MONTANA DEPARTMENT OF TRANSPORTATION
WETLAND MITIGATION MONITORING REPORT: YEAR 2004

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

June 2005

Project No: B43054.00 - 0210

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LAND & WATER

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Cover Photo: Southeast corner of Horseshoe pasture; view is to the northwest.

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LAND & WATER

1.0 INTRODUCTION

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 mitigate for wetland impacts associated with proposed MDT transportation projects. The highway projects were constructed within the vicinity of Ennis and the Madison River drainage in watershed #6 (Upper Missouri River) of the MDT Butte District. 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.

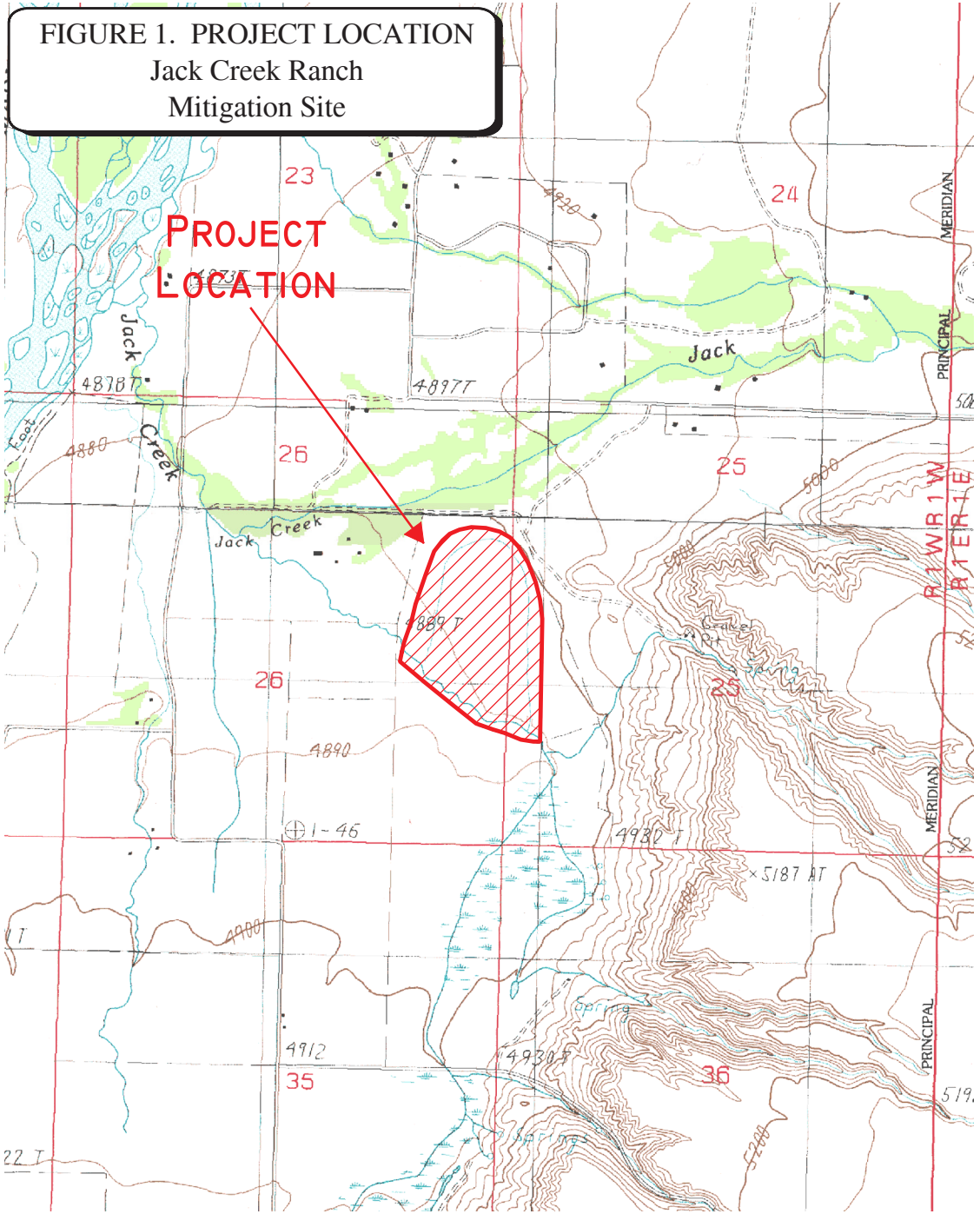
In the summer of 2003, the drainage systems along the perimeter of the Horseshoe pasture were filled. Selected areas within the Horseshoe field were graded to increase habitat diversity. Disturbed areas were seeded with a wetland seed mix and planted with containerized wetland species. Woody species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

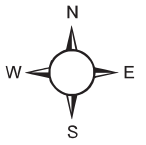
2.0 METHODS

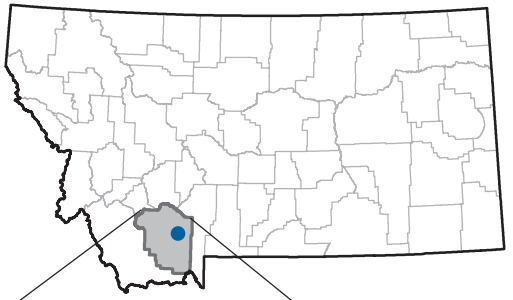
2.1 Monitoring Dates and Activities

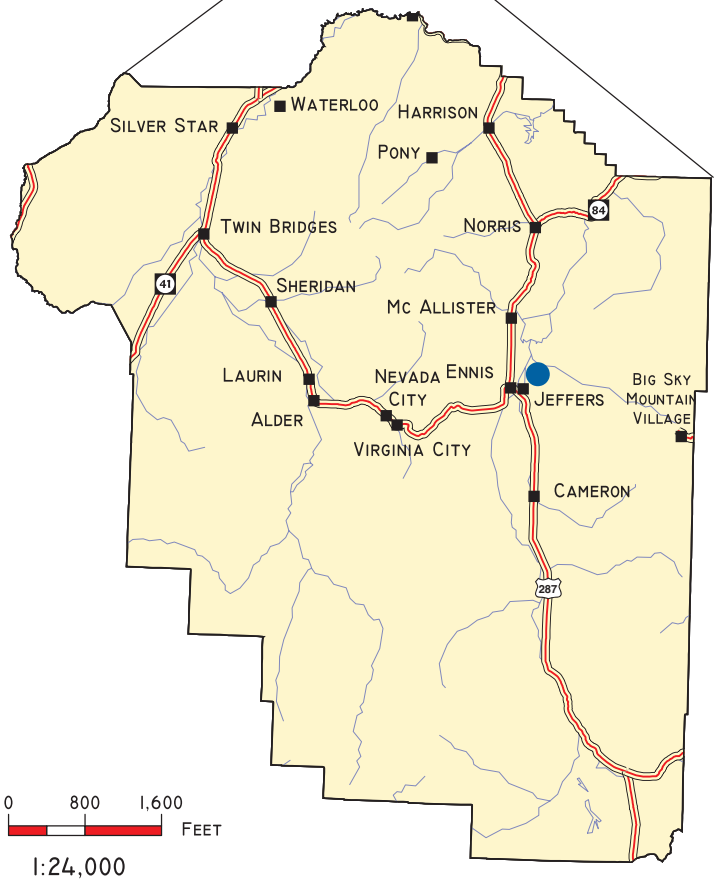
The site was visited on May 27 for spring avian migration use, and on October 21, 2004 for the fall migration use. The transect was established and wetland boundaries were mapped on August 12, 2004. After digitizing, it was apparent that adjustments to the transect length and wetland boundaries were needed and so the site was re-visited on September 7th. Activities and information conducted/collected during the monitoring event included: wetland delineation;

FIGURE 1. PROJECT LOCATION
Jack Creek Ranch
Mitigation Site









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1:24,000

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

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wetland/open water boundary mapping; vegetation community mapping; vegetation transects; soils data; hydrology data; bird and general wildlife use, photograph points; macroinvertebrate sampling; GPS data points; 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 2004 were compared to the 1948-2004 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 and September 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 will be 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. 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 transects will be 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 and September 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 and the 1993 Supplement). 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 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, and the vegetation transects **(Appendix C)**. A description and compass direction for each photograph were recorded on the wetland monitoring form.

During the 2004 monitoring season, each photograph point was marked on the field map and the location recorded with a resource grade GPS. The approximate locations are shown on **Figure 2, 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.

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 and September 2004 monitoring visit, approximately 60% of the assessment area 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 an mean annual precipitation of 12.43 inches for the period from 1948 to 2004 (2005).

The mean annual precipitation from January to August for the period from 1894 through 2004 was 9.42 inches (WRCC 2005). While the mean annual precipitation from January to August for the year of 2004 was 7.01 inches (WRCC 2005). Therefore, the mean annual precipitation from January through August in 2004 was 74% of the normal long-term average, indicating 2004 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)**. Five community types were identified and mapped on the mitigation area (**Figure 3, Appendix A**). 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 arundinacea/Hordeum jubatum.* Dominant species within each community are listed on the monitoring form **(Appendix B)**. Because construction was conducted during 2003, 2004 represents the first growing season for the project site. Hydrophytic vegetation communities will likely increase in size and diversity over time. Species noted in 2004 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. Type 2 is present in areas that will likely develop into wetlands with time. Surface water was present in portions of this community. Type 3 consists of aquatic species, such as cattails (*Typha latifolia*), bulrush (*Scirpus* sp.), sedges (*Carex* sp.), and spikerush (*Eleocharis* sp.) which were common in areas of inundation. Type 4 represents small sparsely vegetated mudflats, small areas of surface water and a mix of OBL, FACW and FAC species. Type 5 occurs along portions of the newly constructed McKee Spring Creek channel and is primarily a mix of FACW and FAC species. There are approximately 25 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 below 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**).

