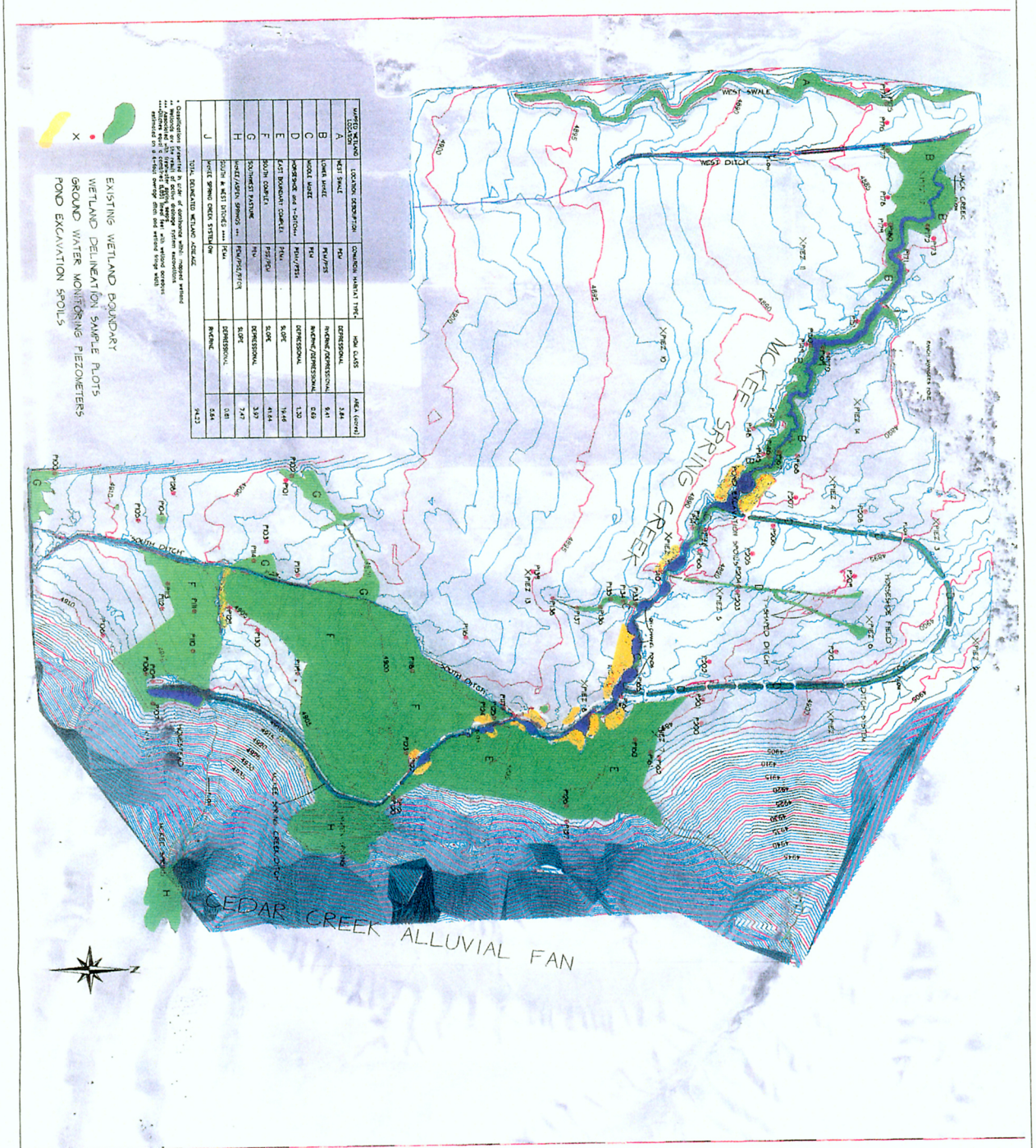
Location: Q Transect 1 western stake facing east. **Compass Reading:** East

Location: R Buffer along far northern project boundary. **Compass Reading:** West

Appendix D

PROPOSED WETLAND MITIGATION SITE MAP

MDT Wetland Mitigation Monitoring
Jack Creek Ranch
Ennis, Montana



DATE: 8/15/02	REVISIONS	DATE	BY	EXISTING CONDITIONS WETLAND DELINEATION	JACK CREEK RANCH SITE PLAN	ADC SERVICES INC. water resource consulting	#1 Ninth Street Island Dr. PO Box 582 Livingston, MT 59047 Phone 406.222.7600 Fax 406.222.7677
SCALE: 1" = 700'							
CONTOUR INTERVAL: 1'							
DRAWN BY: TNC							
SHEET 8 OF 8							

