MONTANA DEPARTMENT OF TRANSPORTATION
WETLAND MITIGATION MONITORING REPORT: YEAR 2006

Jack Creek Ranch
Ennis, Montana

Prepared for:

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

Prepared by:

POST, BUCKLEY, SCHUH & JERNIGAN
P.O. Box 239
Helena, MT 59624

December 2006

Project No: B43054.00 - 0210

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Cover Photo: *View is north of cattails and bulrushes.*

1.0 INTRODUCTION

This annual report summarizes methods and the results of the 2006 (third 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 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.

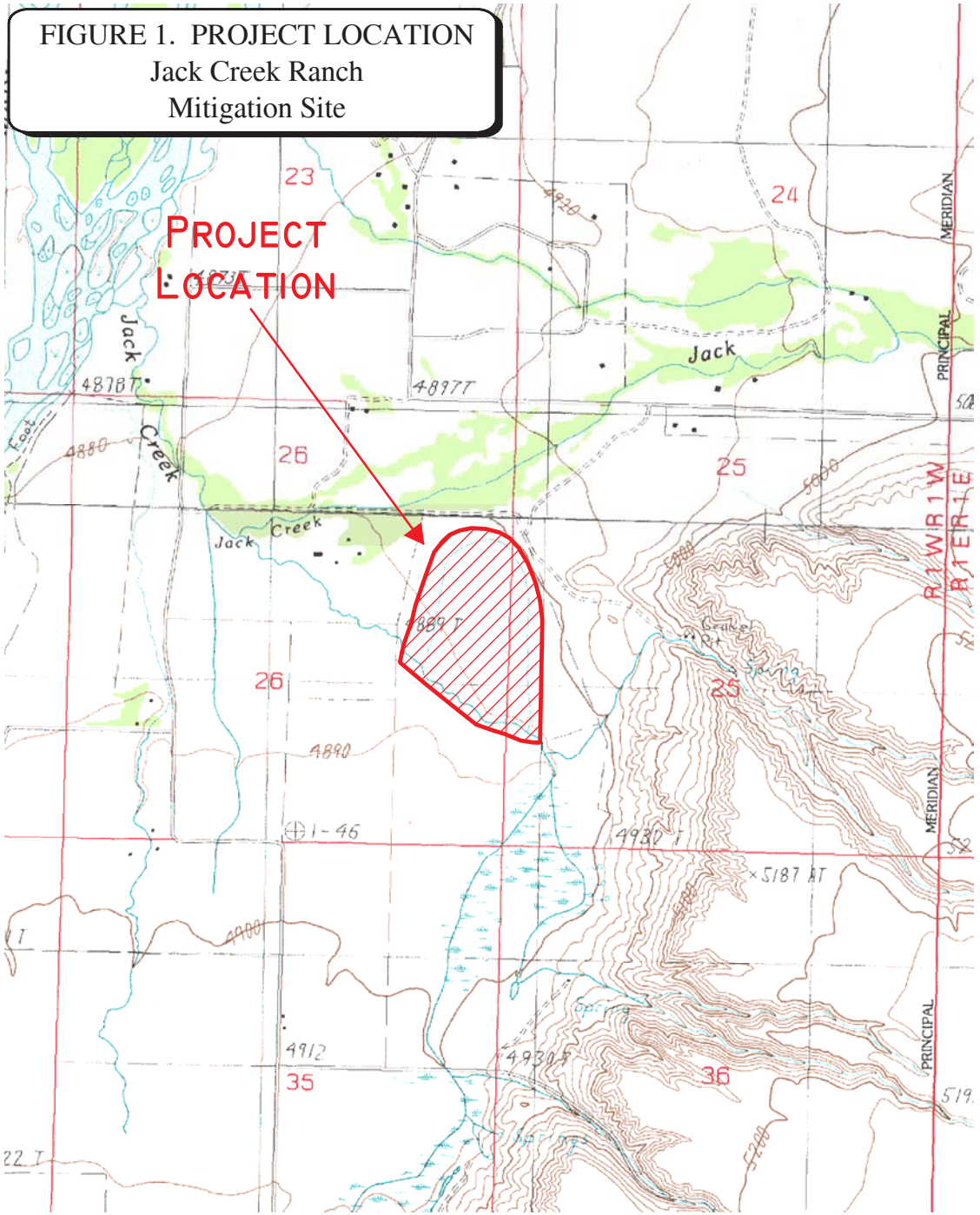
In the summer of 2003, the drainage systems along the perimeter of the Horseshoe pasture were filled. Selected areas within the Horseshoe field were graded to increase habitat diversity. Disturbed areas were seeded with a wetland seed mix and planted with containerized wetland species. Woody species 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**.

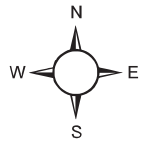
2.0 METHODS

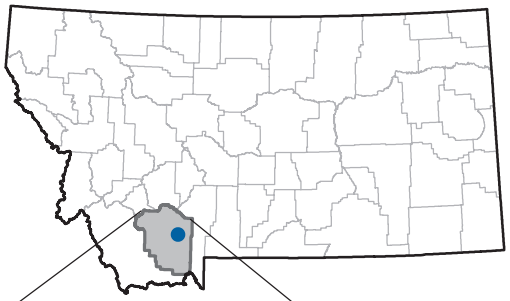
2.1 Monitoring Dates and Activities

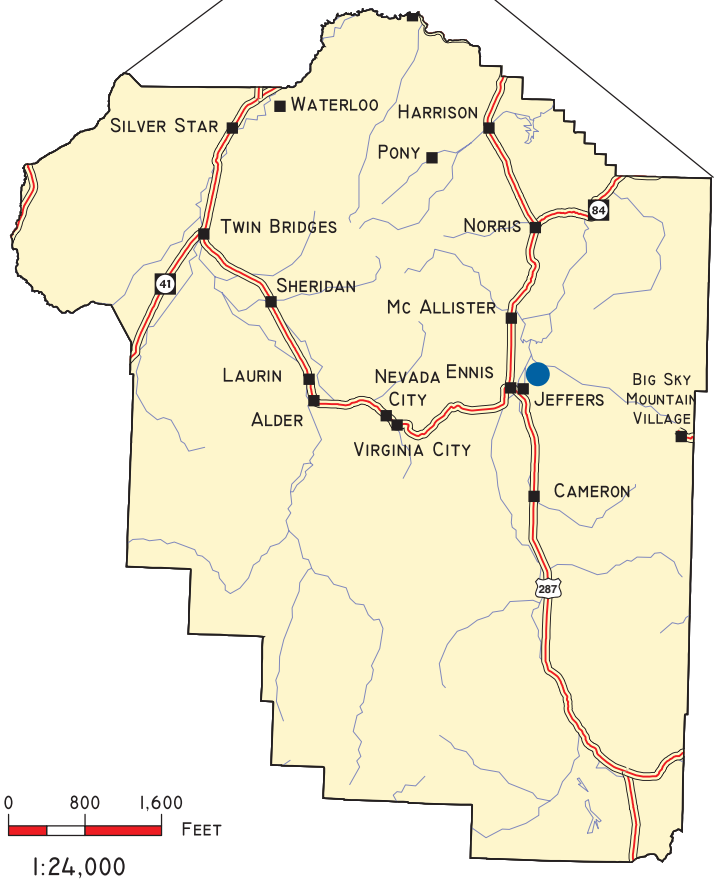
The site was visited on May 1 to assess spring avian migration use, and on July 26, 2006 to assess mid-season use. The transect was monitored and wetland boundaries were revised on July 27, 2006. Activities and information conducted/collected during the monitoring event

FIGURE 1. PROJECT LOCATION
Jack Creek Ranch
Mitigation Site









0 800 1,600 FEET

1:24,000

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

LAND & WATER CONSULTING
PO Box 239
Helena, MT 59624
A Division Of PBS&J

included: wetland delineation; wetland/open water boundary mapping; vegetation community mapping; vegetation transects; soils data; hydrology data; bird and general wildlife use, photograph points; macroinvertebrate sampling; functional assessment; and, maintenance needs (non-engineering) (**Appendix B**).

2.2 Hydrology

Wetland hydrology indicators were recorded using procedures outlined in the COE 1987 Wetland Delineation Manual (Environmental Laboratory 1987). Hydrology data were recorded on a COE Routine Wetland Delineation Data Form (**Appendix B**) at each wetland determination point. Precipitation data for the year 2006 were compared to the 1948-2006 average (WRCC 2006).

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 (L. Urban, 2005).

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 and is updated as new species are encountered. Observations from past years will be compared with new data to document vegetation changes over time. 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 2006 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 and will be updated as new species are encountered. Observations from past years will be compared with new data to determine if wildlife use is changing over time.

2.7 Birds

Bird observations were recorded during the spring and fall migration and during the summer monitoring site visit according to the established Bird Survey Protocol (**Appendix E**). A general, qualitative bird list has been compiled using these observations. Observations will be compared between years in future studies.

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 2006.

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 can be found 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 emanates 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 places and flowing into the creek. A small graveled channel was created to route the overland flow to McKee Spring Creek. During the July 2006 monitoring visit, approximately 85% of the assessment area within the Horseshoe pasture was inundated with 1-6 inches of standing water. Wetland sites that were not inundated were saturated to the surface. Frequent small pools were observed. 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 12.43 inches from 1948 through July 2006 (last updated file). The average precipitation through the month of July for that period was 5.79 inches. For the year 2006, precipitation through July was 6.00 inches or 104% of the mean indicating that the spring and summer (through July) were wetter compared to historic precipitation.

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 McKee Spring Creek (**Figure 3** in **Appendix A**). The Jack Creek Ranch vegetation types include six 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.,* and Type 6, *Typha latifolia/Eleocharis palustris.* Dominant species within each community are listed on the Monitoring Form (**Appendix B**). Because construction was conducted during 2003, 2006 represents the third growing season for the project site. Hydrophytic vegetation communities are increasing in size and diversity. Species noted in 2004 through 2006 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 most of this community. In 2006, foxtail barley (*Hordeum jubatum*) represents 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 2006 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. Most of this community type was inundated with shallow surface water. Primary upland species include smooth brome, tall fescue, and quackgrass. Other minor species noted in 2006 include Kentucky bluegrass (*Poa pratensis*), slender wheatgrass (*Agropyron trachycaulum*), streambank wheatgrass (*Agropyron riparium*), meadow foxtail (*Alopecurus pratensis*), field horsetail *(Equisetum arvense*) and creeping wildrye (*Elymus anadensis*). 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. In 2006, there was continued reduction of 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 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. 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 four vegetation communities (**Chart 1**). A decrease in upland areas (community types 1 and 4) along the transect was observed in 2006 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 31 species (2004 and 2006, respectfully).

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*) as well as one species on the Madison County list, musk thistle (*Carduus nutans*). 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 hounds tongue. Canada thistle is still present as a minor component in 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 musk thistle and hounds tongue. In general, most of the weed species (musk and hounds tongue) were located where the pond excavation spoils were deposited along the upper channel terrace.

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, survival assessment of cuttings along the channel was estimated at 25 percent survival. There did not appear to be any loss of cuttings since the 2005 monitoring. Six live transplanted cottonwoods (*Populus angustifolia*) were counted within the floodplain. Also 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.

Table 1: ***2004 to 2006vegetation 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
Beckmannia syzigachne	OBL
Bromus inermis	(UPL)
Bromus marginatus	(FACU)
Calamagrostis canadensis	FACW+
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
Equisetum arvense	FAC
Epilobium ciliatum	FACW
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)
Phalaris arundinacea	FACW
Phleum pratense	FAC-
Poa palustris	FAC

Table 1 (Continued): ***2004 to 2006 vegetation species list for the Jack Creek Ranch Wetland Mitigation Site.***

Scientific Name	Region 9 (Northwest) Wetland Indicator Status [1]
Poa pratensis	FACU+
Poa compressa	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)
Veronica americana	OBL

[1] **Bolded** species indicate those documented within the analysis area for the first time in 2006.
[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 on biologist's experience.

Table 2: ***2004 to 2006 Transect 1 data summary.***

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

In the Horseshoe pasture approximately 15 to 20 percent of the willow cuttings were alive. The optimum areas for survival were adjacent to flowing water and / or along channels. The overall survival of the willow cuttings has decreased in 2006, possibly due to the amount of surface water across much of the project site. Other factors, such as, browse from deer, and/or transplanting cuttings into saturated clay muck may have contributed to the poor survival of the willow cuttings. Two live willow shrubs were observed in the pasture.