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*). One large weedy area was noted during the 2004 field visit and was mapped on **Figure 3.** This area consisted of black henbane, Canada thistle, summer cypress (*Kochia scoparia*), mustard (*Sisymbrium altissimum*), Russian thistle (*Salsoli kali*), goosefoot (*Chenopodium* sp.), and houndstongue. Canada thistle was common along the McKee Spring Creek channel and the horseshoe pasture primarily in the upland/wetland transition areas. Some portions of the channel floodplain were sparsely vegetated with desirable or seeded species. Common weeds in these areas included black henbane, musk thistle, summer cypress, pennycress, Russian thistle, and several different mustard and goosefoot species. In general, most of the weed species were

Table 1: ***2004 Jack Creek Ranch Vegetation Species List***

Scientific Name	Region 9 (Northwest) Wetland Indicator Status [1]
Agropyron trachycaulum	FAC
Agropyron repens	FAC-
Agropyron riparium	**(FACU)**
Agrostis alba	FAC*
Alopecurus arundinaceus	FAC*
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 longistylis	FACW
Juncus ensifolius	FACW
Juncus torreyi	FACW
Kochia scoparia	FAC
Medicago lupulina	FAC
Muhlenbergia sp.	**(FAC)**
Phalaris arundinacea	FACW
Phleum pretense	FAC-
Poa palustris	FAC
Poa pratensis	FAC
Poa compressa	FACU+
Populus angustifolia	FACW
Puccinellia nuttalliana	FACW+
Ranunculus cynbalaria	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-**
Thlaspi arvense	**(UPL)**
Typha latifolia	OBL
Verbascum thapsus	**(UPL)**
Veronica Americana	OBL

[1] **Bolded** 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 Transect 1 data summary.***

Monitoring Year	2004
Transect Length (feet)	1200
# Vegetation Community Transitions along Transect	13
# Vegetation Communities along Transect	5
# Hydrophytic Vegetation Communities along Transect	3
Total Vegetative Species	55
Total Hydrophytic Species	38
Total Upland Species	17
Estimated % Total Vegetative Cover	82
% Transect Length Comprised of Hydrophytic Vegetation Communities	28
% Transect Length Comprised of Upland Vegetation Communities	70
% Transect Length Comprised of Unvegetated Open Water	1
% Transect Length Comprised of Bare Substrate	1

Chart 1: ***Length of vegetation communities along Transect 1***

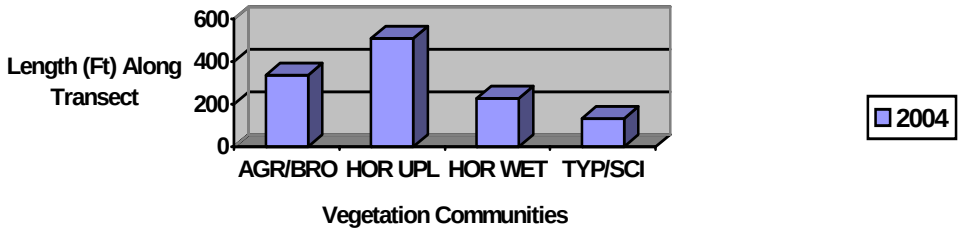
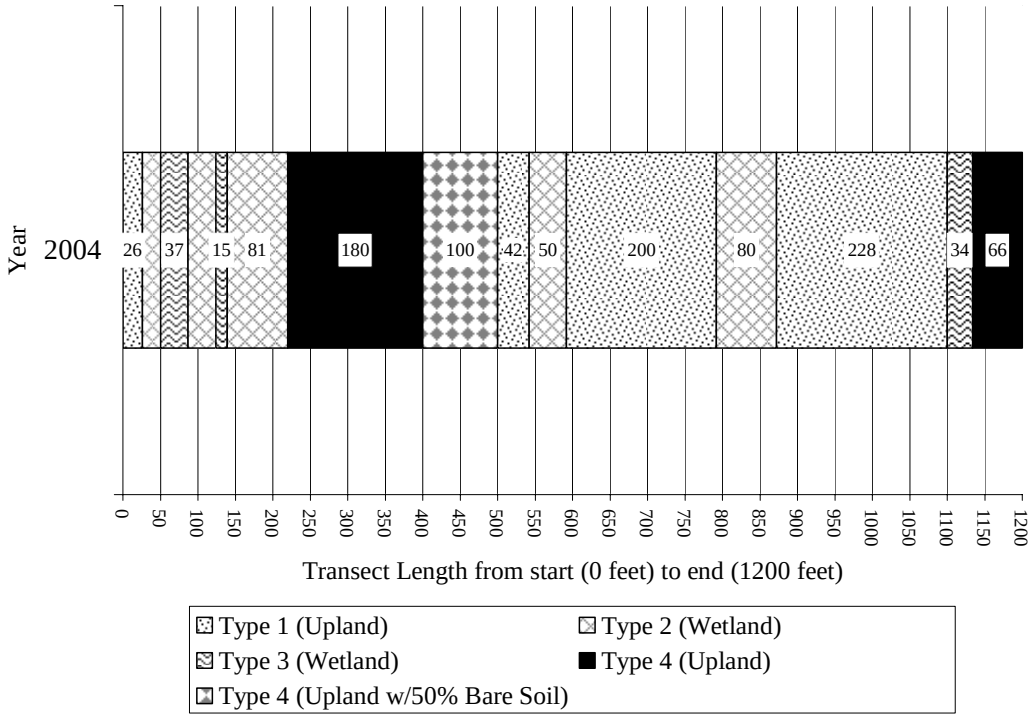


Chart 2: ***Transect map showing vegetation types from start of transect (0 feet) to the end of transect (1200 feet) for 2004.***



located where the pond excavation spoils were deposited along the upper channel terrace and in the far northern end of the project (tip of the horseshoe).

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 and September monitoring visit, survival assessment of cuttings along the channel resulted in mixed or erratic results. It is estimated that approximately 40 to 45 percent of the cuttings in the channel had shoots and/or leaves either at the plant base or at the tip of the cuttings. Cuttings without leaves or shoots appeared most prevalent in the down-gradient portion of the project area. Several of these cuttings were pulled up at the time of the field visit to see if roots had developed. Most of the cuttings had roots several inches long but had not produced buds or leaves. It may take time for willow cuttings to bud as they first must develop roots. However, other factors, such as, browse from deer, grasshoppers (defoliating some willow species), and cutting length can also affect bud and leaf development.

In the Horseshoe pasture approximately 50 to 60 percent of the willow cuttings exhibited shoots and/or leaves. It may take time for willow cuttings to bud as they first must develop roots. However, other factors, such as, browse from deer, grasshoppers (defoliating some willow species), 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.

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) mucky mineral from 0-3 inches; from 3-12 inches a dark gray (10YR 4/1) silty clay loam. A sulfidic odor was detected at 6 inches. Soils were saturated at the surface. The soils at SP-2 were very dark gray (10YR 3/1) sandy clay loam from 0-12 inches. A sulfidic odor was also detected within this soil pit and soils were saturated at three inches below the soil surface. SP-3 is located near the western end of the transect. Soils were dark gray (10YR 4/1) silty clay from 0-4 inches, and from 4 – 12 inches a dark grayish brown (10YR 4/2) gravelly clay. Below 12 inches gravels were more common. Soils were saturated at 6 inches.

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 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 gross wetland boundary encompasses 21.51 acres and includes 2.13 acres of shallow open water (<4 feet deep).

During the August and September field visits, approximately 60 percent of the upland community type (CT-4) was inundated. Shallow surface water was apparent from the transect line south toward the creek. It is anticipated that this area will convert to wetland in the near future. The development of existing wetland species (seed bank) and site planting efforts will require more time to become fully established. The surface water and saturated soils noted in August and September are good indicators that the wetland hydrology is recovering.

3.5 Wildlife

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

The first year of official monitoring resulted in the sighting of 22 avian species, with seven (7) additional sightings during visits by MDT and Aquatic Design & Construction, Inc. within the last few years of project development. Fourteen species of mammals and four (4) fish species have been sighted within the project site.

3.6 Macroinvertebrates

This was a snail-and-midge dominated fauna; the bioassessment score indicated optimal biotic conditions (**Bollman, 2004, Appendix F**). Habitat complexity appeared to have been good, with macrophyte-oriented taxa, water-column-associated taxa, and benthic-dwelling taxa all represented. Taxa richness was high. The biotic index value was only slightly above the median value for sites in this study; water quality was probably good here. The functional mix was diverse, and probably appropriate for a wetland in good condition.

