MONTANA DEPARTMENT OF TRANSPORTATION
WETLAND MITIGATION MONITORING REPORT: YEAR 2009

Jack Creek Ranch
Ennis, Montana



Prepared for:

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

Prepared by:

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820 North Montana Avenue, Suite A
Helena, MT 59601

December 2009

PBS&J Project No: 0B4308802.03.03

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MDT Project Number STPX-BR 29(37)
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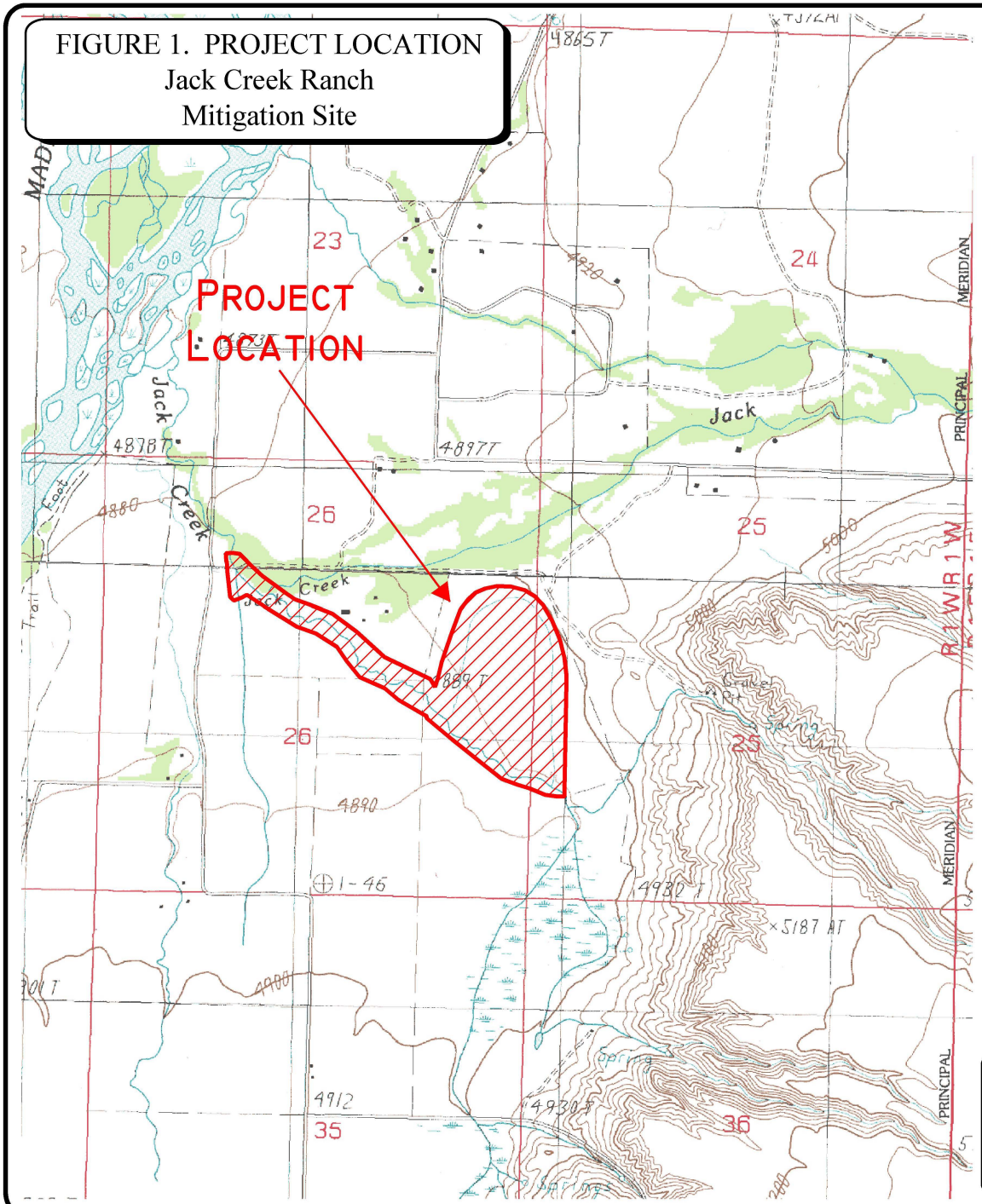
1.0 INTRODUCTION

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. The project was implemented to provide the Montana Department of Transportation's (MDT) Butte District with a wetland / stream mitigation reserve in watershed #6 (Upper Missouri River). The site is located in Madison County approximately 2.5 miles northeast of the town of Ennis in Sections 25 and 26 of Township 5 South and Range 1 West (**Figure 1**). Elevations within the assessment area range from approximately 4,889 to 4,892 feet above sea level. The surrounding land uses include livestock pastures and hay production. This annual report summarizes the methods and results of the sixth year of monitoring at the MDT Jack Creek Ranch mitigation site.

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

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

FIGURE 1. PROJECT LOCATION
Jack Creek Ranch
Mitigation Site





PROJECT #: 0B430880I
DATE: Nov 2008
LOCATION: Madison CO
PROJECT MGR: J. Berglund
DRAWN BY: B. Steinebach

PBS&J

801 N. Last Chance Gulch
Suite 101
Helena, MT 59601-3360

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

2.0 METHODS

2.1 Monitoring Dates and Activities

The site was visited on April 21, 2009 to assess the spring season avian migration use, on July 21 to assess mid-season avian migration use, and on October 14, 2009 to assess fall-season use. Assessments of vegetation, hydrology, and soils were conducted on July 21, 2009. Activities and information conducted or collected during the July 21st monitoring date included: wetland delineation; wetland/open water boundary mapping; vegetation community mapping; vegetation transect monitoring; soils evaluation; hydrology evaluation; bird and general wildlife use; photographing; macroinvertebrate sampling; functional assessment evaluation; and non-engineering maintenance inspection (**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 2009 were compared to the 1948-2009 average using data from the Ennis weather station at the Western Regional Climate Center (WRCC).

All additional hydrologic data were recorded on the Mitigation Site Monitoring Form (**Appendix B**). The boundary between emergent vegetation and open water was mapped onto the 2009 aerial photograph. There are two ground water monitoring piezometers within the wetland and stream corridor assessment areas. The ADC monitored the piezometers during wetland and stream channel construction. In 2008, an additional groundwater monitoring piezometer was placed within the lower reach of the McKee Spring Creek floodplain. Piezometer locations were mapped and water depths were recorded onto the Mitigation Site Monitoring Form (**Appendix B**).

2.3 Vegetation

General vegetation types were delineated onto the 2008 aerial photograph during the July site visit. Coverage of the dominant species in each community type was recorded onto the Wetland Mitigation Site Monitoring Form (**Appendix B**). 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 pasture.

A single 10-foot wide belt transect was established during the 2004 monitoring year to represent the range of current vegetation conditions (**Figure 2** in **Appendix A**). This transect was re-evaluated in 2009 to reflect changes in species composition and changing wetland boundaries. Percent cover for each species was estimated using the following values: + (<1%); 1 (1-5%); 2 (6-10%); 3 (11-20%); 4 (21-50%); and 5 (>50%). Transect ends were marked with metal fence posts and their locations recorded with the global positioning system (GPS) unit. Photographs of the transect were taken during the July visit.

2.4 Soils

Soils were evaluated during the mid-season visit according to the procedure outlined in the COE 1987 Wetland Delineation Manual. Soil data were recorded for each wetland determination point on the COE Routine Wetland Delineation Data Form (**Appendix B**). The 1989 *Soil Survey of Madison County* was consulted (NRCS 1989).

2.5 Wetland Delineation

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

Wetland and upland areas within the monitoring area were investigated for the presence of wetland hydrology, hydrophytic vegetation and hydric soils. The information was recorded on the COE Routine Wetland Delineation Forms **(Appendix B)**. The indicator status of vegetation was derived from the *National List of Plant Species that Occur in Wetlands: Northwest Region 9* (Reed 1988). The wetland/upland and open water boundaries were used to calculate the wetland areas developed at the Jack Creek Ranch site. A pre-construction wetland map was completed by ADC in 2002 (**Appendix D**).

2.6 Fish and Wildlife

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

2.7 Birds

Bird observations were recorded during July (mid-season) and October (fall migration) according to the established Bird Survey Protocol (**Appendix E**). During all visits, bird observations were categorized by species, activity code, general habitat and recorded onto the Bird Survey Field Data Sheet (**Appendix B**).

2.8 Macroinvertebrates

Macroinvertebrate samples were collected during the mid-season site visit at two locations (**Figure 2** in **Appendix A**). Collection occurred using the Macroinvertebrate Sampling Protocol (**Appendix F**). Samples were analyzed by Rhithron Associates, Inc. in Missoula, Montana.

2.9 Functional Assessment

In 2009, the 2008 MDT Montana Wetland Assessment Method (Berglund and McEldowney 2008) was completed for the horseshoe wetland and the middle and lower reaches of McKee Spring Creek (**Appendix B**). A pre-construction functional assessment was completed by ADC in 2002 for the Horseshoe wetland and middle reach of McKee Spring Creek using the 1999 MDT Montana Wetland Assessment Method (Berglund 1999).

2.10 Photographs

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

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

2.11 GPS Data

During the 2004 monitoring season, survey points were collected using a resource grade Trimble Geoexplorer III hand-held GPS unit. 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 at four landmarks that are recognizable on the aerial photograph and helped fit the GPS data to the topography.

In 2008, wetlands associated with the lower reach of the McKee Spring Creek were surveyed using a resource grade Magellan Mobile Mapper GPS unit. Other GPS data included the monitoring well in the lower reach of McKee Spring Creek. In 2009, all of McKee Spring Creek (upper, middle, and lower reaches) and the horseshoe wetlands were surveyed using the Magellan Mobile Mapper GPS unit. Procedures for GPS mapping and aerial photography referencing are included in **Appendix E**.

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 were made and did not constitute an engineering-level structural inspection.