Appendix E

BIRD SURVEY PROTOCOL
GPS PROTOCOL

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

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 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, some sites continued to be mapped using the Trimble GEO III GPS unit while most 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

2007 MACROINVERTEBRATE SAMPLING PROTOCOL AND DATA

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 – 2007

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

INTRODUCTION

Aquatic invertebrate assemblages were collected at a number of mitigated wetlands throughout Montana. This report summarizes data generated from seven years of collection. Over all years of sampling, a total of 182 invertebrate samples were collected. Table 1 lists the currently monitored sites at which aquatic invertebrates were collected in 2007, 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 and 2007 by personnel of PBS&J. Sampling procedures utilized were based on the protocols developed by the Montana Department of Environmental Quality (MT DEQ) 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.

Quality assurance systems

Quality control procedures for initial sample processing and subsampling involved checking sorting efficiency. These checks were conducted on 96% of the samples by independent observers who microscopically re-examined 20% of sorted substrate from each sample. All organisms that were missed were counted and this number was added to the total number obtained in the original sort. Sorting efficiency was evaluated by applying the following calculation:

$$SE = \frac{n_1}{n_{1+2}} \times 100$$

where: SE is the sorting efficiency, expressed as a percentage, n_1 is the total number of specimens in the first sort, and n_{1+2} is the total number of specimens in the first and second sorts combined.

Quality control procedures for taxonomic determinations of invertebrates involved checking accuracy, precision and enumeration. At least 10% of samples are targeted for quality assurance procedures. For this project, three samples were randomly selected and all organisms re-identified and counted by an independent taxonomist. Taxa lists and enumerations were compared by calculating a Bray-Curtis similarity statistic (Bray and Curtis 1957) for each

selected sample. Routinely, discrepancies between the original identifications and the QC identifications are discussed among the taxonomists, and necessary rectifications to the data are made. Discrepancies that cannot be rectified by discussions are routinely sent out to taxonomic specialists for identification. However, taxonomic certainty for identifications in this project was high, and no external verifications were necessary.

Assessment

The method employed to assess these wetlands is based on an index incorporating a battery of 12 bioassessment metrics or attributes (Table 1) tested and recommended by Stribling et al. (1995) in a report to the Montana Department of Health and Environmental Science. In that study, it was determined that some of the metrics were of limited use in some geographic regions, and for some wetland types. Despite that finding, all 12 metrics are used in this evaluation of mitigated wetlands, since detailed geographic information and wetland classifications were unavailable. 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, "optimal" scores were generally those that fell above the 75th percentile (for those metrics that decrease in value in response to stress) or below the 25th percentile (for metrics that respond to stress by an increase in value) of all scores. Additional scoring ranges were established by bisecting the range below the 75th percentile for decreasing scores (or above the 25th percentile for increasing scores) into "sub-optimal" and "poor" assessment categories. A score of 5, 3, or 1 was assigned to optimal, 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.

Several 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 2007, the lotic sites were Camp Creek (2 sites), Cloud Ranch stream, Kleinschmidt stream, Jack Creek, and Woodson Creek-Ringling stream. 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 (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, %Orthocladiinae of Chironomidae, %Crustacea + %Mollusca, and %Amphipoda) measure the relative contributions of certain taxonomic groups that may have significant responses to habitat and/or water quality impacts. For example, amphipods have been demonstrated to increase in abundance in

alkaline conditions. Short-lived, relatively mobile taxa such as chironomids dominate ephemeral environments; many are hemoglobin-bearers capable of tolerating de-oxygenated conditions.

Two tolerance metrics (the 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 2007 samples are given in Tables 4a-4c and 5.

In 2007, thermal preference of the invertebrate assemblages was calculated when possible, using the tool developed by 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 Arctopsychid caddisflies (*Arctopsyche* spp. and *Parapsyche* spp.) build silken nets with large mesh sizes that capture small organisms such as chironomids and early-instar mayflies. Here they are considered predators, and, in this study, their abundance does not contribute to the percent filter feeders metric.
6. Percent tolerant taxa. Tolerant taxa are ubiquitous in stream sites, but when disturbance increases, their abundance increases proportionately. The list of taxa used here includes organisms tolerant of a wide range of disturbances, including warmer water temperatures, organic or nutrient pollution, toxic pollution, sediment deposition, substrate instability and others.

