MONTANA DEPARTMENT OF TRANSPORTATION
WETLAND MITIGATION MONITORING REPORT: YEAR 2005

Jack Creek Ranch
Ennis, Montana

Prepared for:

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

Prepared by:

LAND & WATER CONSULTING
~ A DIVISION OF PBS&J
P.O. Box 239
Helena, MT 59624

December 2005

Project No: B43054.00 - 0210

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TABLE OF CONTENTS

TABLES

FIGURES

CHARTS

APPENDICES

Cover Photo: Cattails and bulrush; view is to the southwest.

1.0 INTRODUCTION

This annual report summarizes methods and the results of the 2005 (second 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 a recommendation from 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.

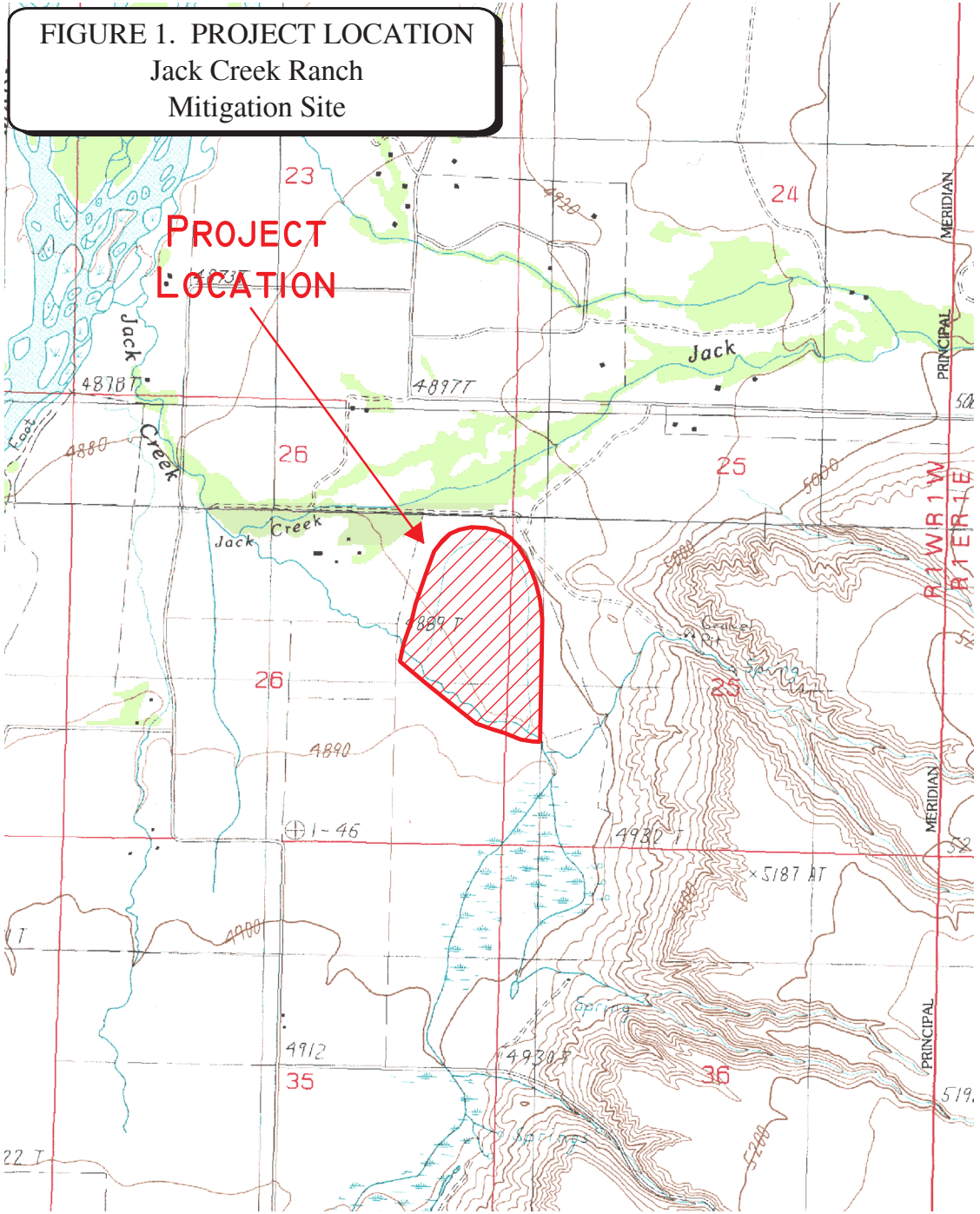
In the summer of 2003, the drainage systems along the perimeter of the Horseshoe pasture were filled. Selected areas within the Horseshoe field were graded to increase habitat diversity. Disturbed areas were seeded with a wetland seed mix and planted with containerized wetland species. Woody species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

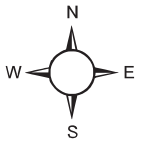
2.0 METHODS

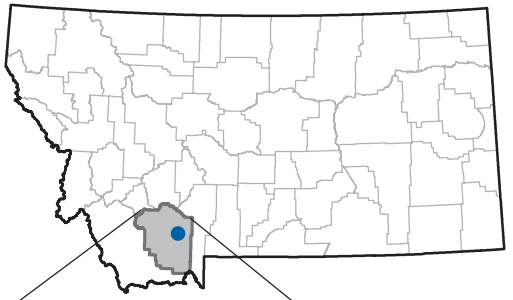
2.1 Monitoring Dates and Activities

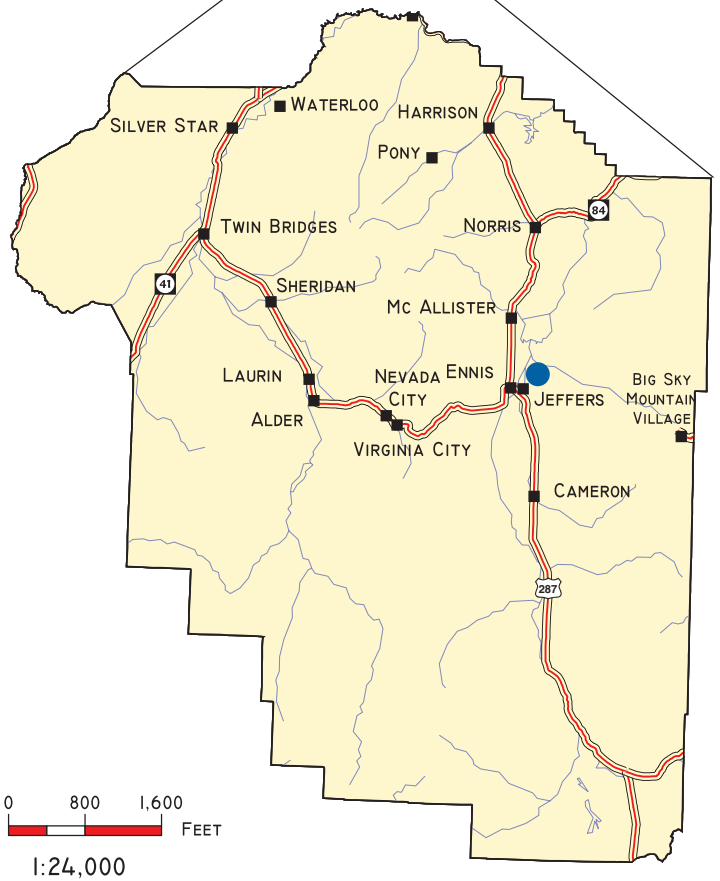
The site was visited on May 18 to assess spring avian migration use, and on July 13, 2005 to asses mid-season use. The transect was monitored and wetland boundaries were revised on August 15, 2005. Activities and information conducted/collected during the monitoring event.

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

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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 2005 were compared to the 1948-2005 average (WRCC 2005).

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, Appendix A)**. There are two ground water monitoring piezometers within the wetland and stream corridor assessment area. Aquatic Design and Construction (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 August site visit (**Figure 3, Appendix A)**. Coverage of the dominant species in each community type is listed on the 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 2005 to reflect changes in species composition and changing wetland boundaries. The transect location is shown on **Figure 2, 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 August 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 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

One macroinvertebrate composite sample was collected during the site visit following the protocol **(Appendix F)**; a sample was collected from a small open water pond located in the southeast corner of the project site. The sample was preserved as outlined in the sampling procedure and sent to Rhithron Associates for analysis. The approximate sampling location is indicated on **Figure 2, Appendix A**. Results are included in **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) and is included in **Section 3.9 - Table 4.**

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 transects **(Appendix C)**. A description and compass direction for each photograph were recorded on the wetland monitoring form.

During the 2005 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, 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 2005.

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 new ponds in the center 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 August 2005 monitoring visit, approximately 80% of the assessment area within the Horseshoe pasture was inundated with 0-2 inches of standing water. Wetland sites that were not inundated were saturated at the surface. Frequent small pools were observed, most with standing water. Larger areas of open water or areas without emergent vegetation along the stream channel are depicted on **Figure 3, Appendix A**.

According to the Western Regional Climate Center (WRCC), the Ennis weather station reported a mean annual precipitation of 12.40 inches for the period from 1948 to 2005. The mean annual precipitation from January to August for the period from 1948 through 2005 was 9.79 inches (WRCC 2005). While the mean annual precipitation from January to August for the year of 2005 was 7.85 inches (WRCC 2005). Therefore, the mean annual precipitation from January through August in 2005 was 80% of the normal long-term average, indicating 2005 was a drier year.

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, Appendix A).** The Jack Creek Ranch vegetation types include five community types. The vegetation types include: Type 1, *Agropyron repens/Bromus inermis/Festuca arundinacea*; Type 2, *Hordeum jubatum*/Mixed Herbaceous Wetland; Type 3, *Typha latifolia*/*Scirpus* sp*;* Type 4, *Hordeum jubatum*/Mixed Grass Upland; and Type 5, *Agrostis alba/Alopecurus sp.* Dominant species within each community are listed on the monitoring form **(Appendix B)**. Because construction was conducted during 2003, 2005 represents the second growing season for the project site. Hydrophytic vegetation communities are increasing in size and diversity. Species noted in 2004 and 2005 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 half of the project area and represents the upland community type along McKee Spring Creek. Type 2 is present in areas that are developing into a more complex wetland system. Surface water was present in most of this community. In 2005, there was a notable reduction of foxtail barley (*Hordeum jubatum*) in this community type compared to 2004. This species is still dominant but rush (*Juncus* sp.), alkali grass (*Puccinellia nuttalliana*), and three-square bulrush (*Scirpus pungens*) are becoming increasingly more abundant, especially on sparsely vegetation mudflats noted in 2004. 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 2005 in the western and northern portions of the Horseshoe pasture. Type 4 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 2005 include buttercup (*Ranunculus cymbalaria*), fowl bluegrass (*Poa palustris*), and creeping wildrye (*Elymus canadensis*). Type 5 occurs along most of the constructed McKee Spring Creek channel and includes a diverse mix of FAC, FACW and OBL species. In 2005, there was a significant reduction in sparsely vegetated areas along the creek channel compared to 2004. Establishment from seeded species and desirable non-seeded species have improved vegetation cover. There

are approximately 31 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 along the transect was observed in 2005 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 2005, respectfully).