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

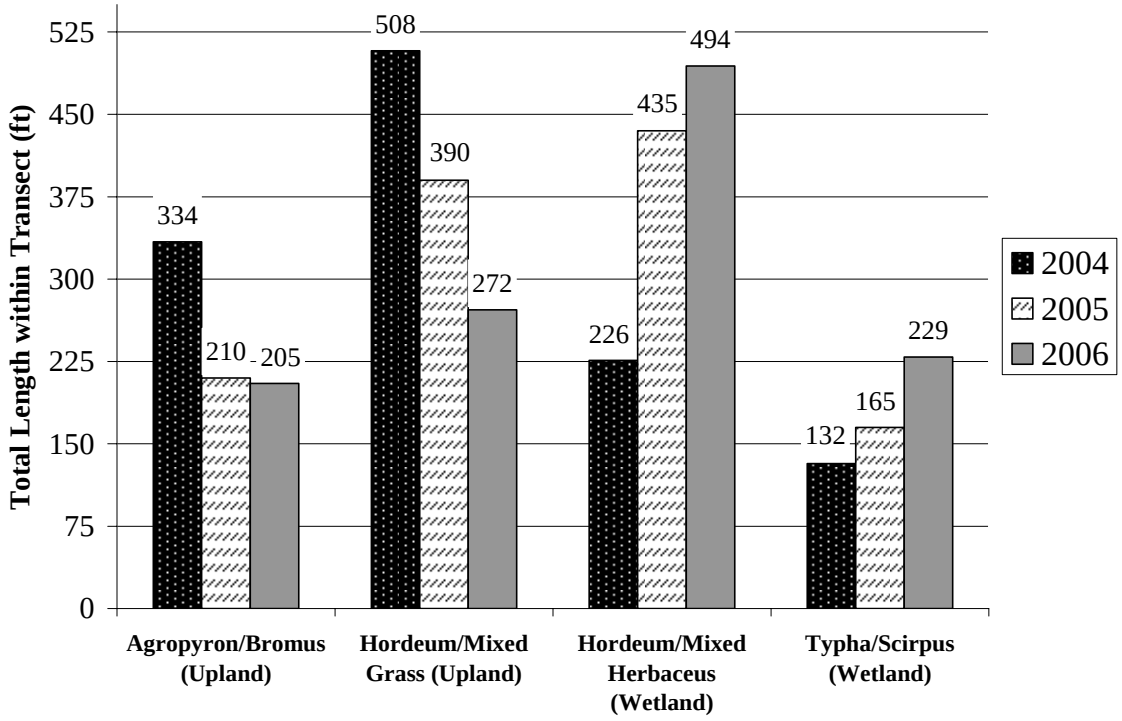
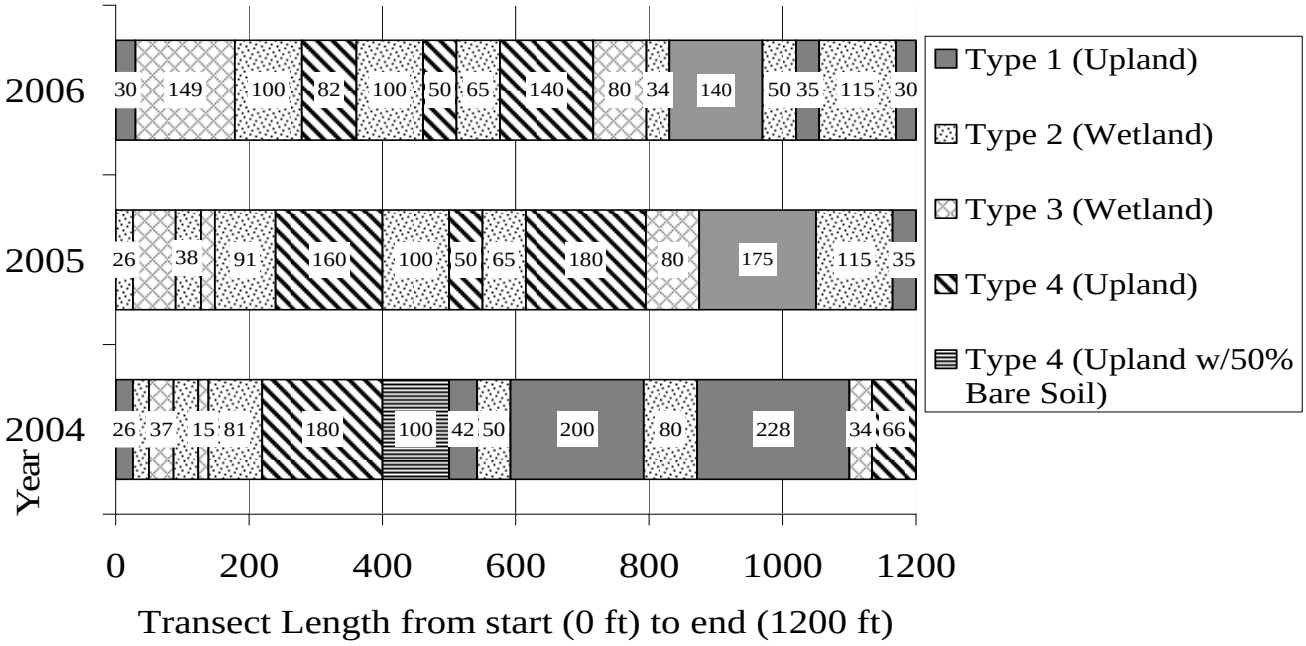


Chart 2: ***Transect map showing vegetation types from start of transect (0 feet) to the end of transect (1200 feet) for each year monitored.***



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 1 and 3 are within upland soils and SP-2 is a wetland soil. Soils at SP-1 (approximately 450 feet west of the eastern transect stake) were a grayish brown (10YR 5/2) silty loam from 0 to 4 inches and a dark grayish brown (10YR 4/2) silty clay loam from 4 to 14 inches. Soils were inundated with 1 inch of surface water. Below 14 inches gravels were present. The soils at SP-3 (closer to the western transect stake) were grayish brown (10YR 5/2) silty loam from 0 to 12 inches and a pale brown (10YR 6/3) silty clay from 2 to 12 inches. Soils were saturated at 6 inches. Both SP-1 and SP-3 met the wetland hydrology parameters but not the hydric soils parameters.

SP-2 is located approximately 100 ft west of the historic wishbone shaped wetland in the center of the horseshoe pasture. Soils were a very dark gray (10YR 3/1) silty clay loam without mottles. Soils were inundated with shallow surface water.

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).

During the July field visit, approximately 85 percent of the upland community type (CT-4) was inundated. Shallow surface water was apparent west, south and north from the transect line. Community type 2 and 3 are increasing in size and it is anticipated that community type 4 will convert to wetland in the near future. The development of existing wetland species (seed bank), seeded species and site planting efforts are successful in germination and establishment. The surface water and 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 38 avian species, 15 species of mammals and four fish species have been sighted within the project site.

3.6 Macroinvertebrates

Macroinvertebrate samples have been collected at the pond each year from 2004 through 2006. A macroinvertebrate sample was collected in the stream in 2006 for the first time to assess the biologic condition. Macroinvertebrate sampling results are provided in **Appendix F** and were summarized by Rhithron Associates, Inc. in the italicized sections below (Bollman 2006). Bioassessment scores at the pond and stream were graphically summarized for each monitoring year (Bollman 2006) (**Chart 3**).

Pond. Very few organisms were present in the sample collected at this site in 2006. A total of 12 organisms in 6 taxa were counted. In spite of the depauperate assemblage, bioassessment scores indicated sub-optimal conditions; scores were skewed by the performance of a few proportional metrics which are not reliable when sampled animals are scarce. Given adequate and appropriate sampling effort, this invertebrate assemblage suggests poor biological conditions.

*Stream. This site was sampled for the first time in 2006. In spite of the "stream" identifier, no rheophilic taxa were collected in the sample collected here. Invertebrate abundance was very low, making interpretation difficult. Naidid worms (*Nais *sp.) were the dominant taxon, suggesting that bacteria may have been an important energy source. Poor biologic conditions were indicated by this depauperate assemblage.*

Chart 3: ***2004 to 2006 bioassessment scores for the Jack Creek Ranch Wetland Mitigation Site.***

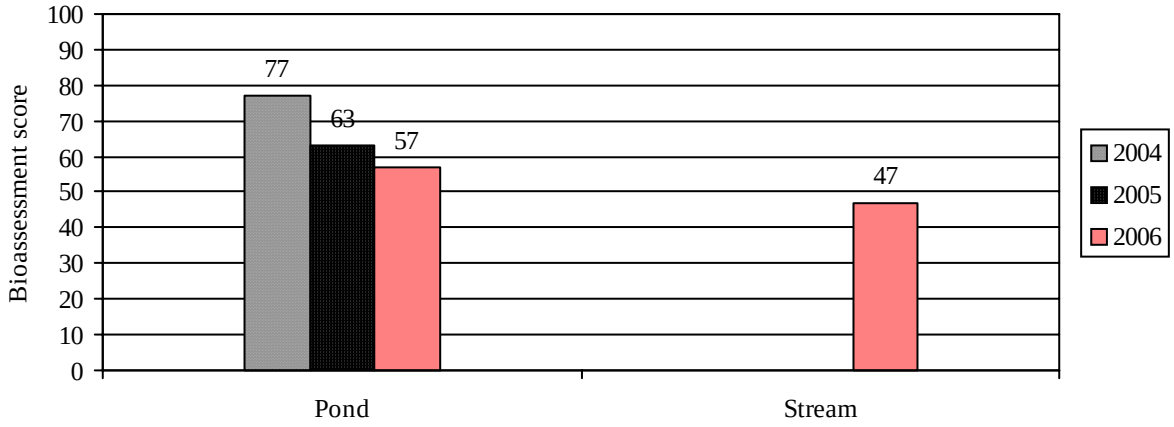


Table 3: ***2004 to 2006 wildlife species observed within the Jack Creek Ranch Wetland Mitigation Site.***

REPTILES	
None	
AMPHIBIANS	
None	
FISH	
Brook trout (*Salvelinus fontinalis*)	Rainbow trout (*Oncorhynchus mykiss*)
Brown trout (*Salmo trutta*)	Long nose dace (*Rhinichthys cataractae*)
CRUSTACEAN	
Crayfish	
BIRDS	
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*)**
Canada Goose (*Branta canadensis*)	Red-tailed hawk (*Buteo jamaicensis*)
Cinnamon Teal (*Anas cyanoptera*)	**Red-winged Blackbird (*Agelaius phoeniceus*)**
Common Goldeneye (*Bucephala clanula*)	Ring-necked Pheasant (*Phasianus colchicus*)
Common Merganser (*Mergus merganser*)	**Sandhill Crane (*Grus canadensis*)**
Common Raven (*Corvus corax*)	**Savanah Sparrow (*Passerculus sandwichensis*)**
Common Snipe (*Gallinago gallinago*)	Sora (*Porzana carolina*)
Common Yellowthroat (*Geothlypis trichas*)	**Spotted Sandpiper (*Actitis macularia*)**
Cliff Swallow (*Hirundo pyrrhonota*)	**Tree Swallow (*Tachycineta bicolor*)**
Eastern Kingbird (*Tyrannus tyrannus*)	Trumpeter swan (*Cygnus buccinator*)
Great Blue Heron (*Ardea herodias*)	Turkey Vulture (*Cathartes aura*)
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*)
MAMMALS	
Antelope (*Antilocarpa Americana*)	**Muskrat (*Ondatra zibethicus*)**
Beaver (*Castor canadensis*)	Porcupine (*Erethizon dorsatum*)
Coyote *(Canis latrans)* or wolf *(Canis lupus)*	River otter (*Lutra canadensis*)
Elk (*Cervus canadensis*)	Red fox (*Vulpes fulva*)
Longtail weasel (*Mustela frenata*)	**White-tailed deer *(Odocoileus virginianus)***
Moose (*Alces alces*)	Striped Skunk (*Mephitis mephitis*)
Mountain cottontail (*Sylvilagus nuttalli*)	Vole sp.
Mule deer (*Odocoileus hemionus*)	

Bolded species indicate those documented within the analysis area in 2006

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 monitoring area has gained over 175 functional units since 2004 due to the increase in shoreline stabilization and gain of wetland acreage. The site maintains a Category II wetland and scores 354 functional units.