Table 1. Montana Department of Transportation Mitigated Wetlands Monitoring Project sites: sampling history. Only those sites monitored in 2007 are included. An asterisk (*) indicates lotic sites.

Site Identifier	2001	2002	2003	2004	2005	2006	2007
Roundup	+	+	+	+	+	+	+
Ridgeway	+	+	+	+	+	+	+
Hoskins Landing MS-1		+	+	+	+		+
Hoskins Landing MS-2							+
Peterson Ranch pond 1		+	+	+	+	+	+
Peterson Ranch pond 2		+		+	+	+	+
Peterson Ranch pond 4		+	+	+	+	+	+
Peterson Ranch pond 5		+	+	+	+	+	+
Camp Creek MS-1*		+	+	+	+	+	+
Camp Creek MS-2*						+	+
Kleinschmidt		+	+	+	+	+	+
Kleinschmidt – stream*			+	+	+	+	+
Cloud Ranch Pond				+	+		+
Cloud Ranch Stream*				+			+
Jack Creek – pond				+	+		+
Jack Creek – McKee*							+
Norem				+	+	+	+
Rock Creek Ranch					+	+	+
Wagner Marsh					+	+	+
Alkali Lake 1						+	+
Charley Creek							+
Woodson pond MI 1							+
Woodson stream MI 2*							+
Little Muddy Creek							+
Selkirk Ranch							+
DH Ranch							+

Table 2. Aquatic invertebrate metrics employed for wetland (lentic) invertebrate assemblages in the MDT mitigated wetlands study, 2001 – 2007.

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 section of individual project monitoring reports. Summary tables for lentic (4a – 4c) and lotic (5) sites and project specific taxa listings and metrics reports are provided on the following pages.)

Quality Assurance

Table 3 gives the results of quality assurance procedures for sample sorting efficiency (SE) and Bray-Curtis similarity statistics for comparisons of taxonomic determinations and enumeration. Sorting efficiency averaged 97.54% for the project, and taxonomic similarity averaged 97.44%.

Table 3. Results of quality control procedures for subsampling and taxonomic and enumeration similarity.

Site name	SE	Bray-Curtis similarity
Roundup	100.00%	
Ridgeway	100.00%	
Hoskins Landing MS-1	100.00%	
Hoskins Landing MS-2	93.40%	
Peterson Ranch pond 1	100.0%	95.38%
Peterson Ranch pond 2	96.64%	
Peterson Ranch pond 4	91.66%	
Peterson Ranch pond 5	96.64%	
Camp Creek MS-1	100.00%	
Camp Creek MS-2	100.00%	96.94%
Kleinschmidt – pond	100.00%	
Kleinschmidt – stream	99.10%	
Cloud Ranch Pond	95.65%	
Cloud Ranch Stream	91.61%	
Jack Creek – pond	n.a.	
Jack Creek - McKee	96.49%	
Norem	100.00%	100.00%
Rock Creek Ranch	100.00%	
Wagner Marsh	100.00%	
Alkali Lake 1	98.04%	
Charley Creek	100.00%	
Woodson pond	91.37%	
Woodson stream	100.00%	
Little Muddy Creek	92.31%	
Selkirk Ranch	95.56%	
DH Ranch	100.00%	

Table 4a. Metric values and scores for wetland (lentic) sites in the MDT mitigated wetland study – 2007 sampling.