3.0 RESULTS

3.1 Hydrology

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

Over the summer the water level gradually continued to rise, filling the ponds or depressions in the center of the field. During the past two years new ponded areas have developed along the west and north portion of the field. This was created by water flowing overland, pooling in areas, and flowing into the creek. A small graveled channel was created to route the overland flow to McKee Spring Creek. During the July 2009 monitoring visit, approximately 90% of the assessment area within the Horseshoe pasture was inundated with one to two inches of standing water. Wetland sites that were not inundated were saturated in the upper 12 inches of the soil profile. Frequent small pools were observed in the previous year's monitoring, but there was more surface water in 2009 and 2008 compared to the previous years. 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 mean annual precipitation calculated at the Ennis weather station was 9.04 inches from 1948 through August 2009 (WRCC 2009). For 2009, precipitation from January through August was 9.83 inches or 108% of the mean indicating that the spring and summer (through August) were wetter compared to historic precipitation.

3.2 Vegetation

Since 2004 a comprehensive plant list has been compiled for the Jack Creek Ranch Wetland Mitigation Site (**Table 1**). Plants found in 2009 were reported on the Monitoring Form (**Appendix B**). There are approximately 46 known species of wetland plants with a facultative-wet (FACW) to obligate-wet (OBL) status within the assessment area (**Table 1**).

The upland communities are decreasing in size as a result of the increase in wetland acreage within the Horseshoe pasture and along the eastern portion of McKee Spring Creek (**Figure 3** in **Appendix A**). Hydrophytic vegetation communities are increasing in size and diversity. The Jack Creek Ranch vegetation types include twelve community types: Type 1 - *Agropyron repens/Bromus inermis/Festuca arundinacea*; Type 2 - Mixed Herbaceous Wetland; Type 3 - *Typha latifolia*/*Scirpus*; Type 4 - *Hordeum jubatum*/Mixed Grass Upland; Type 5 - *Agrostis alba/Alopecurus*;Type 6 - *Typha latifolia/Eleocharis palustris*; Type 7 - *Carex/Juncus/Typha latifolia;* Type 8 - *Typha latifolia/Alopecurus pratensis*; Type 9 - *Scirpus pungens*/Mixed Herbaceous Wetland; Type 10 - *Alopecurus pratensis*/Mixed Herbaceous Wetland; Type 11 -

Table 1: ***Vegetation species observed from 2004 to 2009 at the Jack Creek Ranch Wetland Mitigation Site.***

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

[1] **Bolded** species were documented within the analysis area for the first time in 2009.

[2] Parenthesized 'Indicator Status' are based only on the biologist's experience and are not included in the *National List of Plant Species that Occur in Wetlands: Northwest (Region 9)* (Reed 1988). Indicator Status: OBL=obligate-wet; FACW=facultative-wet; FAC=facultative; FACU=facultative upland; UPL= upland; NL=not listed.

Salix exigua; and Type 12 - *Phalaris arundinacea*. Because construction was conducted during 2003, 2009 represents the sixth growing season for the project site (including the lower reach of McKee creek).

Community Type 1 occurs in the upland and consists primarily of typical pasture grasses such as quackgrass (*Agropyron repens*), smooth brome (*Bromus inermis*) and tall fescue (*Festuca arundinacea*). These areas appeared undisturbed during the wetland restoration activities. This community type is typically found in the western and northern half of the project area and represents the upland community type along McKee Spring Creek. In 2008 and 2009, portions of this community type evolved into Type 2 and or Type 10 wetland communities. Type 2 is present in areas that are developing into a more complex wetland system. Surface water was present in 2009 across most of this community. In 2006 through 2009, foxtail barley (*Hordeum jubatum*) represented a significantly lower percentage of this community type compared to 2004 and 2005. This community type represents a diverse mix of grass and grass-like species ranging from faculatative (FAC) to OBL. Species including Torrey's rush (*Juncus torreyi*), three-stamen rush (*J. ensifolius*), meadow foxtail (*Alopecurus pratensis*) and three-square bulrush (*Scirpus pungens*) are becoming increasingly more abundant. Young cattails were also observed in portions of this community type.

Type 3 consists of aquatic species, such as cattail, bulrush (*Scirpus* sp.), sedges (*Carex* spp.), and spikerush (*Eleocharis* sp.) which were common in areas of inundation. Type 4 was a transitional community with foxtail barley and a mix of primarily upland species and a few wetland species. In 2008 and 2009, this community type primarily shifted to a Type 2 or Type 10.

Type 5 occurs along most of the upper reach of the constructed McKee Spring Creek channel and includes a diverse mix of FAC, FACW and OBL species. There are very few sparsely vegetated areas along the creek channel compared to 2004. Establishment from seeded species and desirable non-seeded species has improved vegetation cover. Type 6 is a community first mapped in 2006 to include areas with a dominance of cattails and creeping spikerush. Recently these areas have developed a taller more mature stand of cattails with an understory of creeping spikerush on the new developing wetland soils. Type 7 is a community first mapped in 2007 to include areas with a dominance of sedge, rush and young cattails, this community is increasing in size as noted during the 2009 monitoring. Type 8 is a small community first mapped in 2008 to include areas with a dominance of cattails and meadow foxtail replacing portions of Type 2. Type 9 is also a small community first mapped in 2008 that represents a dominance of three-square bulrush with mixed wetland species. Other common species include creeping spikerush (*Eleocharis palustris*), Torrey's rush, beaked sedge (*Carex utriculata*), Nebraska sedge (*C. nebrascensis*) and meadow foxtail (*Alopecurus pratensis*). This community is found usually bordering or adjacent to a wetter community type such as Type 3 or Type 6.

As mentioned earlier, Type 10 is replacing areas of uplands or replaced areas previously mapped as Type 2 or Type 5. This new community represents a transition toward wetter species (FACW) with a dominance of meadow foxtail, followed by reed canarygrass, horsetail (*Equistem arvense*), three-square bulrush and Baltic rush (*J. balticus*). Type 11 -*Salix exigua* is a small scrub-shrub community near the Jack Creek and McKee spring creek confluence. This type is dominated by sandbar willow with the herbaceous layer consisting of small-fruited bulrush (*Scirpus microptera*) and reed canarygrass. Type 12 – *Phalaris arundinacea* (reed canarygrass)

is a community mapped in 2009 to include stands of this grass along the eastern edge of the project site. Due to the tall, thick cover by this grass, only a few other species such as foxtail barley, cattails and meadow foxtail were present.

The vegetation transect crosses the entire lower quarter of the project site, extending from southeast to northwest (**Figure 2** in **Appendix A**). The transect crosses eight vegetation communities and 84% of the transect is represented by wetland community types (**Table 2** and **Chart 1**). The number of hydrophytic species has increased from 25 (2004) to 31 (2009) species (**Table 2**). There has been a significant decrease in uplands along the transect (842 feet in 2004 to 190 feet in 2009) (**Chart 2**). There was a corresponding increase in wetlands (1010 feet in 2009 compared to 205 feet in 2004) (**Chart 2**).

Table 2: ***Data summary for Transect 1 at the Jack Creek Ranch Wetland Mitigation Site.***

Monitoring Year	2004	2005	2006	2007	2008	2009
Transect Length (feet)	1200	1200	1200	1200	1200	1200
# Vegetation Community Transitions along Transect	13	14	15	14	15	15
# Vegetation Communities along Transect	4	4	4	5	8	8
# Hydrophytic Vegetation Communities along Transect	3	3	2	3	7	6
Total Vegetative Species	45	44	40	39	38	36
Total Hydrophytic Species	25	31	31	31	31	31
Total Upland Species	20	13	9	8	7	6
Estimated % Total Vegetative Cover	82	90	87	84	85	92
% Transect Length Comprised of Hydrophytic Vegetation Communities	28	50	60	67.5	83	84
% Transect Length Comprised of Upland Vegetation Communities	70	48	39	32.5	17	16
% Transect Length Comprised of Unvegetated Open Water	1	1	<1	<1	<1	0
% Transect Length Comprised of Bare Substrate	1	1	<1	0	0	0