Table 4: ***Summary of 2002 and 2004 - 2006 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	2002[1] Pre-construction	2004[2] Post-construction	2005[2] Post-construction	2006[2] Post-construction
Listed/Proposed T&E Species Habitat	Low (0)	Low (0.3)	Low (0.3)	Low (0.3)
MNHP Species Habitat	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)
General Fish/Aquatic Habitat	Mod (0.6)	Mod (0.7)	Mod (0.7)	Mod (0.7)
Flood Attenuation	NA	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)
Sediment, Nutrient, Toxicant Removal	NA	High (0.9)	High (0.9)	High (0.9)
Sediment/Shoreline Stabilization	NA	Mod (0.7)	High (1.0)	High (1.0)
Production Export/Food Chain Support	Low (0.3)	High (0.8)	High (0.8)	High (0.8)
Groundwater Discharge/Recharge	Low (0.1)	High (1.0)	High (1.0)	High (1.0)
Uniqueness	Low (0.1)	Mod (0.4)	Mod (0.4)	Mod (0.4)
Recreation/Education Potential	Low (0.1)	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
% of Possible Score Achieved	30%	66%	68%	70%
Overall Category	III	II	II	II
Total Acreage of Assessed Wetland / Open Water Areas within Easement	**23.6**	**21.51**	**33.44**	**42.15**
Functional Units (acreage x actual points) (fu)	**49.8**	**169.9**	**274.2**	**354.1**
Net Acreage Gain in Mitigation Area (ac)	**NA**	**19.52**	**31.45**	**40.16**
Approximate Functional Unit Gain in Mitigation Area (acreage gain x actual points) (fu)	**---**	**154.2**	**257.9**	**337.3**

[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) and one Madison County-listed noxious weed (musk thistle). Only a few live hounds tongue and musk thistle plants were noted during the July 2006 monitoring visit. Weed control efforts have been effective in significantly reducing these two species. Canada thistle still poses the greatest risk for potential spread in transition and upland areas. Continued spot spraying is recommended in 2007 primarily for Canada thistle; and hounds tongue and musk thistle as needed.

3.10 Current Credit Summary

The gross wetland boundary increased from 33.44 acres in 2005 to 42.15 acres in 2006. This one-year gain encompasses 8.71 acres and includes 2.13 acres of shallow open water (<4 feet deep). The monitoring area has gained over 175 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 354 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 42.15 gross wetland acres or 84% 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 40.16 acres. Since construction, the site has gained 337 functional units.

4.0 REFERENCES

Berglund, J. 1999. *MDT Montana Wetland Assessment Method*. May 25th. Prepared for Montana Department of Transportation and Morrison-Maierle, Inc. Prepared by Western EcoTech. Helena, Montana. 18 pp.

Bollman, W. 2006. MDT Mitigated Wetland Monitoring Project – Aquatic Invertebrate Monitoring Summary 2001-2006. Rhithron Associates Inc. Missoula, MT.

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

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

USDA Natural Resource Conservation Service (NRCS). 1989. *Soil Survey of Madison County, Montana.*

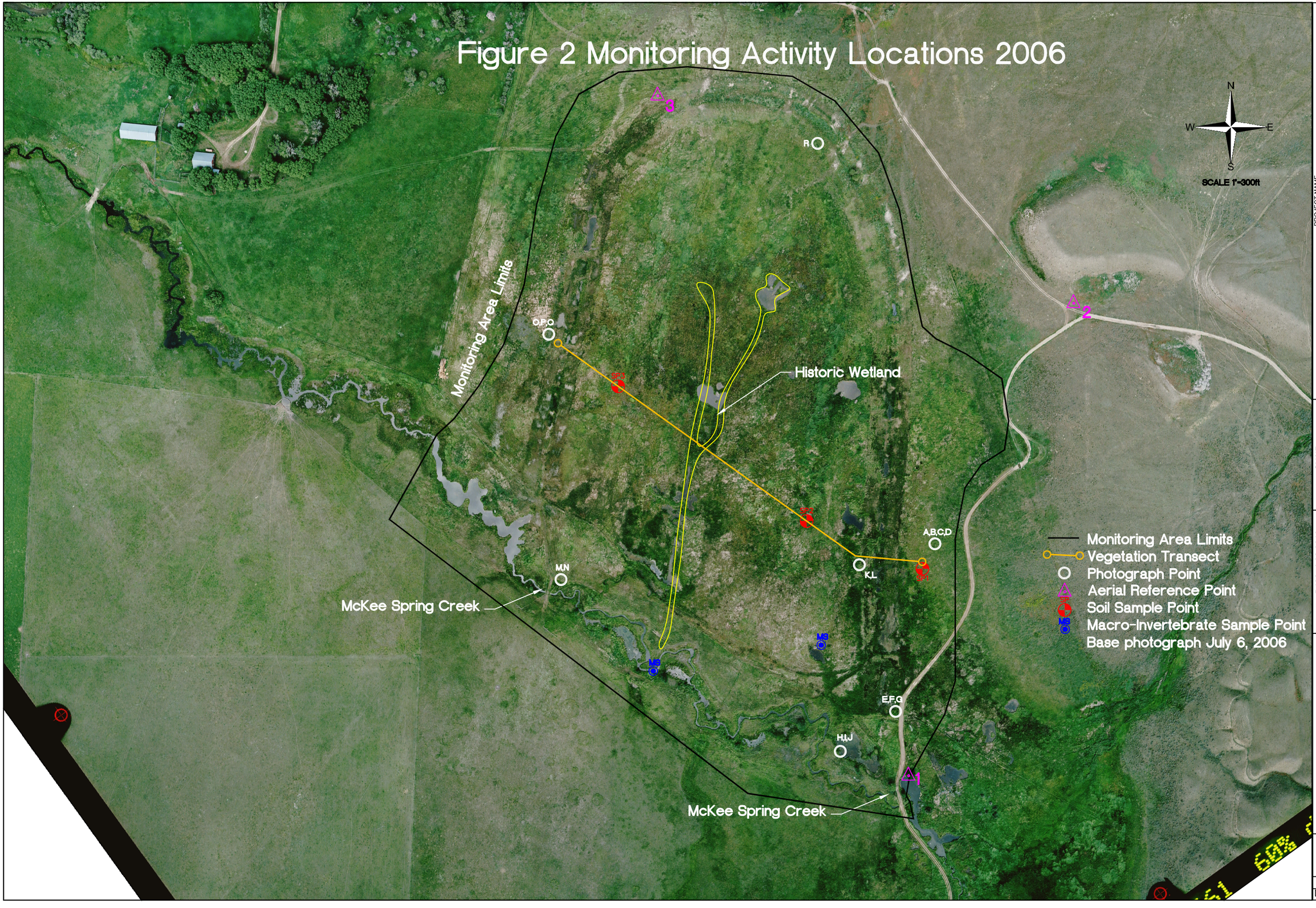
Western Regional Climate Center (WRCC). 2006. Ennis Station: http://www.wrcc.dri.edu/cgi-bin/cliMAIN.pl.mtenni.

Appendix A

FIGURES 2 & 3

MDT Wetland Mitigation Monitoring
Jack Creek Ranch
Ennis, Montana

Figure 2 Monitoring Activity Locations 2006



PROJECT NAME
MDT JACK CREEK WETLAND MITIGATION

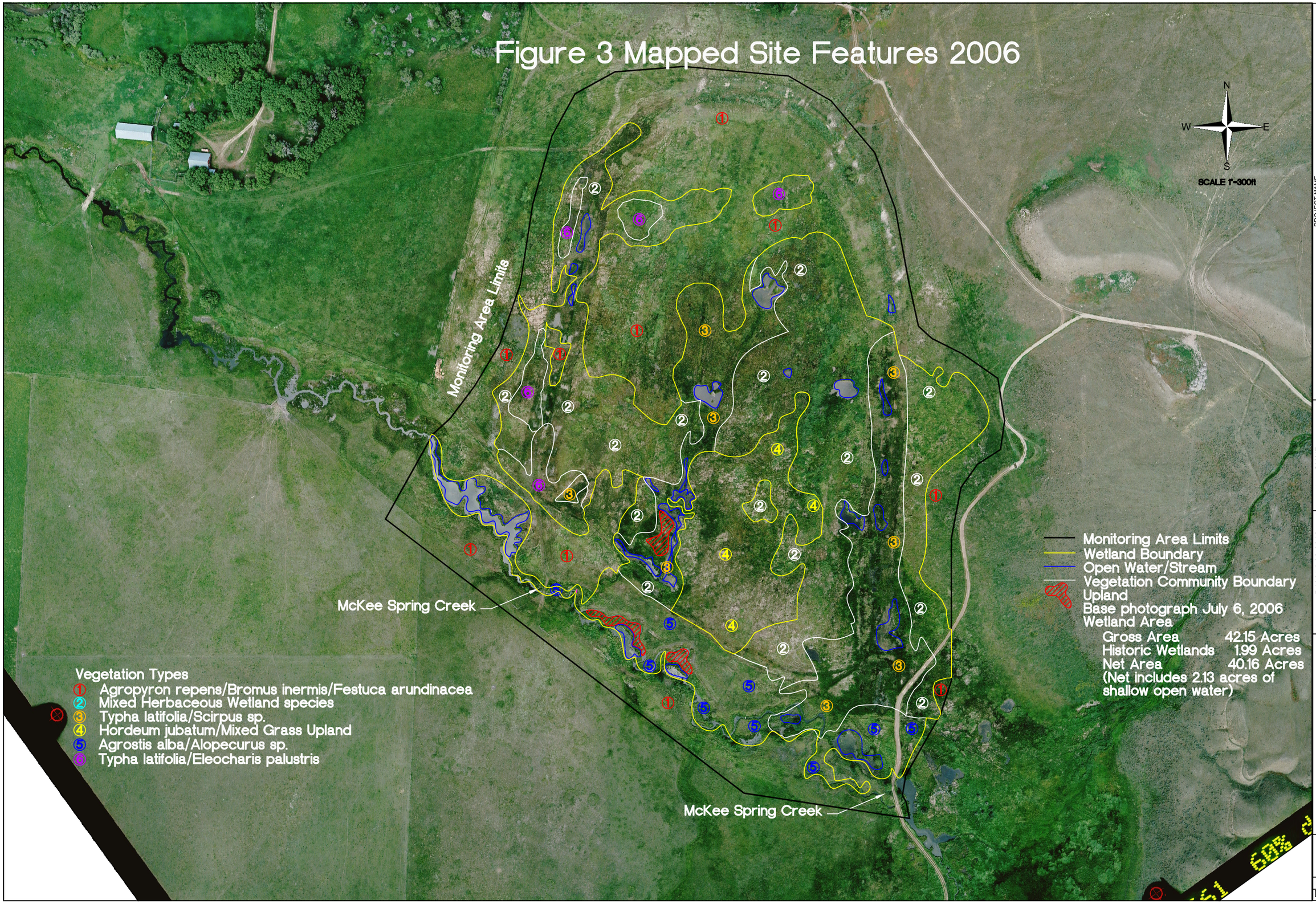
DRAWING TITLE
MONITORING ACTIVITY LOCATIONS 2006

PROJ NO: B43054.00 0210	DRAWN: SH/JR		
LOCATION: ENNIS, MT	PROJ MGR: J. BERGLUND		
SCALE: 1" = 300'	CHECKED: CH	APPVD: JB	
FILE NAME: Jack Creek 2006.dwg			

PBSJ
3810 Valley Commons Drive
Suite 4
Bozeman, MT 59718

FIGURE
2 OF
REV -
Dec/15/2006

Figure 3 Mapped Site Features 2006



PROJECT NAME
MDT JACK CREEK WETLAND MITIGATION

DRAWING TITLE
MAPPED SITE FEATURES 2006

DRAWN: SH/JR
PROJ MGR: J. BERGLUND
CHECKED: CH | APPVD: JB

PROJ NO: B43054.00 0210
LOCATION: ENNIS, MT
SCALE: 1" = 300'
FILE NAME: Jack Creek 2006.dwg

PBSJ
3810 Valley Commons Drive
Suite 4
Bozeman, MT 59718

FIGURE
3 OF
REV -
Dec/15/2006

Appendix B

2006 WETLAND MITIGATION SITE MONITORING FORM
2006 BIRD SURVEY FORMS
2006 COE WETLAND DELINEATION FORMS
2006 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: **B43054-0210**
Assessment Date: **July 27, 2006** Person(s) conducting the assessment: **CH/LWC**
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: **85%**
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, water marks in pot holes, silts/sediment on wetland vegetation, and stained vegetation.