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

REPTILES	
None	
AMPHIBIANS	
None	
FISH	
Brook trout (*Salvelinus fontinalis*)	Rainbow trout (*Oncorhynchus mykiss*)
Brown trout (*Salmo trutta*)	Long nose dace (*Rhinichthys cataractae*)
CRUSTACEAN	
Crayfish	
BIRDS	
American Kestrel (*Falco sparerius*)	Northern Harrier (*Circus cyaneus*)
American Robin (*Turdus migratorius*)	Red-tailed hawk (*Buteo jamaicensis*)
Bald eagle (*Haliaeetus leucocephalus*)	Red-winged Blackbird (*Agelaius phoeniceus*)
Canada Goose (*Branta canadensis*)	Ring-necked Pheasant (Phasianus colchicus)
Cinnamon Teal (*Anas cyanoptera*)	Sandhill Crane (*Grus canadensis*)
Common Goldeneye (*Bucephala clanula*)	Savanah Sparrow (*Passerculus sandwichensis*)
Common Merganser (*Mergus merganser*)	Sora (*Porzana Carolina*)
Common Snipe (*Gallinago gallinago*)	Spotted Sandpiper (*Actitis macularia*)
Eastern Kingbird (*Tyrannus tyrannus*)	Tree Swallow (*Tachycineta bicolor*)
Great Blue Heron (*Ardea herodias*)	Trumpeter swan (*Cygnus buccinator*)
Green-winged Teal (*Anas crecca*)	Turkey Vulture (*Cathartes aura*)
Killdeer (*Charadrius vociferous*)	Western Meadowlark (*Sturnella neglecta*)
Lesser Scaup (*Aythya fuligula*)	Wilson's Phalarope (*Phalaropus tricolor*)
Mallard (*Anas platyrhynchos*)	Yellow-rumped Warbler (*Dendroica coronata*)
Northern Flicker (*Colaptes auratus*)	
MAMMALS	
Antelope (*Antilocarpa Americana*)	Muskrat (*Ondatra zibethicus*)
Beaver (*Castor canadensis*)	Porcupine (*Erethizon dorsatum*)
Elk (*Cervus canadensis*)	River otter (*Lutra canadensis*)
Longtail weasel (*Mustela frenata*)	Red fox (*Vulpes fulva*)
Moose (*Alces alces*)	White-tailed deer *(Odocoileus virginianus)*
Mountain cottontail (*Sylvilagus nuttalli*)	Striped Skunk (*Mephitis mephitis*)
Mule deer (*Odocoileus hemionus*)	Vole spp.

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 156 functional units since construction due to several high to exceptional ranking variables. The wetland has attained Category II wetland status in 2004, an improvement from the Category III status in 2002.

Table 4: ***Summary of 2002 and 2004 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
Listed/Proposed T&E Species Habitat	Low (0)	Low (0.3)
MNHP Species Habitat	Mod (0.6)	Mod (0.60)
General Wildlife Habitat	Low (0.3)	High (1.00)
General Fish/Aquatic Habitat	Mod (0.6)	Mod (0.7)
Flood Attenuation	NA	Low (0.1)
Short and Long Term Surface Water Storage	NA	Mod (0.7)
Sediment, Nutrient, Toxicant Removal	NA	High (0.9)
Sediment/Shoreline Stabilization	NA	Mod (0.7)
Production Export/Food Chain Support	Low (0.3)	High (0.9)
Groundwater Discharge/Recharge	Low (0.1)	High (1.0)
Uniqueness	Low (0.1)	Mod (0.4)
Recreation/Education Potential	Low (0.1)	Mod (0.7)
Actual Points/Possible Points	2.7/9	8.0/12
% of Possible Score Achieved	30%	67%
Overall Category	III	II
Total Acreage of Assessed Wetland / Open Water Areas within Easement	**23.6**	**21.51**
Functional Units (acreage x actual points) (fu)	**49.8**	**172**
Net Acreage Gain in Mitigation Area (ac)	**NA**	**19.52**
Approximate Functional Unit Gain in Mitigation Area (acreage gain x actual points) (fu)	**---**	**156.2**

[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).

3.8 Photographs

Representative photos taken from photo points and transect ends are included in **Appendix C.** A 2004 aerial photograph is also provided 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 scare crows hung in the horseshoe pasture are in need of minor repair. The fence around the wetland was intact.

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). Active control measures are recommended for selected areas where these four weed species are prevalent.

Grasshoppers were noted defoliating the willow cuttings, this should continue to be monitored to assess whether chemical or mechanical control measures should be implemented.

3.10 Current Credit Summary

The gross wetland boundary encompasses 21.51 acres and includes 2.13 acres of shallow open water (<4 feet deep). The monitoring area has gained approximately 156 functional units since construction due to several high to exceptional ranking variables. The wetland has attained Category II wetland status in 2004, an improvement from the Category III status in 2002.

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 21.51 gross wetland acres or 43% 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 19.52 acres.

4.0 REFERENCES

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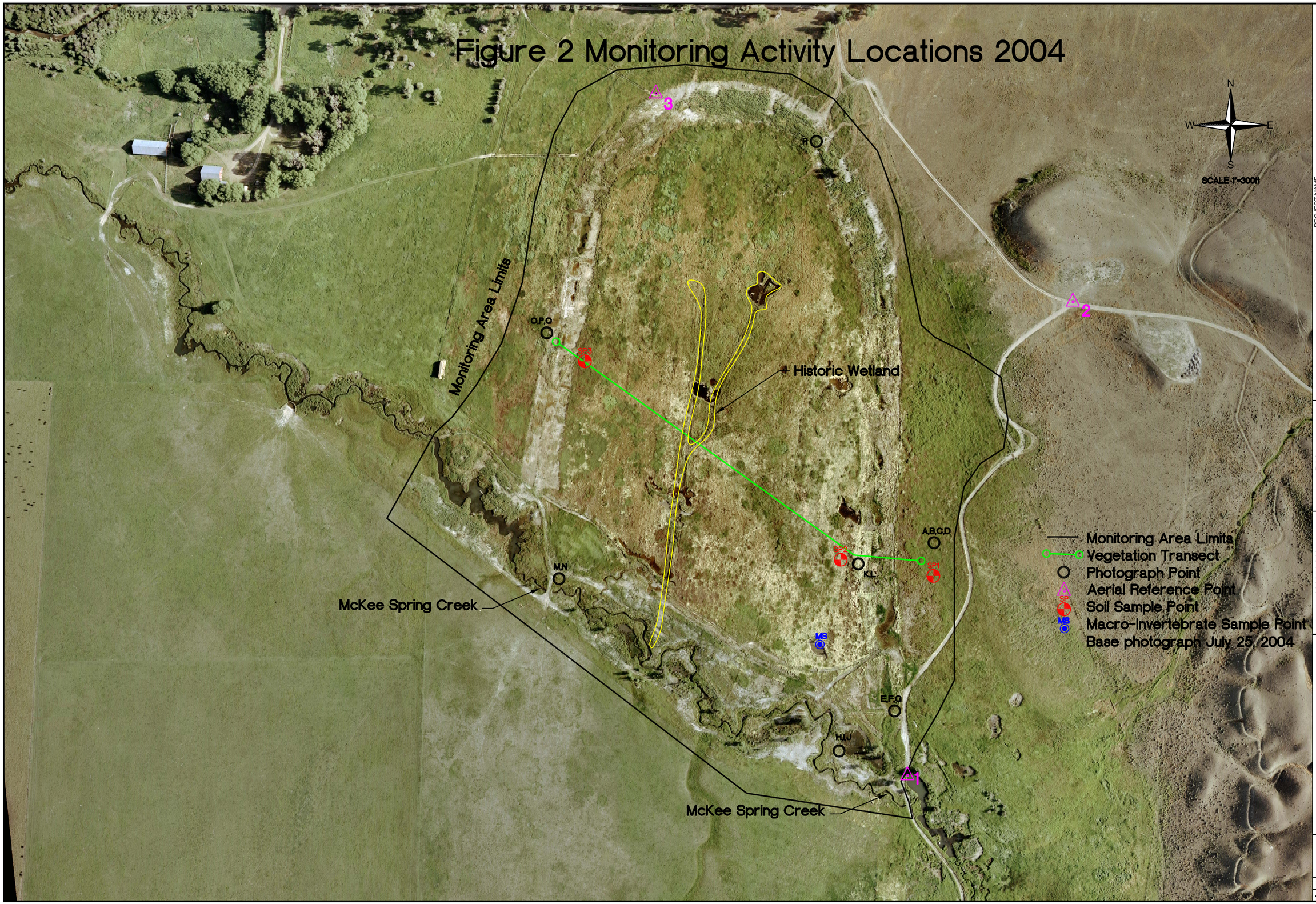
Appendix A

FIGURES 2 - 3

MDT Wetland Mitigation Monitoring
Jack Creek Ranch
Ennis, Montana

Figure 2 Monitoring Activity Locations 2004



PROJECT NAME
MDT Jack Creek Wetland Mitigation
DRAWING TITLE
Monitoring Activity Location 2004