	ROUNDUP	RIDGEWAY	HOSKINS LANDING MS-1	HOSKINS LANDING MS-2	PETERSON RANCH 1	PETERSON RANCH 2	PETERSON RANCH 4	PETERSON RANCH 5
Total taxa	7	13	18	21	17	18	26	18
POET	0	2	3	5	2	0	6	4
Chironomidae taxa	5	5	2	8	8	12	12	6
Crustacea + Mollusca	1	2	5	4	4	5	4	4
% Chironomidae	7.62%	30.00%	18.75%	52.68%	36.45%	51.79%	42.59%	14.78%
Orthocladiinae/Chir	0.38	0.17	0.00	0.03	0.08	0.16	0.09	0.12
%Amphipoda	0.00%	10.00%	0.00%	0.00%	0.93%	0.00%	21.30%	1.74%
%Crustacea + %Mollusca	89.52%	15.00%	26.79%	8.04%	10.28%	43.75%	28.70%	37.39%
HBI	8.02	7.11	7.23	6.55	7.42	7.76	6.53	7.23
%Dominant taxon	89.52%	30.00%	17.86%	35.71%	39.25%	23.21%	17.59%	30.43%
%Collector-Gatherers	92.38%	70.00%	78.57%	82.14%	49.53%	71.43%	38.89%	26.96%
%Filterers	0.00%	0.00%	0.89%	6.25%	9.35%	3.57%	1.85%	5.22%
Total taxa	1	1	3	5	3	3	5	3
POET	1	1	3	5	1	1	5	5
Chironomidae taxa	3	3	1	5	5	5	3	3
Crustacea + Mollusca	1	1	3	3	3	3	1	3
% Chironomidae	5	3	3	1	3	1	1	5
Orthocladiinae/Chir	3	1	1	1	1	1	3	1
%Amphipoda	5	3	5	5	5	5	5	5
%Crustacea + %Mollusca	1	5	5	5	5	3	5	3
HBI	1	3	3	5	3	1	5	3
%Dominant taxon	1	5	5	3	3	5	1	5
%Collector-Gatherers	5	3	3	5	3	3	3	1
%Filterers	3	3	3	1	1	3	5	3
Total score	**30**	**32**	**38**	**44**	**36**	**34**	**42**	**40**
Percent of maximum score	**50.00%**	**53.33%**	**63.33%**	**73.33%**	**60.00%**	**56.67%**	**70.00%**	**66.67%**
Impairment classification	**poor**	**sub-optimal**	**optimal**	**optimal**	**sub-optimal**	**sub-optimal**	**optimal**	**optimal**

Table 4b. Metric values and scores for wetland (lentic) sites in the MDT mitigated wetland study – 2007 sampling.

	KLEIN-SCHMIDT POND	CLOUD RANCH POND	JACK CREEK POND	NOREM	ROCK CREEK RANCH	WAGNER MARSH	ALKALI LAKE 1	CHARLEY CREEK
Total taxa	25	13	9	6	18	11	9	13
POET	5	2	0	1	2	2	0	0
Chironomidae taxa	8	11	5	2	4	4	2	3
Crustacea + Mollusca	8	1	4	1	4	0	2	3
% Chironomidae	18.63%	81.54%	92.79%	31.58%	4.76%	11.39%	1.96%	27.17%
Orthocladiinae/Chir	0.53	0.38	0.03	0.00	0.60	0.44	0.50	0.68
%Amphipoda	10.78%	3.08%	0.00%	0.00%	17.14%	0.00%	0.00%	22.83%
%Crustacea + %Mollusca	36.27%	3.08%	7.21%	21.05%	23.81%	0.00%	61.76%	53.26%
HBI	7.35	7.22	9.73	6.63	6.33	7.28	8.07	6.88
%Dominant taxon	13.73%	18.46%	62.16%	26.32%	29.52%	45.57%	60.78%	29.35%
%Collector-Gatherers	53.92%	84.62%	70.27%	57.89%	29.52%	15.19%	70.59%	32.61%
%Filterers	11.76%	9.23%	0.90%	0.00%	0.95%	0.00%	0.00%	0.00%
Total taxa	5	1	1	1	3	1	1	1
POET	5	1	1	1	1	1	1	1
Chironomidae taxa	5	5	3	1	3	3	1	3
Crustacea + Mollusca	5	1	3	1	3	1	1	1
% Chironomidae	3	1	1	3	5	5	5	3
Orthocladiinae/Chir	5	3	1	1	5	3	5	5
%Amphipoda	3	5	5	5	3	5	5	3
%Crustacea + %Mollusca	3	5	5	5	5	5	3	3
HBI	3	3	1	5	5	3	1	5
%Dominant taxon	5	5	1	5	5	3	1	5
%Collector-Gatherers	3	5	3	3	1	1	3	1
%Filterers	1	1	3	3	3	3	3	3
Total score	**46**	**36**	**28**	**34**	**42**	**34**	**30**	**34**
Percent of maximum score	**76.67%**	**60.00%**	**46.67%**	**56.67%**	**70.00%**	**56.67%**	**50.00%**	**56.67%**
Impairment classification	**optimal**	**sub-optimal**	**poor**	**sub-optimal**	**poor**	**sub-optimal**	**poor**	**sub-optimal**

Table 4c. Metric values and scores for wetland (lentic) sites in the MDT mitigated wetland study – 2007 sampling.