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%	Cirsium arvense	2 = 6-10%
Bromus inermis	3 = 11-20%	Elymus canadensis	1 = 1-5%
Festuca arundinacea	3 = 11-20%	Agrostis alba	2 = 6-10%
Poa pratensis	1 = 1-5%	Agropyron dasystachyum	+ = < 1%
Phalaris arundinacea	2 = 6-10%		
Hordum jubatum	1 = 1-5%		

Comments / Problems: **Very few weedy or undesirable species compared to 2004. Shallow surface water over most of the upland soils in the northwestern portion of the horseshoe. Still some areas where weed control (Cirsium arvense) needs to be continued.**

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

Dominant Species	% Cover	Dominant Species	% Cover
Scirpus pungens	2 = 6-10%	Carex nebrascensis	1 = 1-5%
Deschampsia cespitosa	2 = 6-10%	Puccinellia nuttalliana	2 = 6-10%
Juncus torreyi	2 = 6-10%	Juncus balticus	1 = 1-5%
Juncus ensifolius	2 = 6-10%	Hordeum jubatum	1 = 1-5%
Agrostis alba	1 = 1-5%	Typha latifolia (young plants)	1 = 1-5%
Phalaris arundinacea	1 = 1-5%	C. lanuginosa	1 = 1-5%

Comments / Problems: **Historically, Hordeum jubatum represented approximately 20% of this community; last year (2005) there was a significant decrease in cover by this plant. In 2006, Hordeum jubatum was still present but represented a very 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 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%	Carex utriculata	2 = 6-10%
Scirpus validus	3 = 11-20%	Eleocharis palustris	1 = 1-5%
Scirpus pungens	2 = 6-10%	Bechmannia syziachne	+ = < 1%
Juncus torreyi	2 = 6-10%	Ranunculus cymbalaris	1 = 1-5%
Open water	2 = 6-10%	Veronica americana	1 = 1-5%
Carex aquatilis	2 = 6-10%	Carex lanuginosa	+ = < 1%

Comments / Problems: **This community type was typically found in areas of shallow water or around the perimeter of open 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%
Bromus inermis	2 = 6-10%	Agropyron trachycaulum	1 = 1-5%
Festuca arundinacea	3 = 11-20%	Agropyron riparium	1 = 1-5%
Agropyron repens	3 = 11-20%	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 to dry soil conditions.**

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

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

Comments / Problems: **This community type represents emergent vegetation along portions of McKee Spring creek. Other minor species include Mentha arvense, Distichis spicata, Juncus mertensianus, Agropyron riparium and a few live Salix sp. (cuttings).**

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	1 = 1-5%		
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. Cattails and creeping spikerush represent the two main species in these wetlands.**

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
Bechmannia syzigachne	2, 3, 5`	Phleum pratense	1
Bromus inermis	1, 4	Poa palustris	4, 5
Bromus marginatus	5	Poa pratensis	1, 2, 4
Calamagrostis canadensis	5	Poa compressa	1, 4
Carduus nutans	5	Populus angustifolia	5
Carex aquatilis	2, 3, 6	Potentilla anserina	2
Carex lanuginosa	2, 3, 5	Puccinellia nuttalliana	2, 3
Carex microptera	2	Ranunculus cymbalaria	2, 3
Carex nebrascensis	2, 5	Rumex crispus	2
Carex utriculata	3, 6	Salix bebbiana	3
Chenopodium album	1	Salix exigua	3, 5
Cirsium arvense	1, 2, 4, 5	Salix lasiandra	3, 5
Cynoglossum officinale	1, 5	Salsola kali	1
Deschampsia cespitosa	2, 5	Scirpus pungens	2, 3, 5, 6
Distichlis spicata	2, 5	Scirpus validus	3
Eleocharis palustris	2, 3, 6	Sisymbrium altissimum	1
Elymus canadensis	1, 4	Spartina gracilis	2
Equisetum arvense	2, 4	Thlaspi arvense	1
Festuca arundinacea	1, 2, 4	Tragopogon dubuis	1
Festuca pratensis	1, 4	Typha latifolia	2, 3, 6
Glyceria grandis	5	Verbascum thapsus	1
Glycyrrhiza lepidota	1	Veronica americana	3
Hordeum jubatum	1, 2, 4, 5		
Hyoscyamus niger	1		
Juncus balticus	2, 3, 5	Juncus ensifolius	2, 3, 6
Juncus bufonius	5	Epilobium ciliatum	2
Juncus longistylis	2, 5		
Juncus mertensianus	2, 5		
Juncus torreyi	2, 3, 5, 6		

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. Six live transplanted cottonwoods (4 to 8 ft) were counted within floodplain. Also volunteer cottonwood root suckers were observed within the floodplain. One live transplanted willow was alive 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. Two live (larger) willows were observed in the pasture.

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 CT 2 along eastern side	NE
B		Transect 1 cattails replacing foxtail barley	West
C		Transect 1 developing vegetation on mud flats	South
D		Transect 1 impressive stands of CT 3	North
E		At fence line - CT 3 expanding toward creek	West
F		At fence line - expansion of wetlands to E, SE	NE
G		At fence line - CT 3 created by low head berm	SW
H		Ponds along McKee Spring Creek	SE
I		McKee Creek and floodplain vegetation	SE
J		CT 3 along portion of McKee Spring Creek	SW
K		Shallow open water pond south of Transect 1	SE
L		Vegetation encroachment in mud flats	South
M		McKee Spring Creek and floodplain mixed species	NE
N		CT 5 along the southern side of McKee Creek	West
O		West side of Transect 1 - CT 6	North
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 27, 2006** Examiner: **CH/LWC**
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**
AGRALB	3 = 11-20%
HORJUB	3 = 11-20%
PHAARU	2 = 6-10%
RANCYM	3 = 11-20%
EPICIL	2 = 6-10%
TYPLAT	1 = 1-5%
POAPRA	1 = 1-5%
ALOARU	2 = 6-10%
PUCNUT	1 = 1-5%
Total Vegetative Cover:	90%

Vegetation Type B: **CT 3 (wetland)**	
Length of transect in this type: 149 feet	
Plant Species	**Cover**
TYPLAT	3 = 11-20%
SCIPUN	3 = 11-20%
SCIVAL	3 = 11-20%
JUNTOR	2 = 6-10%
CARAQU	2 = 6-10%
CARUTR	1 = 1-5%
VERAME	1 = 1-5%
RANCYM	1 = 1-5%
ELEPAL	2 = 6-10%
Open water	3 = 11-20%
BECSYN	+ = < 1%
Total Vegetative Cover:	90%

Vegetation Type C: **CT 2 (wetland)**	
Length of transect in this type: 100 feet	
Plant Species	**Cover**
DESCES	2 = 6-10%
JUNBAL	2 = 6-10%
JUNMER	2 = 6-10%
JUNTOR	2 = 6-10%
CARAQU	2 = 6-10%
SCIPUN	2 = 6-10%
CARLAN	2 = 6-10%
PHAARV	1 = 1-5%
EQUARV	1 = 1-5%
RANCYM	1 = 1-5%
MENARV	1 = 1-5%
TYPLAT	1 = 1-5%
Total Vegetative Cover:	90%

Vegetation Type D: **CT 4 (upland)**	
Length of transect in this type: 82 feet	
Plant Species	**Cover**
HORJUB	4 = 21-50%
BROINE	3 = 11-20%
FESARU	3 = 11-20%
AGRTRA	2 = 6-10%
ELYCAN	1 = 1-5%
CIRARV	3 = 11-20%
MUHSPP	1 = 1-5%
surface water	2 = 6-10%
Total Vegetative Cover:	90%

MDT WETLAND MONITORING – VEGETATION TRANSECT

Site: **Jack Creek Ranch** Date: **July 27, 2006** 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: 100 feet	
Plant Species	**Cover**
AGRALB	3 = 11-20%
PUCNUT	3 = 11-20%
PHAARV	2 = 6-10%
ELEPAL	1 = 1-5%
EPICIL	1 = 1-5%
HORJUB	2 = 6-10%
SCIPUN	1 = 1-5%
bare soil	1 = 1-5%
FESARU	2 = 6-10%
Total Vegetative Cover:	85%

Vegetation Type F: **CT4 (upland)**	
Length of transect in this type: 50 feet	
Plant Species	**Cover**
HORJUB	3 = 11-20%
FESARU	3 = 11-20%
AGRALB	3 = 11-20%
BROINE	3 = 11-20%
CIRARV	1 = 1-5%
POAPRA	1 = 1-5%
Total Vegetative Cover:	100%

Vegetation Type G: **CT 2 (wetland)**	
Length of transect in this type: 65 feet	
Plant Species	**Cover**
SCIPUN	2 = 6-10%
PHAARU	2 = 6-10%
CARNEB	1 = 1-5%
JUNBAL	3 = 11-20%
JUNMER	1 = 1-5%
AGRALB	2 = 6-10%
JUNTOR	2 = 6-10%
EPICIL	1 = 1-5%
1 to 2 inches surface water	1 = 1-5%
TYPLAT	1 = 1-5%
DESCES	1 = 1-5%
Total Vegetative Cover:	90%

Vegetation Type H: **CT 4 (upland)**	
Length of transect in this type: 140 feet	
Plant Species	**Cover**
HORJUB	3 = 11-20%
AGRREP	3 = 11-20%
FESARU	3 = 11-20%
POAPRA	2 = 6-10%
ELYCAN	1 = 1-5%
AGRALB	1 = 1-5%
MELALB	1 = 1-5%
Total Vegetative Cover:	80%

MDT WETLAND MONITORING – VEGETATION TRANSECT

Site: **Jack Creek Ranch** Date: **July 27, 2006** Examiner: **CH**
Transect Number: **1** Approximate Transect Length: **1200 feet** Compass Direction from Start: **44˚** Note: **east to west**

Vegetation Type E: **CT 3 (wetland)**	
Length of transect in this type: 80 feet	
Plant Species	**Cover**
TYPLAT	4 = 21-50%
SCIPUN	2 = 6-10%
SCIVAL	2 = 6-10%
JUNENS	2 = 6-10%
JUNBAL	1 = 1-5%
Salix cuttings (15 - 20% survival)	1 = 1-5%
PHAARU	1 = 1-5%
ELEPAL	1 = 1-5%
2 to 4 inch deep water	1 = 1-5%
Total Vegetative Cover:	95%

Vegetation Type F: **CT 2 (wetland)**	
Length of transect in this type: 34 feet	
Plant Species	**Cover**
SCIPUN	2 = 6-10%
HORJUB	3 = 11-20%
PUCNUT	2 = 6-10%
JUNENS	2 = 6-10%
DESCES	2 = 6-10%
EQUARV	1 = 1-5%
JUNMER	1 = 1-5%
JUNLON	1 = 1-5%
1 inch shallow water	1 = 1-5%
Total Vegetative Cover:	75%

Vegetation Type G: **CT 1 (upland)**	
Length of transect in this type: 140 feet	
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%
AGRDAS	+ = < 1%
Total Vegetative Cover:	85%

Vegetation Type H: **CT 2 (wetland)**	
Length of transect in this type: 50 feet	
Plant Species	**Cover**
DESCES	3 = 11-20%
HORJUB	2 = 6-10%
JUNENS	2 = 6-10%
AGRALB	3 = 11-20%
CARLAN	2 = 6-10%
ALOPRA	2 = 6-10%
DISSPI	1 = 1-5%
Total Vegetative Cover:	80%

MDT WETLAND MONITORING – VEGETATION TRANSECT

Site: **Jack Creek Ranch** Date: **July 27, 2006** Examiner: **CH/LWC**
Transect Number: **1** Approximate Transect Length: **1200 feet** Compass Direction from Start: **44˚** Note: **east to west**

Vegetation Type I: **CT 1 (upland)**	
Length of transect in this type: 35 feet	
Plant Species	**Cover**
BROINE	3 = 11-20%
FESARU	3 = 11-20%
AGRREP	3 = 11-20%
HORJUB	3 = 11-20%
CIRARV	1 = 1-5%
AGRDAS	1 = 1-5%
Total Vegetative Cover:	85%

Vegetation Type J: **CT 2 (wetland)**	
Length of transect in this type: 115 feet	
Plant Species	**Cover**
HORJUB	3 = 11-20%
DESCES	2 = 6-10%
AGRALB	2 = 6-10%
CARLAN	2 = 6-10%
ALOPRA	2 = 6-10%
JUNENS	2 = 6-10%
PHAARU	1 = 1-5%
CARNEB	1 = 1-5%
CARMIC	1 = 1-5%
SPAGRA	1 = 1-5%
BECSYZ	+ = < 1%
Total Vegetative Cover:	80%

Vegetation Type K: **CT 1 (upland)**	
Length of transect in this type: 30 feet	
Plant Species	**Cover**
BROINE	3 = 11-20%
AGRREP	5 = > 50%
CIRARV	1 = 1-5%
Bare soil	1 = 1-5%
MUHSPP	1 = 1-5%
Total Vegetative Cover:	90%