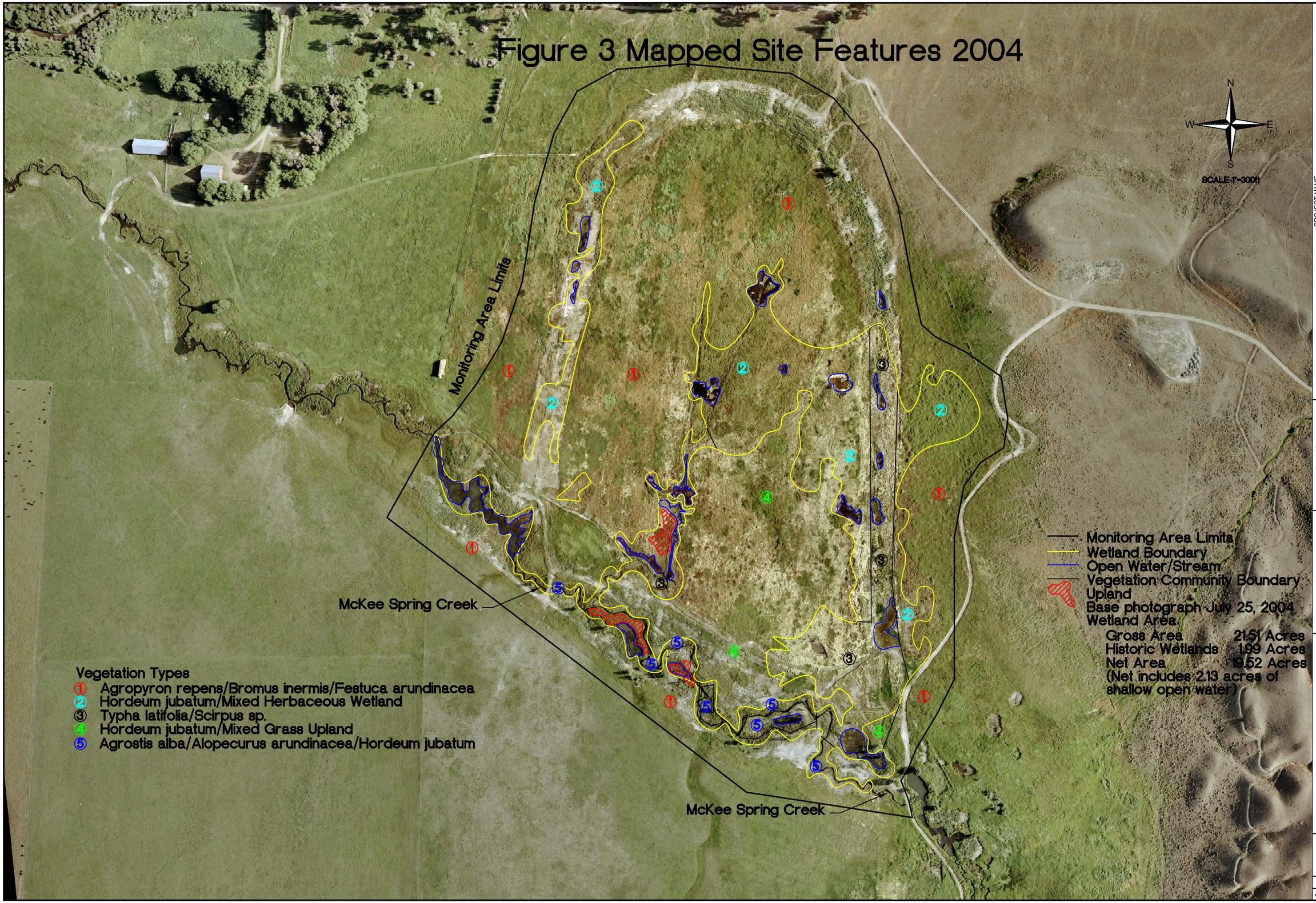
DRAWN: RAA
PROJ MGR: J.Bergland
CHECKED:
APPVD:

PROJ NO: 330054.210
LOCATION:
SCALE: 1"=300ft
FILE NAME: Jack Creek 2004.dwg

LAND & WATER CONSULTING, INC.
P.O. BOX 8254
Missoula, MT 59807

FIGURE
2 OF .
REV 02
Jun/23/2005

Figure 3 Mapped Site Features 2004



PROJECT NAME
MDT Jack Creek Wetland Mitigation
DRAWING TITLE
Mapped Site Features 2004

DRAWN: RAA/SH
PROJ MGR: J.Bergland
CHECKED:
APPVD:

PROJ NO: 330054.210
LOCATION:
SCALE: 1"=300ft
FILE NAME: Jack Creek 2004.dwg

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P.O. BOX 8254
Missoula, MT 59807

FIGURE
3
OF
REV 02
Jun/23/2005

Appendix B

2004 WETLAND MITIGATION SITE MONITORING FORM
2004 BIRD SURVEY FORMS
2004 WETLAND DELINEATION FORMS
2004 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: 330054.210 Assessment Date: 8/12/04 & 9/7/04
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: 11:00 AM
Weather Conditions: warm, dry, sunny Person(s) conducting the assessment: CH/LB/LWC
Initial Evaluation Date: 8 / 12 /04 Visit #: 1 Monitoring Year: 2004
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: 60%
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.

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*_____

Dominant Species	% Cover	Dominant Species	% Cover
Agropyron repens	20	*Agrostis alba*	5
Bromus inermis	20	*Poa compressa*	<5
Festuca arundinacea	15		
Poa pratensis	10		
Agropyron trachycaulum	10		
Phalaris arundinacea	5		
Cirsium arvense	5		
Elymus canadensis	5		

COMMENTS/PROBLEMS: _Other species that represent approximately 5% of the cover include *Carduus nutans*, *Kochia scoparia*, *Sisymbrium altissimum*, *Hyoscyamus niger*, *Salsola kali*, *and Chenopodium sp.*

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

Dominant Species	% Cover	Dominant Species	% Cover
Hordeum jubatum	30	*Carex nebrascensis*	5
Puccinellia nuttalliana	10	*Deschampsia caespitosa*	5
Eleocharis palustris	10	*Juncus longistylis*	<5
Scirpus pungens	10	*J.ensifolius*	<5
Juncus balticus	10	*Scirpus validus*	<5
Agrostis alba	10	*Equisetum arvense*	<5
Phalaris arundinacea	10	*Typha latifolia*	<5

COMMENTS/PROBLEMS: Other minor species include *Carex microptera*, *Distichis spicata*, *Muhlenbergia sp.*, *Calamogrostis canadensis* and *Rumex crispus.*

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

Dominant Species	% Cover	Dominant Species	% Cover
Typha latifolia	25	*Puccinellia nuttalliana*	5
Scirpus validus	20	*Eleocharis palustris*	5
Scirpus pungens	20	*Beckmannia syzigachne*	<5
Open water	10	*Salix sp.* (cuttings)	<5
Ranunculus cynbalaria	5	*Juncus torreyi*	10

COMMENTS/PROBLEMS: Other minor species noted include *Veronica americana* around the perimeter of standing water, *Carex aquatilis, C. lanuginosa* and *C. utriculata*.

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

Dominant Species	% Cover	Dominant Species	% Cover
Hordeum jubatum	25	*Agropyron riparium*	5
Bromus inermis	20		
Festuca arundinacea	15		
Poa compressa	5		
Elymus canadensis	5		
Agropyron repens	10		
Cirsium arvense	5		
Agropyron trachycaulum	5		

COMMENTS/PROBLEMS:

Community No.:__5__ Community Title (main species*):___Agrostis alba/Alopercurus pratensis/Hordeum jubatum*

Dominant Species	% Cover	Dominant Species	% Cover
Agrostis alba	20	*Cirsium arvense*	<5
Alopercurus pratensis	15	*Mentha arvense*	<5
Hordeum jubatum	15	*Juncus longistyle*	5
Beckmannia syzigachne	5	*Calamagrostis canadensis*	10
Juncus torreyi	5	*Poa palustris*	5
Deschampsia caespitosa	10	*Carex nebrscensis*	5
Carduus nutans	<5	*Juncus mertensianus*	<5

COMMENTS/PROBLEMS: This community type represents emergent vegetation establishment along portions of McKee Spring Creek. Other minor species noted include *Carex aquatilis*, *Bromus marginatus*, *Kochia scoparia*, *Medicago lupulina*, *Mentha arvense*, *Juncus bufonius*, *Agropyron trachycaulum*, *Glyceria grandis* and *Salix* sp. *(cuttings).*

Additional Activities Checklist:

__X__Record and map vegetative communities on air photo

2004 Comprehensive Vegetation List

Species	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 arundinaceus	1,4	*Thlaspi arvense*	1
Beckmannia syzigachne	3,5	*Veronica americana*	3
Bromus inermis	1, ,4		
Bromus marginatus	5		
Calamagrostis canadensis	5		
Carduus nutans	1,5		
Carex aquatilis	3,5		
Carex lanuginose	3		
Carex microptera	2		
Carex nebrascensis	2,5		
Chenopodium sp.	1		
Cirsium arvense	1,5		
Cynoglossum officinale	1,5		
Deschampsia caespitosa	2,5		
Distichlis spicata	2		
Eleocharis palustris	2,3		
Elymus canadensis	1,4		
Equisetum arvense	2		
Glyceria grandis (=G. maxima)	5		
Hordeum jubatum	2,,4		
Hyoscyamus niger	1		
Juncus balticus	2,		
Juncus bufonius	5		
Juncus lanugnosa	3		
Juncus longistylis	2,5		
Juncus mertensianus	5		
Kochia scoparia	1,5		
Medicago lupulina	5		
Mentha arvense	5		
Muhlenbergia sp.	2		
Mimulus sp.	5		
Phalaris arundinacea	1,2,		
Phleum pretense	1		
Poa palustris	5		
Poa pratensis	1		
Poa compressa	1,4		
Populus angustifolia	5		
Puccinellia nuttalliana	2,3		
Ranunculus cynbalaria	3		
Rumex crispus	2		
Salix bebbiana	3		
Salix exigua	3,5		
Salix lasiandra	3,5		

COMMENTS/PROBLEMS:

PLANTED WOODY VEGETATION SURVIVAL

Species	Number Originally Planted	Number Observed	Mortality Causes
McKee Spring Creek	NA	Approximately 40-45 percent of the cuttings along the channel were alive.	Browse from deer, defoliation from grasshoppers 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.	It is likely that the cottonwoods may re-sprout from the base if the roots are still viable. Will observe in 2005.
Transplanted willow species	NA	Only a few were noted along the channel or floodplain. The plants noted were alive but not robust.	
Horseshoe Pasture			
Willow cuttings	NA	Approximately 50 to 60 percent of the cuttings were alive.	Browse from deer, defoliation from grasshoppers, cuttings length and planted in "muck" soils.
Transplanted willows	NA	Only a few larger willows were observed within the horseshoe pasture. Most of the shrubs noted were dead or declining.	It is likely that the willows may re-sprout from the base in 2005 if the roots are still viable.