Noxious weeds are present at the site, including two species on the State of Montana list, Canada thistle (*Cirsium arvense*), and houndstongue (*Cynoglossum officinale*) as well as two on the Madison County list, musk thistle (*Carduus nutans*) and black henbane (*Hyoscyamus niger*). Weed spraying in 2004 and 2005 has been effective in the reduction of black henbane, Canada thistle, summer cypress (*Kochia scoparia*), Russian thistle (*Salsoli kali*), and houndstongue. 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. Portions of the channel floodplain that were sparsely vegetated in 2004 have improved cover with desirable or seeded species. There is a significant reduction of weed species including black henbane, musk thistle, summer cypress, pennycress, Russian thistle, and goosefoot species in 2005. In general, most of the weed species (thistle and a few houndstongue) 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 August monitoring visit, survival assessment of cuttings along the channel resulted in mixed or erratic results. It is estimated that approximately 25 percent of the cuttings in the channel had shoots and/or leaves either at the plant base or at the tip of the cuttings. Most of the cuttings had not produced buds or leaves in 2005. This is a reduction in survival based on the 40 to 45 percent survival observed in 2004. Factors such as, browse from deer, grasshoppers (defoliating some willow species in 2004), and cutting length can also affect bud and leaf development or overall survival.

In the Horseshoe pasture approximately 20 to 25 percent of the willow cuttings exhibited shoots and/or leaves. The majority of the cuttings had not developed any stems or leaves during the 2005 growing season. Factors, such as, browse from deer, grasshoppers (defoliating some willow species in 2004), cutting length, and/or transplanting cuttings into saturated clay muck which may not allow for oxygenated soil conditions can also affect bud and leaf development.

Table 1: ***2004 and 2005 Jack Creek Ranch vegetation species list***

Scientific Name	Region 9 (Northwest) Wetland Indicator Status [1]
Agropyron trachycaulum	FAC
Agropyron repens	FACU-
Agropyron riparium	(FACU)
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 lanuginose	OBL
Carex microptera	FAC
Carex nebrascensis	OBL
Carex utriculata	OBL
Chenopodium album	FAC
Cirsium arvense	FACU+
Cynoglossum officinale	FACU*
Deschampsia caespitosa	FACW
Distchlis spicata	FAC+
Eleocharis palustris	OBL
Elymus Canadensis	FAC
Equisetum arvense	FAC
Festuca arundinacea	FAC-
Glyceria grandis	OBL
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
Muhlenbergia sp.	(FAC)
Melilotus officinalis	**FACU**
Mentha arvense	**FAC**
Phalaris arundinacea	FACW
Phleum pretense	FAC-
Poa palustris	FAC
Poa pratensis	FACU+
Poa compressa	FACU+
Populus angustifolia	FACW
Potentilla anserine	**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-

Table 1 (continued): ***2004 and 2005 Jack Creek Ranch vegetation species list.***

Scientific Name	Region 9 (Northwest) Wetland Indicator Status [1]
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 2005.
[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 and 2005 Transect 1 data summary.***

Monitoring Year	2004	2005
Transect Length (feet)	1200	1200
# Vegetation Community Transitions along Transect	13	14
# Vegetation Communities along Transect	4	4
# Hydrophytic Vegetation Communities along Transect	3	3
Total Vegetative Species	55	62
Total Hydrophytic Species	38	43
Total Upland Species	17	19
Estimated % Total Vegetative Cover	82	90
% Transect Length Comprised of Hydrophytic Vegetation Communities	28	50
% Transect Length Comprised of Upland Vegetation Communities	70	48
% Transect Length Comprised of Unvegetated Open Water	1	1
% Transect Length Comprised of Bare Substrate	1	1

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

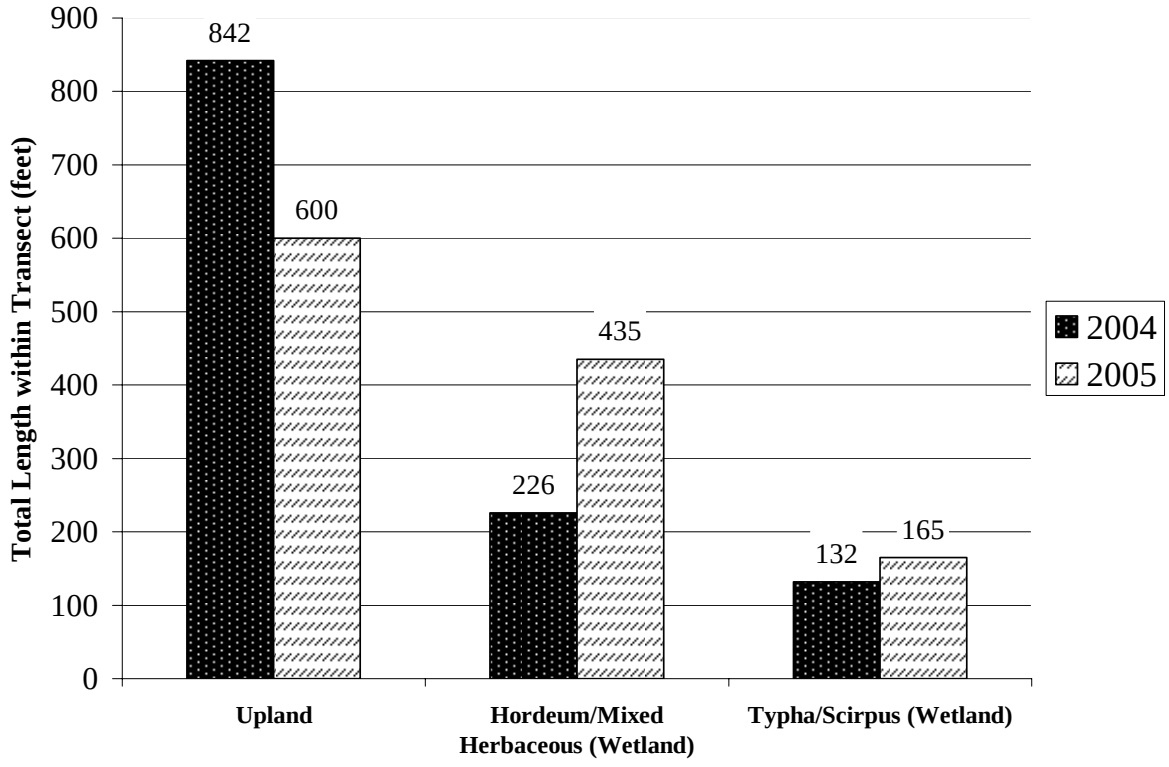
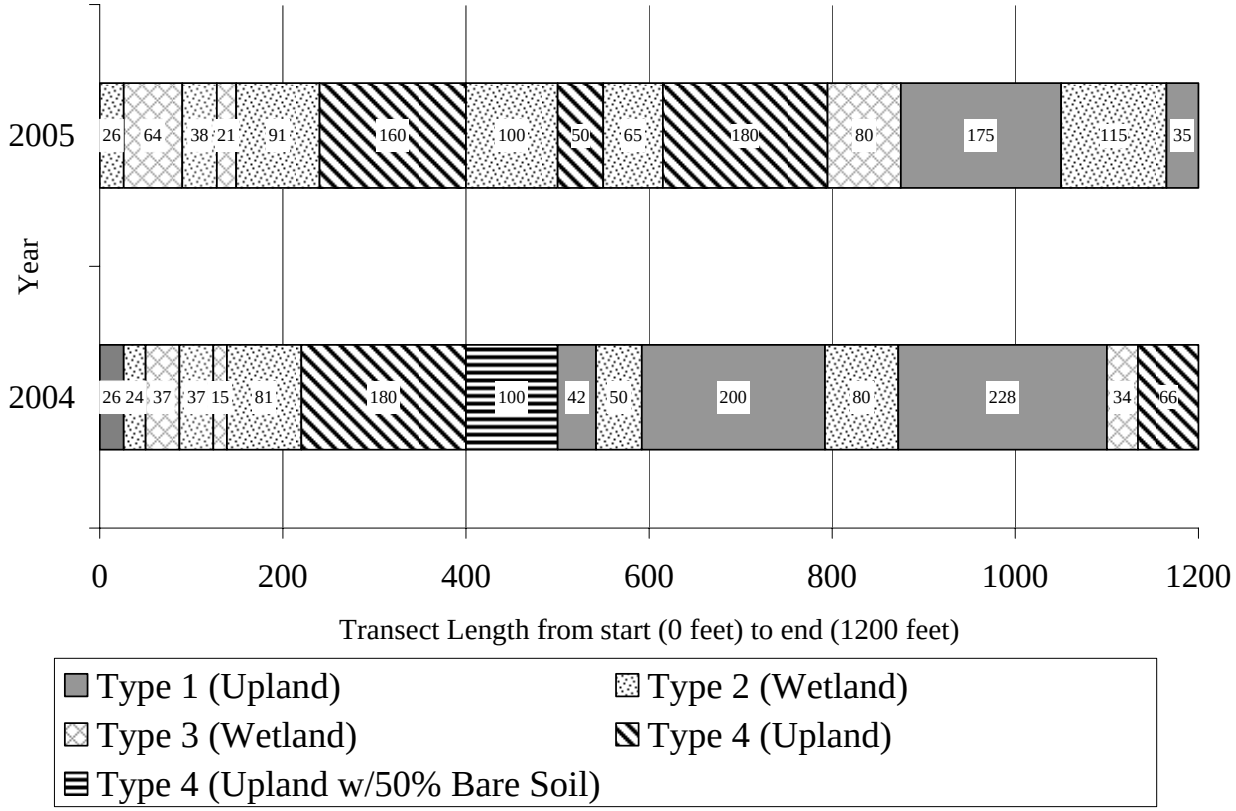


Chart 2: ***Transect map showing vegetation types from start of transect (0 feet) to the end of transect (1200 feet) for 2004 and 2005.***



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 (3) sample points (SP-1, SP-2, and SP-3 Transect 1). Soil pits 1 and 2 are within wetland soils and SP-3 is an upland soil. Soils at SP-1 (eastern project boundary) were a very dark gray (10YR 3/1) silty clay loam at 10 inches. Soils were saturated at the surface. The soils at SP-2 were very dark gray (10YR 3/1) silty clay loam from 0 to 12 inches. Small, common mottles (7.5YR 4/6) were noted at 3 inches. A sulfidic odor was also detected within this soil pit and soils were inundated. SP-3 is located near the western end of the transect. Soils were dark grayish brown (10YR 4/2) silty clay with some gravels from 0 to 12 inches. Below 12 inches gravels were more common. Soils were saturated at the surface. This soil profile suggests this area is converting to wetland, however, the vegetation is still dominated by upland species.

3.4 Wetland Delineation

The delineated wetland boundary is depicted on **Figure 3, Appendix A**. The COE data 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 encompasses 33.44 acres and includes 2.13 acres of shallow open water (<4 feet deep), an increase of 11.93 acres.

During the August field visit, approximately 80 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 continue 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 August are good indicators that the wetland hydrology is recovering.

3.5 Wildlife

Wildlife species observed on the site in 2004 and 2005 are listed in **Table 3.** Activities and densities associated with these observations are included on the monitoring form in **Appendix B**.

The second year of official monitoring resulted in the sighting of four new avian species. Since 2004 a total of thirty two (32) avian species, fifteen (15) species of mammals and four (4) fish species have been sighted within the project site.

3.6 Macroinvertebrates

Macroinvertebrate sampling results are provided in **Appendix F** and were summarized by Rhithron Associates in the italicized sections below (Bollman 2005).

Loss of relatively sensitive taxa in the POET group drove taxa richness down at this site between 2004 and 2005. The dominant taxa were copepods, suggesting that the water column provided a dominant habitat. Other faunal components apparently inhabited macrophyte surfaces, where bacterial films seemed to provide an energy source for the abundant naidid worms (Nais sp.). Filamentous algae and hypoxic substrates were probably other available habitats here. The presence of the midge Pseudosmittia sp. may indicate that cow dung was present in the wetland. The functional mix was skewed strongly toward gatherers.