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

MDT WETLAND MONITORING – VEGETATION TRANSECT

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

Percent of perimeter developing wetland vegetation (excluding dam/berm structures): **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: _____
Survey Time: _____ to _____

Bird Species	#	Behavior	Habitat	Bird Species	#	Behavior	Habitat
May 1, 2006				Savanah Sparrow*	2	BD	
Red-winged Blackbird	4	BD	MA	AmericanGoldfinch*	2	BD	
Green-winged Teal	2	F	MA	shorebird unident*	1	F	
Mallard	3	FO F	MA	October 23/06			
Tree Swallow	1	F	MA	Green-winged Teal	11	F	MA
Northern Harrier	1	F	MA	Northern Shrike	1	F	MA
Marsh Wren	1	BD	MA	Common Raven	1	FO	MA
Sandhill Crane	2	FO	MA	Green-winged Teal*	6	FO	
Great Blue Heron*	1	F					
American Wigeon*	2	F					
Blue-winged Teal*	2	F					
Red-winged Blackbird*	3	BD					
Mallard*	3	F					
Marsh Wren*	1	BD					
July 26, 2006							
Savanah Sparrow	4	BD	MA				
Marsh Hawk @	4	F	UP				
Marsh Wren	7	BD	MA				
Common Yellowthroat	2	BD	MA				
Red-winged Balckbird	15	BD	MA				
Mallard	3	F	MA				
Common Snipe	7	F	MA				
Red-wiinged Blackbird*	4	BD					

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: ***Observed within the stream corridor; MA = Marsh area within the "horseshoe"; @ = 3 of these were fledglings, the 4th an adult female**

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

Project / Site: **Jack Creek Ranch**	Date: **July 27, 2006**
Applicant / Owner: **MDT**	County: **Madison**
Investigator: **CH/LWC**	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-1**

VEGETATION

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

Percent of Dominant Species that are OBL, FACW, or FAC (excluding FAC-): **2** / **6** = **33**%	FAC Neutral: / = %

Remarks: **33% 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: **YES** 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 = **1** (in.) Depth to Free Water in Pit > **14** (in.) Depth to Saturated Soil = **0** (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: **Sampling area inundated with 1 inch of water. 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.
0-4		10 YR 5/2	/ /	N/A N/A	 Silty loam
4-14	A/B	10 YR 4/2	/ /	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
- **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: **some gravels below 14 inches.**

WETLAND DETERMINATION

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

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

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

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

Project / Site: **Jack Creek Ranch**	Date: **July 27, 2006**
Applicant / Owner: **MDT**	County: **Madison**
Investigator: **CH/LWC**	State: **Montana**

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

VEGETATION

Dominant Species	Stratum	Indicator	Dominant Species	Stratum	Indicator
1. *SCIPUN*	Herb	OBL	11.		
2. *HORJUB*	Herb	FAC+	12.		
3. *PUCNUT*	Herb	OBL	13.		
4. *JUNENS*	Herb	FACW	14.		
5. *DESCES*	Herb	FACW-	15.		
6. *EQUARV*	Herb	FAC	16.		
7. *JUNMER*	Herb	OBL	17.		
8.			18.		
9.			19.		
10.			20.		

Percent of Dominant Species that are OBL, FACW, or FAC (excluding FAC-): **7** / **7** = **100**%	FAC Neutral: / = %
Remarks: **100% 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: **YES** 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 = **1** (in.) Depth to Free Water in Pit = **3** (in.) Depth to Saturated Soil = **0** (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: **Shallow 1 inch deep water across wetland and uplands in this portion of the horseshoe**	

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.
0-12	A	10 YR 3/1	/ /	N/A N/A	 Silty clay loam
		/	/ /	N/A N/A	
		/	/ /	N/A N/A	
		/	/ /	N/A N/A	
		/	/ /	N/A N/A	

Hydric Soil Indicators:

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

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

WETLAND DETERMINATION

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

Remarks: **Very likely this wetland expansion off the historic wetlands will continue to the west and northwest.**

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

Project / Site: **Jack Creek Ranch**	Date: **July 27, 2006**
Applicant / Owner: **MDT**	County: **Madison**
Investigator: **CH/LWC**	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. *FESARU*	Herb	FACU-	12.		
3. *AGRREP*	Herb	FACU	13.		
4. *HORJUB*	Herb	FAC+	14.		
5. *POAPRA*	Herb	FACU+	15.		
6. *CIRARV*	Herb	FACU+	16.		
7.			17.		
8.			18.		
9. *I*			19.		
10.			20.		

Percent of Dominant Species that are OBL, FACW, or FAC (excluding FAC-): **1** / **6** = **17**%	FAC Neutral: / = %

Remarks: **17% 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 **N/A** ____ (in.) Depth to Free Water in Pit **N/A** ____ (in.) Depth to Saturated Soil = **6** (in.)	Secondary Indicators (2 or more required): **NO** Oxidized Root Channels in Upper 12 inches **NO** Water-Stained Leaves **NO** Local Soil Survey Data **NO** FAC-Neutral Test **NO** Other (Explain in Remarks)

Remarks: **Soils saturated at 6 inches. Large areas of upland surface water to the east but not within this upland portion along 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.
0-2		10 YR 5/2	/ /	N/A N/A	 Silty loam
2-12	A	10 YR 6/3	/ /	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? **YES** Hydric Soils Present? **NO**	Is this Sampling Point within a Wetland? **NO**

Remarks: **Hydrophytic vegetation 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: 7/27/2006 **4. Evaluator(s):** CH/LWC **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 LWC

8. Wetland Size (total acres): 42.15 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): 42.15 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

ii. Prominent weedy, alien, & introduced species: weeds include Canada thistle, musk 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	Bald eagle	
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)	---

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	Arctic grayling, Peregrine falcon,
Incidental habitat **(list species)**	☐ D ☐ S	_____
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	345.6
		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

2006 REPRESENTATIVE PHOTOGRAPHS

MDT Wetland Mitigation Monitoring
Jack Creek Ranch
Ennis, Montana

2006 JACK CREEK RANCH WETLAND MITIGATION SITE

Location: A **Description:** CT 2 along eastern end of Transect 1. **Compass Reading:** NE

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

Location: C **Description:** mud flats developing into cattails, bulrush and rush wetland. C**ompass Reading:** S

Location: D **Description:** Impressive stands of CT 3 (cattails and bulrush). **Compass Reading:** North

Location: E **Description:** Cattails and bulrush expanding toward creek. **Compass Reading:** West

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

2006 JACK CREEK RANCH WETLAND MITIGATION SITE

Location: G **Description:** Cattails/bulrush wetlands created by low head berm. **Compass Reading:** SW

Location: H **Description:** Ponds along McKee Spring Creek. **Compass Reading: SE**

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

Location: J **Description:** CT 3 along portions of McKee Spring Creek. **Compass Reading:** Southwest

Location: K **Description:** Shallow open water pond south of transect 1. **Compass Reading:** SE

Location: L **Description:** Wetland vegetation on mud flats south of transect. **Compass Reading:** South

2006 JACK CREEK RANCH WETLAND MITIGATION SITE

Location: M **Description:** McKee Spring Creek floodplain – mixed species. **Compass Reading:** NE

Location: N **Description:** CT 5 along south side of McKee Spring Creek. **Compass Reading:** West

Location: 0 **Description:** West side Transect 1 – cattails and creeping spikerush. **Compass Reading**: North

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

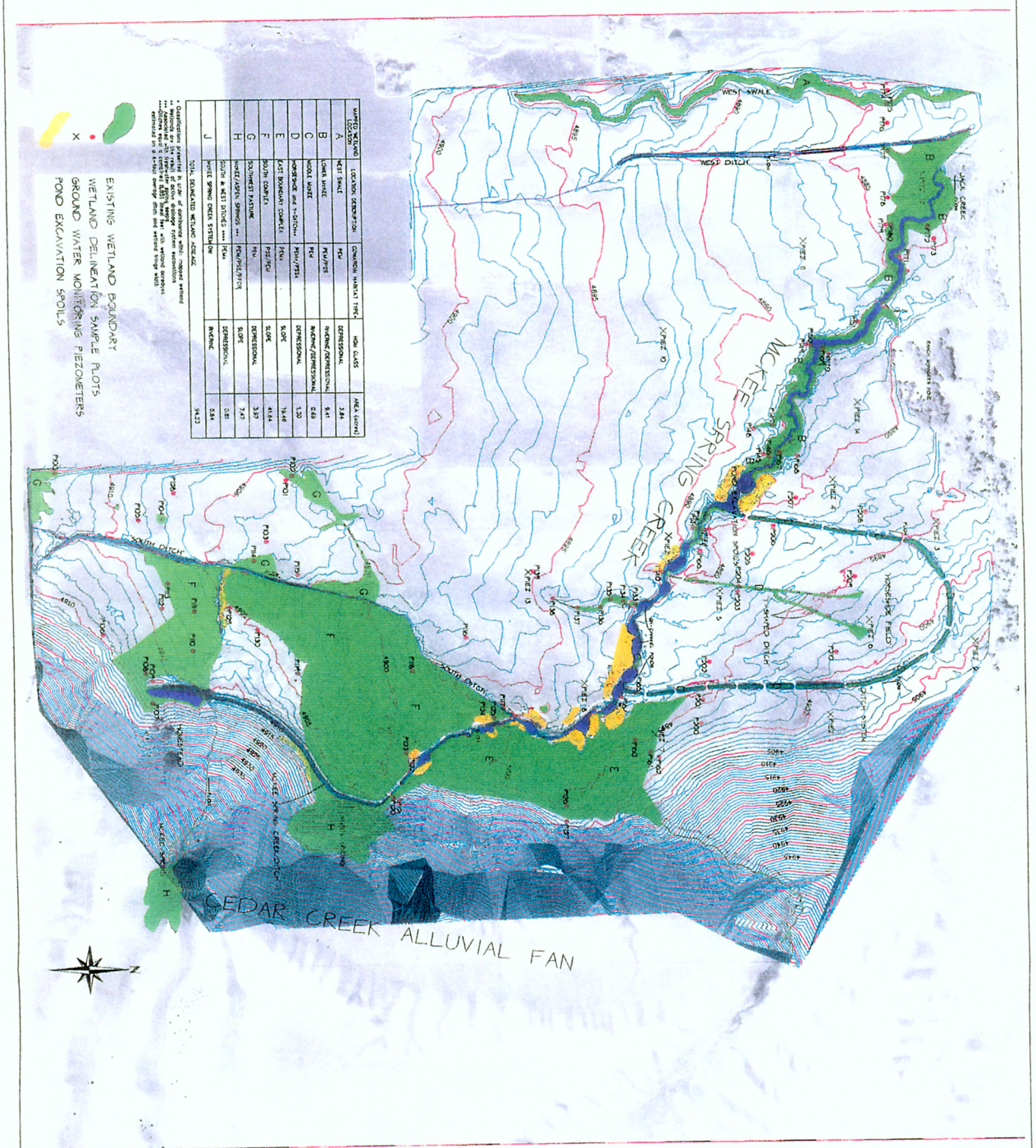
Location: Q **Description:** Transect 1 western stake looking east. **Compass Reading:** East

Location: R **Description:** 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



SHEET 1 OF 1	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							

Appendix E

BIRD SURVEY PROTOCOL
GPS PROTOCOL

MDT Wetland Mitigation Monitoring
Jack Creek Ranch
Ennis, Montana

BIRD SURVEY PROTOCOL

The following is an outline of the MDT Wetland Mitigation Site Monitoring Bird Survey Protocol. Though each site is vastly different, the bird survey data collection methods must be standardized to a certain degree to increase repeatability. An Area Search within a restricted time frame will be used to collect the following data: a bird species list, density, behavior, and habitat-type use. There will be some decisions that team members must make to fit the protocol to their particular site. Each of the following sections and the desired result describes the protocol established to reflect bird species use over time.

Species Use within the Mitigation Wetland: Survey Method

Result: To conduct a bird survey of the wetland mitigation site within a restricted period of time and the budget allotment.

Sites that can be circumambulated or walked throughout.

These types of sites will include ponds, enhanced historic river channels, wet meadows, and any area that can be surveyed from the entirety of its perimeter or walked throughout. If the wetland is not uncomfortably inundated, conduct several "meandering" transects through the site in an orderly fashion (record the number and approximate location/direction of the transects in the field notebook; they do not have to be formalized or staked). If a very small portion of the site cannot be crossed due to inundation, this method will also apply. Though the sizes of the site vary, each site will require surveying to the fullest extent possible within a set time limit. The optimum times to conduct the survey are in the morning hours. Conduct the survey from sunrise to no later than 11:00 AM. (Note: some sites may have to be surveyed in the late afternoon or evening due to time constraints or weather; if this is the case, record the time of day and include this information in your report discussion.) If the survey is completed before 11:00 AM and no additions are being made to the list, then the task is complete. The overall limiting factor regarding the number of hours that are spent conducting this survey is the number of budgeted hours; this determination must be made by site by each individual.