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

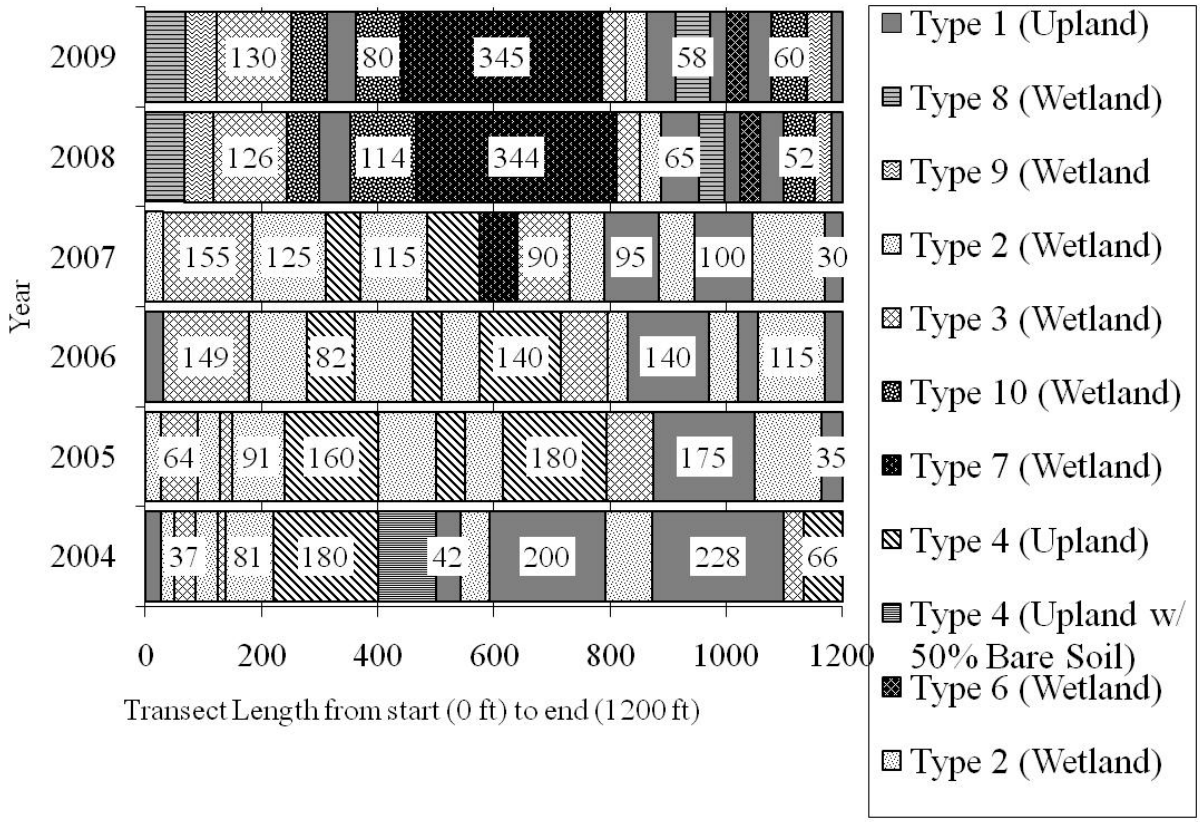
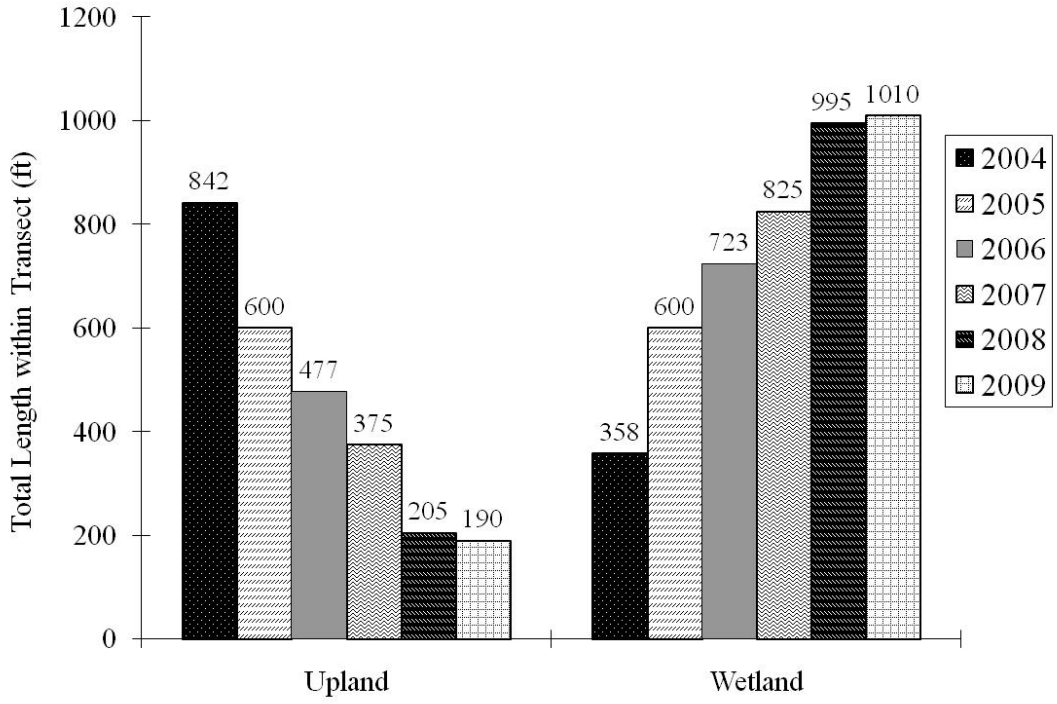


Chart 2: ***Length of vegetation communities within Transect 1 during each year monitored.***



Two State of Montana noxious weeds are present at the site: Canada thistle (*Cirsium arvense*) and hound's-tongue (*Cynoglossum officinale*). Weed spraying in 2004 and 2005 has been effective in the eradication of black henbane (*Hyoscyanus niger*) and the reduction of Canada thistle, hound's-tongue , summer cypress (*Kochia scoparia*), and Russian thistle (*Salsoli kali*). Canada thistle is still present in the central and eastern portion of the horseshoe pasture in the upland areas and along the upper reach and lower reach of the McKee Spring Creek channel. Infestation size and cover class for Canada thistle are shown on **Figure 3** (**Appendix B**). Only a few scattered plants of hound's-tongue were found near the culverts and along the road **and were not mapped onto Figure 3**. A small isolated patch of the State noxious plant, orange hawkweed (*Hieracium aurantiacum*), was found in the lower reach of the McKee creek southern floodplain in 2008 but plants were not observed in 2009.

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 plant morphology. Willow species included sandbar (*Salix exigua*), Pacific (*S. lasiandra*) and Bebb's (*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 (*Populus angustifolia*) were transplanted along the stream corridor and Horseshoe wetlands.

During the July 2009 monitoring visit, there were no viable willow cuttings observed along the stream channel (**Monitoring Form** in **Appendix B**). In 2006, approximately 25% survival was estimated during this monitoring period. Specific causes for this mortality may have included lower stream flows that reduced soil moisture/saturation along the banks, damage from wildlife (muskrats, mice, or deer), or competition from the dense floodplain vegetation; any of these reasons would have posed a problem for the sustained growth of the willow cuttings. Six live transplanted cottonwoods were counted within the floodplain during the 2009 monitoring (**Monitoring Form** in **Appendix B**). Volunteer cottonwood root suckers were observed within the floodplain. One live transplanted willow was alive along the channel. This plant was healthy with no visible insect damage compared to 2004 when grasshoppers defoliated the shrubs. In the Horseshoe pasture, only a few of the willow cuttings were alive in 2009 (1%). These few were found adjacent to flowing water and / or along channels. The overall survival of the willow cuttings has decreased since 2006, possibly due to factors such as browse from deer, unexpected water levels, and/or transplanting cuttings into saturated clay muck. No live willow shrub transplants remain in the pasture.

3.3 Soils

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

Soils were sampled at three sample points (SP-1, SP-2, and SP-3) along Transect 1. Two additional soil pits (SP-4 and SP-5) were added in 2008 along the lower reach of the McKee Spring Creek to discern upland / wetland boundaries. All soil pits revealed hydric soils (except SP-3) based on low chroma values and /or mottles. Soils at SP-1 (approximately 25 east of the eastern transect stake) were a very dark gray (10YR 3/1) silty loam from 0 to 6 inches and a very dark gray (10YR 3/1) silty clay loam from 6 to 14 inches. Soils were saturated to the surface.

SP-2 is located between community types 10 and 8, approximately 362 ft west of the eastern transect post. Soils included a grayish brown (10YR 5/2) silty clay loam from 0 to 4 inches and a dark gray (10YR 4/1) from 4 to 12 inches. Soils were saturated to the surface. SP-3 is located approximately 20 feet east of the western transect post. Soils were a grayish brown (10YR 5/2) silt loam from 0 to 5 inches and light brownish gray (10YR 6/2) silty clay from 5 to 14 inches. Soils were saturated at 8 inches. SP-4 is located along the lower reach of McKee Spring Creek, approximately 15 feet north of the channel. Soils included a dark brown (10YR 3/3) loam from 0 to 6 inches and a gray clay loam (10YR 5/1) from 6 to 14 inches. Soils were saturated at 6 inches. Soils at SP-5 were gray (10YR 5/1) clay loam with strong brown mottles (7.5YR 5/6) at 6 inches. Soils were saturated to the surface. SP-1, SP-2, SP-4 and SP-5 met the hydric soil criteria, while SP-3 did not.

3.4 Wetland Delineation

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

In 2008, per MDT's request, the monitoring area limits of 2004 to 2007 were extended to include the lower restored reach of McKee Spring Creek. The MDT and the designers had determined that the credits purchased included this area and that it was eligible for credit (Urban pers. comm.). In 2009, the gross wetland boundary was 64.21 acres and included 2.51 acres of shallow open water (<4 feet deep).

During the July field visit, approximately 75% of the upland community (Type 1) was inundated; inundation was primarily in the western quarter of the project area. Shallow surface water was observed along most of the transect and extended past the western transect stake to the western fence line. Community Type 4 has converted to wetland communities of Type 2 or Type 10. Portions of Type 3 have transitioned into wetlands dominated by sedge, three-square bulrush, or rush species. Community Type 5 is converting into wetland communities of Types 8 or 10. Wetlands bordering the middle and lower reaches of McKee spring creek are typically sedge, rush, and cattails (Type 7) transitioning to mixed wetland species (Type 2). The development of existing wetland species (seed bank), seeded species, and site planting efforts are successful in germination and establishment. The saturated soils and increased surface water noted in July are good indicators that the wetland hydrology is recovering.

3.5 Fish and Wildlife

Since 2004, a total of 50 avian, 17 mammal, four fish, and one amphibian species have been sighted within the project site (**Table 3**). Activities and densities associated with the 2009 observations are included on the **Monitoring Form**s in **Appendix B**.

Table 3: ***Fish and wildlife species observed from 2004 to 2009 at the Jack Creek Ranch Mitigation Site.***

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

Bolded species indicate those documented within the analysis area in 2009.
* Species observed by MDT and/or MFWP.

Table 3 (continued): ***Fish and wildlife species observed from 2004 to 2009 at the Jack Creek Ranch Mitigation Site.***

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

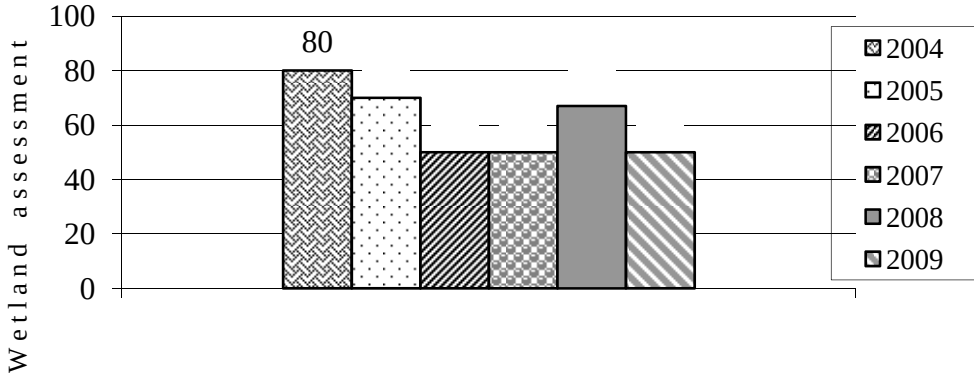
Bolded species indicate those documented within the analysis area in 2009.
* Species observed by MDT and/or MFWP.