Chart 3: ***2004 and 2005 Bioassessment scores – Jack Creek Ranch wetland mitigation site.***

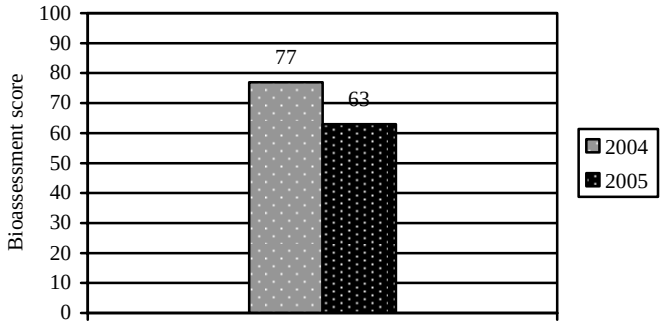


Table 3. ***2004 and 2005 wildlife species observed within the Jack Creek Ranch Mitigation Site.***

REPTILES None	
AMPHIBIANS None	
FISH Brook trout (*Salvelinus fontinalis*) Brown trout (*Salmo trutta*)	 Rainbow trout (*Oncorhynchus mykiss*) Long nose dace (*Rhinichthys cataractae*)
CRUSTACEAN Crayfish	
BIRDS **American Goldfinch (*Carduelis psaltria*)** American Kestrel (*Falco sparerius*) American Robin (*Turdus migratorius*) Bald eagle (*Haliaeetus leucocephalus*) Canada Goose (*Branta canadensis*) **Cinnamon Teal (*Anas cyanoptera*)** Common Goldeneye (*Bucephala clanula*) Common Merganser (*Mergus merganser*) **Common Snipe (*Gallinago gallinago*)** **Common Yellowthroat (*Geothlypis trichas*)** **Cliff Swallow (***Hirundo pyrrhonota***)** **Eastern Kingbird (*Tyrannus tyrannus*)** **Great Blue Heron (*Ardea herodias*)** **Green-winged Teal (*Anas crecca*)** Killdeer (*Charadrius vociferous*) **Lesser Scaup (*Aythya fuligula*)** **Mallard (*Anas platyrhynchos*)** **Marsh Wren (***Cistothorus palustris***)** Northern Flicker (*Colaptes auratus*)	 **Northern Harrier (*Circus cyaneus*)** Red-tailed hawk (*Buteo jamaicensis*) **Red-winged Blackbird (*Agelaius phoeniceus*)** Ring-necked Pheasant (*Phasianus colchicus*) **Sandhill Crane (*Grus canadensis*)** **Savanah Sparrow (*Passerculus sandwichensis*)** **Sora (*Porzana carolina*)** **Spotted Sandpiper (*Actitis macularia*)** Tree Swallow (*Tachycineta bicolor*) **Trumpeter swan (*Cygnus buccinator*)** Turkey Vulture (*Cathartes aura*) Western Meadowlark (*Sturnella neglecta*) **Wilson's Phalarope (*Phalaropus tricolor*)** 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 2005

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 the ADC (2002). The results of that assessment are included in **Table 4.** The monitoring area has gained approximately 103 functional units since 2004 due to the increase in shoreline stabilization and gain of wetland acreage. The percent of possible score has increased two percentage points to 68 percent.

Table 4: ***Summary of 2002, 2004 and 2005 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[3] Post-construction**
Listed/Proposed T&E Species Habitat	Low (0)	Low (0.3)	Low (0.3)
MNHP Species Habitat	Mod (0.6)	Mod (0.6)	Mod (0.6)
General Wildlife Habitat	Low (0.3)	High (1.0)	High (1.0)
General Fish/Aquatic Habitat	Mod (0.6)	Mod (0.7)	Mod (0.7)
Flood Attenuation	NA	Low (0.1)	Low (0.1)
Short and Long Term Surface Water Storage	NA	Mod (0.7)	Mod (0.7)
Sediment, Nutrient, Toxicant Removal	NA	High (0.9)	High (0.9)
Sediment/Shoreline Stabilization	NA	Mod (0.7)	High (1.0)
Production Export/Food Chain Support	Low (0.3)	High (0.8)	High (0.8)
Groundwater Discharge/Recharge	Low (0.1)	High (1.0)	High (1.0)
Uniqueness	Low (0.1)	Mod (0.4)	Mod (0.4)
Recreation/Education Potential	Low (0.1)	Mod (0.7)	Mod (0.7)
Actual Points/Possible Points	2.7/9	7.9/12	8.2/12
% of Possible Score Achieved	30%	66%	68%
Overall Category	III	II	II
Total Acreage of Assessed Wetland / Open Water Areas within Easement	**23.6**	**21.51**	**33.44**
Functional Units (acreage x actual points) (fu)	**49.8**	**169.9**	**274.2**
Net Acreage Gain in Mitigation Area (ac)	**NA**	**19.52**	**31.45**
Approximate Functional Unit Gain in Mitigation Area (acreage gain x actual points) (fu)	**---**	**154.2**	**257.9**

[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] 2004 assessment included the horseshoe wetlands and the middle reach of McKee Spring Creek (the mitigation area).
[3] 2005 assessment included 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 sparsely vegetated areas 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, however the barbed wire is injuring wildlife. A young deer was tangled in the wire and died. During the spring and mid-season birding, numerous young deer were injured in an attempt to jump, go through or under the barbed wire.

The site has two (2) State of Montana Noxious Weeds (Canada thistle and hounds tongue) and two (2) on the Madison County list (musk thistle and black henbane). Continued spot spraying is recommended in 2006 for these four weed species where prevalent.

3.10 Current Credit Summary

The gross wetland boundary increased from 21.51 acres in 2004 to 33.44 acres in 2005. This one-year gain encompasses 11.93 acres and includes 2.13 acres of shallow open water (<4 feet deep). The monitoring area has gained approximately 103 functional units since 2004 due to the increase in shoreline stabilization and gain of wetland acreage. The percent of possible score increased 2 percentage points to 68 percent between 2004 and 2005.

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 33.44 gross wetland acres or 67% 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 31.45 acres. Since construction, the site has gained 258 functional units.

4.0 REFERENCES

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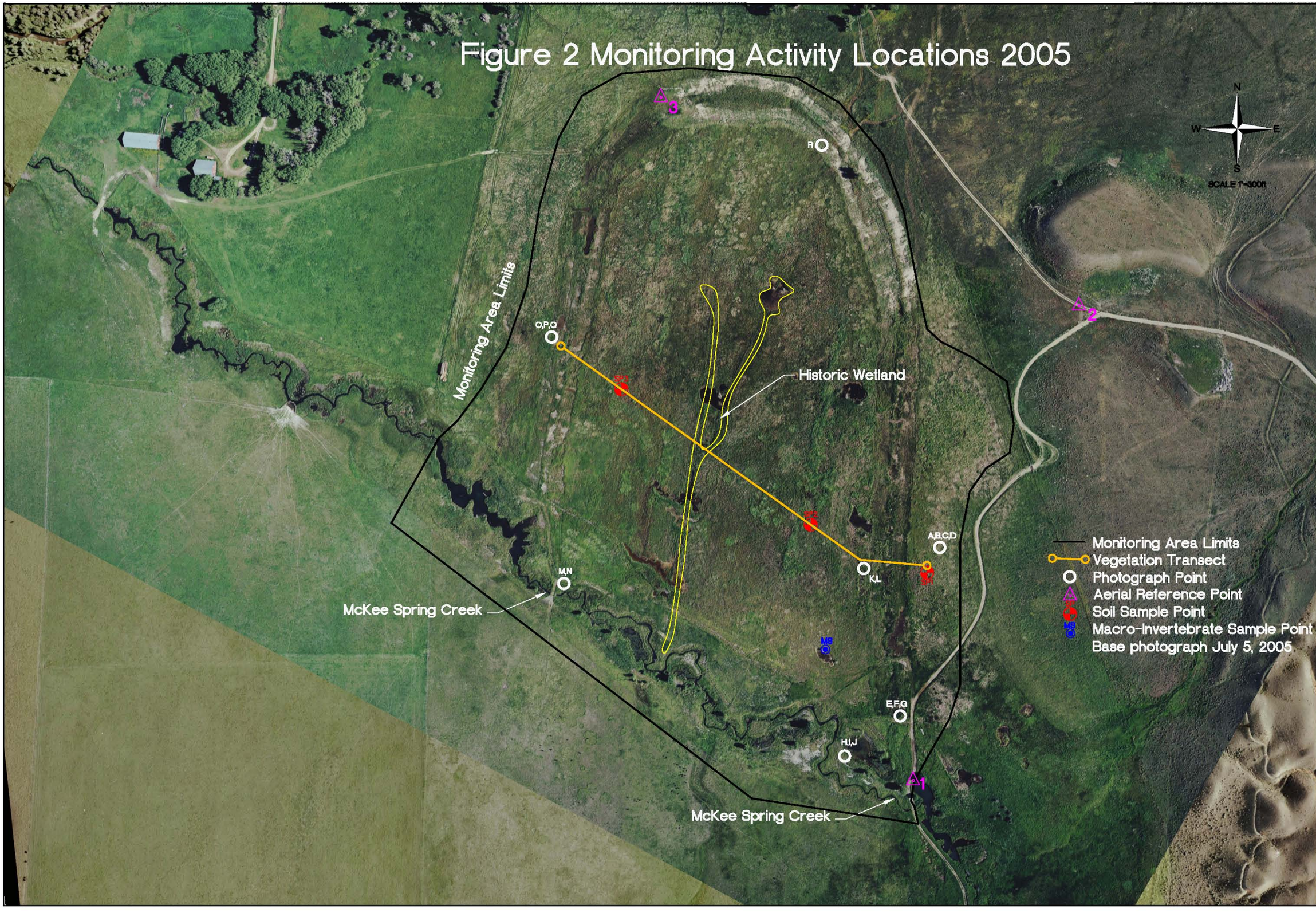
Appendix A

FIGURES 2 - 3

MDT Wetland Mitigation Monitoring
Jack Creek Ranch
Ennis, Montana

Figure 2 Monitoring Activity Locations 2005



PROJECT NAME
MDT Jack Creek Wetland Mitigation

DRAWING TITLE
Monitoring Activity Locations 2005

PROJ NO:	B43054.00 0210
LOCATION:	Ennis, MT
SCALE:	1"=300'
FILE NAME:	Jack Creek 2005.dwg
DRAWN:	SH
PROJ MGR:	JB
CHECKED:	CH
APPVD:	JB