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
Canid (fox or coyote)		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 – eastern side of project site. View of adjacent land use.	East
B	Transect 1 – eastern side, view of upland to wetland.	West
C	Transect 1 – eastern side - crayfish holes.	South
D	Transect 1 - eastern side – a view of two different communities types	North
E	SE corner of the Horseshoe pasture – wetland features.	SW
F	SE corner of the Horseshoe pasture – wetland features.	West
G	SE corner of the Horseshoe pasture – shallow pool near fence line.	South
H	McKee Spring Creek –newly constructed channel and floodplain.	East
I	McKee Spring Creek – channel with willow cuttings.	SE
J	McKee Spring Creek floodplain- vegetation establishment.	SW
K	Transect 1 – view of type 3 wetland.	North
L	Transect 1 – large mudflat just south of transect line.	South
M	SW corner of the project - viewing McKee Creek.	West
N	SW corner of the project - viewing McKee Creek	NW
O	Transect 1 – western side of project site. Large shallow pool.	North
P	Transect 1 – western side of project site. Developing wetlands.	South
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:

__X__ Jurisdictional wetland boundary
__X__ 4-6 landmarks recognizable on the air photo
__X__ Start and end points of vegetation transect(s)
_2004_ Photo reference points
__-__ Groundwater monitoring well locations

COMMENTS/PROBLEMS: ____A second trip was conducted in September to GPS the western wetlands and the transect was extended across the entire project area to collect additional community type data.

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: 8/12/04 9/7/04 Examiner: CH/LB/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 1 (UPLAND)
Length of transect in this type:	0-26’ (26’) Feet
Species:	Cover:
AGRREP	50
POAPRA	10
BROINE	20
PHAARU	5
FESARU	5
Bare soil	10
Total Vegetative Cover:	90%

Vegetation type B:	CT 2 (Wetland)
Length of transect in this type:	26-50’ (24’) feet
Species:	Cover:
HORJUB	30
TYPLAT	10
POACOM.	10
Open water	20
PUCNUT	10
ELEPAL	5
SCIPUN	10
JUNBAL	5
Total Vegetative Cover:	80%

Vegetation type C:	CT 3 (Wetland)
Length of transect in this type:	50-87’ (37”) feet
Species:	Cover:
TYPLAT	20
SCIVAL	20
SCIPUN	10
Open water	15
RANCYM	10
PUCNUT	5
ELEPAL	5
BECSYN	5
HORJUB	10
Total Vegetative Cover:	85%

Vegetation type D:	CT 2 (Wetland)
Length of transect in this type:	87-124’(37’)
HORJUB	40
PUCNUT	10
ELEPAL	10
RANCYM	5
Mud-salt flats	15
SCIPUN	10
DISSPI	10
Total Vegetative Cover:	85%

MDT WETLAND MONITORING – VEGETATION TRANSECT (continued)

Site: Jack Creek Ranch Date: 8/12/04 & 9/7/04 Examiner: CH/LB/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 3 (Wetland)
Length of transect in this type:	124-139'(15') feet
Species:	Cover:
TYPLAT	60
ELEPAL	10
JUNTOR	5
SCIVAL	5
Open water 6 to 12 inches deep	15
CARUTR	5
Total Vegetative Cover:	85%

Vegetation type F:	CT 2 (Wetland)
Length of transect in this type:	139-220'(81') feet
Species:	Cover:
HORJUB	65
PHAARU	15
RANCYN	7
AGRALB	7
JUNLON	2
POACOM	2
JUN sp. (no seedheads)	1
EQUARV	1
Total Vegetative Cover:	100%

Vegetation type G:	CT-4 (Upland)
Length of transect in this type:	220-400' (180') feet
HORJUB	25
FESARU	20
BROINE	15
AGRTRA	10
ELYCAN	5
AGRREP	5
CIRARV	5
AGRALB	5
Open water	5
Total Vegetative Cover:	95%

Vegetation type H:	CT-4 (Upland)
Length of transect in this type:	400-500 (100') feet
Species:	Cover:
HORJUB	20
FESARU	20
PHAARU	10
Bare soil	50
Total Vegetative Cover:	50%

MDT WETLAND MONITORING – VEGETATION TRANSECT (continued)

Site: Jack Creek Ranch Date: 8/12/04 9/7/04 Examiner: CH/LB/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-1 (Upland)
Length of transect in this type:	500-542 (42') feet
Species:	Cover:
FESARU	35
AGRALB	30
BROINE	35
Total Vegetative Cover:	100%

Vegetation type J:	CT-2 (Wetland)
Length of transect in this type:	542-592 (50') feet
Species:	Cover:
HORJUB	35
PHAARU	15
JUNTEN	10
CARMIC	10
CARNEB	10
JUNLON	5
ELEPAL	5
JUNBAL	5
Open water	5
Total Vegetative Cover:	95%

Vegetation type K:	CT-1 (Upland)
Length of transect in this type:	592-792 (200') feet
Species:	Cover:
AGRREP	35
FESARU	35
POACOM	10
ELYCAN	5
HORJUB	15
Total Vegetative Cover:	100%

Vegetation type L:	CT -3 (Wetland)
Length of transect in this type:	792 - 872 (80') feet
Species:	Cover:
TYPLAT	30
HORJUB	20
PHAARN	5
JUNBAL	10
SCIPUN	15
Salix cuttings (80% survival)	10
SCIVAL	5
Open water	5
Total Vegetative Cover:	95%

MDT WETLAND MONITORING – VEGETATION TRANSECT (continued)

Site: Jack Creek Ranch Date: 8/12/04 & 9/7/04 Examiner: CH/LB/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-4 (Upland)	
Length of transect in this type:	872-1100' (228')	feet
Species:		Cover:
HORJUB		25
BROINE		20
FESARU		20
POACOM		5
ELYCAN		5
CIRARV		5
AGRREP		10
Water		10
Total Vegetative Cover:		90%

Vegetation type N:	CT-2 (Wetland)	
Length of transect in this type:	1100-1134 (34')	feet
Species:		Cover:
JUNLON		10
PUCNUT		25
HORJUB		25
Bare soil		20
EQUARV		10
JUNTEN		10
Total Vegetative Cover:		80%

Vegetation type 0:	CT-1 (Upland)	
Length of transect in this type:	1134-1200 (66')	feet
Species:		Cover:
BROINE		80
Bare soil		10
AGRREP		10
Total Vegetative Cover:		90%

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:

[3]**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 27/04				**Fall 10/21/04**			
American Kestrel	1	FO	HS MA	Common Snipe	3	F/LO?	HS MA
American Robin	1	L	HS MA	Northern Harrier (F)	1	F	HS MA
Canada Goose	10	L	HS MA	Ring-necked Pheasant	1	L?/F?	Between HS and MC
Cinnamon Teal	2	F		Unident Phalarope	flock	?	MC flushed
Common Snipe	2	FO/BR	HS MA	Unident teal	1	F?	HS MA
Eastern Kingbird	1	MA	MC ponds	Western Meadowlark	1	FO	HS MA
Green-winged Teal	5	F	MC flowing stream				
Killdeer							
Lesser Scaup	4	BR	Flowing stream				
Mallard	7	F	HS MA/ MC flowing stream				
Northern Flicker	1	F	MC stream corridor				
Red-winged Blackbird	6	BD	MA/OW				
Sandhill Crane	2	BR	HS MA				
Savannah Sparrow	2	BR	HS MS				
Spotted Sandpiper	1	BR	MC flowing Stream				
Tree Swallow	~10	F	MC Stream corridor				
Western Meadowlark	1	BR	UPL: Between MC and HS				
Wilson's Phalarope	7	F	MA				
Yellow-rumped Warbler	2	F	MC Stream edge				
Mid-season – 8/12/04							
Common Snipe	~11	LO/?F	HS MA				
Eastern Kingbird	2	F	HS MA				
Turkey Vulture	1	FO/F	HS MA				
Wilson's Phalarope	1	F	MC flowing stream				

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: 8/12/04
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-1
(If needed, explain on reverse.)					

VEGETATION

	Dominant Plant Species	Stratum	Indicator		Dominant Plant Species	Stratum	Indicator
1	AGRREP	H	FAC-	9			
2	POAPRA	H	FAC	10			
3	BROINE	H	-(UPL)	11			
4	PHAARU	H	FACW	12			
5	FESARU	H	FAC-	13			
6				14			
7				15			
8				16			

Percent of Dominant Species that are OBL, FACW, or FAC (excluding FAC-). 2/5 = 40% hydrophytic vegetation

Soil pit at the beginning (east) point of transect #1.

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: - (in.)

Depth to Free Water in Pit: 8 (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:
Soils were saturated at the surface.

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.
0-3	0	10YR 3/1			mucky mineral
3-12	A	10YR 4/1			silty clay loam sand

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)

Hydric soil

WETLAND DETERMINATION

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

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

Remarks:

Based on the soils and hydrology data, this sampling site will likely start to show vegetation changes toward more mesic species within several growing seasons.

Approved by HQUSACE 2/92

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

Project/Site: Jack Creek Ranch	Date: 8/12/04 & 9/07/04
Applicant/Owner: MDT	County: Madison
Investigator: CH/LB/MDT	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.)					