3.6 Macroinvertebrates

Macroinvertebrate samples have been collected in shallow open water each year from 2004 through 2009. A macroinvertebrate sample was collected in the stream in 2006 for the first time and again in 2007, 2008, and 2009. The complete macroinvertebrate sampling results are provided in **Appendix F.** Rhithron Associates, Inc. has summarized the results in the italicized sections below (Bollman 2009).

> *Horseshoe Pasture. Invertebrate abundance and diversity were very low at the Jack Creek wetland site in 2009, although, faunal components remained similar to those sampled in 2008. The assemblage was dominated by the hemoglobin-bearing midge* Chironomus *sp., which accounted for 57% of the animals collected. This suggests hypoxic substrates. Warm water temperatures and increased nutrient availability may be indicated. Thermal preference of the assemblage was estimated at 17.2ºC. Similar to 2008, aquatic habitats appear to be limited to hypoxic substrates and open water. Although several of the bioassessment metrics scored well enough to produce an overall score of 50% ("sub-optimal" conditions), the scarcity of invertebrates at this site suggests moderate impairment (**Chart 3**).*

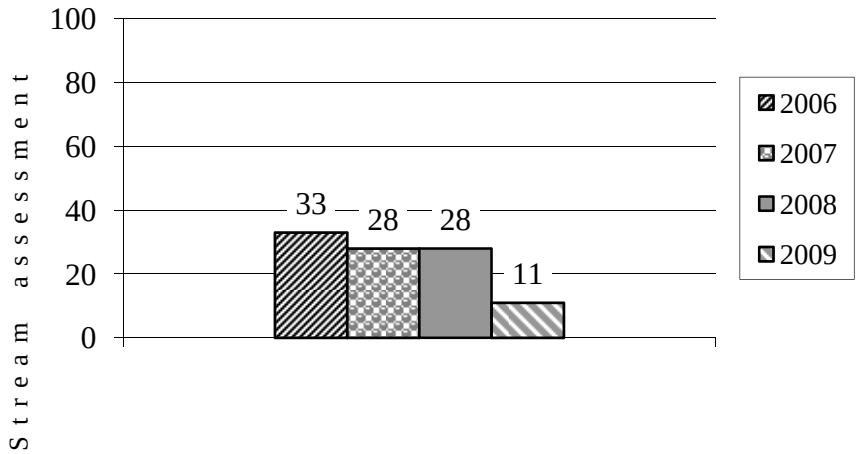
Chart 3: ***Bioassessment scores using the wetland index for the pond at the Jack Creek Ranch Wetland Mitigation Site.***



*McKee Spring Creek. Rheophilic taxa were prominent in the invertebrate assemblage at this site; scores indicated in the chart were derived by means of a metric battery and scoring criteria developed for lotic conditions (MVFP index: Bollman 1998). The scores indicate severe impairment, but it is important to note that if the spring significantly influences the flow in McKee Spring Creek, the site may not support an assemblage typical of runoff-dominated systems (**Chart 4**). The MVFP index may overestimate impairment in such a case. The sampled assemblage was dominated by midges (accounting for 62% of sampled animals) and blackflies. There were no indications of hypoxic sediments in 2009, but taxa affiliated with filamentous algae were present. The thermal preference of this assemblage was calculated to be 15.5ºC; this suggests cooler water compared to 2008.*

Recent (winter/spring 2008) upstream channel construction and associated temporary sedimentation may have contributed to reduced bioassessment scores in 2009.

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



3.7 Functional Assessment

Pre-construction functional assessments were completed for the wetlands as well as the middle and lower reach of McKee Spring Creek by ADC (2002) using the 1999 MDT Montana Wetland Assessment Method (MWAM). From 2008 to 2009, conditions were assessed using the 2008 MDT MWAM. General trends in wetland functional development can be made from comparing the 1999 and 2008 MWAMs (**Table 4**). The site remains a Category II wetland and scores 507 functional units (**Table 4**). The 2009 Functional Assessment Forms are included in **Appendix B**.

Table 4: ***Summary of 2002 and 2009 wetland function/value ratings and functional points at the Jack Creek Ranch Wetland Mitigation Project.***

Function and Value Parameters from the MDT Montana Wetland Assessment Method	Pre-construction 2002[1]	Post-construction 2009[2]
Listed/Proposed T&E Species Habitat	Low (0)	Low (0.0)
MTNHP Species Habitat	Mod (0.6)	Mod (0.5)
General Wildlife Habitat	Low (0.3)	Exc (1.0)
General Fish Habitat	Mod (0.6)	Mod (0.7)
Flood Attenuation	NA	Mod (0.5)
Short and Long Term Surface Water Storage	NA	High (0.9)
Sediment/Nutrient/Toxicant Retention and Removal	NA	High (0.9)
Sediment/Shoreline Stabilization	NA	High (1.0)
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 (0.1)
Actual Points / Possible Points	**2.7 / 9**	**7.9 / 11**
% of Possible Score Achieved	**30%**	**72%**
Overall Category	**III**	**II**
Total Acreage of Assessed Wetland / Open Water Areas within Easement	**11.40**	**64.21**
Functional Units (acreage x actual points)	**30.78**	**507.26**
Net Acreage Gain in Mitigation Area	NA	**52.81**
Approximate Functional Unit Gain in Mitigation Area	---	**476.48**

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

[2] In 2008 the assessment area was expanded to include the horseshoe wetland and the lower and middle reaches of McKee Spring Creek. The 2009 MWAM is in **Appendix B**.

3.8 Photographs

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

3.9 Maintenance Needs/Recommendations

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

The fence is not barbed; however, the bottom strand does not appear to be high enough to allow for the passage of ungulates. It is possible that snow depth would deter deer from traveling under the fence even if suspended at 18 inches.

Only two Wood Duck (*Aix sponsa*) nest boxes remain attached to the trees; the northern one is hanging askew.

The site has two State of Montana Noxious Weeds, Canada thistle and hound's-tongue. Live hound's-tongue plants were noted during the July 2009 monitoring visit within the McKee Spring Creek floodplain. Weed control efforts have been effective in reducing Canada thistle and hound's-tongue. However, Canada thistle still continues to pose the greatest problem in the transition and upland areas (**Figure 3** in **Appendix B).** Spot spraying is recommended in 2009 for Canada thistle and hound's-tongue.

3.10 Current Credit Summary

In 2008, per MDT's request, the monitoring area limits from 2004 to 2007 were extended to include the lower restored reach of McKee Spring Creek; The MDT and the designers had determined that this area was part of the credit purchase and was eligible for credit (Urban pers. comm.). In 2009, the gross wetland boundary included 64.21 acres with the addition of the lower reach of McKee Spring Creek.

MDT anticipates grossing at least 50 acres of wetland at this site (MDT 2002). The mitigation efforts have thus far resulted in 64.21 gross wetland acres or 128 percent of the goal (the 50 acre goal included the pre-existing wetlands and open water). Subtracting the original, pre-project wetland / open water acreage of 11.40 (**2002 Wetland Map** in **Appendix D**), the current net gain acreage of aquatic habitat totals 52.81 acres.

The monitoring area has gained substantive functional units since 2004 due to increase in shoreline stabilization, flood attenuation, surface water storage and gain of wetland acreage. The site is a Category II wetland and scores 507 functional units.

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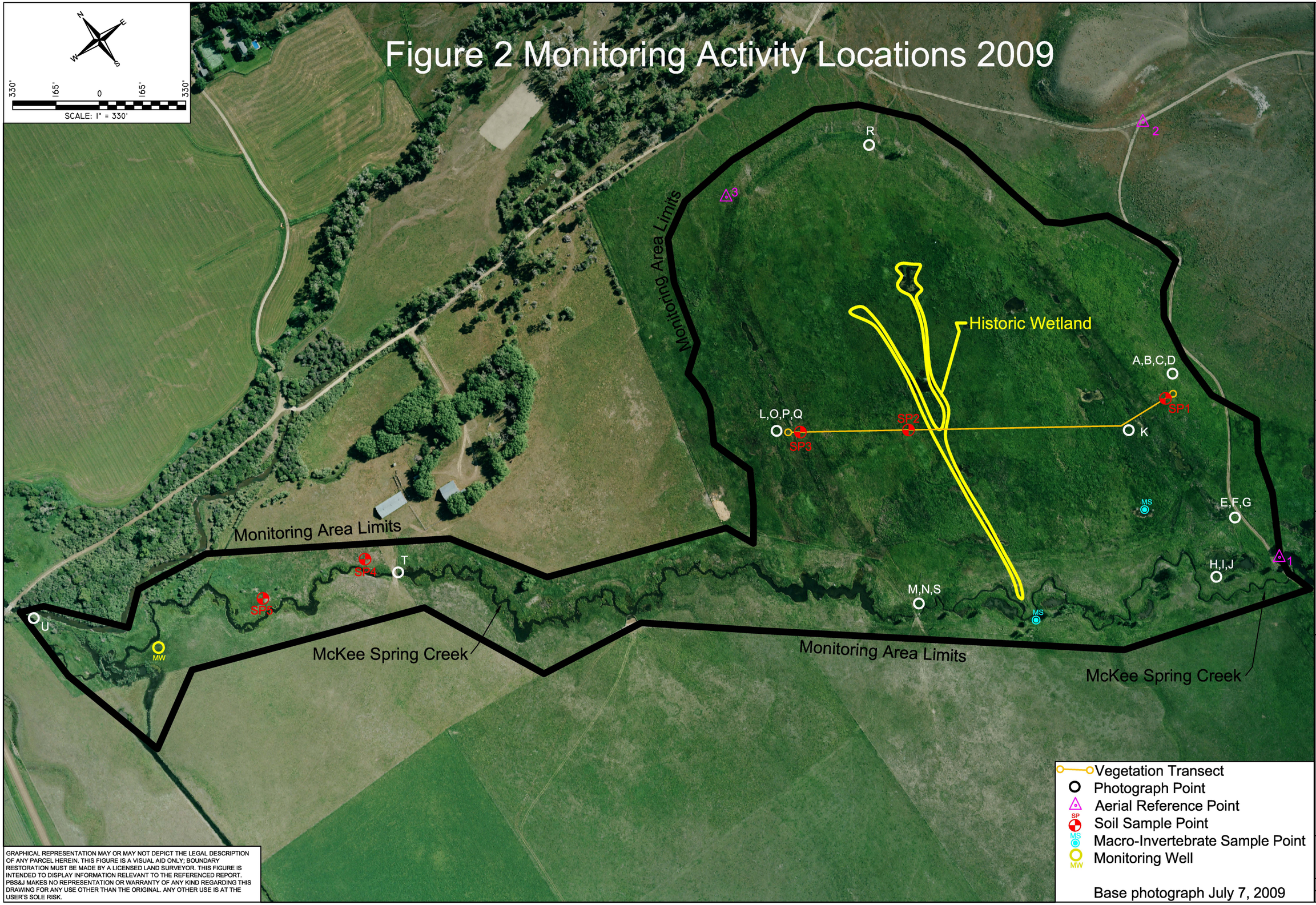
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Appendix A