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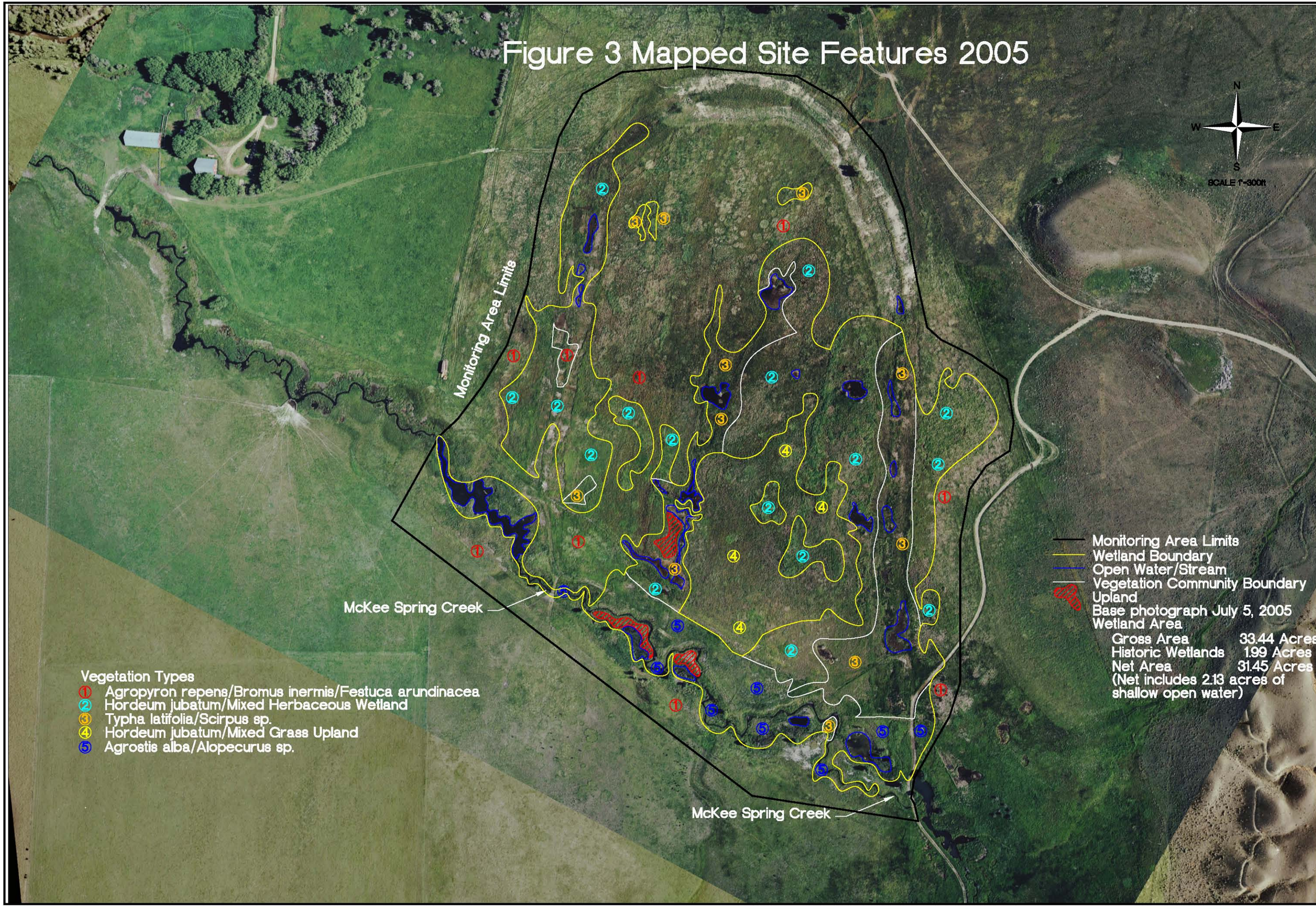
Figure 3 Mapped Site Features 2005



PROJECT NAME
MDT Jack Creek Wetland Mitigation

DRAWING TITLE
Mapped Site Features 2005

PROJ NO: B43054.00 0210
LOCATION: Ennis, MT
SCALE: 1"=300'
FILE NAME: Jack Creek 2005.dwg

DRAWN: SH
PROJ MGR: JB
CHECKED: CH
APPV'D: JB

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Appendix B

2005 WETLAND MITIGATION SITE MONITORING FORM
2005 BIRD SURVEY FORMS
2005 WETLAND DELINEATION FORMS
2005 FUNCTIONAL ASSESSMENT FORMS

MDT Wetland Mitigation Monitoring
Jack Creek Ranch
Ennis, Montana

LWC / MDT WETLAND MITIGATION SITE MONITORING FORM

Project Name: Jack Creek Ranch Project Number: B43054.210 Assessment Date: 8/15/05
Location: 2.5 miles northeast of Ennis MDT District: Butte: Watershed #6 –Upper Missouri River Basin - Milepost:
Legal description: T 5 N R 1 W Sections 25 & 26 Time of Day: 8:00 AM
Weather Conditions: very warm, dry, sunny Person(s) conducting the assessment: CH/LWC
Initial Evaluation Date: 8 / 15 /05 Visit #: 1 Monitoring Year: 2005
Size of evaluation area: 86+ acres. Land use surrounding wetland: livestock grazing

HYDROLOGY

Surface Water Source: Groundwater springs and McKee Spring Creek.
Inundation**:** Present X Absent Average depths: 2 inches Range of depths: 0- 4 inches
Assessment area under inundation: 80%
Depth at emergent vegetation-open water boundary: 2 inches.
If assessment area is not inundated are the soils saturated w/in 12" of surface**:** Yes X No
Other evidence of hydrology on site (drift lines, erosion, stained vegetation etc.):

Saturated mud flats, water marks in pot holes and stained vegetation.

Groundwater
Monitoring wells: Present X Absent wells were damaged and unable to record groundwater depths.
Record depth of water below ground surface

Well #	Depth	Well #	Depth	Well #	Depth

Additional Activities Checklist:
X Map emergent vegetation-open water boundary on air photo
X Observe extent of surface water during each site visit and look for evidence of past surface water elevations (drift lines, erosion, vegetation staining etc.)
\- GPS survey groundwater monitoring wells locations if present

COMMENTS/PROBLEMS:

VEGETATION COMMUNITIES

Community No.:__1__ Community Title (main species):__*Agropyron repens/Bromus inermis/Festuca arundinacea*_____

Dominant Species	% Cover	Dominant Species	% Cover
Agropyron repens	20	*Agrostis alba*	5
Bromus inermis	20		
Festuca arundinacea	20		
Poa pratensis	10		
Phalaris arundinacea	10		
Hordum jubatum	5		
Cirsium arvense	5		
Elymus canadensis	5		

COMMENTS/PROBLEMS: _Weedy species noted in 2004 (*Carduus nutans*, *Kochia scoparia*, *Sisymbrium altissimum*, *Hyoscyamus niger*, *Salsola kali*, *and Chenopodium sp*.) were significantly reduced. Live weed species were less abundant – the 2005 weed control efforts have been very effective. *Tragopogon dubius* and *Melilotus officinalis* were noted in 2005 as a minor component of this community type.

Community No.:__2__ Community Title (main species*):*___*Hordeum jubatum*/Mixed Herbaceous Wetland

Dominant Species	% Cover	Dominant Species	% Cover
Hordeum jubatum	20	*Carex nebrascensis*	5
Puccinellia nuttalliana	10	*Deschampsia caespitosa*	5
Juncus torreyi	10	*Juncus balticus*	5
Scirpus pungens	10	*Juncus ensifolius*	5
Juncus ensifolius	10	*Typha latifolia*	5
Agrostis alba	5	*Juncus balticus*	5
Phalaris arundinacea	5		

COMMENTS/PROBLEMS: Starting to see a decrease in the *Hordeum jubatum* and an increase in *Juncus sp*. *Scirpus pungens* and the encroachment of *Typha latifolia* in these areas. Other minor species noted within this community type include *Eleocharis palustris*, *Potentilla anserine*, *Distichis spicata*, *Bechmannia syzigachne*, *and Juncus mertensianus.*

Community No.:_3___ Community Title (main species):___*Typha latifolia/Scirpus sp.* ___

Dominant Species	% Cover	Dominant Species	% Cover
Typha latifolia	20	*Carex utriculata*	5
Scirpus validus	15	*Eleocharis palustris*	5
Scirpus pungens	15	*Beckmannia syzigachne*	<5
Juncus torreyi	10	*Salix sp.* (cuttings)	<5
Open water	5	*Juncus balticus*	5
Carex aquatilis	5	*Ranunculus cymbalaria*	5

COMMENTS/PROBLEMS: Other minor species noted around the perimeter of shallow open water include *Veronica americana, Carex lanuginose,and C. utriculata*.

Community No.:__4__ Community Title (main species):__*Hordeum jubatum*/Mixed Grass Upland

Dominant Species	% Cover	Dominant Species	% Cover
Hordeum jubatum	20	*Agropyron riparium*	5
Bromus inermis	10		
Festuca arundinacea	10		
Agropyron repens	10		
Elymus canadensis	5		
Poa pratensis	5		
Cirsium arvense	5		
Agropyron trachycaulum	5		

COMMENTS/PROBLEMS: A large portion of this community type was inundated with shallow surface water during the 2005 site monitoring. *Hordeum jubatum* represents one of the most common species but species such as *Ranunculus cymbalaria*, *Poa palustris* and *Elymus canadensis* are starting to encroach into this transitional area.

Community No.:__5__ Community Title (main species*):___Agrostis alba/Alopercurus sp.*

Dominant Species	% Cover	Dominant Species	% Cover
Agrostis alba	20	*Glyceria grandis*	5
Alopercurus pratensis	10	*Cirsium arvense*	5
Alopercurus arundinacea	5	*Juncus longistyle*	5
Deschampsia caespitosa	10	*Carex aquatilis*	5
Poa palustris	10	*Carex nebrascensis*	5
Juncus torreyi	5	*Scirpus validus*	<5
Calamagrostis canadensis	5	*Hordeum jubatum*	5

COMMENTS/PROBLEMS: This community type represents emergent vegetation establishment along portions of McKee Spring Creek. There is a considerable reduction in the cover by *Hordeum jubatum* compared to 2004. Other minor species noted include *Mentha arvense*, *Distichis spicata*, *Bromus marginatus*, *Alopecurus aequalis*, *Juncus mertensianus*, *Agropyron trachycaulum*, and *a few live Salix* sp. *(cuttings).*

Additional Activities Checklist:

__X__Record and map vegetative communities on air photo

Comprehensive Vegetation List+

Species [1]	Vegetation Community Number(s)	Species	Vegetation Community Number(s)
Agropyron trachycaulum	1, 4, 5	*Salsola kali*	1
Agropyron repens	1, 4	*Scirpus pungens*	2,3
Agropyron riparium	4	*Scirpus validus*	2,3
Agrostis alba	1, 2, 5,	*Sisymbrium altissimum*	1
Alopecurus aequalis	3, 5	***Spartina gracilis***	2
Alopecurus arundinaceus	1,4, 5	*Thlaspi arvense*	1
Alopecurus pratensis	1, 2, 5	*Tragopogon dubuis*	1
Beckmannia syzigachne	2, 3, 5	*Typha latifolia*	2, 3
Bromus inermis	1, 4	*Verbascum thapsus*	1
Bromus marginatus	5	*Veronica americana*	3
Calamagrostis canadensis	5		
Carduus nutans	5		
Carex aquatilis	3, 5		
Carex lanuginose	3		
Carex microptera	2		
Carex nebrascensis	2, 5		
Carex utriculata	3		
Chenopodium album.	1		
Cirsium arvense	1, 5		
Cynoglossum officinale	1, 5		
Deschampsia caespitosa	2, 5		
Distichlis spicata	2, 5		
Eleocharis palustris	2, 3		
Elymus canadensis	1,4		
Equisetum arvense	2		
Glyceria grandis (=G. maxima)	5		
Hordeum jubatum	1, 2, 4, 5		
Hyoscyamus niger	1		
Juncus balticus	2, 3		
Juncus bufonius	5		
Juncus longistylis	2,5		
Juncus mertensianus	2, 5		
Juncus torreyi	2, 3, 5		
Kochia scoparia	1		
Medicago lupulina	5		
Melilotus officinalis	1		
Mentha arvense	5		
Muhlenbergia sp.	2		
Mimulus sp.	5		
Phalaris arundinacea	1, 2		
Phleum pretense	1		
Poa palustris	4, 5		
Poa pratensis	1, 2		
Poa compressa	1, 4		
Populus angustifolia	5		
Potentilla anserina	2		
Puccinellia nuttalliana	2,3		
Ranunculus cymbalaria	2, 3, 4		
Rumex crispus	2		
Salix bebbiana	3		
Salix exigua	3,5		
Salix lasiandra	3,5		

[1] **Bolded** species indicate those documented within the analysis area for the first time in 2005.