	WOODSON POND	LITTLE MUDDY CREEK	SELKIRK RANCH	DH RANCH
Total taxa	12	2	16	8
POET	0	0	2	1
Chironomidae taxa	9	0	8	4
Crustacea + Mollusca	1	1	2	2
% Chironomidae	85.71%	0.00%	77.27%	27.50%
Orthocladiinae/Chir	0.32	0.00	0.61	0.00
%Amphipoda	0.00%	0.00%	0.00%	0.00%
%Crustacea + %Mollusca	2.86%	75.00%	8.18%	64.17%
HBI	9.34	8.50	7.82	7.38
%Dominant taxon	33.33%	75.00%	46.36%	39.17%
%Collector-Gatherers	55.24%	75.00%	32.73%	27.50%
%Filterers	0.00%	0.00%	8.18%	17.50%
Total taxa	1	1	3	1
POET	1	1	1	1
Chironomidae taxa	5	1	5	3
Crustacea + Mollusca	1	1	1	1
% Chironomidae	1	5	1	3
Orthocladiinae/Chir	3	1	5	1
%Amphipoda	5	5	5	5
%Crustacea + %Mollusca	5	1	5	1
HBI	1	1	1	3
%Dominant taxon	5	1	3	3
%Collector-Gatherers	3	3	1	1
%Filterers	3	3	1	1
Total score	**34**	**24**	**32**	**24**
Percent of maximum score	**56.67%**	**40.00%**	**53.33%**	**40.00%**
Impairment classification	**sub-optimal**	**poor**	**sub-optimal**	**poor**

Table 5. Metric values and scores for stream (lotic) sites in the MDT mitigated wetland study – 2007 sampling.

	CAMP CREEK MS-1	CAMP CREEK MS-2	KLEIN-SCHMIDT STREAM	CLOUD RANCH STREAM	JACK CREEK - MCKEE	WOODSON STREAM
E Richness	6	6	0	2	1	1
P Richness	0	0	0	2	0	0
T Richness	4	6	2	4	4	0
Pollution Sensitive Richness	3	4	0	1	0	0
Filterer Percent	4.85%	5.56%	7.14%	3.57%	2.83%	16.67%
Pollution Tolerant Percent	32.04%	34.26%	9.82%	14.29%	58.49%	8.33%
E Richness	3	3	0	1	0	0
P Richness	0	0	0	2	0	0
T Richness	2	3	1	2	2	0
Pollution Sensitive Richness	2	3	0	1	0	0
Filterer Percent	3	2	2	3	3	1
Pollution Tolerant Percent	1	1	2	1	0	2
Total score	**11**	**12**	**5**	**10**	**5**	**3**
Percent of maximum score	**61.11%**	**66.67%**	**27.78%**	**55.56%**	**27.78%**	**16.67%**
Impairment classification	**slight**	**slight**	**moderate**	**slight**	**moderate**	**severe**

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Bray, J. R. and J. T. Curtis. 1957. An ordination of upland forest communities of southern Wisconsin. Ecological Monographs 27: 325-349.

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: MDT07PBSJ
RAI No.: MDT07PBSJ008

RAI No.: MDT07PBSJ008 **Sta. Name:** Jack Creek Pond
Client ID:
Date Coll.: 7/10/2007 **No. Jars:** 1 **STORET ID:**

Taxonomic Name	Count	PRA	Unique	Stage	Qualifier	BI	Function
Non-Insect							
Cladocera	1	0.90%	Yes	Unknown		8	CF
Copepoda	5	4.50%	Yes	Unknown		8	CG
Asellidae							
Caecidotea sp.	1	0.90%	Yes	Unknown		8	CG
Pisidiidae							
Pisidiidae	1	0.90%	Yes	Unknown		8	CG
Chironomidae							
Chironomidae							
Chironomus sp.	69	62.16%	Yes	Larva		10	CG
Cricotopus (Isocladius) sp.	3	2.70%	Yes	Larva		7	SH
Paratanytarsus sp.	1	0.90%	Yes	Larva		6	CG
Procladius sp.	1	0.90%	Yes	Larva		9	PR
Psectrotanypus sp.	29	26.13%	Yes	Larva		10	PR
Sample Count	**111**						

Metrics Report

Project ID: MDT07PBSJ
RAI No.: MDT07PBSJ008
Sta. Name: Jack Creek Pond
Client ID:
STORET ID:
Coll. Date: 7/10/2007

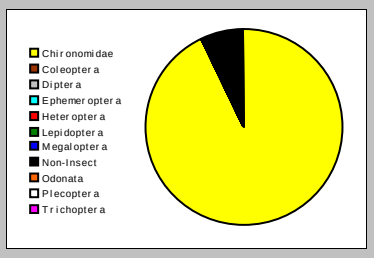
Abundance Measures

Sample Count: 111
Sample Abundance: 2,664.00 4.17% of sample used

Coll. Procedure:
Sample Notes:

Taxonomic Composition

Category	R	A	PRA
Non-Insect	4	8	7.21%
Odonata			
Ephemeroptera			
Plecoptera			
Heteroptera			
Megaloptera			
Trichoptera			
Lepidoptera			
Coleoptera			
Diptera			
Chironomidae	5	103	92.79%

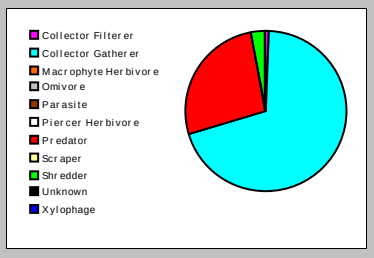


Dominant Taxa

Category	A	PRA
Chironomus	69	62.16%
Psectrotanypus	29	26.13%
Copepoda	5	4.50%
Cricotopus (Isocladius)	3	2.70%
Procladius	1	0.90%
Pisidiidae	1	0.90%
Paratanytarsus	1	0.90%
Cladocera	1	0.90%
Caecidotea	1	0.90%

Functional Composition

Category	R	A	PRA
Predator	2	30	27.03%
Parasite			
Collector Gatherer	5	77	69.37%
Collector Filterer	1	1	0.90%
Macrophyte Herbivore			
Piercer Herbivore			
Xylophage			
Scraper			
Shredder	1	3	2.70%
Omivore			
Unknown			

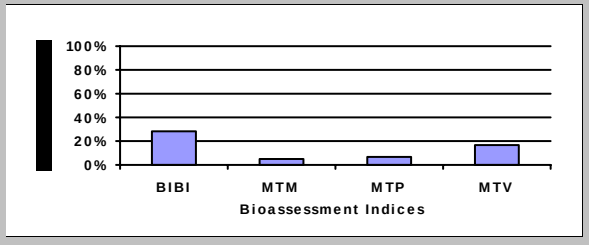


Metric Values and Scores

Metric	Value	BIBI	MTP	MTV	MTM
Composition					
Taxa Richness	9	1	0		0
Non-Insect Percent	7.21%				
E Richness	0	1		0	
P Richness	0	1		0	
T Richness	0	1		0	
EPT Richness	0		0		0
EPT Percent	0.00%		0		0
Oligochaeta+Hirudinea Percent					
Baetidae/Ephemeroptera	0.000				
Hydropsychidae/Trichoptera	0.000				
Dominance					
Dominant Taxon Percent	62.16%		0		0
Dominant Taxa (2) Percent	88.29%				
Dominant Taxa (3) Percent	92.79%	1			
Dominant Taxa (10) Percent	100.00%				
Diversity					
Shannon H (loge)	1.096				
Shannon H (log2)	1.581		0		
Margalef D	1.699				
Simpson D	0.453				
Evenness	0.130				
Function					
Predator Richness	2		0		
Predator Percent	27.03%	5			
Filterer Richness	1				
Filterer Percent	0.90%			3	
Collector Percent	70.27%		2		1
Scraper+Shredder Percent	2.70%		0		0
Scraper/Filterer	0.000				
Scraper/Scraper+Filterer	0.000				
Habit					
Burrower Richness	1				
Burrower Percent	62.16%				
Swimmer Richness	0				
Swimmer Percent	0.00%				
Clinger Richness	1	1			
Clinger Percent	2.70%				
Characteristics					
Cold Stenotherm Richness	0				
Cold Stenotherm Percent	0.00%				
Hemoglobin Bearer Richness	3				
Hemoglobin Bearer Percent	89.19%				
Air Breather Richness	0				
Air Breather Percent	0.00%				
Voltinism					
Univoltine Richness	2				
Semivoltine Richness	0	1			
Multivoltine Percent	98.20%		0		
Tolerance					
Sediment Tolerant Richness	0				
Sediment Tolerant Percent	0.00%				
Sediment Sensitive Richness	0				
Sediment Sensitive Percent	0.00%				
Metals Tolerance Index	3.986				
Pollution Sensitive Richness	0	1		0	
Pollution Tolerant Percent	90.09%	1		0	
Hilsenhoff Biotic Index	9.730		0		0
Intolerant Percent	0.00%				
Supertolerant Percent	96.40%				
CTQa	108.000				