VEGETATION

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

Percent of Dominant Species that are OBL, FACW, or FAC (excluding FAC-). 9/9 = 100% 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: - (in.)

Depth to Free Water in Pit: 10 (in.)

Depth to Saturated Soil: 3 (in.)

Wetland Hydrology Indicators:

Primary Indicators:
- Inundated
- X Saturated in Upper 12 Inches
- X 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:
Water marks were noted in low areas adjacent to this sampling point.

SOILS

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

Taxonomy (Subgroup): Fluvaquentic Haplaquolls Field Observations

Confirm Mapped Type? _____ Yes _____ No

Profile Description:

Depth inches	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-12	A	10YR 3/1			sandy 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)

Hydric because of low-chroma.

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:

Sampling point is within a wetland. Diverse wetland vegetation – other minor species include *Distichis spicata, Juncus longistylis* and *Rumex crispus*.

Approved by HQUSACE 2/92

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

Project/Site:	Jack Creek Ranch			Date:	8/12/04 & 9/7/04
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.)					

VEGETATION

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

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

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

Depth to Saturated Soil: 6 (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:

SOILS

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

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

Profile Description:

Depth inches	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-4	A	10YR 4/1			silty clay
4-12	B	10YR 4/2			gravelly clay

Hydric Soil Indicators:

_____ Histosol
_____ Histic Epipedon
_____ Sulfidic Odor
_____ Aquic Moisture Regime
_____ Reducing Conditions
_____ Gleyed or Low-Chroma Colors
_____ Concretions
_____ High Organic Content in surface Layer in Sandy Soils
_____ Organic Streaking in Sandy Soils
_____ Listed on Local Hydric Soils List
_____ Listed on National Hydric Soils List
_____ 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 #:** 330054 **Control #:** _____

3. Evaluation Date: 9/7/2004 **4. Evaluator(s):** CH/LB/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): ≥30 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): _____ (visually estimated)
21.5 ac (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 spiny skeleton, 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 %	--	--	--
35-64 %	.7 (M)	--	--
< 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	--	--	.9H	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
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	0.3	1	
B. MT Natural Heritage Program Species Habitat	M	0.6	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	M	0.70	1	
I. Production Export/Food Chain Support	H	0.90	1	
J. Groundwater Discharge/Recharge	H	1.00	1	
K. Uniqueness	M	0.40	1	
L. Recreation/Education Potential	M	0.70	1	
	Totals:	8.00	12.00	142
	Percent of Total Possible Points:		**67%** (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
2004 AERIAL PHOTOGRAPH

MDT Wetland Mitigation Monitoring
Jack Creek Ranch
Ennis, Montana

2004 JACK CREEK RANCH

Location: A **Description:** Transect 1 – eastern side, adjacent land use. **Compass Reading:** east

Location: B **Description:** Transect 1 – eastern side. View from upland to wetland. **Compass Reading:** west

Location: C **Description:** Transect 1 – crayfish holes. **Compass Reading:** south

Location: D **Description:** Transect 1, viewing 2 different community types. **Compass Reading:** north

Location: E **Description:** Southeast wetland corner of the project site. **Compass Reading:** southwest

Location: F **Description:** Southwest corner. **Compass Reading:** west

2004 JACK CREEK RANCH

Location: G **Description:** Ponded areas created by low head berm. **Compass Reading:** southeast

Location: H **Description:** Newly constructed McKee Spring Creek channel. **Compass Reading:** east

Location: I **Description:** McKee Spring Creek channel with willow cuttings. **Compass Reading:** southeast

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

Location: K **Description:** Transect 1: view into Type 3 wetland. **Compass Reading:** north

Location: L **Description:** Transect 1: Mudflat south of transect. **Compass Reading:** south

2004 JACK CREEK RANCH

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

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

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

Location: P **Description:** Western end of Transect 1. **Compass Reading:** south

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

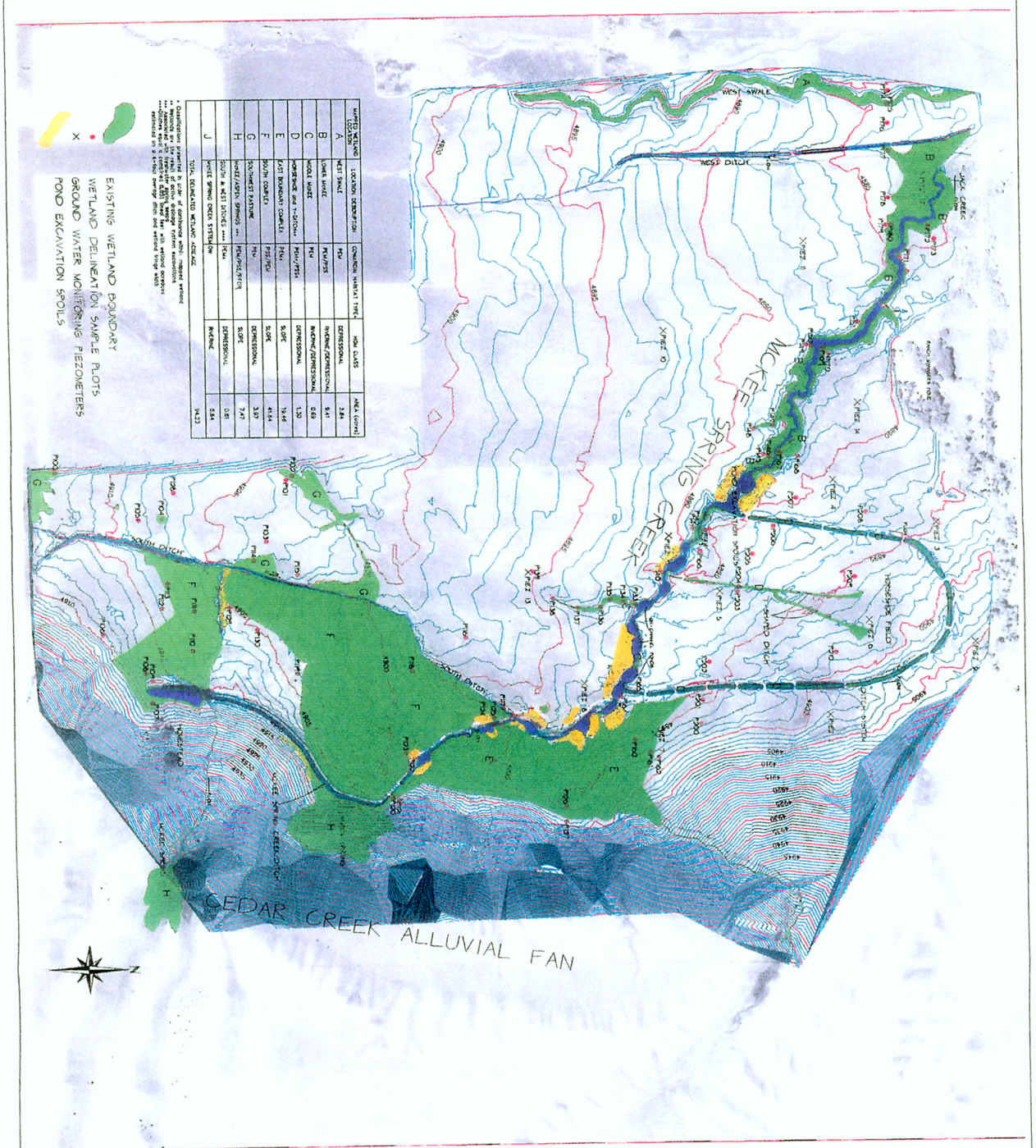
Location: R **Description:** Buffer along far northern project boundary. **Compass Reading:** west

Jack Creek 2004

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

2004 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 see 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 Wetland Mitigation Monitoring Project
Aquatic Invertebrate Monitoring
Summary 2001 - 2004

METHODS

Among other monitoring activities, aquatic invertebrate assemblages were collected at a number of mitigation wetlands throughout Montana. This report summarizes data generated from four years of collection.

The method employed to assess these wetlands is based on constructing an index using a battery of 12 bioassessment metrics or attributes (Table1) 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, 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, and 2004, was assessed using the tested metric battery developed for montane streams of Western Montana (Bollman 1998).The fauna at the Camp Creek site was different from that of the other sites, and suggested montane stream conditions rather than wetland conditions. For the wetlands, “optimal” scores were generally those that fell above the 75th percentile (for those metrics that decrease in value in response to stress) or below the 25th percentile (for metrics that respond to stress by an increase in value) of all scores. Additional scoring ranges were established by bisecting the range below the 75th percentile for decreasing scores (or above the 25th percentile for increasing scores) into “sub-optimal” and “poor” assessment categories. A score of 5, 3, or 1 was assigned to optimal, sub-optimal, and poor metric performance, respectively. In this way, metric values were translated into normalized metric scores, and scores for all metrics were summed to produce a total bioassessment score. Total bioassessment scores were classified according to a similar process, using the ranges and distributions of total scores for all sites studied in all years.

The purpose of constructing an index from biological attributes or metrics is to provide a means of integrating information to facilitate the determination of whether management action is needed. The nature of the action needed is not determined solely by the index score, however, but by consideration of an analysis of the component metrics, the taxonomic composition of the assemblages, and other issues. The diagnostic functions of the metrics and taxonomic data need more study; 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.

Sample processing

Aquatic invertebrate samples were collected at mitigation wetland sites in the summer months of 2001, 2002, 2003, and 2004 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 1 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.