PLANTED WOODY VEGETATION SURVIVAL

Species	Number Originally Planted	Number Observed	Mortality Causes
McKee Spring Creek	NA	Approximately 25 percent of the cuttings along the channel were alive.	Browse from deer, defoliation from grasshoppers (2004) and cutting length.
Sandbar willow cuttings			
Pacific willow cuttings			
Bebbs willow cuttings			
Transplanted Narrowleaf cottonwood	NA	Approximately 40 percent of the transplanted cottonwoods were dead or declining.	A few of the cottonwoods have re-sprouted from the base.
Transplanted willow species	NA	Only a few were noted along the channel or floodplain. The plants noted were alive and have improved in vigor and growth compared to 2004 appearance.	
Horseshoe Pasture			
Willow cuttings	NA	Approximately 20 to 25 percent of the cuttings were alive. A decrease in survival percentages estimated in 2004.	Browse from deer, defoliation from grasshoppers, cuttings length and planted in "muck" soils.
Transplanted willows	NA	Only a few transplanted willows were alive. Most of the shrubs noted were dead or declining.	Re-growth from the base of declining willows was not apparent in 2005.

COMMENTS/PROBLEMS: _____

WILDLIFE

BIRDS

(Attach Bird Survey Field Forms)

Were man made nesting structures installed? Yes_X__ No____Type:_old birdhouse_ How many__1___ Are the nesting structures being utilized? Yes____ No__?__ Do the nesting structures need repairs? Yes____ No____

MAMMALS AND HERPTILES

Species	Number Observed	Indirect indication of use			
		Tracks	Scat	Burrows	Other
Crayfish					
Moose		X			
Deer		X			
Muskrat					lodge
Coyote or wolf		X	X		

Additional Activities Checklist:

__X___Macroinvertebrate sampling (if required)

COMMENTS/PROBLEMS:

PHOTOGRAPHS

Using a camera with a 50 mm lenses and color film take photographs of the following permanent reference points listed in the checklist below. Record the direction of the photograph using a compass. (The first time at each site establish a permanent reference point by setting a ½ inch rebar or fencepost extending 2-3' above ground, survey the location with a resource grade GPS and mark the location on the air photo.)
Checklist:

__X___One photo for each of the 4 cardinal directions surrounding wetland
__X__ At least one photo showing upland use surrounding wetland – if more than one upland use exists, take additional photos
__X__ At least one photo showing buffer surrounding wetland
__X___One photo from each end of vegetation transect showing transect

Location	Photograph Description	Compass Reading
A	Transect 1 – northeastern side, adjacent land use.	Northeast
B	Transect 1 – eastern side, cattails replacing foxtail barley.	West
C	Transect 1 – mud flats developing into cattail, bulrush and rush wetland. .	South
D	Transect 1 - a view of two different communities types	North
E	SE corner of the Horseshoe pasture – cattails and bulrush replacing foxtail barley. .	Southwest
F	Upland/wetland mosaic.	West
G	Cattail and bulrush marsh near fence line.	Southeast
H	McKee Spring Creek –vegetation development along channel and floodplain.	East
I	McKee Spring Creek –wetland vegetation along channel.	SE
J	McKee Spring Creek floodplain vegetation establishment.	SW
K	Transect 1 – encroachment of cattails and rush into a saturated mud flat.	North
L	Transect 1 –vegetation encroachment on mudflats south of transect.	South
M	SW corner of the project - viewing McKee Creek.	Northeast
N	SW corner of the project - viewing McKee Creek and floodplain	West
O	Transect 1 – western side of project site. Large shallow pool.	North
P	Transect 1 – northwestern side of project site. Developing wetlands.	North
Q	Transect 1 – western side of project site. Upland vegetation.	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 with the GPS unit set at 5 second recording rate. Record file numbers fore site in designated GPS field notebook

Checklist: (2004)
_ X___ Jurisdictional wetland boundary
__X___ 4-6 landmarks recognizable on the air photo
__X___ Start and end points of vegetation transect(s)
_2005_ Photo reference points
__-___ Groundwater monitoring well locations
COMMENTS/PROBLEMS: _____

WETLAND DELINEATION

(Attach Corps of Engineers delineation forms)

At each site conduct the items on the checklist below:
__X___Delineate wetlands according to the 1987 Army Corps manual.
__X__Delineate wetland-upland boundary on the air photo
__(X)_ Survey wetland-upland boundary with a resource grade GPS survey

COMMENTS/PROBLEMS:

_____
_____
_____
_____

FUNCTIONAL ASSESSMENT

(Complete and attach full MDT Montana Wetland Assessment Method field forms; also attach abbreviated field forms, if used)

COMMENTS/PROBLEMS: _____
_____
_____
_____
_____

MAINTENANCE

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

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

COMMENTS/PROBLEMS: _ Only 2 wood duck boxes remain attached to trees and one of these (north one) is hanging askew. _____
_____
_____
_____

MDT WETLAND MONITORING – VEGETATION TRANSECT

Site: Jack Creek Ranch Date: 8/15/05 Examiner: CH/LWC Transect # 1 (page 1 of 4)

Approx. transect length: 1200 ft Compass Direction from Start (Upland): East to west 44 degrees

Vegetation type A:	CT 2 (Wetland)
Length of transect in this type:	0-26’ (26’) Feet
Species:	Cover:
HORJUB	25
AGRREP	10
POAPRA	10
PHAARU	15
RANCYM	10
TYPLAT	10
FESARU	5
BROINE	5
Open water	5
Bare soil	5
Total Vegetative Cover:	90%

Vegetation type B:	CT 3 (Wetland)
Length of transect in this type:	26-90’ (64’) feet
Species:	Cover:
TYPLAT	25
SCIPUN	15
JUNENS	15
Open water	10
SCIVAL	10
ELEPAL	5
HORJUB	5
JUNBAL	5
PHAARU	5
BECSYN	5
Total Vegetative Cover:	90%

Vegetation type C:	CT 2 (Wetland)
Length of transect in this type:	90-128’ (38”) feet
Species:	Cover:
HORJUB	40
PUCNUT	10
ELEPAL	10
RANCYM	10
JUNENF	10
JUNMER	5
Mud flats	10
TYPLAT	5
Total Vegetative Cover:	90%

Vegetation type D:	CT 3 (Wetland)
Length of transect in this type:	128-149’(21’)
TYPLAT	40
SCIVAL	10
SCIPUN	10
JUNTOR	5
CARUTR	10
GLYELA	5
Open water	10
CARNEB	5
HORJUB	5
Total Vegetative Cover:	90%

MDT WETLAND MONITORING – VEGETATION TRANSECT (continued)

Site: Jack Creek Ranch Date: 8/15/05 Examiner: CH/LWC Transect # 1 (pg 2/4)

Approx. transect length: 1200 ft Compass Direction from Start (Upland): East to west 44 degrees

Vegetation type E:	CT 2 (Wetland)
Length of transect in this type:	149-240'(91') feet
Species:	Cover:
HORJUB	30
PHAARU	15
RANCYM	10
AGRALB	10
JUNLON	5
JUNMER	10
EQUARV	5
Total Vegetative Cover:	85%

Vegetation type F:	CT 4 (Upland)
Length of transect in this type:	240-400'(160') feet
Species:	Cover:
HORJUB	30
FESARU	15
BROINE	10
AGRTRA	10
ELYCAN	5
AGRREP	5
CIRARV	5
AGRALB	5
Open water	10
PUCNUT	5
(Soils saturated at surface)	
Total Vegetative Cover:	90%

Vegetation type G:	CT-2 (Wetland)
Length of transect in this type:	400-500' (100') feet
HORJUB	20
FESARU	15
AGRALB	20
PHAARU	20
PUCNUT	10
Bare soil	15
Total Vegetative Cover:	85%

Vegetation type H:	CT-4 (Upland)
Length of transect in this type:	500-550 (50') feet
Species:	Cover:
HORJUB	20
FESARU	30
AGRALB	25
BROINE	25
Total Vegetative Cover:	100%

MDT WETLAND MONITORING – VEGETATION TRANSECT (continued)

Site: Jack Creek Ranch Date: 8/15/05 Examiner: CH/LWC Transect # 1 (pg 3/4)

Approx. transect length: 1200 ft Compass Direction from Start (Upland): East to northwest 65 degrees

Vegetation type I:	CT-2 (Wetland)	
Length of transect in this type:	550-615 (65')	feet
Species:		Cover:
HORJUB		25
PHAARU		20
JUNTEN		10
CARNEB		10
JUNLON		5
ELEPAL		5
JUNBAL		5
Open water		10
TYPLAT		5
	Total Vegetative Cover:	90%

Vegetation type J:	CT-4 (Upland)	
Length of transect in this type:	615-795 (180')	feet
Species:		Cover:
AGRREP		30
FESARU		30
POAPRA		10
ELYCAN		5
HORJUB		20
	Total Vegetative Cover:	95%

Vegetation type K:	CT-3 (Wetland)	
Length of transect in this type:	795-875 (80')	feet
Species:		Cover:
TYPLAT		35
HORJUB		10
JUNENS		10
JUNBAL		10
SCIPUN		10
Salix cuttings (40% survival)		10
SCIVAL		5
Open water		5
PHAARN		5
	Total Vegetative Cover:	95%

Vegetation type L:	CT -1 (Upland)	
Length of transect in this type:	875- 1050 (175')	feet
Species:		Cover:
BROINE		20
FESARU		15
CIRARV		10
AGRREP		10
Surface water		10
HORJUB		10
TYPLAT		5
POAPRA		5
	Total Vegetative Cover:	85%

MDT WETLAND MONITORING – VEGETATION TRANSECT (continued)

Site: Jack Creek Ranch Date: 8/15/05 Examiner: CH/LWC Transect # 1 (pg 4/4)

Approx. transect length: 1200 feet Compass Direction from Start (Upland): East to northwest 65 degrees

Vegetation type M:	CT-2 (Wetland)
Length of transect in this type:	1050-1165' (115') feet
Species:	Cover:
HORJUB	25
PUCNUT	25
JUNLON	10
JUNENS	10
Bare soil	15
JUNMER	5
EQUARV	5
AGRREP	5
Total Vegetative Cover:	85%

Vegetation type N:	CT-1 (Upland)
Length of transect in this type:	1165-1200 (35') feet
Species:	Cover:
BROINE	10
Bare soil	10
AGRREP	60
Total Vegetative Cover:	90%

Vegetation type 0:	
Length of transect in this type:	feet
Species:	Cover:
Total Vegetative Cover:	

Vegetation type P:	
Length of transect in this type:	feet
Species:	Cover:
Total Vegetative Cover:	

MDT WETLAND MONITORING – VEGETATION TRANSECT (back of form)

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

Percent of perimeter 25% % developing wetland vegetation – excluding dam/berm structures.

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

Estimate cover within a 10 ft 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.