FIGURES 2 & 3

MDT Wetland Mitigation Monitoring
Jack Creek Ranch
Ennis, Montana

Figure 2 Monitoring Activity Locations 2009



GRAPHICAL REPRESENTATION MAY OR MAY NOT DEPICT THE LEGAL DESCRIPTION OF ANY PARCEL HEREIN. THIS FIGURE IS A VISUAL AID ONLY; BOUNDARY RESTORATION MUST BE MADE BY A LICENSED LAND SURVEYOR. THIS FIGURE IS INTENDED TO DISPLAY INFORMATION RELEVANT TO THE REFERENCED REPORT. PBS&J MAKES NO REPRESENTATION OR WARRANTY OF ANY KIND REGARDING THIS DRAWING FOR ANY USE OTHER THAN THE ORIGINAL. ANY OTHER USE IS AT THE USER'S SOLE RISK.

PROJECT NAME
MDT JACK CREEK WETLAND MITIGATION

DRAWING TITLE
MONITORING ACTIVITY LOCATIONS 2009

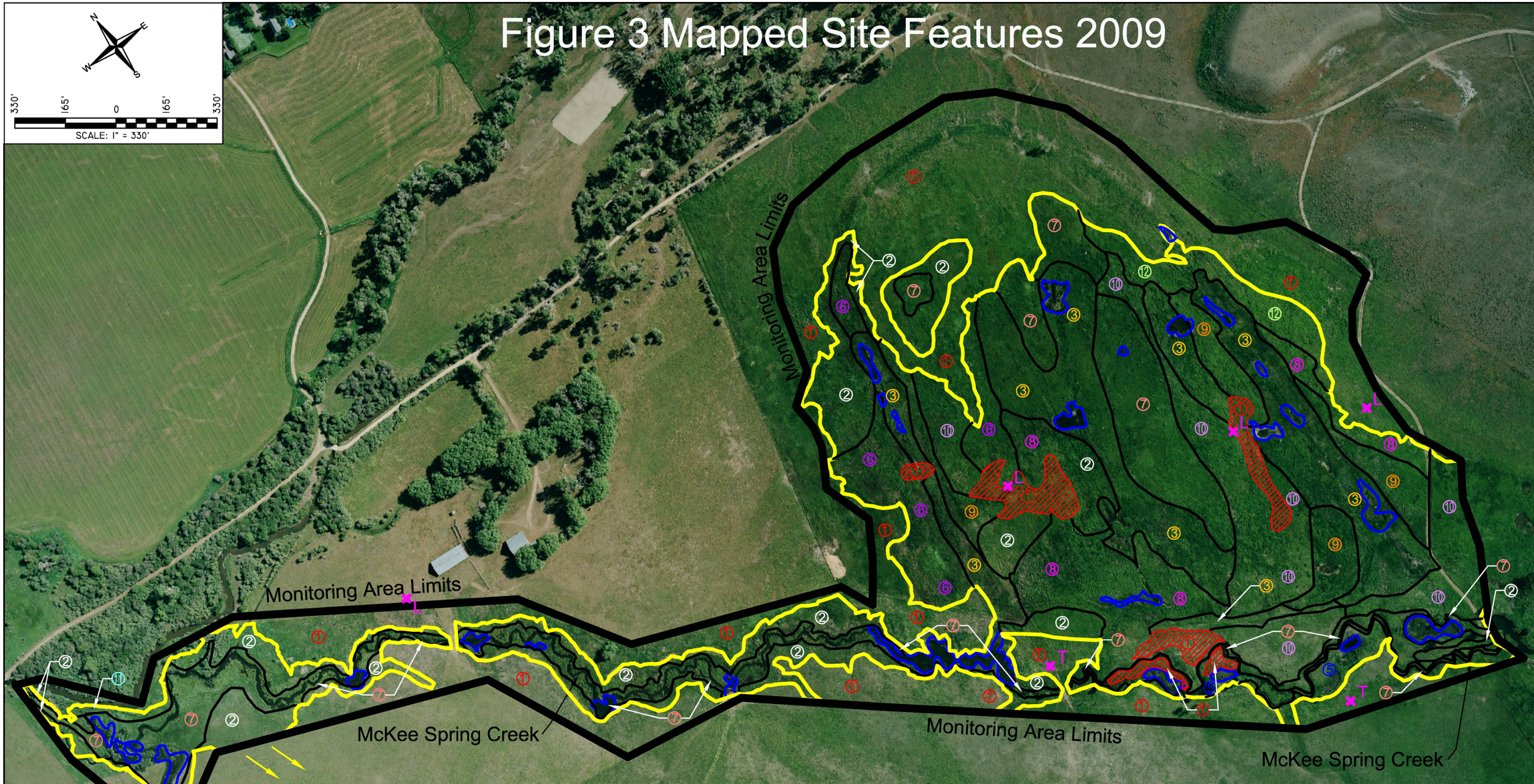
DRAWN: SH/JR
PROJ MGR: J. BERGLUND
CHECKED: CH APPV'D: JB

PROJ NO: 0B4308802 03.03
LOCATION: ENNIS, MT
SCALE: 1" = 330'
FILE NAME: BASE 2009.dwg

PBSJ
3810 Valley Commons Drive
Suite 4
Bozeman, MT 59718

FIGURE
2 OF -
REV -
Nov/24/2009

Figure 3 Mapped Site Features 2009



Legend

- Monitoring Area Limits
- Wetland Boundary
- Open Water
- Vegetation Community Boundary
- Upland

Base photograph July 7, 2009

Wetland Area

Gross Area	64.21 Acres
Historic Wetlands	11.40 Acres
Net Area	52.81 Acres

(Net includes 2.51 acres of shallow open water)

Noxious Weeds

Cirsium arvense

Infestation Size

✖ = < 0.1 acre

Cover Class

T = Trace (<1% cover)

L = Low (1-5% cover)

Vegetation Types

① Agropyron repens/Bromus inermis/Festuca arundinacea
② Mixed Herbaceous Wetland species
③ Typha latifolia/Scirpus sp.
④ Hordeum jubatum/Mixed Grass Upland
⑤ Agrostis alba/Alopecurus sp.
⑥ Typha latifolia/Eleocharis palustris
⑦ Carex sp./Juncus sp./Typha latifolia
⑧ Typha latifolia/Alopecurus pratensis
⑨ Scirpus pungens/Mixed Wetland species
⑩ Alopecurus pratensis/Mixed Wetland species
⑪ Salix exigua
⑫ Phalaris arundinacea

GRAPHICAL REPRESENTATION MAY OR MAY NOT DEPICT THE LEGAL DESCRIPTION OF ANY PARCEL HEREIN. THIS FIGURE IS A VISUAL AID ONLY; BOUNDARY RESTORATION MUST BE MADE BY A LICENSED LAND SURVEYOR. THIS FIGURE IS INTENDED TO DISPLAY INFORMATION RELEVANT TO THE REFERENCED REPORT. PBS&J MAKES NO REPRESENTATION OR WARRANTY OF ANY KIND REGARDING THIS DRAWING FOR ANY USE OTHER THAN THE ORIGINAL. ANY OTHER USE IS AT THE USER'S SOLE RISK.

PROJECT NAME
MDT JACK CREEK WETLAND MITIGATION

DRAWING TITLE
MAPPED SITE FEATURES 2009

PROJ NO: 0B4308802 03.03 | DRAWN: SH/JR
LOCATION: ENNIS, MT | PROJ MGR: J. BERGLUND
SCALE: 1" = 330' | CHECKED: CH | APPVD: JB
FILE NAME: BASE 2009.dwg

PBSJ
3810 Valley Commons Drive
Suite 4
Bozeman, MT 59718

FIGURE 3 OF

REV -
Nov/10/2009

Appendix B

2009 WETLAND MITIGATION SITE MONITORING FORM
2009 BIRD SURVEY FORMS
2009 COE WETLAND DELINEATION FORMS
2009 FUNCTIONAL ASSESSMENT FORMS

MDT Wetland Mitigation Monitoring
Jack Creek Ranch
Ennis, Montana

PBS&J / MDT WETLAND MITIGATION SITE MONITORING FORM

Project Name: **Jack Creek Ranch** Project Number: **B4308802-0303**
Assessment Date: **July 21, 2009** Person(s) conducting the assessment: **CH/PBSJ**
Location: **2.5 miles NE of Ennis** MDT District: **Butte** Milepost: _____
Legal Description: T **5N** R **1W** Section **25 & 26**
Weather Conditions: **very warm, dry, sunny** Time of Day: **8 AM**
Initial Evaluation Date: **August 12, 2004** Monitoring Year: 6 # Visits in Year: **1**
Size of evaluation area: **86 + acres** Land use surrounding wetland: **grazing/hay/residential**

HYDROLOGY

Surface Water Source: **Groundwater springs and McKee Spring Creek**
Inundation: **Present** Average Depth: **0.25 feet** Range of Depths: **0-.50 ft**
Percent of assessment area under inundation: **90%**
Depth at emergent vegetation-open water boundary: **0.25 feet**
If assessment area is not inundated then are the soils saturated within 12 inches of surface: **Yes**
Other evidence of hydrology on the site (ex. – drift lines, erosion, stained vegetation, etc.):
saturated mud flats, sediment deposits.

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

Well Number	Depth	Well Number	Depth	Well Number	Depth
NA	**10 inches**				

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

COMMENTS / PROBLEMS:
Wells are present but damaged. Unable to record groundwater depths. PVC pipes were broken or pulled out of the ground - possibly during construction or revegetation efforts. Except for the well found in the lower reach of McKee Spring Creek floodplain was monitored on July 21 2009. Water levels were recorded 10 inches below the ground surface.