In many cases, binoculars will be the only instrument that is needed to identify and count the birds using the wetland. If the wetland includes deep water habitat that can not be assessed with binoculars, then a scope and tripod are necessary. If this is the case, establish as many lookout posts as necessary from key vantage points to collect the data. Depending on the size of the open water, more time may be spent viewing the mitigation area from these vantage points than is spent walking the peripheries of more shallow-water wetlands.

Sites that cannot be circumambulated.

These types of sites will include large-bodied waters, such as reservoirs, particularly those with deep water habitat (>6 ft) close to the shore and no wetland development in that area of the shoreline. If one area of the reservoir was graded in such a way to create or enhance the development of a wetland, then that will be the area in which the ambulatory bird survey is conducted. The team member must then determine the length of the shoreline that will be surveyed during each visit.

As stated above in the ambulatory site section, these large sites most likely will have to be surveyed from established vantage points.

Species Use within the Mitigation Wetland: Data Recording

Result: A complete list of bird species using the site, an estimate of bird densities and associated behaviors, and identification of habitat use.

1. Bird Species List

Record the bird species on the Bird Survey - Field Data Sheet using the appropriate 4-letter code of the common name. The coding uses the first two letters of the first two words of the birds' common name or if one name, the first four (4) letters. For example, mourning dove is coded MODO and mallard is MALL. If an unknown individual is observed, use the following protocol and define your abbreviation at the bottom of the field data sheet: unknown shorebird: UNSB; unknown brown bird (UNBR); unknown warbler (UNWA); unknown waterfowl (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 parentheses; do not fill in the habitat column. For example, a flock of black, medium-sized birds could be coded: UNBB / FO (25). You may also note on the data sheet if that particular individual is using a constructed nest box.

2. Bird Density

In the office, sum the Bird Survey – Field Data Sheet data by species and by behavior. Record this data in the Bird Summary Table.

3. Bird Behavior

Bird behavior must be identified by what is known. When a species is simply observed, the behavior that it is immediately exhibiting is what is recorded. Only behaviors that have discreet descriptive terms should be used. The following terms are recommended: breeding pair individual (BP); foraging (F); flyover (FO); loafing (L; e.g. sleeping, roosting, floating with head tucked under wing are loafing behaviors); and, nesting (N). If more behaviors are observed that do have a specific descriptive word, use them and we will add it to the protocol; descriptive words or phrases such as "migrating" or "living on site" are unknown behaviors.

4. Bird Species Habitat Use

We are interested in what bird species are using which particular habitat within the mitigation wetlands. This data is easily collected by simply recording what habitat the species was initially observed. Use the following broad category habitat classifications: aquatic bed (AB - rooted floating, floating-leaved, or submergent vegetation); forested (FO); marsh (MA – cattail, bulrush, emergent vegetation, etc. with surface water); open water (OW – primarily unvegetated); scrub-shrub (SS); and upland buffer (UP); wet meadow (WM – sedges, rushes, grasses with little to no surface water). If other categories are observed onsite that are not suggested here, we will make a new category next year.

GPS Mapping and Aerial Photo Referencing Procedure

The wetland boundaries, photograph location points and sampling locations were field located with mapping grade Trimble Geo III GPS units. The data was collected with a minimum of three positions per feature using Course/Acquisition code. The collected data was then transferred to a PC and differentially corrected to the nearest operating Community Base Station. The corrected data was then exported to ACAD drawings in Montana State Plain Coordinates NAD 83 international feet.

The GPS positions collected and processed had a 68% accuracy of 7 feet except in isolated areas of Tasks .008 and .011, where it went to 12 feet. This is within the 1 to 5 meter range listed as the expected accuracy of the mapping grade Trimble GPS.

Aerial reference points were used to position the aerial photographs. This positioning did not remove the distortion inherent in all photos; this imagery is to be used as a visual aide only. The located wetland boundaries were given a final review by the wetland biologist and adjustments were made if necessary.

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

2006 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. Wildco is a good source of these.
- Spare net.
- 1-liter plastic sample jars, wide-mouth. VWR has these: catalog #36319-707.
- 95% ethanol: Northwest Scientific in Billings carries this.

All these other things are generally available at hardware or sporting goods stores. Make the labels on an ink jet printer preferably.

- hip waders.
- pre-printed sample labels (printed on Rite-in-the-Rain or other coated paper, two labels per sample).
- pencil.
- plastic pail (3 or 5 gallon).
- large tea strainer or framed screen.
- towel.
- tape for affixing label to jar.
- cooler with ice for sample storage.

Site Selection

Select the sampling site with these considerations in mind:

- Select a site accessible with hip waders. If substrates are too soft, lay a wide board down to walk on.
- Determine a location that is representative of the overall condition of the wetland.

Sampling

Wetland invertebrates inhabit the substrate, the water column, the stems and leaves of aquatic vegetation, and the water surface. Your goal is to sweep the collecting net through each of these habitat types, and then to combine the resulting samples into the 1-liter sample jar.

Dip out about a gallon of water into the pail. Pour about a cup of ethanol into the sample jar. Fill out the top half of the sample labels, using pencil, since ink will dissolve in the ethanol.

Ideally, you can sample a swath of water column from near-shore outward to a depth of approximately 3 feet with a long sweep of the net, keeping the net at about half the depth of the water throughout the sweep. Sweep the water surface as well. Pull the net through a vegetated area, beneath the water surface, for at least a meter of distance.

Sample the substrate by pulling the net along the bottom, bumping it against the substrate several times as you pull.

This step is optional, but it gives you a chance to <u>see</u> that you've collected some invertebrates. Rinse the net out into the bucket, and look for insects, crustaceans, etc. If necessary, repeat the sampling process in a nearby location, and add the net contents to the bucket. Remember to sample all four environments.

Sieve the contents of the bucket through the straining device and pour or carefully scrape the contents of the strainer into the sample jar.

If you skip the bucket-and-sieve steps, simply lift handfuls of material out of the sampling net into the jars. In either case, please include some muck or mud and some vegetation in the jar. Often, you will have collected a large amount of vegetable material. If this is the case, lift out handfuls of material from the sieve into the jar, until the jar is about half full. Please limit material you include in the sample, so that there is only a single jar for each sample.

Top off the sample jar with enough ethanol to cover all the material in the jar. Leave as little headroom as possible.

It is not necessary to sample habitats in any specified order. Keep in mind that disturbing the habitats prior to sampling will chase off the animals you are trying to capture.

Complete the sample labels. Place one label inside the sample jar and tape the other label securely to the outside of the jar. Dry the jar before attaching the outer label if necessary. In some situations, it may be necessary to collect more than one sample at a site. If you take multiple samples from the same site, clearly indicate this by using individual sample numbers, along with the total number of samples collected at the site (e.g. Sample #3 of 5 total samples).

Photograph the sampled site.

Sample Handling/Shipping

- In the field, keep collected samples cool by storing them in a cooler. Only a small amount of ice is necessary.
- Inventory all samples, preparing a list of all sites and enumerating all samples, before shipping or delivering to the laboratory.
- Deliver samples to Rhithron.

MDT Mitigated Wetland Monitoring Project: Aquatic Invertebrate Monitoring Summary 2001 – 2006

Prepared for PBS&J, Inc.
Prepared by W.Bollman, Rhithron Associates, Inc.

INTRODUCTION

Among other monitoring activities, aquatic invertebrate assemblages were collected at a number of mitigated wetlands throughout Montana. This report summarizes data generated from six years of collection. Over all years of sampling, a total of 182 invertebrate samples were collected. Table 2 summarizes sites and sampling years.

METHODS

Sample processing

Aquatic invertebrate samples were collected at mitigated wetland sites in the summer months of 2001, 2002, 2003, 2004, 2005 and 2006 by personnel of PBS&J, Inc. Sampling procedures utilized were based on the protocols developed by the Montana Department of Environmental Quality (MT DEQ). 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.

At Rhithron's laboratory, Caton subsamplers and stereomicroscopes with 10X magnification were used to randomly select a minimum of 100 organisms from each sample. In some instances, the entire sample contained fewer than 100 organisms; in these cases, all organisms from the sample were taken. Animals were identified to lowest practical taxonomic levels using relevant published resources. Quality control (QC) procedures were applied to sample sorting, taxonomic determinations and enumeration, and data entry. QC statistics are presented in Table 3. The identified samples have been archived at Rhithron's laboratory.

Assessment

The method employed to assess these wetlands is based on an index incorporating a battery of 12 bioassessment metrics or attributes (Table 1) tested and recommended by Stribling et al. (1995) in a report to the Montana Department of Health and Environmental Science. In that study, it was determined that some of the metrics were of limited use in some geographic regions, and for some wetland types. Despite that finding, all 12 metrics are used in this evaluation of mitigated wetlands, since detailed geographic information and wetland classifications were unavailable.

Scoring criteria for metrics were developed by generally following the tactic used by Stribling et al. Boxplots were generated using a statistical software package (Statistica™), and distributions, median values, ranges, and quartiles for each metric were examined. All sites in all years of sampling were used. Camp Creek, which was sampled in 2002, 2003, 2004, 2005 and 2006, and Kleinschmidt Creek, sampled in 2003, 2004, 2005 and 2006, were assessed using the tested metric battery developed for montane streams of Western Montana (Bollman 1998).Invertebrate assemblages at these sites differed from those of the other sites, and suggested montane or foothill stream conditions rather than wetland conditions. 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. 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.

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. The nature of the action needed is not determined solely by the index score, however, 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

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.

Metric scoring criteria were re-examined each year as new data was added. For 2005, all 151 records were utilized. Ranges of individual metrics, as well as median metric values remained remarkably consistent over all 5 years of analysis. Since metric value distributions changed insignificantly with the addition of the 2006 data, no changes were made to scoring criteria this year. Summary metric values and scores for the 2006 samples are given in Tables 3a-3d.

Quality control

Quality control procedures for initial sample processing and subsampling involved checking sorting efficiency. These checks were conducted on 100% of the samples by independent technicians 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:

$$SE = \frac{n_1}{n_2} \times 100$$

Where: SE is the sorting efficiency, expressed as a percentage, n_1 is the total number of specimens in the first sort, and n_2 is the total number of specimens in the first and second sorts combined.

Quality control procedures for taxonomic determinations involved checking accuracy, precision and enumeration. Four samples were randomly selected and all organisms re-identified by independent taxonomists. A Bray-Curtis similarity statistic (Bray and Curtis 1957) was generated to evaluate identifications.

Table 1. Montana Department of Transportation Mitigated Wetlands Monitoring Project sites. 2001 – 2006.

Site identifier	2001	2002	2003	2004	2005	2006
Beaverhead 1	+	+	+	+	+	+
Beaverhead 2	+	+				
Beaverhead 3	+	+		+	+	+
Beaverhead 4	+	+	+			
Beaverhead 5	+	+	+	+	+	+
Beaverhead 6	+	+	+	+	+	+
Big Sandy 1	+					
Big Sandy 2	+					
Big Sandy 3	+					
Big Sandy 4	+					
Johnson-Valier	+					
VIDA	+					
Cow Coulee	+	+	+			
Fourchette – Puffin	+	+	+	+		
Fourchette – Flashlight	+	+	+	+		
Fourchette – Penguin	+	+	+	+		
Fourchette – Albatross	+	+	+	+		
Big Spring	+	+	+	+	+	
Vince Ames	+					
Ryegate	+					
Lavinia	+					
Stillwater	+	+	+	+	+	
Roundup	+	+	+	+	+	+
Wigeon	+	+	+	+	+	+
Ridgeway	+	+	+	+	+	+
Musgrave – Rest. 1	+	+	+	+	+	+
Musgrave – Rest. 2	+	+	+	+	+	+
Musgrave – Enh. 1	+	+	+	+	+	+
Musgrave – Enh. 2	+					+
Hoskins Landing		+	+	+	+	
Hoskins Landing						
Peterson - 1		+	+	+	+	+
Peterson – 2		+		+	+	+
Peterson – 4		+	+	+	+	+
Peterson – 5		+	+	+	+	+
Jack Johnson - main		+	+			
Jack Johnson - SW		+	+			
Creston		+	+	+	+	
Lawrence Park		+				
Perry Ranch		+			+	
SF Smith River		+	+	+	+	+
Camp Creek		+	+	+	+	+
Camp Creek						+
Kleinschmidt		+	+	+	+	+
Kleinschmidt – stream			+	+	+	+
Ringling - Galt			+			
Circle				+		
Cloud Ranch Pond				+	+	
Cloud Ranch Stream				+		
American Colloid				+	+	+
Jack Creek				+	+	
Jack Creek						
Norem				+	+	+
Rock Creek Ranch					+	+
Wagner Marsh					+	+
Alkali Lake 1						+
Alkali Lake 2						+

Table 2. Aquatic invertebrate metrics employed in the MTDT mitigated wetland monitoring study, 2001-2005.