Notes:

2005 BIRD SURVEY – FIELD DATA SHEET Page_1__of_1___

Date: see dates within table

SITE: Jack Creek Ranch Survey Time: varied

Bird Species	#	Behavior	Site[1]/Habitat	Bird Species	#	Behavior	Habitat
Spring May 18/05				**Mid-season – 7/13/05**			
Cinnamon Teal	2	F	MC stream pool	Cliff Swallow	>10	F	HS MA
Mallard	4		HS MA/ MC flowing stream	Marsh Wren	1	BR	HS MA
Red-winged Blackbird	6	BR	HS/MA	Common Yellowthroat	7	BR	HS MA MC
Sandhill Crane	2	F	HS MA	Northern Harrier	2	F/BR	HS MA
Savannah Sparrow	2	F	HS MS	Savanah Sparrow	10	BR	HS MA
Spotted Sandpiper	1	F	MC flowing Stream	Red-winged Blackbird	10	FO	HS MA
				Common Snipe	3	BR	HS MA
				Sora	2	BR	HS MA
				Eastern Kingbird	5	FO	HS MA MC
				Lesser Scaup	5	FO	HS MA/Pond MC
				Wilson's Phalarope	2	FO	HS MA
				Green-winged Teal	1	LO/F	HS MA/Pond
				Trumpeter Swam			Pond
				Great Blue Heron	2	F	MC
				American Gold finch	1	FO	MC MA

Notes:
HS: Horseshoe
MC: McKee Spring Creek

Behavior: BP – one of a breeding pair; BD – breeding display; F – foraging; FO – flyover; L – loafing; N – nesting

Habitat: 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 shoreline

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

Project/Site: Jack Creek Ranch	Date: 8/15/05
Applicant/Owner: MDT	County: Madison
Investigator: CH/LWC	State: MT

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

VEGETATION

	Dominant Plant Species	Stratum	Indicator		Dominant Plant Species	Stratum	Indicator
1	HORJUB	H	FAC+	9			
2	POAPRA	H	FACU	10			
3	RANCYM	H	OBL	11			
4	PHAARU	H	FACW	12			
5				13			
6				14			
7				15			
8				16			

Percent of Dominant Species that are OBL, FACW, or FAC (excluding FAC-). 3/4 = 75% hydrophytic vegetation

Soil pit at the beginning (east) point of transect #1. Young cattails noted in this area.

HYDROLOGY

X Recorded Data (Describe in Remarks):
- Stream, Lake, or Tide Gauge
- X Aerial Photographs
- Other

No Recorded Data Available

Field Observations:

Depth of Surface Water: 1 (in.)

Depth to Free Water in Pit: -- (in.)

Depth to Saturated Soil: 0 (in.)

Wetland Hydrology Indicators:

Primary Indicators:
- x Inundated
- x Saturated in Upper 12 Inches
- Water Marks
- Drift Lines
- Sediment Deposits
- - Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):
- Oxidized Root Channels in Upper 12 Inches
- Water-Stained Leaves
- Local Soil Survey Data
- FAC-Neutral Test
- Other (Explain in Remarks)

Remarks:
Soils were saturated at the surface. Surface water covered most of this area including the uplands.

SOILS

Map Unit Name (Series and Phase): _____
Taxonomy (Subgroup): Fluvaquentic Haplaquolls.
Drainage Class: Poorly drained
Field Observations
Confirm Mapped Type? X Yes ____ No

Profile Description:

Depth inches	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
10	A	10YR 3/1			Silty clay loam

Hydric Soil Indicators:

____	Histosol	____	Concretions
____	Histic Epipedon	____	High Organic Content in surface Layer in Sandy Soils
____	Sulfidic Odor	____	Organic Streaking in Sandy Soils
____	Aquic Moisture Regime	____	Listed on Local Hydric Soils List
____	Reducing Conditions	____	Listed on National Hydric Soils List
X	Gleyed or Low-Chroma Colors	____	Other (Explain in Remarks)

Hydric soil

WETLAND DETERMINATION

Hydrophytic Vegetation Present? X Yes ____ No
Wetland Hydrology Present? X Yes ____ No
Hydric Soils Present? X Yes ____ No

Is this Sampling Point Within a Wetland? X Yes ____ No

Remarks:

Upland species such as smooth brome and quackgrass are still present but do not represent the dominant cover. Areas of bare soil near the transect post are now vegetated with wetland vegetation.

Approved by HQUSACE 2/92

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

Project/Site:	Jack Creek Ranch			Date:	8/15/05
Applicant/Owner:	MDT			County:	Madison
Investigator:	CH/LWC			State:	MT
Do Normal Circumstances exist on the site:	X Yes		No	Community ID:	Wetland
Is the site significantly disturbed (Atypical Situation)?	Yes	X	No	Transect ID:	1
Is the area a potential Problem Area?:	Yes	X	No	Plot ID:	SP-2
(If needed, explain on reverse.)				Approximately 300 ft west of SP-1	

VEGETATION

	Dominant Plant Species	Stratum	Indicator		Dominant Plant Species	Stratum	Indicator
1	HORJUB	H	FAC+	9	JUNBAL	H	FACW+
2	AGRALB	H	FACW	10			
3	PHAARU	H	FACW	11			
4	PUCNUT	H	OBL	12			
5	FESARU	H	FAC-	13			
6				14			
7				15			
8				16			

Percent of Dominant Species that are OBL, FACW, or FAC (excluding FAC-). 5/6 = 80% hydrophytic vegetation

HYDROLOGY

X Recorded Data (Describe in Remarks):
- Stream, Lake, or Tide Gauge
- X Aerial Photographs
- Other

No Recorded Data Available

Field Observations:

Depth of Surface Water: 1 (in.)

Depth to Free Water in Pit: NA (in.)

Depth to Saturated Soil: 0 (in.)

Wetland Hydrology Indicators:

Primary Indicators:
- X Inundated
- X Saturated in Upper 12 Inches
- Water Marks
- Drift Lines
- Sediment Deposits
- Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):
- Oxidized Root Channels in Upper 12 Inches
- Water-Stained Leaves
- Local Soil Survey Data
- FAC-Neutral Test
- Other (Explain in Remarks)

Remarks:

Soils were saturated at the surface, surface water covered most of this area. Slight increases in topography result in drier soils. Water is flowing toward the creek (south).

SOILS

Map Unit Name (Series and Phase): _____ Drainage Class: Poorly drained

Taxonomy (Subgroup): Fluvaquentic Haplaquolls Field Observations Confirm Mapped Type? X Yes ____ No

Profile Description:

Depth inches	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
12	A	10YR 3/1	7.5YR 4/6	Small, common	silty clay loam

Hydric Soil Indicators:

____	Histosol	____	Concretions
____	Histic Epipedon	____	High Organic Content in surface Layer in Sandy Soils
X	Sulfidic Odor	____	Organic Streaking in Sandy Soils
____	Aquic Moisture Regime	____	Listed on Local Hydric Soils List
____	Reducing Conditions	____	Listed on National Hydric Soils List
X	Gleyed or Low-Chroma Colors	____	Other (Explain in Remarks)

Mottles noted at 3 inches and below.

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	X	Yes	____	No
Wetland Hydrology Present?	X	Yes	____	No
Hydric Soils Present?	X	Yes	____	No

Is this Sampling Point Within a Wetland? X Yes ____ No

Remarks:

Central portion of the Horseshoe is starting to develop into a diverse wetland. Cattails, bulrush and rush species encroaching into low wet areas. Wetland species starting to replace upland species.

Starting to see a reduction of foxtail barley and more cattails and bulrush species.

Approved by HQUSACE 2/92

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

Project/Site:	Jack Creek Ranch			Date:	8/15/05
Applicant/Owner:	MDT			County:	Madison
Investigator:	CH/LB/LWC			State:	MT
Do Normal Circumstances exist on the site:	X Yes		No	Community ID:	Upland
Is the site significantly disturbed (Atypical Situation)?	Yes	X	No	Transect ID:	1
Is the area a potential Problem Area?:	Yes	X	No	Plot ID:	SP-3
(If needed, explain on reverse.)				Near west end of transect	

VEGETATION

	Dominant Plant Species	Stratum	Indicator		Dominant Plant Species	Stratum	Indicator
1	HORJUB	H	FAC+	9			
2	AGRREP	H	FAC-	10			
3	BROINE	H	-(UPL)	11			
4	ELYCAN	H	FAC	12			
5	CIRARV	H	FACU+	13			
6				14			
7				15			
8				16			

Percent of Dominant Species that are OBL, FACW, or FAC (excluding FAC-). 2/6 = 33% hydrophytic vegetation

HYDROLOGY

X Recorded Data (Describe in Remarks):
- Stream, Lake, or Tide Gauge
- X Aerial Photographs
- Other

No Recorded Data Available

Field Observations:

Depth of Surface Water: 1 (in.)

Depth to Free Water in Pit: -- (in.)

Depth to Saturated Soil: 0 (in.)

Wetland Hydrology Indicators:

Primary Indicators:
- Inundated
- X Saturated in Upper 12 Inches
- Water Marks
- Drift Lines
- Sediment Deposits
- Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):
- Oxidized Root Channels in Upper 12 Inches
- Water-Stained Leaves
- Local Soil Survey Data
- FAC-Neutral Test
- Other (Explain in Remarks)

Remarks:
Surface water was present over most of the uplands and wetlands along the central and western portion of the Horseshoe.

SOILS

Map Unit Name (Series and Phase): _____ Drainage Class: Poorly drained

Taxonomy (Subgroup): Fluvaquentic Haplaquolls Field Observations Confirm Mapped Type? X Yes ____ No

Profile Description:

Depth inches	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
12	A	10YR 4/2			silty clay (some gravels)

Hydric Soil Indicators:

____ Histosol	____ Concretions
____ Histic Epipedon	____ High Organic Content in surface Layer in Sandy Soils
____ Sulfidic Odor	____ Organic Streaking in Sandy Soils
____ Aquic Moisture Regime	____ Listed on Local Hydric Soils List
____ Reducing Conditions	____ Listed on National Hydric Soils List
____ Gleyed or Low-Chroma Colors	____ Other (Explain in Remarks)

WETLAND DETERMINATION

Hydrophytic Vegetation Present? ____ Yes X No

Wetland Hydrology Present? X Yes ____ No

Hydric Soils Present? ____ Yes X No

Is this Sampling Point Within a Wetland? ____ Yes X No

Remarks:

The soil profile and hydrology suggests this area is converting to a wetland, however, the vegetation is still dominated by upland species.