Bioassessment Indices

BioIndex	Description	Score	Pct	Rating
BIBI	B-IBI (Karr et al.)	14	28.00%	
MTP	Montana DEQ Plains (Bukantis 1998)	2	6.67%	Severe
MTV	Montana Revised Valleys/Foothills (Bollman 1998)	3	16.67%	Severe
MTM	Montana DEQ Mountains (Bukantis 1998)	1	4.76%	Severe



Taxa Listing

Project ID: MDT07PBSJ
RAI No.: MDT07PBSJ009

RAI No.: MDT07PBSJ009 **Sta. Name:** Jack Creek McKee Spring Creek
Client ID:
Date Coll.: 7/10/2007 **No. Jars:** 1 **STORET ID:**

Taxonomic Name	Count	PRA	Unique	Stage	Qualifier	BI	Function
Non-Insect							
Ostracoda	2	1.89%	Yes	Unknown		8	CG
Asellidae							
Caecidotea sp.	16	15.09%	Yes	Unknown		8	CG
Hyalellidae							
Hyalella sp.	5	4.72%	Yes	Unknown		8	CG
Lymnaeidae							
Stagnicola sp.	2	1.89%	Yes	Unknown		6	SC
Physidae							
Physa sp.	7	6.60%	Yes	Unknown		8	SC
Planorbidae							
Gyraulus sp.	20	18.87%	Yes	Unknown		8	SC
Ephemeroptera							
Baetidae							
Callibaetis sp.	1	0.94%	Yes	Larva		9	CG
Heteroptera							
Corixidae							
Corixidae	2	1.89%	No	Larva		10	PH
Sigara sp.	2	1.89%	Yes	Adult		5	PH
Trichoptera							
Brachycentridae							
Brachycentrus americanus	2	1.89%	Yes	Larva		1	CF
Hydroptilidae							
Hydroptila sp.	10	9.43%	Yes	Larva		6	PH
Limnephilidae							
Limnephilidae	1	0.94%	Yes	Larva	Damaged	3	SH
Psychoglypha sp.	1	0.94%	Yes	Larva		0	CG
Coleoptera							
Elmidae							
Cleptelmis addenda	1	0.94%	Yes	Larva		4	CG
Diptera							
Ceratopogonidae							
Ceratopogoninae	1	0.94%	Yes	Larva		6	PR
Empididae							
Trichoclinocera sp.	1	0.94%	Yes	Larva		6	PR
Tipulidae							
Dicranota sp.	2	1.89%	Yes	Larva		3	PR

Taxa Listing

Project ID: MDT07PBSJ
RAI No.: MDT07PBSJ009

RAI No.: MDT07PBSJ009 **Sta. Name:** Jack Creek McKee Spring Creek
Client ID:
Date Coll.: 7/10/2007 **No. Jars:** 1 **STORET ID:**

Taxonomic Name	Count	PRA	Unique	Stage	Qualifier	BI	Function
Chironomidae							
Chironomidae							
Brillia sp.	1	0.94%	Yes	Larva		4	SH
Chironomidae	3	2.83%	No	Pupa		10	CG
Chironomus sp.	1	0.94%	Yes	Larva		10	CG
Cricotopus (Isocladius) sp.	5	4.72%	Yes	Larva		7	SH
Cricotopus bicinctus	1	0.94%	Yes	Larva		7	SH
Dicrotendipes sp.	1	0.94%	Yes	Larva		8	CG
Orthocladius sp.	3	2.83%	Yes	Larva		6	CG
Parakiefferiella sp.	1	0.94%	Yes	Larva		6	CG
Paratanytarsus sp.	2	1.89%	Yes	Larva		6	CG
Paratendipes sp.	1	0.94%	Yes	Larva		10	CG
Radotanypus sp.	3	2.83%	Yes	Larva		7	PR
Stictochironomus sp.	3	2.83%	Yes	Larva		5	CG
Tanytarsus sp.	1	0.94%	Yes	Larva		6	CF
Thienemanniella sp.	3	2.83%	Yes	Larva		6	CG
Tvetenia Bavarica Gr.	1	0.94%	Yes	Larva		5	CG
Sample Count	**106**						

Metrics Report

Project ID: MDT07PBSJ
RAI No.: MDT07PBSJ009
Sta. Name: Jack Creek McKee Spring Creek
Client ID:
STORET ID:
Coll. Date: 7/10/2007

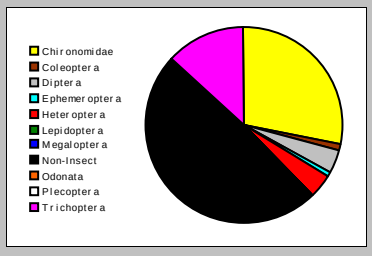
Abundance Measures

Sample Count: 106
Sample Abundance: 132.50 80.00% of sample used

Coll. Procedure:
Sample Notes:

Taxonomic Composition

Category	R	A	PRA
Non-Insect	6	52	49.06%
Odonata			
Ephemeroptera	1	1	0.94%
Plecoptera			
Heteroptera	1	4	3.77%
Megaloptera			
Trichoptera	4	14	13.21%
Lepidoptera			
Coleoptera	1	1	0.94%
Diptera	3	4	3.77%
Chironomidae	14	30	28.30%

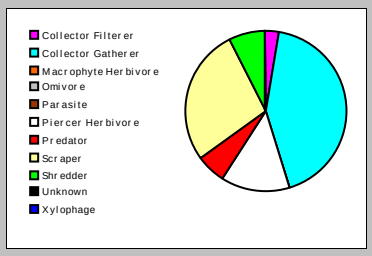


Dominant Taxa

Category	A	PRA
Gyraulus	20	18.87%
Caecidotea	16	15.09%
Hydroptila	10	9.43%
Physa	7	6.60%
Hyalella	5	4.72%
Cricotopus (Isocladius)	5	4.72%
Thienemanniella	3	2.83%
Stictochironomus	3	2.83%
Radotanypus	3	2.83%
Orthocladius	3	2.83%
Chironomidae	3	2.83%
Stagnicola	2	1.89%
Dicranota	2	1.89%
Corixidae	2	1.89%
Brachycentrus americanus	2	1.89%

Functional Composition

Category	R	A	PRA
Predator	4	7	6.60%
Parasite			
Collector Gatherer	15	45	42.45%
Collector Filterer	2	3	2.83%
Macrophyte Herbivore			
Piercer Herbivore	2	14	13.21%
Xylophage			
Scraper	3	29	27.36%
Shredder	4	8	7.55%
Omivore			
Unknown			



Metric Values and Scores

Metric	Value	BIBI	MTP	MTV	MTM
Composition					
Taxa Richness	30	3	3		3
Non-Insect Percent	49.06%				
E Richness	1	1		0	
P Richness	0	1		0	
T Richness	4	1		2	
EPT Richness	5		1		0
EPT Percent	14.15%		1		0
Oligochaeta+Hirudinea Percent					
Baetidae/Ephemeroptera	1.000				
Hydropsychidae/Trichoptera	0.000				
Dominance					
Dominant Taxon Percent	18.87%		3		3
Dominant Taxa (2) Percent	33.96%				
Dominant Taxa (3) Percent	43.40%	5			
Dominant Taxa (10) Percent	70.75%				
Diversity					
Shannon H (loge)	2.848				
Shannon H (log2)	4.108		3		
Margalef D	6.284				
Simpson D	0.082				
Evenness	0.055				
Function					
Predator Richness	4		2		
Predator Percent	6.60%	1			
Filterer Richness	2				
Filterer Percent	2.83%			3	
Collector Percent	45.28%		3		3
Scraper+Shredder Percent	34.91%		3		1
Scraper/Filterer	9.667				
Scraper/Scraper+Filterer	0.906				
Habit					
Burrower Richness	7				
Burrower Percent	9.43%				
Swimmer Richness	2				
Swimmer Percent	4.72%				
Clinger Richness	6	1			
Clinger Percent	18.87%				
Characteristics					
Cold Stenotherm Richness	1				
Cold Stenotherm Percent	0.94%				
Hemoglobin Bearer Richness	6				
Hemoglobin Bearer Percent	27.36%				
Air Breather Richness	1				
Air Breather Percent	1.89%				
Voltinism					
Univoltine Richness	10				
Semivoltine Richness	2	1			
Multivoltine Percent	40.57%		2		
Tolerance					
Sediment Tolerant Richness	3				
Sediment Tolerant Percent	22.64%				
Sediment Sensitive Richness	0				
Sediment Sensitive Percent	0.00%				
Metals Tolerance Index	3.724				
Pollution Sensitive Richness	0	1		0	
Pollution Tolerant Percent	58.49%	1		0	
Hilsenhoff Biotic Index	7.009		0		0
Intolerant Percent	2.83%				
Supertolerant Percent	55.66%				
CTQa	94.095				

Bioassessment Indices

BioIndex	Description	Score	Pct	Rating
BIBI	B-IBI (Karr et al.)	16	32.00%	
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)	10	47.62%	Moderate