VEGETATION COMMUNITIES

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

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

Comments / Problems: In 2009, most of the upland areas were inundated with the exception of the far northern quarter and southwest corner of the horseshoe. Agropyron repens and Bromun inermis are starting to yellow from the water. Noticing more Scirpus pungens encroaching into Community Type 1. Continue to see the encroachment of Alopecurus pratensis into this community type. Still some areas where weed control (Cirsium arvense) needs to be continued (south of McKee Creek and central horseshoe area).

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

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

Comments / Problems: Historically, Hordeum jubatum represented approximately 20% of the vegetation in this community. In 2006 and 2007, Hordeum jubatum is still present but represents a low percent of the total plant cover. In 2008 and 2009, very little Hordeum jubatum persists. This community is a very diverse mix of grass and grass-like species ranging from FAC to OBL. In 2009 starting to see an increase of Alopecurus pratensis in this community type. Other minor species include Juncus mertensianus, Agrostis alba, Camassia quamash, Iris missouriensis, Alopecurus arundinacea, and Mentha arvense.

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

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

Comments / Problems: This community type was typically found in areas of shallow water or around the perimeter of open water. Due to the lower water levels noted in 2007, portions of this community type are now (2009) dominated by Carex species, Scirpus pungens, Juncus species or have evolved into Community Type 7. CT 3 is still an impressive community closer along the eastern, southern and central portion of the horseshoe wetland.

VEGETATION COMMUNITIES (continued)

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

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

Comments / Problems: In 2008 and 2009, this community type has primarily shifted to CT 2 (a mix of wetland species) or CT 10 (a dominance of Alopecurus pratensis –with mixed wetland species).

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

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

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

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

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

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

VEGETATION COMMUNITIES (continued)

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

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

Comments / Problems: This is a new community added in 2007 that represents a transition to dominant species within CT 2. Typha latifolia (young plants) represents a co-dominant species in some areas with shallow water. In 2008 -2009 this community type has increased primarily bordering or adjacent to community type 3.

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

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

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

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

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

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

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

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

Comments / Problems: CT 10 is replacing areas of uplands, noting a stronger transition toward wetter species. In 2009 noted an increase in the cover of Phalaris arundinacea along the eastern boundary.

VEGETATION COMMUNITIES (continued)

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

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

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

Community Number:**12** Community Title (main spp): **Phalaris arundinacea**

Dominant Species	% Cover	Dominant Species	% Cover
Phalaris arundinacea	5 = >50%		
Hordeum jubatum	1 = 1-5%		
Alopecurus pratensis	1 = 1-5%		
Typha latifolia	1 = 1-5%		

Comments / Problems: A new community mapped in 2009 along the eastern side of the horseshoe wetland. Due to the tall, thick cover by reed canarygrass, only a few other species occupy this community type.

Additional Activities Checklist:

☒ Record and map vegetative communities on aerial photograph.

COMPREHENSIVE VEGETATION LIST

Plant Species	Vegetation Community Number (s)	Plant Species	Vegetation Community Number (s)
Agropyron dasystachyum	1	*Juncus ensifolius*	2, 3, 6, 7
Agropyron repens	1, 4	*Juncus longistylis*	2, 5
Agropyron riparium	4, 5	*Juncus mertensianus*	2, 5
Agropyron trachycaulum	1, 4, 5	*Juncus torreyi*	2, 3, 5, 6, 7, 9
Agrostis alba	1, 2, 4, 5, 10	*Kochia scoparia*	1
Alopecurus aequalis	3, 5	*Lactuca serriola*	9
Alopecurus arundinacea	1, 2, 4, 5, 6, 8, 9	*Medicago lupulina*	5
Alopecurus pratensis	1, 2, 3, 4, 5, 8, 9, 10, 12	*Melilotus alba*	1, 4
Astragalus sp.	1, 5	*Melilotus officinalis*	1
Bechmannia syzigachne	2, 3, 5`	*Mentha arvense*	2, 3, 5
Bromus inermis	1, 4	*Mimulus sp.*	2, 5
Bromus marginatus	5	*Muhlenbergia asperifolia*	2
Bromus tectorum	1	*Najas sp.*	stream
Calamagrostis canadensis	5	*Phalaris arundinacea*	1, 2, 3, 8, 10, 11, 12
Callitriche hermaphroditica	stream	*Phleum pratense*	1
Camassia quamash	2, 5	*Poa compressa*	1, 4
Carduus nutans	5	*Poa palustris*	4, 5
Carex aquatilis	2, 3, 6, 7, 9	*Poa pratensis*	1, 2, 4, 7, 8, 10
Carex lanuginosa	2, 3, 5, 7	*Polygonum amphibium*	7
Carex microptera	2, 7	*Populus angustifolia*	5
Carex nebrascensis	2, 3, 5, 7, 9	*Potentilla anserina*	2, 6, 7, 9
Carex utriculata	3, 6, 7, 9	*Puccinellia nuttalliana*	2, 3
Chenopodium album	1	*Ranunculus cymbalaria*	2, 3
Cirsium arvense	1, 2, 4, 5, 6	*Rorippa nasturtium-aquaticum*	7
Cynoglossum officinale	1, 2, 5	*Rumex crispus*	2
Dactylis glomerata	2	*Ruppia maritima*	3,8
Deschampsia cespitosa	2, 5, 7	*Salix bebbiana*	3
Distichlis spicata	2, 5	*Salix exigua*	3, 5, 11
Eleocharis acicularis	7	*Salix lasiandra*	3, 5
Eleocharis palustris	2, 3, 6, 8, 9	*Salsola kali*	1
Elymus canadensis	1, 4	*Scirpus microptera*	7, 11
Elymus cinereus	1	*Scirpus pungens*	2, 3, 5, 6, 8, 9, 10
Epilobium ciliatum	2	*Scirpus validus*	3, 7, 8
Equisetum arvense	2, 3, 4, 9, 10	*Sisymbrium altissimum*	1
Equisetum hyemale	2	*Sisymrinchium angustifoilium*	2
Festuca arundinacea	1, 2, 4, 6, 7, 10	*Solidago sp.*	2
Festuca pratensis	1, 4	*Spartina gracilis*	2
Glyceria grandis	5	*Thermopsis montana*	2
Glycyrrhiza lepidota	1, 11	*Thlaspi arvense*	1
Grindelia squarrosa	1	*Tragopogon dubuis*	1
Hieracium aurantiacum	2	*Trifolium sp.*	5
Hordeum jubatum	1, 2, 4, 5, 9,12	*Triglochin palustre*	7
Hyoscyamus niger	1	*Typha latifolia*	2, 3, 6, 7, 8, 9, 10, 12
Iris missouriensis	2	*Verbascum thapsus*	1
Juncus balticus	2, 5, 6, 7, 8, 9, 10	*Verbena hastata*	3
Juncus bufonius	2, 3, 7	*Veronica americana*	3, 9

Comments / Problems:

PLANTED WOODY VEGETATION SURVIVAL

Plant Species	Mortality Causes & General Information
McKee Spring Creek Sandbar willow cuttings Pacific willow cuttings Bebbs willow cuttings Transplanted cottonwoods Transplanted willow species Original planting number is NA.	Approximately 25 percent of the cuttings along the channel were alive in 2006. In 2007, 2008 and 2009 no live willow cuttings were found along middle reach or the lower reach of the creek. Mortality causes likely include: lower stream flows reducing soil moisture/saturation along the banks, possible damage from wildlife (muskrats, deer) or the competition from the dense floodplain vegetation posed a problem for the establishment and sustained growth of the willow cuttings. In 2009, six of the live transplanted cottonwoods (5 to 9 ft) within the floodplain are healthy and robust. Also volunteer cottonwood root suckers were observed within the floodplain (see photograph J). In 2009, one live transplanted willow remains along the channel. Willows were healthy with little insect damage compared to 2004 where grasshoppers defoliated the young plants.
Horseshoe Pasture Willow cuttings Transplanted willows	Very few live willow cuttings were noted during the 2006 field survey. In 2005 the percent survival was estimated between 20 to 25 percent based on the number of dead cuttings vs the number of live cuttings. The survival percentage in 2006 was estimated between 15 to 20 percent, a reduction from 2005, possibly due to the amount of surface water across much of the project site. Browse from deer, and the soil texture (clay - muck) may have also contributed to the poor survival of the cuttings. In 2007, the survival percentage is estimated at 7 to 10 percent. Approximately one-half of the live willows noted in last year (2006) were alive this year (2007). Surface water was present where the transplanted willows were located. In 2008, the survival percentage of the willow stakes planted within the horseshoe wetland is estimated at 5 percent. In 2006, two live (large) willow transplants were observed in the pasture. In 2007 and 2008 only one live (large) willow transplant remains. In 2009, very few of the willows stakes remain within the horseshoe wetland (1%). It is likely that in a lentic wetland system, the lack of oxygenated water through a fine-textured inundated/saturated soil profile would likely restrict the development and growth of roots from cuttings. It is also possible that the extreme heat and lower moisture levels in 2007 may have stressed the live willow stakes within the horseshoe.

Comments / Problems: _____

WILDLIFE

Birds

Were man-made nesting structures installed? **Yes**
If yes, type of structure: **birdhouse** How many? **2**
Are the nesting structures being used? **NA**
Do the nesting structures need repairs? No

Mammals and Herptiles

Mammal and Herptile Species	Number Observed	Indirect Indication of Use			
		Tracks	Scat	Burrows	Other
Muskrat	several lodges	☐	☐	☐	
White-tailed deer	20 - April; 20+ - July 50 - October	☒	☒	☐	Several age classes in one herd close to red barn and large willows
Elk	April, October	☒	☒	☐	
		☐	☐	☐	
		☐	☐	☐	
		☐	☐	☐	
		☐	☐	☐	
		☐	☐	☐	

Additional Activities Checklist:
Yes Macroinvertebrate Sampling (if required)

Comments / Problems: _____

PHOTOGRAPHS

Using a camera with a 50mm lens and color film take photographs of the following permanent reference points listed in the check list below. Record the direction of the photograph using a compass. When at the site for the first time, establish a permanent reference point by setting a ½ inch rebar or fencepost extending 2-3 feet above ground. Survey the location with a resource grade GPS and mark the location on the aerial photograph.