Approved by HQUSACE 2/92

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

1. Project Name: Jack Creek Ranch **2. Project #:** B43054 **Control #:** _____

3. Evaluation Date: 8/15/2005 **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): 33.4 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): 33.4 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, houndstongue, and black henbane:

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**	--	--	--	--	--	--	--	--	--
Wetlands in AA flood or pond **< 5 out of 10 years**	--	--	--	.7 (M)	--	--	--	--	--

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	H	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	M	0.70	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:	8.20	12.00	281
	Percent of Total Possible Points:		**68%** (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

REPRESENTATIVE PHOTOGRAPHS

MDT Wetland Mitigation Monitoring
Jack Creek Ranch
Ennis, Montana

JACK CREEK RANCH WETLAND MITIGATION SITE 2005

Location: A **Description:** Transect 1 – northeastern side, adjacent land use. **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:** Transect 1 – viewing 2 different community types. **Compass Reading:** North

Location: E **Description:** Cattails and bulrush replacing foxtail. **Compass Reading:** Southwest

Location: F **Description:** Upland/wetland mosaic. **Compass Reading:** West

JACK CREEK RANCH WETLAND MITIGATION SITE 2005

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

Location: H **Description:** Vegetation on McKee Spring Creek and floodplain. **Compass Reading:** East

Location: I **Description:** McKee Spring Creek channel. **Compass Reading:** SE

Location: J **Description:** McKee Spring Creek floodplain. **Compass Reading:** Southwest

Location: K **Description:** Transect 1 -encroachment of cattails/rush on saturated mudflat. **Compass Reading: N**

Location: L **Description:** Vegetation encroachment on mudflats s. of transect. **Compass Reading:** South

Location: M **Description:** McKee Spring Creek floodplain and mix of species. **Compass Reading:** NE

Location: N **Description:** McKee Spring Creek channel and floodplain. **Compass Reading:** West

Location: 0 **Description:** Transect 1 – far west side. **Compass Reading**: North

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

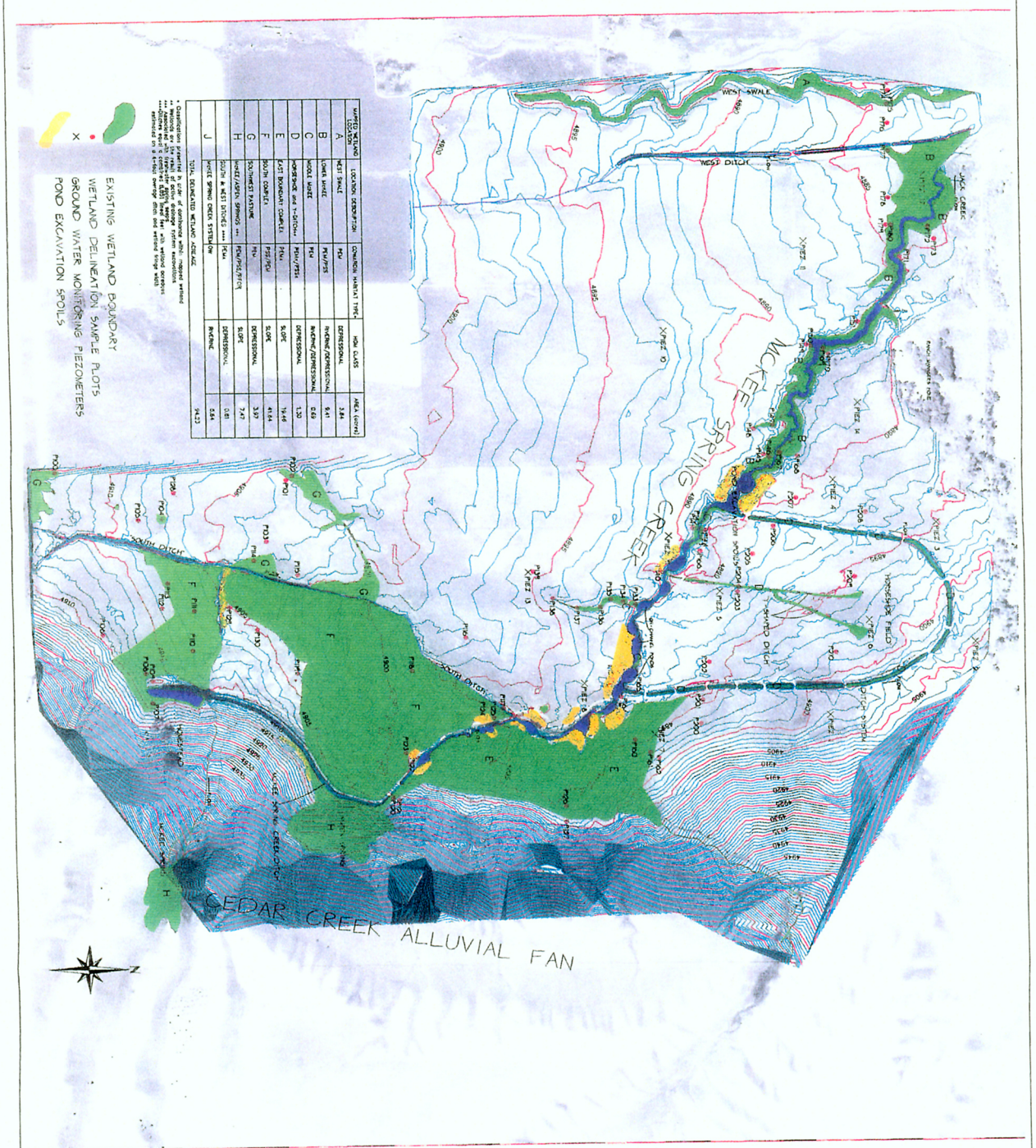
Location: Q **Description:** Western end of Transect 1. **Compass Reading:** East

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



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

Appendix E

BIRD SURVEY PROTOCOL
GPS PROTOCOL

MDT Wetland Mitigation Monitoring
Jack Creek Ranch
Ennis, Montana

BIRD SURVEY PROTOCOL

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

2005 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 - 2005

METHODS

Among other monitoring activities, aquatic invertebrate assemblages were collected at a number of mitigated wetlands throughout Montana. This report summarizes data generated from five years of collection. In 2001, 29 sites were sampled statewide. Nineteen of these sites were revisited in 2002, and 13 new sites were sampled. In 2003, 17 sites that had been visited in both 2001 and 2002 were re-sampled, and 11 sites sampled for the first time in 2001 were re-visited. In addition, 2 new sites were sampled. In 2004, 25 sites were re-visited, and 6 new sites were sampled. In 2005, an additional 2 sites were added. Over all years of sampling, a total of 151 sites were sampled for invertebrates. Table 2 summarizes sites and sampling years.

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, and 2005, and Kleinschmidt Creek, sampled in 2003, 2004, and 2005, were assessed using the tested metric battery developed for montane streams of Western Montana (Bollman 1998).Invertebrate assemblages at these sites were different from that 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 75^{th} percentile (for those metrics that decrease in value in response to stress) or below the 25^{th} percentile (for metrics that respond to stress by an increase in value) of all scores. Additional scoring ranges were established by bisecting the range below the 75^{th} percentile for decreasing scores (or above the 25^{th} 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; our understanding of the interrelationships of natural environmental factors and anthropogenic disturbances are tentative. Thus, the further interpretive remarks accompanying the raw taxonomic and metric data are offered cautiously.

Table 1. Montana Department of Transportation Mitigated Wetlands Monitoring Project sites, 2001 – 2005.

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

Sample Processing

Aquatic invertebrate samples were collected at mitigation wetland sites in the summer months of 2001, 2002, 2003, 2004, and 2005 by personnel of Land and Water Consulting, 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, over the water surface, and included disturbing and scraping substrates at each sampled sites. Samples were preserved in ethanol at each wetland site and subsequently 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, when possible, from each sample. In some cases, the entire sample contained fewer than 100 organisms; in these cases, all organisms from the sample were taken. Taxa were identified in general accordance with the taxonomic resolution standards set out in the MT DEQ Standard Operating Procedures for Sampling and Sample Analysis (Bukantis 1998). All samples were re-identified by a second taxonomist for quality assurance purposes. The identified samples have been archived at Rhithron's laboratory. Taxonomic data and organism counts were entered into an Excel 2000 spreadsheet, and metrics were calculated and scored using spreadsheet formulae.

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 2005 data, no changes were made to scoring criteria this year. Summary metric values and scores for the 2005 samples are given in Tables 3a-3d.

Table 2. Aquatic invertebrate metrics employed in the MTDT mitigation 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 times that taxon's modified Hilsenhoff Biotic Index 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 Land &Water Consulting / PBS&J and are included in the Macro-Invertebrate sections of individual reports. Summary tables are provided on the following pages.*)

Table 3a. Metric values and scores for Montana Department of Transportation mitigated wetland sites in 2005.

	BEAVERHEAD #1	BEAVERHEAD #3	BEAVERHEAD #5	BEAVERHEAD #6	BIG SPRING CREEK	STILLWATER	ROUNDUP	WIDGEON
Total taxa	22	9	14	18	28	17	7	19
POET	2	0	0	2	4	4	0	0
Chironomidae taxa	7	4	4	4	9	5	3	11
Crustacea + Mollusca	4	3	1	4	7	5	2	4
% Chironomidae	59.80%	7.55%	50.00%	16.67%	33.65%	9.43%	22.22%	76.47%
Orthocladiinae/Chir	0.197	0.625	0.059	0.067	0.457	0.500	0.000	0.205
%Amphipoda	1.96%	0.94%	0.00%	1.11%	18.27%	7.55%	0.00%	10.78%
%Crustacea + %Mollusca	10.78%	90.57%	2.94%	55.56%	33.65%	53.77%	72.65%	15.69%
HBI	7.71	7.88	7.88	7.98	7.55	7.28	8.33	8.25
%Dominant taxon	34.31%	76.42%	35.29%	25.56%	18.27%	33.02%	71.79%	44.12%
%Collector-Gatherers	56.86%	93.40%	47.06%	21.11%	70.19%	64.15%	82.05%	26.47%
%Filterers	0.00%	0.00%	0.00%	0.00%	0.96%	3.77%	0.00%	6.86%
Total taxa	5	1	1	3	5	3	1	3
POET	1	1	1	1	5	5	1	1
Chironomidae taxa	5	3	3	3	5	3	3	5
Crustacea + Mollusca	3	1	1	3	5	3	1	3
% Chironomidae	1	5	1	5	3	5	3	1
Orthocladiinae/Chir	3	5	1	1	5	5	1	3
%Amphipoda	5	5	5	5	3	3	5	3
%Crustacea + %Mollusca	5	1	5	3	3	3	1	5
HBI	1	1	1	1	3	3	1	1
%Dominant taxon	3	1	3	5	5	5	1	3
%Collector-Gatherers	3	5	3	1	3	3	5	1
%Filterers	3	3	3	3	3	3	3	1
Total score	**38**	**32**	**28**	**34**	**48**	**44**	**26**	**30**
Percent of maximum score	**0.633333**	**0.533333**	**0.466667**	**0.566667**	**0.8**	**0.733333**	**0.433333**	**0.5**
Impairment classification	**sub-optimal**	**poor**	**poor**	**sub-optimal**	**optimal**	**optimal**	**poor**	**poor**

Table 3b. Metric values and scores for Montana Department of Transportation mitigated wetland sites in 2005.

	RIDGEWAY	MUSGRAVE REST. 1	MUSGRAVE REST. 2	MUSGRAVE ENH. 1	HOSKINS LANDING	PETERSON RANCH 1	PETERSON RANCH 2	PETERSON RANCH 4	PETERSON RANCH 5
Total taxa	19	19	23	19	27	29	16	25	16
POET	3	1	3	1	5	4	2	4	4
Chironomidae taxa	6	6	8	3	6	11	6	8	7
Crustacea + Mollusca	5	5	3	7	6	6	5	6	2
% Chironomidae	9.26%	14.55%	22.00%	2.80%	17.58%	17.48%	13.91%	24.55%	16.96%
Orthocladiinae/Chir	0.600	0.750	0.136	0.667	0.188	0.556	0.563	0.630	0.632
%Amphipoda	6.48%	3.64%	0.00%	0.93%	0.00%	0.97%	7.83%	1.82%	8.04%
%Crustacea + %Mollusca	22.22%	30.91%	38.00%	58.88%	27.47%	31.07%	72.17%	20.00%	8.93%
HBI	7.71	7.22	7.77	7.16	6.81	7.16	7.43	7.65	8.08
%Dominant taxon	53.70%	21.82%	35.00%	28.04%	14.29%	26.21%	33.04%	18.18%	31.25%
%Collector-Gatherers	68.52%	40.00%	15.00%	11.21%	31.87%	59.22%	28.70%	43.64%	68.75%
%Filterers	0.00%	0.00%	0.00%	2.80%	0.00%	4.85%	33.91%	5.45%	1.79%
Total taxa	3	3	5	3	5	5	3	5	3
POET	3	1	3	1	5	5	1	5	5
Chironomidae taxa	3	3	5	3	3	5	3	5	5
Crustacea + Mollusca	3	3	1	5	5	5	3	5	1
% Chironomidae	5	5	3	5	5	5	5	3	5
Orthocladiinae/Chir	5	5	1	5	3	5	5	5	5
%Amphipoda	3	5	5	5	5	5	3	5	3
%Crustacea + %Mollusca	5	5	3	3	5	5	1	5	5
HBI	1	3	1	3	5	3	3	1	1
%Dominant taxon	1	5	3	5	5	5	5	5	5
%Collector-Gatherers	3	1	1	1	1	3	1	1	3
%Filterers	3	3	3	3	3	3	1	3	3
Total score	**38**	**42**	**34**	**42**	**50**	**54**	**34**	**48**	**44**
Percent of maximum score	**0.633333**	**0.7**	**0.566667**	**0.7**	**0.833333**	**0.9**	**0.566667**	**0.8**	**0.733333**
Impairment classification	**sub-optimal**	**optimal**	**sub-optimal**	**optimal**	**optimal**	**optimal**	**sub-optimal**	**optimal**	**optimal**

Table 3c. Metric values and scores for Montana Department of Transportation mitigated wetland sites in 2005.