RESULTS

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. Thus, the 2004 database contains data for 122 sampling events at 50 unique sites. Table 2 summarizes sites and sampling years.

Metric scoring criteria were re-developed each year as new data was added. For 2004, all 122 records were utilized. Ranges of individual metrics, as well as median metric values remained remarkably consistent in each of the 4 years; minimal changes resulted from the addition of new data in 2004. The summary metric values and scores for the 2004 samples are given in Tables 3a-3d.

Literature cited

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

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

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.

Table 1. Aquatic invertebrate metrics employed in the MTDT mitigation wetland monitoring study, 2001- 2004.

Metric	Metric Calculation	Expected Response to Degradation or Impairment
Total taxa	Count of unique taxa identified to lowest recommended taxonomic level	Decrease
POET	Count unique Plecoptera, Trichoptera, Ephemeroptera, and Odonata taxa identified to lowest recommended taxonomic level	Decrease
Chironomidae taxa	Count unique midge taxa identified to lowest recommended taxonomic level	Decrease
Crustacea taxa + Mollusca taxa	Count 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

Table 2. Montana Department of Transportation Mitigated Wetlands Monitoring Project sites. 2001 – 2004.

2001	2002	2003	2004
Beaverhead 1	Beaverhead 1	Beaverhead 1	Beaverhead 1
Beaverhead 2	Beaverhead 2		
Beaverhead 3	Beaverhead 3		Beaverhead 3
Beaverhead 4	Beaverhead 4	Beaverhead 4	
Beaverhead 5	Beaverhead 5	Beaverhead 5	Beaverhead 5
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
Vince Ames			
Ryegate			
Lavinia			
Stillwater	Stillwater	Stillwater	Stillwater
Roundup	Roundup	Roundup	Roundup
Wigeon	Wigeon	Wigeon	Wigeon
Ridgeway	Ridgeway	Ridgeway	Ridgeway
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 – Enh. 1	Musgrave – Enh. 1	Musgrave – Enh. 1	Musgrave – Enh. 1
Musgrave – Enh. 2			
	Hoskins Landing	Hoskins Landing	Hoskins Landing
	Peterson - 1	Peterson – 1	Peterson – 1
	Peterson – 2		Peterson – 2
	Peterson – 4	Peterson – 4	Peterson – 4
	Peterson – 5	Peterson – 5	Peterson – 5
	Jack Johnson - main	Jack Johnson - main	
	Jack Johnson - SW	Jack Johnson - SW	
	Creston	Creston	Creston
	Lawrence Park		
	Perry Ranch		
	SF Smith River	SF Smith River	SF Smith River
	Camp Creek	Camp Creek	Camp Creek
	Kleinschmidt	Kleinschmidt – pond	Kleinschmidt – pond
		Kleinschmidt – stream	Kleinschmidt – stream
		Ringling - Galt	
			Circle
			Cloud Ranch Pond
			Cloud Ranch Stream
			Colloid
			Jack Creek
			Norem

Table 3a.

	BEAVER HEAD #1	BEAVER HEAD #3	BEAVER HEAD #5	BEAVER HEAD #6	BIG SPRING CREEK	CIRCLE	CLOUD RANCH POND	CLOUD RANCH STREAM	COLLOID	CRESTON
Total taxa	27	12	21	18	25	16	16	20	8	18
POET	3	0	2	3	4	2	2	4	2	3
Chironomidae taxa	7	5	5	5	8	5	6	11	1	2
Crustacea + Mollusca	7	3	4	6	7	1	6	1	1	7
% Chironomidae	0.33636	0.18888	0.39285	0.57547	0.44329	0.55855	0.41666	0.84	0.09090	0.06087
Orthocladiinae/Chir	0.05405	0.35294	0.06818	0.36065	0.27907	0.69354	0.4	0.16666	0	0
%Amphipoda	0.03636	0	0.01785	0.05660	0.05154	0	0.00925	0	0	0
%Crustacea + %Mollusca	0.31818	0.73333	0.05357	0.12264	0.18556	0.03603	0.36111	0.01	0.09090	0.73913
HBI	7.97169	7.88888	8.36363	8.15789	7.61855	7.19090	7.32291	4.84	6	6.92173
%Dominant taxon	0.2	0.57777	0.23214	0.25471	0.23711	0.38738	0.13888	0.38	0.27272	0.37391
%Collector-Gatherers	0.40909	0.75555	0.51785	0.62264	0.78350	0.05405	0.67592	0.74	0.18181	0.29565
%Filterers	0.12727	0	0	0	0.01030	0.15315	0.09259	0.17	0	0.06087
Total taxa	5	1	5	3	5	3	3	3	1	3
POET	3	1	1	3	5	1	1	5	1	3
Chironomidae taxa	5	3	3	3	5	3	3	5	1	1
Crustacea + Mollusca	5	1	3	5	5	1	5	1	1	5
% Chironomidae	3	3	3	1	1	1	1	1	5	5
Orthocladiinae/Chir	1	3	1	3	3	5	3	1	1	1
%Amphipoda	5	5	5	3	3	5	5	5	5	5
%Crustacea + %Mollusca	5	1	5	5	5	5	3	5	5	1
HBI	1	1	1	1	1	3	3	5	5	3
%Dominant taxon	5	1	5	5	5	3	5	3	5	3
%Collector-Gatherers	1	3	3	3	3	1	3	3	1	1
%Filterers	1	3	3	3	3	1	1	1	3	1
	40	26	38	38	44	32	36	38	34	32
	0.666667	0.433333	0.633333	0.633333	0.733333	0.533333	0.6	0.633333	0.566667	0.533333
	sub-optimal	poor	sub-optimal	sub-optimal	optimal	sub-optimal	sub-optimal	sub-optimal	sub-optimal	sub-optimal

Table 3b.

	FOURCHETTE CREEK ALBATROSS RESERVOIR	FOURCHETTE CREEK FLASHLIGHT RESERVOIR	FOURCHETTE CREEK PENGUIN RESERVOIR	FOURCHETTE CREEK PUFFIN RESERVOIR	JACK CREEK	MDT CAMP CREEK	MDT HOSKINS LANDING	MDT KLEINSCHMIDT CREEK	MDT KLEINSCHMIDT POND
Total taxa	18	23	19	22	23	35	25	19	19
POET	3	5	4	3	5	12	4	4	6
Chironomidae taxa	6	9	6	4	8	14	4	6	4
Crustacea + Mollusca	3	4	5	8	7	1	6	2	4
% Chironomidae	0.135135	0.265306	0.066116	0.247934	0.352113	0.37963	0.036697	0.438776	0.047619
Orthocladiinae/Chir	0.2	0.346154	0.625	0.3	0.52	0.585366	0.5	0.627907	0.8
%Amphipoda	0.126126	0.336735	0.578512	0.041322	0.028169	0	0.018349	0.010204	0.009524
%Crustacea + %Mollusca	0.684685	0.387755	0.77686	0.371901	0.380282	0.111111	0.541284	0.061224	0.190476
HBI	7.972973	7.216495	7.7	6.950413	7.647059	4.570093	6.59633	6.561224	6.67619
%Dominant taxon	0.495495	0.336735	0.561983	0.140496	0.15493	0.111111	0.366972	0.316327	0.552381
%Collector-Gatherers	0.873874	0.816327	0.702479	0.38843	0.394366	0.416667	0.091743	0.683673	0.114286
%Filterers	0	0.010204	0.132231	0.008264	0.042254	0.12037	0.018349	0.153061	0.047619
Total taxa									
POET	3	5	3	5	5	5	5	3	3
Chironomidae taxa	3	5	5	3	5	5	5	5	5
Crustacea + Mollusca	3	5	3	3	5	5	3	3	3
% Chironomidae	1	3	3	5	5	1	5	1	3
Orthocladiinae/Chir	5	3	5	3	3	3	5	1	5
%Amphipoda	3	3	5	3	5	5	5	5	5
%Crustacea + %Mollusca	3	1	1	3	5	5	5	5	5
HBI	1	3	1	3	3	5	3	5	5
%Dominant taxon	1	3	1	3	1	5	5	5	5
%Collector-Gatherers	1	5	1	5	5	5	3	5	1
%Filterers	5	5	3	1	1	1	1	3	1
	3	3	1	3	3	1	3	1	3
	32	44	32	40	46	46	48	42	44
	0.533333	0.733333	0.533333	0.666667	0.766667	0.766667	0.8	0.7	0.733333
	sub-optimal	optimal	sub-optimal	optimal	optimal	optimal	optimal	optimal	optimal

Table 3d.