Photograph Checklist:

- ☒ One photograph for each of the four cardinal directions surrounding the wetland.
- ☒ At least one photograph showing upland use surrounding the wetland. If more than one upland exists then take additional photographs.
- ☒ At least one photograph showing the buffer surrounding the wetland.
- ☒ One photograph from each end of the vegetation transect, showing the transect.

Location	Photograph Frame #	Photograph Description	Compass Reading (°)
A		Transect 1- viewing wetland species moving into uplands north and east of transect.	NE
B		Transect 1 diverse wetland species have replaced foxtail barley.	West
C		Transect 1 historic mud flat - vegetated with cattails, bulrush, sedges and spikerush.	South
D		Community types 3 and 9.	North
E		At fence line – expansion of wetlands to E and S.	West
F		CT 9 on left side of road and CT 10 on the right side of the road.	NE
G		Remnants of a muskrat lodge in cattail/bulrush wetlands.	SE
H		Pond along McKee Spring Creek.	SE
I		McKee Creek and floodplain vegetation	SE
J		Cottonwood root suckers within creek floodplain.	South
K		Increased water levels in the shallow water pond.	SE
L		Inundated uplands with cattail wetlands developing in areas.	South
M		McKee Spring Creek - CT 7 immediately along the waters edge and CT5 within the floodplain.	East
N		CT 1 and healthy young trees along the southern side of McKee Creek.	SE
O		Transect 1 western stake, viewing CT 3 and CT 9.	SE
P		CT 6 and 8 developing in the northwestern portion of the horseshoe.	North
Q		Transect 1 at western stake looking east.	East
R		Buffer along far northern project boundary.	West
S		Lower reach of McKee Spring Creek.	West
T		Lower reach of McKee Spring Creek.	East
U		Above the Jack Creek confluence.	SE

Comments / Problems: _____

GPS SURVEYING

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

GPS Checklist:

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

Comments / Problems: _____

WETLAND DELINEATION

(attach COE delineation forms)

At each site conduct these checklist items:

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

Comments / Problems: **Survey was done in 2004 of the horseshoe wetland and the middle reach of McKee Spring Creek. The lower reach of the spring creek was surveyed in 2008. In 2009 the horseshoe wetland and all of McKee Spring Creek were surveyed.**

FUNCTIONAL ASSESSMENT

(Complete and attach full MDT Montana Wetland Assessment Method field forms.)
(Also attach any completed abbreviated field forms, if used)

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

MAINTENANCE

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

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

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

MDT WETLAND MONITORING – VEGETATION TRANSECT

Site: **Jack Creek Ranch** Date: **July 21, 2009** Examiner: **CH/PBSJ**
Transect Number: **1** Approximate Transect Length: **1200 feet** Compass Direction from Start: **44˚** Note: **East to west**

Vegetation Type: **CT 8 (Wetland)**	
Length of transect in this type: **70 feet**	
Plant Species	**Cover**
TYPLAT	5 = >50%
ALOPRA	3 = 11-20%
SCIPUN	2 = 6-10%
PHAARU	2 = 6-10%
SCIVAL	2 = 6-10%
ELEPAL	1 = 1-5%
ALOARU	1 = 1-5%
JUNBAL	1 = 1-5%
POAPRA	+ = <1%
PUCNUT	+ = <1%
Surface water (1 to 3 inches)	
Total Vegetative Cover:	100%

Vegetation Type: **CT 9 (Wetland)**	
Length of transect in this type: **52 feet**	
Plant Species	**Cover**
SCIPUN	5 = >50%
ELEPAL	3 = 11-20%
JUNTOR	3 = 11-20%
EPICIL	3 = 11-2%
POAPAL	2 = 6-10%
JUNBAL	1 = 1-5%
CARAQU	1 = 1-5%
TYPLAT	1 = 1-5%
Litter	3 = 11-20%
Surface water (1 to 2 inches)	
Total Vegetative Cover:	95%

Vegetation Type: **CT 3 (Wetland)**	
Length of transect in this type: **130 feet**	
Plant Species	**Cover**
TYPLAT	5 = >50%
SCIPUN	4 = 21-50%
ELEPAL	2 = 6-10%
SCIVAL	2 = 6-10%
CARNEB	1 = 1-5%
CARUTR	1 = 1-5%
EQUARV	1 = 1-5%
JUNBAL	1 = 1-5%
Surface water (pockets 3 to 6 inches)	
Total Vegetative Cover:	100%

Vegetation Type: **CT10 (Wetland)**	
Length of transect in this type: **60 feet**	
Plant Species	**Cover**
ALOPRA	5 = >50%
PHAARU	4 = 21-50%
AGRALB	2 = 6-10%
JUNBAL	1 = 1-5%
Surface water (1 to 2 inches)	
Total Vegetative Cover:	95%

MDT WETLAND MONITORING – VEGETATION TRANSECT

Site: **Jack Creek Ranch** Date: **July 21, 2009** Examiner: **CH**
Transect Number: **1** Approximate Transect Length: **1200 feet** Compass Direction from Start: **44˚** Note: **east to west**

Vegetation Type: **CT 1 (Upland)**	
Length of transect in this type: **50 feet**	
Plant Species	**Cover**
FESARU	4 = 21-50%
CIRARV	3 = 11-20%
POAPRA	3 = 11-20%
BROINE	2 = 6-10%
ALOARU	2 = 6-10%
PHAARU	1 = 1-5%
JUNBAL	+ = <1%
HORJUB	+ = <1%
Total Vegetative Cover:	95%

Vegetation Type: **CT 10 (Wetland)**	
Length of transect in this type: **80 feet**	
Plant Species	**Cover**
ALOPRA	4 = 21-50%
PHAARU	4 = 21-50%
CIRARV	2 = 6-10%
TYPLAT	1 = 1-5%
CARUTR	1 = 1=5%
EPICIL	1 = 1-5%
FESARU	1 = 1-5%
CARLAN	1 = 1-5%
Surface water(1 to 2 inches)	
Total Vegetative Cover:	95%

Vegetation Type**: CT 7 (Wetland)**	
Length of transect in this type: **345 feet**	
Plant Species	**Cover**
CARUTR	4 = 21-50%
CARLAN	3 = 11-20%
CARAQU	2 = 6-10%
ALOPRA	2 = 6-10%
JUNBAL	2 = 6-10%
DESCES	2 = 6-10%
POAPRA	2 = 6-10%
DESCAE	1 = 1-5%
PHAARU	1 = 1-5%
TYPLAT	1 = 1-5%
Surface water (1 inch)	
Total Vegetative Cover:	90%

Vegetation Type: **CT 3 (Wetland)**	
Length of transect in this type: **40 feet**	
Plant Species	**Cover**
TYPLAT	5 = >50%
SCIVAL	3 = 11-20%
JUNBAL	3 = 11-20%
CARUTR	2 = 6-10%
ALOPRA	2 = 6-10%
JUNENS	1 = 1-5%
CARAQU	1 = 1-5%
ELEACI	1 = 1-5%
Surface water (12 to 14 inches)	
Total Vegetative Cover:	90%

MDT WETLAND MONITORING – VEGETATION TRANSECT

Site: **Jack Creek Ranch** Date: **July 21, 2009** Examiner: **CH**
Transect Number: **1** Approximate Transect Length: **1200 feet** Compass Direction from Start: **44˚** Note: **east to west**

Vegetation Type : **CT 2 (Wetland)**	
Length of transect in this type: **37 feet**	
Plant Species	**Cover**
ALOPRA	4 = 21-50 %
CARSPP	4 = 21-50%
SCIPUN	3 = 11-20%
SCIVAL	1 = 1-5%
POAPRA	1 = 1-5%
FESARU	1 = 1-5%
EQUARV	1 = 1-5%
JUNBAL	1 = 1-5%
PHAARU	1 = 1-5%
Surface water (1 inch)	
Total Vegetative Cover	90%

Vegetation Type: **CT 1 (Upland)**	
Length of transect in this type: **50 feet**	
Plant Species	**Cover**
FESARU	4 = 21-50%
AGRREP	3 = 11-20%
ALOPRA	2 = 6-10%
POAPRA	2 = 6-10%
CIRARV	1 = 1-5%
HORJUB	1 = 1-5%
Surface water (1/2 to 1 inch)	
Total Vegetative Cover	80%

Vegetation Type: **CT 8 (Wetland)**	
Length of transect in this type: **58 feet**	
Plant Species	**Cover**
TYPLAT	5 = >50%
ALOPRA	3 = 11-20%
SCIVAL	2 = 6-10%
CARUTR	1 = 1-5%
JUNBAL	1 = 1-5%
JUNTOR	1 = 1-5%
POTANS	1 = 1-5%
Total Vegetative Cover:	90%

Vegetation Type: **CT 1 (Upland)**	
Length of transect in this type: **30 feet**	
Plant Species	**Cover**
FESARU	5 = >50%
POAPRA	2 = 6-10%
AGRREP	2 = 6-10%
Surface water (1 to 2 inches)	
Total Vegetative Cover:	85%

MDT WETLAND MONITORING – VEGETATION TRANSECT

Site: **Jack Creek Ranch** Date: **July 21, 2009** Examiner: **CH/LWC**
Transect Number: **1** Approximate Transect Length: **1200 feet** Compass Direction from Start: **44˚** Note: **east to west**

Vegetation Type: **CT 6 (Wetland)**	
Length of transect in this type**: 35 feet**	
Plant Species	**Cover**
TYPLAT	4 = 21-50%
ELEPAL	3 = 11-20%
JUNBAL	2 = 6-10%
ALOARU	2 = 6-10%
FESARU	1 = 1-5%
CIRARV	1 = 1-5%
POTANS	1 = 1=5%
Surface water (4 to 6 inches)	
Total Vegetative Cover:	90%

Vegetation Type: **CT 1 (Upland)**	
Length of transect in this type: **42 feet**	
Plant Species	**Cover**
AGRREP	4 = 21-50%
BROINE	4 = 21-50%
FESARU	3 = 11-20%
POAPRA	2 = 6-10%
ALOPRA	1 = 1-5%
Surface water (1 to 2 inches)	
Total Vegetative Cover:	85%