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

RESULTS

(Note: Individual site discussions were removed from this report by PBS&J and are included in the macroinvertebrate sections of individual monitoring reports. Summary tables (4a – 4d) are provided on the following pages.)

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Quality Assurance

Table 3 gives the results of quality assurance procedures for sample sorting and taxonomic determinations and enumeration.

Table 3. *Results of quality control procedures for subsampling and taxonomy.*

Sample ID	Site name	SE	Bray-Curtis similarity
MDT06PBSJ001	MUSGRAVE LAKE ES-1	91.67%	
MDT06PBSJ002	MUSGRAVE LAKE ES-2	94.44%	
MDT06PBSJ003	MUSGRAVE LAKE RS-1	87.30%	
MDT06PBSJ004	MUSGRAVE LAKE RS-2	100.00%	
MDT06PBSJ005	ROCK CREEK RANCH	96.49%	95.25%
MDT06PBSJ006	Alkali Lake Sample 1	100.00%	
MDT06PBSJ007	Alkali Lake Sample 2	100.00%	
MDT06PBSJ008	Peterson Ranch Pond # 4	100.00%	
MDT06PBSJ009	Peterson Ranch Pond # 1	97.35%	
MDT06PBSJ010	Peterson Ranch Pond # 5	91.67%	
MDT06PBSJ011	South Fork Smith River	100.00%	
MDT06PBSJ012	Beaverhead 1	100.00%	
MDT06PBSJ013	Beaverhead 3	95.65%	
MDT06PBSJ014	Beaverhead 5	100.00%	
MDT06PBSJ015	Beaverhead 6	94.12%	98.38%
MDT06PBSJ016	Peterson Ranch Pond # 2	91.67%	99.66%
MDT06PBSJ017	American Colloid	100.00%	
MDT06PBSJ018	Norem	100.00%	
MDT06PBSJ019	Cloud Ranch	85.56%	98.89%
MDT06PBSJ020	Jack Creek Pond	100.00%	
MDT06PBSJ021	Jack Creek Stream	100.00%	
MDT06PBSJ022	Camp Creek 1	99.10%	
MDT06PBSJ023	Camp Creek 2	100.00%	
MDT06PBSJ024	Kleinschmidt Pond	100.00%	
MDT06PBSJ025	Kleinschmidt Stream	96.49%	
MDT06PBSJ026	Hoskins Landing 1	97.35%	
MDT06PBSJ027	Hoskins Landing 2	96.49%	
MDT06PBSJ028	Wagner Marsh	100.00%	
MDT06PBSJ029	Wigeon Reservoir	100.00%	
MDT06PBSJ030	Ridgeway	98.21%	
MDT06PBSJ031	Roundup	100.00%	

Table 4a. Metric values and scores for Montana Department of Transportation mitigated wetland sites. 2006.

	BEAVERHEAD #1	BEAVERHEAD #3	BEAVERHEAD #5	BEAVERHEAD #6	ROUNDUP	WIDGEON	RIDGEWAY	MUSGRAVE RS-1
Total taxa	12	11	4	15	11	11	21	23
POET	1	0	1	3	2	1	3	4
Chironomidae taxa	5	3	1	7	4	3	10	7
Crustacea + Mollusca	1	4	2	3	2	2	5	7
% Chironomidae	52.38%	25.22%	0.69%	63.06%	18.87%	6.42%	37.25%	9.62%
Orthocladiinae/Chir	0.181818	0.965517	0	0.142857	0.2	0.285714	0.289474	0.7
%Amphipoda	0.00%	0.00%	0.00%	0.90%	0.00%	6.42%	11.76%	1.92%
%Crustacea + %Mollusca	9.52%	69.57%	98.62%	3.60%	73.58%	79.82%	45.10%	51.92%
HBI	7.857143	7.773913	7.97931	7.243243	8.09434	8.100917	7.127451	7.403846
%Dominant taxon	33.33%	39.13%	97.93%	27.93%	72.64%	73.39%	28.43%	23.08%
%Collector-Gatherers	61.90%	68.70%	100.00%	84.68%	87.74%	6.42%	49.02%	47.12%
%Filterers	0.00%	2.61%	0.00%	1.80%	0.00%	0.00%	0.00%	4.81%
Total taxa	1	1	1	3	1	1	5	5
POET	1	1	1	3	1	1	3	5
Chironomidae taxa	3	3	1	5	3	3	5	5
Crustacea + Mollusca	1	3	1	1	1	1	3	5
% Chironomidae	1	3	5	1	3	5	3	5
Orthocladiinae/Chir	1	5	1	1	3	3	3	5
%Amphipoda	5	5	5	5	5	3	3	5
%Crustacea + %Mollusca	5	1	1	5	1	1	3	3
HBI	1	1	1	3	1	1	3	3
%Dominant taxon	5	3	1	5	1	1	5	5
%Collector-Gatherers	3	3	5	5	5	1	3	3
%Filterers	3	3	3	3	3	3	3	3
Total score	30	32	26	40	28	24	42	52
Percent of maximum score	0.5	0.533333	0.433333	0.666667	0.466667	0.4	0.7	0.866667
Impairment classification	**poor**	**poor**	**poor**	**sub-optimal**	**poor**	**poor**	**optimal**	**optimal**

Table 4b. Metric values and scores for Montana Department of Transportation mitigated wetland sites. 2006.

	MUSGRAVE RS- 2	MUSGRAVE ES- 1	MUSGRAVE ES- 2	HOSKINS LANDING 1	HOSKINS LANDING 2	PETERSON RANCH 1	PETERSON RANCH 2	PETERSON RANCH 4	PETERSON RANCH 5
Total taxa	10	21	10	22	29	19	17	28	26
POET	1	2	1	5	4	2	2	3	4
Chironomidae taxa	2	7	4	6	6	7	4	13	9
Crustacea + Mollusca	3	6	0	5	9	5	6	5	6
% Chironomidae	3.96%	10.89%	10.00%	18.18%	11.71%	64.08%	7.48%	27.52%	14.29%
Orthocladiinae/Chir	0	0.181818	0.125	0.055556	0.307692	0.757576	0.75	0.6	0.75
%Amphipoda	0.00%	2.97%	0.00%	5.05%	1.80%	1.94%	22.43%	2.75%	15.18%
%Crustacea + %Mollusca	8.91%	75.25%	0.00%	20.20%	23.42%	8.74%	42.06%	19.27%	40.18%
HBI	6.326733	6.940594	6	7.111111	7.585586	6.631068	6.719626	7.293578	7.321429
%Dominant taxon	70.30%	38.61%	83.75%	25.25%	42.34%	47.57%	28.04%	20.18%	16.07%
%Collector-Gatherers	15.84%	8.91%	3.75%	64.65%	62.16%	72.82%	31.78%	34.86%	50.89%
%Filterers	0.00%	0.00%	0.00%	6.06%	5.41%	3.88%	3.74%	8.26%	0.89%
Total taxa	1	5	1	5	5	3	3	5	5
POET	1	1	1	5	5	1	1	3	5
Chironomidae taxa	1	5	3	3	3	5	3	5	5
Crustacea + Mollusca	1	5	1	3	5	3	5	3	5
% Chironomidae	5	5	5	3	5	1	5	3	5
Orthocladiinae/Chir	1	1	1	1	3	5	5	5	5
%Amphipoda	5	5	5	3	5	5	3	5	3
%Crustacea + %Mollusca	5	1	5	5	5	5	3	5	3
HBI	5	3	5	3	3	5	5	3	3
%Dominant taxon	1	3	1	5	3	3	5	5	5
%Collector-Gatherers	1	1	1	3	3	3	1	1	3
%Filterers	3	3	3	1	3	3	3	1	3
Total score	30	38	32	40	48	42	42	44	50
Percent of maximum score	0.5	0.633333	0.533333	0.666667	0.8	0.7	0.7	0.733333	0.833333
Impairment classification	**poor**	**sub-optimal**	**poor**	**sub-optimal**	**optimal**	**optimal**	**optimal**	**optimal**	**optimal**

Table 4c. Metric values and scores for Montana Department of Transportation mitigated wetland sites. 2006

	SOUTH FORK SMITH RIVER	CAMP CREEK 1*	CAMP CREEK 2*	KLEINSCH MIDT POND	KLEINSCH MIDT STREAM*	CLOUD RANCH	COLLOID	JACK CREEK POND	JACK CREEK STREAM
Total taxa	14	31	29	20	22	13	7	7	5
POET	4	8	8	5	1	1	2	0	0
Chironomidae taxa	3	10	8	6	8	6	4	4	0
Crustacea + Mollusca	4	1	3	2	5	3	0	2	2
% Chironomidae	18.02%	45.87%	16.07%	8.04%	77.68%	23.81%	84.21%	75.00%	0.00%
Orthocladiinae/Chir	0.05	0.26	0.277778	0.222222	0.448276	0.65	0.25	0.555556	0
%Amphipoda	18.02%	0.00%	0.00%	25.00%	0.00%	4.76%	0.00%	0.00%	5.00%
%Crustacea + %Mollusca	58.56%	0.92%	3.57%	25.89%	5.36%	11.90%	0.00%	16.67%	7.50%
HBI	7.540541	4.504587	4.294643	7.241071	5.928571	7.535714	6.315789	8.833333	7.325
%Dominant taxon	25.23%	24.77%	37.50%	25.00%	33.93%	36.90%	52.63%	33.33%	60.00%
%Collector-Gatherers	41.44%	48.62%	31.25%	62.50%	46.43%	64.29%	21.05%	58.33%	67.50%
%Filterers	15.32%	6.42%	7.14%	3.57%	38.39%	2.38%	0.00%	0.00%	0.00%
Total taxa	1	5	5	3	5	1	1	1	1
POET	5	5	5	5	1	1	1	1	1
Chironomidae taxa	3	5	5	3	5	3	3	3	1
Crustacea + Mollusca	3	1	1	1	3	1	1	1	1
% Chironomidae	3	1	5	5	1	3	1	1	5
Orthocladiinae/Chir	1	3	3	3	3	5	3	5	1
%Amphipoda	3	5	5	1	5	3	5	5	3
%Crustacea + %Mollusca	3	5	5	5	5	5	5	5	5
HBI	3	5	5	3	5	3	5	1	3
%Dominant taxon	5	5	3	5	5	3	1	5	1
%Collector-Gatherers	1	3	1	3	3	3	1	3	3
%Filterers	1	1	1	3	1	3	3	3	3
Total score	32	44	44	40	42	34	30	34	28
Percent of maximum score	0.533333	*0.733333*	*0.733333*	0.666667	*0.7*	0.566667	0.5	0.566667	0.466667
Impairment classification	**poor**	***optimal***	***optimal***	**sub-optimal**	***optimal***	**sub-optimal**	**poor**	**sub-optimal**	**poor**

*Sites indicated by asterisks were dominated by lotic fauna, and were evaluated with the MDEQ index for streams in the text and charts. Scores and impairment classifications in this table (italicized) are included only for completeness and are not reliable indications of conditions at these sites. See text.

Table 4d. Metric values and scores for Montana Department of Transportation mitigated wetland sites. 2006.