	ROUNDUP	SOUTH FORK SMITH RIVER	STILLWATER	WIGEON
Total taxa	9	20	23	16
POET	0	5	4	3
Chironomidae taxa	4	7	9	5
Crustacea + Mollusca	3	3	4	3
% Chironomidae	0.55	0.482143	0.466667	0.314815
Orthocladiinae/Chir	0.072727	0.055556	0.244898	0.647059
%Amphipoda	0	0.071429	0.12381	0.481481
%Crustacea + %Mollusca	0.42	0.116071	0.180952	0.574074
HBI	8.89	6.589286	6.47619	7.534653
%Dominant taxon	0.28	0.294643	0.133333	0.481481
%Collector-Gatherers	0.56	0.839286	0.628571	0.657407
%Filterers	0.14	0	0	0.083333
Total taxa				
POET	1	3	5	3
Chironomidae taxa	1	5	5	3
Crustacea + Mollusca	3	5	5	3
% Chironomidae	1	1	3	1
Orthocladiinae/Chir	1	1	1	3
%Amphipoda	1	1	3	5
%Crustacea + %Mollusca	5	3	3	1
HBI	3	5	5	3
%Dominant taxon	1	5	5	3
%Collector-Gatherers	5	5	5	3
%Filterers	3	5	3	3
	1	3	3	1
	26	42	46	32
	0.433333	0.7	0.766667	0.533333
	poor	optimal	optimal	Sub-optimal

Aquatic Invertebrate Taxonomic Data

Site Name JACK CREEK **Date Collected**

Order	Family	Taxon	Count	Percent	Unique	BI	FFG
		Nematoda	1	1.41%	Yes	5	PA
		Ostracoda	2	2.82%	Yes	8	CG
		Copepoda	1	1.41%	Yes	8	CG
Amphipoda							
	Talitridae						
		Hyalella	2	2.82%	Yes	8	CG
Basommatophora							
	Lymnaeidae						
		Lymnaeidae	2	2.82%	Yes	6	SC
	Physidae						
		Physidae	8	11.27%	Yes	8	SC
	Planorbidae						
		Gyraulus	11	15.49%	Yes	8	SC
Diplostraca							
		Cladocera	1	1.41%	Yes	8	CF
Diptera							
	Ceratopogonidae						
		Ceratopogoninae	8	11.27%	Yes	6	PR
	Chironomidae						
		Ablabesmyia	2	2.82%	Yes	8	CG
		Acricotopus	6	8.45%	Yes	10	CG
		Apedilum	2	2.82%	Yes	11	CG
		Dicrotendipes	1	1.41%	Yes	8	CG
		Parachironomus	2	2.82%	Yes	10	PR
		Psectrocladius	7	9.86%	Yes	8	CG
		Pseudochironomus	3	4.23%	Yes	5	CG
		Tanytarsus	2	2.82%	Yes	6	CF
Ephemeroptera							
	Baetidae						
		Callibaetis	1	1.41%	Yes	9	CG
	Caenidae						
		Caenis	1	1.41%	Yes	7	CG
Heteroptera							
	Corixidae						
		Cenocorixa	1	1.41%	Yes	8	PR
Odonata							
	Coenagrionidae						
		Coenagrionidae	5	7.04%	Yes	7	PR
	Libellulidae						
		Libellulidae	1	1.41%	Yes	9	PR
Trichoptera							
	Leptoceridae						
		Ylodes	1	1.41%	Yes	11	SH
Grand Total			**71**				

Aquatic Invertebrate Data Summary

Project ID: MDT04LW
STORET Station ID:
Station Name: JACK CREEK

Activity ID:
Sample Date:

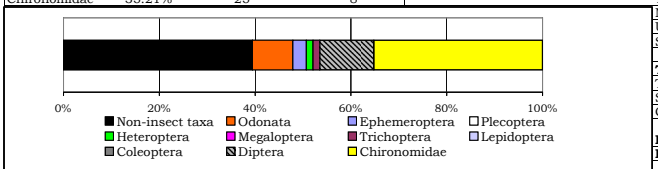
Sample type	
SUBSAMPLE TOTAL ORGANISMS	71
Portion of sample used	100.00%
Estimated number in total sample	71
Conversion factor	1.345
Estimated number in 1 square meter	95
Sampling effort	
Habitat type	
EPT abundance	3
Taxa richness	23
Number EPT taxa	3
Percent EPT	4.23%

TAXONOMIC COMPOSITION

GROUP	PERCENT	ABUNDANCE	#TAXA
Non-insect taxa	39.44%	28	8
Odonata	8.45%	6	2
Ephemeroptera	2.82%	2	2
Plecoptera	0.00%	0	0
Heteroptera	1.41%	1	1
Megaloptera	0.00%	0	0
Trichoptera	1.41%	1	1
Lepidoptera	0.00%	0	0
Coleoptera	0.00%	0	0
Diptera	11.27%	8	1
Chironomidae	35.21%	25	8

TAXONOMIC RATIOS

METRIC	VALUE
EPT/Chironomidae	0.12
Baetidae/Ephemeroptera	0.50
Hydropsychidae/Trichopt	0.00

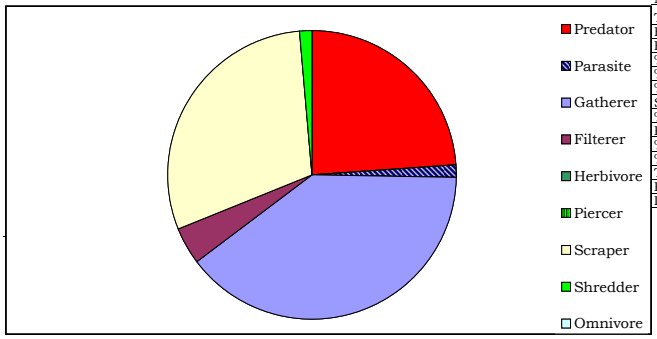


FUNCTIONAL COMPOSITION

GROUP	PERCENT	ABUNDANCE	#TAXA
Predator	23.94%	17	5
Parasite	1.41%	1	1
Gatherer	39.44%	28	11
Filterer	4.23%	3	2
Herbivore	0.00%	0	0
Piercer	0.00%	0	0
Scraper	29.58%	21	3
Shredder	1.41%	1	1
Omnivore	0.00%	0	0
Unknown	0.00%	0	0

FUNCTIONAL RATIOS

METRIC	VALUE
Scraper/Filterer	7.00
Scraper/Scraper + Filtere	0.88



COMMUNITY TOLERANCES

Sediment tolerant taxa	2
Percent sediment tolerant	18.31%
Sediment sensitive taxa	0
Percent sediment sensitive	0.00%
Metals tolerance index (McGuire)	3.31
Cold stenotherm taxa	0
Percent cold stenotherms	0.00%

HABITUS MEASURES

Hemoglobin bearer richness	3
Percent hemoglobin bearers	21.13%
Air-breather richness	0
Percent air-breathers	0.00%
Burrower richness	3
Percent burrowers	16.90%
Swimmer richness	3
Percent swimmers	4.23%

DOMINANCE

TAXON	ABUNDANCE	PERCENT
Gyraulus	11	15.49%
Physidae	8	11.27%
Ceratopogoninae	8	11.27%
Psectrocladius	7	9.86%
Acricotopus	6	8.45%
SUBTOTAL 5 DOMINANTS	40	56.34%
Coenagrionidae	5	7.04%
Pseudochironomus	3	4.23%
Lymnaeidae	2	2.82%
Ostracoda	2	2.82%
Hyalella	2	2.82%
TOTAL DOMINANTS	54	76.06%

TOLERANCE/CONDITION INDICES

Community Tolerance Quotient (CTQa)	103.50
Hilsenhoff Biotic Index	7.65

DIVERSITY

Shannon H (loge)	4.54
Shannon H (log2)	3.15
Margalef D	5.16
Simpson D	0.07
Evenness	0.14

VOLTINISM

TYPE	ABUNDANCE	# TAXA	PERCENT
Multivoltine	31	13	43.66%
Univoltine	39	9	54.93%
Semivoltine	1	1	1.41%

TAXA CHARACTERS	#TAXA	PERCENT
Tolerant	11	57.75%
Sensitive	0	0.00%
Clinger	1	2.82%

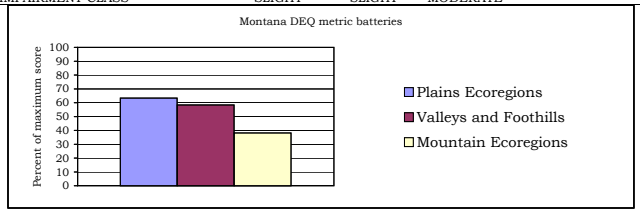
BIOASSESSMENT INDICES

B-IBI (Karr et al.)

METRIC	VALUE	SCORE
Taxa richness	23	3
E richness	2	1
P richness	0	1
T richness	1	1
Long-lived	1	1
Sensitive richness	0	1
%tolerant	57.75%	1
%predators	23.94%	5
Clinger richness	1	1
%dominance (3)	38.03%	5
	TOTAL SCORE	20 40%

MONTANA DEQ INDICES (Bukantis 1998)

METRIC	VALUE	Plains Ecoregions	Valleys and Foothills	Mountain Ecoregions
Taxa richness	23	2	2	1
EPT richness	3	1	0	0
Biotic Index	7.65	0	0	0
%Dominant taxon	15.49%	3	3	3
%Collectors	43.66%	3	3	3
%EPT	4.23%	0	0	0
Shannon Diversity	3.15	3		
%Scrapers +Shredde	30.99%	3	3	1
Predator taxa	5	2		
%Multivoltine	43.66%	2		
%H of T	0.00%		3	
TOTAL SCORES		19	14	8
PERCENT OF MAXIMUM		63.33	58.33	38.10
IMPAIRMENT CLASS		SLIGHT	SLIGHT	MODERATE



Montana Valleys and Foothills revised index (Bollman 1998)

Percent max.	22.22%	Impairment class	MODERATE

Montana Plains ecoregions metrics (Bramblett and Johnson 2002)

Riffle		*Pool*	
EPT richness	3	E richness	2
Percent EPT	4.23%	T richness	1
Percent Oligochaetes and Leeches	0.00%	Percent EPT	4.23%
Percent 2 dominants	26.76%	Percent non-insect	39.44%
Filterer richness	2	Filterer richness	2
Percent intolerant	0.00%	Univoltine richness	9
Univoltine richness	9	Percent supertolerant	69.01%
Percent clingers	2.82%		
Swimmer richness	3		