	CRESTON	PERRY RANCH	SOUTH FORK SMITH RIVER	CAMP CREEK	KLEINSCH MIDT POND	KLEINSCH MIDT STREAM	CLOUD RANCH POND	COLLOID	JACK CREEK
Total taxa	16	18	19	36	27	23	22	9	16
POET	0	0	4	14	6	5	2	1	1
Chironomidae taxa	4	8	6	13	6	9	11	4	9
Crustacea + Mollusca	6	4	5	0	2	3	3	1	4
% Chironomidae	27.62%	43.69%	21.67%	45.54%	8.85%	45.08%	37.50%	25.83%	29.41%
Orthocladiinae/Chir	0.931	0.622	0.192	0.804	0.200	0.473	0.256	0.000	0.467
%Amphipoda	0.00%	0.00%	29.17%	0.00%	5.31%	0.82%	0.00%	0.00%	0.98%
%Crustacea + %Mollusca	52.38%	38.83%	62.50%	0.00%	7.96%	3.28%	7.69%	67.50%	41.18%
HBI	7.52	7.31	7.54	5.06	7.40	5.83	6.96	8.53	7.39
%Dominant taxon	25.71%	25.24%	29.17%	18.81%	30.09%	32.79%	41.35%	67.50%	35.29%
%Collector-Gatherers	64.76%	47.57%	65.00%	47.52%	37.17%	50.82%	75.96%	88.33%	91.18%
%Filterers	6.67%	27.18%	8.33%	5.94%	0.88%	2.46%	2.88%	0.00%	2.94%
Total taxa	3	3	3	5	5	5	5	1	3
POET	1	1	5	5	5	5	1	1	1
Chironomidae taxa	3	5	3	5	3	5	5	3	5
Crustacea + Mollusca	5	3	3	1	1	1	1	1	3
% Chironomidae	3	1	3	1	5	1	3	3	3
Orthocladiinae/Chir	5	5	3	5	3	5	3	1	1
%Amphipoda	5	5	1	5	3	5	5	5	5
%Crustacea + %Mollusca	3	3	3	5	5	5	5	1	3
HBI	3	3	3	5	3	5	3	1	3
%Dominant taxon	5	5	5	5	5	5	3	1	3
%Collector-Gatherers	3	3	3	3	1	3	3	5	5
%Filterers	1	1	1	3	3	3	3	3	3
Total score	**40**	**38**	**36**	**48**	**42**	**48**	**40**	**26**	**38**
Percent of maximum score	**0.666667**	**0.633333**	**0.6**	**0.8**	**0.7**	**0.8**	**0.666667**	**0.433333**	**0.633333**
Impairment classification	**sub-optimal**	**sub-optimal**	**sub-optimal**	**optimal**	**optimal**	**optimal**	**sub-optimal**	**poor**	**sub-optimal**

Table 3d. Metric values and scores for Montana Department of Transportation mitigated wetland sites in 2005.

	NOREM	ROCK CREEK RANCH	WAGNER MARSH
Total taxa	4	24	23
POET	0	2	5
Chironomidae taxa	2	8	8
Crustacea + Mollusca	2	4	5
% Chironomidae	37.50%	22.00%	24.00%
Orthocladiinae/Chir	0.000	0.318	0.167
%Amphipoda	0.00%	3.00%	7.00%
%Crustacea + %Mollusca	62.50%	40.00%	19.00%
HBI	7.50	7.61	8.58
%Dominant taxon	56.25%	18.00%	38.00%
%Collector-Gatherers	6.25%	57.00%	40.00%
%Filterers	0.00%	0.00%	3.00%
Total taxa	1	5	5
POET	1	1	5
Chironomidae taxa	1	5	5
Crustacea + Mollusca	1	3	3
% Chironomidae	3	3	3
Orthocladiinae/Chir	1	3	1
%Amphipoda	5	5	3
%Crustacea + %Mollusca	3	3	5
HBI	3	1	1
%Dominant taxon	1	5	3
%Collector-Gatherers	1	3	1
%Filterers	3	3	3
Total score	**24**	**40**	**38**
Percent of maximum score	**0.4**	**0.666667**	**0.633333**
Impairment classification	**poor**	**sub-optimal**	**sub-optimal**

Literature Cited

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

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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: MDT05LW
RAI No.: MDT05LW025

RAI No.: MDT05LW025 **Sta. Name:** JACK CREEK
Client ID:
Date Coll.: 8/5/2005 **No. Jars:** 1 **STORET ID:**

Taxonomic Name	Count	PRA	Unique	Stage	Qualifier	BI	Function
Non-Insect							
Copepoda	36	35.29%	Yes	Unknown		8	CG
Hydrozoa	1	0.98%	Yes	Unknown		5	PR
Isopoda	1	0.98%	Yes	Immature	Immature	8	CG
Naididae							
Naididae	28	27.45%	Yes	Unknown		8	CG
Physidae							
Physidae	4	3.92%	Yes	Unknown		8	SC
Talitridae							
Hyalella sp.	1	0.98%	Yes	Unknown		8	CG
Odonata							
Coenagrionidae							
Coenagrionidae	1	0.98%	Yes	Larva	Early Instar	7	PR
Chironomidae							
Chironomidae							
Acricotopus sp.	2	1.96%	Yes	Larva		10	CG
Apedilum sp.	1	0.98%	Yes	Larva		11	CG
Chironomus sp.	4	3.92%	Yes	Larva		10	CG
Corynoneura sp.	7	6.86%	Yes	Larva		7	CG
Micropsectra sp.	7	6.86%	Yes	Larva		4	CG
Orthocladius sp.	1	0.98%	Yes	Larva		6	CG
Pseudochironomus sp.	1	0.98%	Yes	Larva		5	CG
Pseudosmittia sp.	4	3.92%	Yes	Larva		6	CG
Tanytarsini	3	2.94%	No	Larva	Early Instar	6	CF
Sample Count	**102**						

Metrics Report

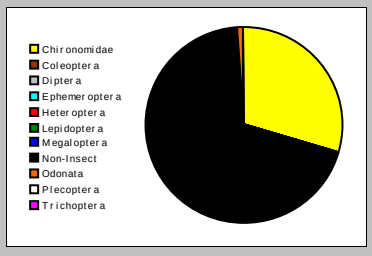
Project ID: MDT05LW
RAI No.: MDT05LW025
Sta. Name: JACK CREEK
Client ID:
STORET ID
Coll. Date: 8/5/2005

Abundance Measures

Sample Count:	102	
Sample Abundance:	1,530.00	6.67% of sample used
Total Abundance:	2,057.85	
Coll. Procedure:		
Sample Notes:		

Taxonomic Composition

Category	R	A	PRA
Non-Insect	6	71	69.61%
Odonata	1	1	0.98%
Ephemeroptera			
Plecoptera			
Heteroptera			
Megaloptera			
Trichoptera			
Lepidoptera			
Coleoptera			
Diptera			
Chironomidae	8	30	29.41%

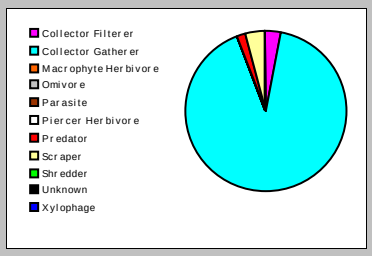


Dominant Taxa

Category	A	PRA
Copepoda	36	35.29%
Naididae	28	27.45%
Micropsectra	7	6.86%
Corynoneura	7	6.86%
Pseudosmittia	4	3.92%
Physidae	4	3.92%
Chironomus	4	3.92%
Tanytarsini	3	2.94%
Acricotopus	2	1.96%
Pseudochironomus	1	0.98%
Orthocladius	1	0.98%
Hydrozoa	1	0.98%
Hyalella	1	0.98%
Coenagrionidae	1	0.98%
Apedilum	1	0.98%

Functional Composition

Category	R	A	PRA
Predator	2	2	1.96%
Parasite			
Collector Gatherer	12	93	91.18%
Collector Filterer	0	3	2.94%
Macrophyte Herbivore			
Piercer Herbivore			
Xylophage			
Scraper	1	4	3.92%
Shredder			
Omivore			
Unknown			



Metric Values and Scores

Metric	Value	BIBI	MTP	MTV	MTM
Composition					
Taxa Richness	15	1	1		0
Non-Insect Percent	69.61%				
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	27.45%				
Baetidae/Ephemeroptera	0.000				
Hydropsychidae/Trichoptera	0.000				
Dominance					
Dominant Taxon Percent	35.29%		2		1
Dominant Taxa (2) Percent	62.75%				
Dominant Taxa (3) Percent	69.61%	3			
Dominant Taxa (10) Percent	94.12%				
Diversity					
Shannon H (loge)	1.892				
Shannon H (log2)	2.730		2		
Margalef D	3.047				
Simpson D	0.220				
Evenness	0.104				
Function					
Predator Richness	2		0		
Predator Percent	1.96%	1			
Filterer Richness	0				
Filterer Percent	2.94%			3	
Collector Percent	94.12%		1		0
Scraper+Shredder Percent	3.92%		1		0
Scraper/Filterer	1.333				
Scraper/Scraper+Filterer	0.571				
Habit					
Burrower Richness	2				
Burrower Percent	4.90%				
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	5.88%				
Air Breather Richness	0				
Air Breather Percent	0.00%				
Voltinism					
Univoltine Richness	6				
Semivoltine Richness	0	1			
Multivoltine Percent	64.71%		1		
Tolerance					
Sediment Tolerant Richness	0				
Sediment Tolerant Percent	0.00%				
Sediment Sensitive Richness	0				
Sediment Sensitive Percent	0.00%				
Metals Tolerance Index	4.034				
Pollution Sensitive Richness	0	1		0	
Pollution Tolerant Percent	9.80%	5		2	
Hilsenhoff Biotic Index	7.545		0		0
Intolerant Percent	0.00%				
Supertolerant Percent	74.51%				
CTQa	108.000				

Bioassessment Indices

BioIndex	Description	Score	Pct	Rating
BIBI	B-IBI (Karr et al.)	16	32.00%	
MTP	Montana DEQ Plains (Bukantis 1998)	8	26.67%	Moderate
MTV	Montana Revised Valleys/Foothills (Bollman 1998)	5	27.78%	Moderate
MTM	Montana DEQ Mountains (Bukantis 1998)	1	4.76%	Severe