	NOREM	ROCK CREEK RANCH	WAGNER MARSH	ALKALI LAKE 1	ALKALI LAKE 2
Total taxa	6	15	11	6	5
POET	1	0	0	0	0
Chironomidae taxa	2	4	4	3	0
Crustacea + Mollusca	1	4	3	1	1
% Chironomidae	82.93%	8.40%	13.51%	42.86%	0.00%
Orthocladiinae/Chir	0	0.2	0.6	0.666667	0
%Amphipoda	0.00%	0.00%	0.00%	0.00%	0.00%
%Crustacea + %Mollusca	7.32%	65.55%	23.42%	7.14%	9.52%
HBI	7.317073	7.638655	7.036036	7.785714	7.904762
%Dominant taxon	65.85%	47.06%	45.95%	42.86%	52.38%
%Collector-Gatherers	68.29%	56.30%	47.75%	28.57%	9.52%
%Filterers	17.07%	0.00%	0.90%	0.00%	0.00%
Total taxa	1	3	1	1	1
POET	1	1	1	1	1
Chironomidae taxa	1	3	3	3	1
Crustacea + Mollusca	1	3	1	1	1
% Chironomidae	1	5	5	1	5
Orthocladiinae/Chir	1	3	5	5	1
%Amphipoda	5	5	5	5	5
%Crustacea + %Mollusca	5	1	5	5	5
HBI	3	1	3	1	1
%Dominant taxon	1	3	3	3	1
%Collector-Gatherers	3	3	3	1	1
%Filterers	1	3	3	3	3
Total score	24	34	38	30	26
Percent of maximum score	0.4	0.566667	0.633333	0.5	0.433333
Impairment classification	**poor**	**sub-optimal**	**sub-optimal**	**poor**	**poor**

Literature cited

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

Bukantis, R. 1998. Rapid bioassessment macroinvertebrate protocols: Sampling and sample analysis SOP's. Working draft. Montana Department of Environmental Quality. Planning Prevention and Assistance Division. Helena, Montana.

McCune, B. and J.B. Grace. 2002. Analysis of Ecological Communities. MjM Software Design, Gleneden Beach, Oregon, USA.

McCune, B. and M.J. Mefford. 2002. PC-ORD. Multivariate Analysis of Ecological Data, Version 4. MjM Software Design, Gleneden Beach, Oregon, USA.

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: MDT06PBSJ
RAI No.: MDT06PBSJ020

RAI No.: MDT06PBSJ020 **Sta. Name:** Jack Creek Pond
Client ID:
Date Coll.: 7/29/2006 **No. Jars:** 1 **STORET ID:**

Taxonomic Name	Count	PRA	Unique	Stage	Qualifier	BI	Function
Non-Insect							
Physidae							
Physidae	1	8.33%	Yes	Unknown		8	SC
Planorbidae							
Planorbidae	1	8.33%	Yes	Immature		6	SC
Diptera							
Ceratopogonidae							
Ceratopogoninae	1	8.33%	Yes	Larva		6	PR
Chironomidae							
Chironomidae							
Acricotopus sp.	4	33.33%	Yes	Larva		10	CG
Chironomus sp.	2	16.67%	Yes	Larva		10	CG
Orthocladiinae	1	8.33%	No	Larva	Damaged	6	CG
Psectrotanypus sp.	2	16.67%	Yes	Larva		10	PR
Sample Count	**12**						

Metrics Report

Project ID: MDT06PBSJ
RAI No.: MDT06PBSJ020
Sta. Name: Jack Creek Pond
Client ID:
STORET ID:
Coll. Date: 7/29/2006

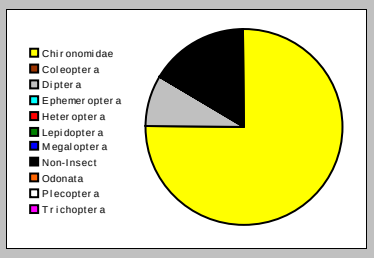
Abundance Measures

Sample Count: 12
Sample Abundance: 12.00 100.00% of sample used

Coll. Procedure:
Sample Notes:

Taxonomic Composition

Category	R	A	PRA
Non-Insect	2	2	16.67%
Odonata			
Ephemeroptera			
Plecoptera			
Heteroptera			
Megaloptera			
Trichoptera			
Lepidoptera			
Coleoptera			
Diptera	1	1	8.33%
Chironomidae	3	9	75.00%

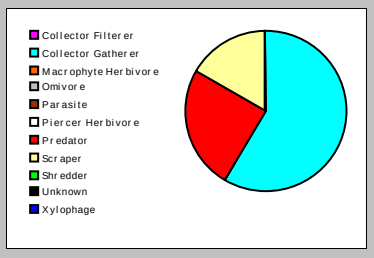


Dominant Taxa

Category	A	PRA
Acricotopus	4	33.33%
Psectrotanypus	2	16.67%
Chironomus	2	16.67%
Planorbidae	1	8.33%
Physidae	1	8.33%
Orthocladiinae	1	8.33%
Ceratopogoninae	1	8.33%

Functional Composition

Category	R	A	PRA
Predator	2	3	25.00%
Parasite			
Collector Gatherer	2	7	58.33%
Collector Filterer			
Macrophyte Herbivore			
Piercer Herbivore			
Xylophage			
Scraper	2	2	16.67%
Shredder			
Omivore			
Unknown			

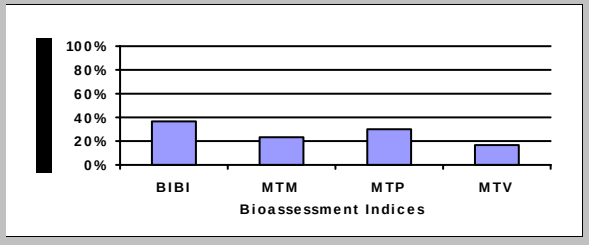


Metric Values and Scores

Metric	Value	BIBI	MTP	MTV	MTM
Composition					
Taxa Richness	6	1	0		0
Non-Insect Percent	16.67%				
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	33.33%		2		2
Dominant Taxa (2) Percent	50.00%				
Dominant Taxa (3) Percent	66.67%	3			
Dominant Taxa (10) Percent	100.00%				
Diversity					
Shannon H (loge)	1.642				
Shannon H (log2)	2.369		1		
Margalef D	2.085				
Simpson D	0.145				
Evenness	0.171				
Function					
Predator Richness	2		0		
Predator Percent	25.00%	5			
Filterer Richness	0				
Filterer Percent	0.00%			3	
Collector Percent	58.33%		3		3
Scraper+Shredder Percent	16.67%		2		0
Scraper/Filterer	0.000				
Scraper/Scraper+Filterer	0.000				
Habit					
Burrower Richness	2				
Burrower Percent	25.00%				
Swimmer Richness	0				
Swimmer Percent	0.00%				
Clinger Richness	0	1			
Clinger Percent	0.00%				
Characteristics					
Cold Stenotherm Richness	0				
Cold Stenotherm Percent	0.00%				
Hemoglobin Bearer Richness	3				
Hemoglobin Bearer Percent	41.67%				
Air Breather Richness	0				
Air Breather Percent	0.00%				
Voltinism					
Univoltine Richness	3				
Semivoltine Richness	0	1			
Multivoltine Percent	75.00%		1		
Tolerance					
Sediment Tolerant Richness	1				
Sediment Tolerant Percent	8.33%				
Sediment Sensitive Richness	0				
Sediment Sensitive Percent	0.00%				
Metals Tolerance Index	3.600				
Pollution Sensitive Richness	0	1		0	
Pollution Tolerant Percent	50.00%	3		0	
Hilsenhoff Biotic Index	8.833		0		0
Intolerant Percent	0.00%				
Supertolerant Percent	75.00%				
CTQa	108.000				

Bioassessment Indices

BioIndex	Description	Score	Pct	Rating
BIBI	B-IBI (Karr et al.)	18	36.00%	
MTP	Montana DEQ Plains (Bukantis 1998)	9	30.00%	Moderate
MTV	Montana Revised Valleys/Foothills (Bollman 1998)	3	16.67%	Severe
MTM	Montana DEQ Mountains (Bukantis 1998)	5	23.81%	Moderate



Taxa Listing

Project ID: MDT06PBSJ
RAI No.: MDT06PBSJ021

RAI No.: MDT06PBSJ021 **Sta. Name:** Jack Creek Stream
Client ID:
Date Coll.: 7/29/2006 **No. Jars:** 1 **STORET ID:**

Taxonomic Name	Count	PRA	Unique	Stage	Qualifier	BI	Function
Non-Insect							
Copepoda	1	2.50%	Yes	Unknown		8	CG
Naididae							
Naididae	24	60.00%	Yes	Unknown		8	CG
Talitridae							
Hyalella sp.	2	5.00%	Yes	Unknown		8	CG
Coleoptera							
Haliplidae							
Haliplus sp.	1	2.50%	Yes	Larva		5	PH
Diptera							
Ceratopogonidae							
Ceratopogoninae	12	30.00%	Yes	Larva		6	PR
Sample Count	**40**						

Metrics Report

Project ID: MDT06PBSJ
RAI No.: MDT06PBSJ021
Sta. Name: Jack Creek Stream
Client ID:
STORET ID:
Coll. Date: 7/29/2006

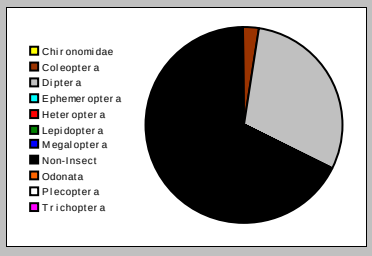
Abundance Measures

Sample Count: 40
Sample Abundance: 40.00 100.00% of sample used

Coll. Procedure:
Sample Notes:

Taxonomic Composition

Category	R	A	PRA
Non-Insect	3	27	67.50%
Odonata			
Ephemeroptera			
Plecoptera			
Heteroptera			
Megaloptera			
Trichoptera			
Lepidoptera			
Coleoptera	1	1	2.50%
Diptera	1	12	30.00%
Chironomidae			

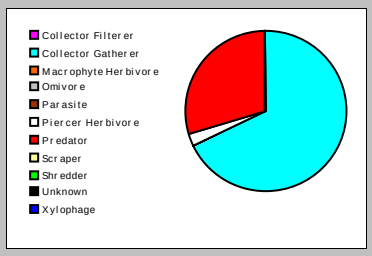


Dominant Taxa

Category	A	PRA
Naididae	24	60.00%
Ceratopogoninae	12	30.00%
Hyalella	2	5.00%
Haliplus	1	2.50%
Copepoda	1	2.50%

Functional Composition

Category	R	A	PRA
Predator	1	12	30.00%
Parasite			
Collector Gatherer	3	27	67.50%
Collector Filterer			
Macrophyte Herbivore			
Piercer Herbivore	1	1	2.50%
Xylophage			
Scraper			
Shredder			
Omivore			
Unknown			



Metric Values and Scores

Metric	Value	BIBI	MTP	MTV	MTM
Composition					
Taxa Richness	5	1	0		0
Non-Insect Percent	67.50%				
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	60.00%				
Baetidae/Ephemeroptera	0.000				
Hydropsychidae/Trichoptera	0.000				
Dominance					
Dominant Taxon Percent	60.00%		1		0
Dominant Taxa (2) Percent	90.00%				
Dominant Taxa (3) Percent	95.00%	1			
Dominant Taxa (10) Percent	100.00%				
Diversity					
Shannon H (loge)	1.002				
Shannon H (log2)	1.445		0		
Margalef D	1.084				
Simpson D	0.440				
Evenness	0.189				
Function					
Predator Richness	1		0		
Predator Percent	30.00%	5			
Filterer Richness	0				
Filterer Percent	0.00%			3	
Collector Percent	67.50%		2		2
Scraper+Shredder Percent	0.00%		0		0
Scraper/Filterer	0.000				
Scraper/Scraper+Filterer	0.000				
Habit					
Burrower Richness	1				
Burrower Percent	30.00%				
Swimmer Richness	1				
Swimmer Percent	2.50%				
Clinger Richness	0	1			
Clinger Percent	0.00%				
Characteristics					
Cold Stenotherm Richness	0				
Cold Stenotherm Percent	0.00%				
Hemoglobin Bearer Richness					
Hemoglobin Bearer Percent					
Air Breather Richness	0				
Air Breather Percent	0.00%				
Voltinism					
Univoltine Richness	3				
Semivoltine Richness	1	1			
Multivoltine Percent	2.50%		3		
Tolerance					
Sediment Tolerant Richness	0				
Sediment Tolerant Percent	0.00%				
Sediment Sensitive Richness	0				
Sediment Sensitive Percent	0.00%				
Metals Tolerance Index	4.579				
Pollution Sensitive Richness	0	1		0	
Pollution Tolerant Percent	2.50%	5		3	
Hilsenhoff Biotic Index	7.325		0		0
Intolerant Percent	0.00%				
Supertolerant Percent	67.50%				
CTQa	90.000				

Bioassessment Indices

BioIndex	Description	Score	Pct	Rating
BIBI	B-IBI (Karr et al.)	18	36.00%	
MTP	Montana DEQ Plains (Bukantis 1998)	6	20.00%	Moderate
MTV	Montana Revised Valleys/Foothills (Bollman 1998)	6	33.33%	Moderate
MTM	Montana DEQ Mountains (Bukantis 1998)	2	9.52%	Severe