Vegetation Type: **CT 10 (Wetland)**	
Length of transect in this type: **60 feet**	
Plant Species	**Cover**
ALOPRA	5 = >50%
TYPLAT	2 = 6-10%
JUNBAL	2 = 6-10%
Total Vegetative Cover:	90%

Vegetation Type: **CT 9 (Wetland)**	
Length of transect in this type: **43 feet**	
Plant Species	**Cover**
SCIPUN	5 = >50%
ELEPAL	3 = 11-20%
CARAQU	3 = 11=20%
CARLAN	3 = 11-20%
HORJUB	1 = 1-5%
ALOPRA	1 = 1-5%
EQUARU	1 = 1-5%
LACSER	1 = 1-5%
Total Vegetative Cover:	95%

MDT WETLAND MONITORING – VEGETATION TRANSECT

Site: **Jack Creek Ranch** Date: **July 21, 2009** Examiner: **CH/LWC**
Transect Number: **1** Approximate Transect Length: **1200 feet** Compass Direction from Start: **44˚** Note: **east to west**

Vegetation Type: **CT 1 (Upland)**	
Length of transect in this type: **18 feet**	
Plant Species	**Cover**
AGRREP	4 = 21-50%
BROINE	3 = 11-20%
CIRARV	3 = 11-20%
FESARU	1 = 1-5%
POAPRA	1 = 1-5%
Total Vegetative Cover:	95%

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

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

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

MDT WETLAND MONITORING – VEGETATION TRANSECT

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

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

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

Estimate cover within a 10 foot wide "belt" along the transect length. At a minimum, establish a transect at the windward and leeward sides of the wetland. Remember that the purpose of this sampling is to monitor, not inventory, representative portions of the wetland site.

Comments: _____

BIRD SURVEY – FIELD DATA SHEET 2009

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

Bird Species	#	Behavior	Habitat	Bird Species	#	Behavior	Habitat
April 21, 2009							
Cinnamon Teal	4	F	Stream	**July 21, 2009**			
European Starling	sev	Flushed	Willows near Barn	American Robins	5	Flush, F,BR	Stream
Great Horned Owl	1	Flushed	Cottonwood near Barn	Black-billed Magpie	3	FO	MA/Stream
Mallard	20	F,L,Flush	MA/Stream	Canada Goose		L	Stream
Marsh Wren	1	BR (singing)	MA	Great Blue Heron	1	Flush	Stream
Red-tailed Hawk	1	FO	MA	Mallard	3	Flush	Stream
Red-winged Blackbird	25	BR	MA/Stream	Marsh Wren	13	BR	MA
Sandhill Crane	2	F	Stream	Red-winged blackbird	26	BR	MA/Stream
Western Meadowlark	2	BD	MA	Savannah Sparrow	30	BR	MA/Stream
Wilson's Snipe	3	BR (Display)	MA/Stream	Western Meadowark	1	BR	MA
				October 14, 2009			
				American Wigeon and Mallard mixed flock	50	F/L	Stream
				American Goldfinch	1	F	Barn
				Green-winged Teal	4	Fly-in	Stream
				Trumpeter Swan Carcass	1		Near Barn on Stream

BEHAVIOR CODES
BP = One of a breeding pair **FO** = Flyover
BD = Breeding display **L** = Loafing
F = Foraging **N** = Nesting

HABITAT CODES
AB = Aquatic bed **SS** = Scrub/Shrub **MA** = Marsh **US** = Unconsolidated shore
FO = Forested **UP** = Upland buffer **MF** = Mud Flat **OW** = Open Water
I = Island W**M** = Wet meadow

Weather: **Sunny all 3 observation days**
Notes: Stream location indicates wetland fringe along stream.

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

Project / Site: **Jack Creek Ranch**	Date: **July 21, 2009**
Applicant / Owner: **MDT**	County: **Madison**
Investigator: **CH/PBS&J**	State: **Montana**

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

VEGETATION

Dominant Species	Stratum	Indicator	Dominant Species	Stratum	Indicator
1. *PHAARU*	Herb	FACW	11.		
2. *AGRREP*	Herb	FACU	12.		
3. *HORJUB*	Herb	FAC+	13.		
4. *TYPLAT*	Herb	OBL	14.		
5. *FESARU*	Herb	FACU+	15.		
6.			16.		
7.			17.		
8.			18.		
9.			19.		
10.			20.		

Percent of Dominant Species that are OBL, FACW, or FAC (excluding FAC-): **3** / **5** = **60**%	FAC Neutral: / = %

Remarks: **Soil pit is located approximately 25 ft west of transect stake. Thick vegetation with a dominance of Phalaris arundinacea.**

HYDROLOGY

Yes Recorded Data (Describe in Remarks): **N/A** Stream, Lake, or Tide Gauge **Yes** Aerial Photographs **N/A** Other **No** No Recorded Data	Wetland Hydrology Indicators Primary Indicators: **NO** Inundated **YES** Saturated in Upper 12 Inches **NO** Water Marks **NO** Drift Lines **NO** Sediment Deposits **NO** Drainage Patterns in Wetland
Field Observations: Depth of Surface Water **None** ____ (in.) Depth to Free Water in Pit = **1** (in.) Depth to Saturated Soil = **0** (in.)	Secondary Indicators (2 or more required): **NO** Oxidized Root Channels in Upper 12 inches **NO** Water-Stained Leaves **NO** Local Soil Survey Data **NO** FAC-Neutral Test **NO** Other (Explain in Remarks)

Remarks: **Soils saturated to the surface, water in pit at 1 inch.**

SOILS

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

Profile Description

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Color(s) (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-6	A	10 YR 3/1	/ /	N/A N/A	 Silt loam
6-14	A/B	10 YR 3/1	/ /	N/A N/A	 Silty clay loam
		/	/ /	N/A N/A	
		/	/ /	N/A N/A	
		/	/ /	N/A N/A	

Hydric Soil Indicators:

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

Remarks: **low chroma values and sulfidic odor**

WETLAND DETERMINATION

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

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

Remarks: **Wetlands are expanding to the east. Reed canarygrass, meadow foxtail and foxtail barley are spreading into areas of smooth brome, quackgrass, and tall fescue.**

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

Project / Site: **Jack Creek Ranch**	Date: **July 21, 2009**
Applicant / Owner: **MDT**	County: **Madison**
Investigator: **CH/PBS&J**	State: **Montana**

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

VEGETATION

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

Percent of Dominant Species that are OBL, FACW, or FAC (excluding FAC-): **3** / **8** = **37**%	FAC Neutral: / = %
Remarks: **37% hydrophytic vegetation**	

HYDROLOGY

Yes Recorded Data (Describe in Remarks): **N/A** Stream, Lake, or Tide Gauge **Yes** Aerial Photographs **N/A** Other **No** No Recorded Data	Wetland Hydrology Indicators Primary Indicators: **NO** Inundated **YES** Saturated in Upper 12 Inches **NO** Water Marks **NO** Drift Lines **NO** Sediment Deposits **NO** Drainage Patterns in Wetland
Field Observations: Depth of Surface Water **N/A** ____ (in.) Depth to Free Water in Pit **N/A** ____ (in.) Depth to Saturated Soil = **0** (in.)	Secondary Indicators (2 or more required): **NO** Oxidized Root Channels in Upper 12 inches **NO** Water-Stained Leaves **NO** Local Soil Survey Data **NO** FAC-Neutral Test **NO** Other (Explain in Remarks)
Remarks: **In 2006, this area portion of the horsesoe was inundated. In 2007 soils were moist at 12 inches but not saturated. This year (2009) soils were saturated to the surface.**	

SOILS

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

Profile Description

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Color(s) (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-4	A	10 YR 5/2	/ /	N/A N/A	 Silty clay loam
4-12	A/B	10 YR 4/1	/ /	N/A N/A	 Silty clay
		/	/ /	N/A N/A	
		/	/ /	N/A N/A	
		/	/ /	N/A N/A	

Hydric Soil Indicators:

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

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

WETLAND DETERMINATION

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

Remarks: **More than 50% of dominant vegetation species are upland plants; it is likely this area will convert to wetland vegetation with time. Starting to see patches of wetland vegetation in this area and less quackgrass, smooth brome, and Kentucky bluegrass.**

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

Project / Site: **Jack Creek Ranch**	Date: **July 21, 2009**
Applicant / Owner: **MDT**	County: **Madison**
Investigator: **CH/PBS&J**	State: **Montana**

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

VEGETATION

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

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

Remarks: **Dominance of upland vegetation**

HYDROLOGY

Yes Recorded Data (Describe in Remarks): **N/A** Stream, Lake, or Tide Gauge **Yes** Aerial Photographs **N/A** Other **No** No Recorded Data	Wetland Hydrology Indicators Primary Indicators: **NO** Inundated **YES** Saturated in Upper 12 Inches **NO** Water Marks **NO** Drift Lines **NO** Sediment Deposits **NO** Drainage Patterns in Wetland
Field Observations: Depth of Surface Water **N/A** ____ (in.) Depth to Free Water in Pit **N/A** ____ (in.) Depth to Saturated Soil = **8** (in.)	Secondary Indicators (2 or more required): **NO** Oxidized Root Channels in Upper 12 inches **NO** Water-Stained Leaves **NO** Local Soil Survey Data **NO** FAC-Neutral Test **NO** Other (Explain in Remarks)

Remarks: **Surface water within 20 feet of the soil pit. Over the past several years, this area east and west of the transect has become increasing wet (shallow surface water).**

SOILS

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

Profile Description

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Color(s) (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-5		10 YR 5/2	/ /	N/A N/A	Silt Loam
5-14	A/B	10 YR 6/2	/ /	N/A N/A	Silty Clay
		/	/ /	N/A N/A	
		/	/ /	N/A N/A	
		/	/ /	N/A N/A	

Hydric Soil Indicators:

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

Remarks:

WETLAND DETERMINATION

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

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

Remarks:

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

Project / Site: **Jack Creek Ranch**	Date: **July 21, 2009**
Applicant / Owner: **MDT**	County: **Madison**
Investigator: **CH/PBS&J**	State: **Montana**

Do Normal Circumstances exist on the site? **Yes** Is the site significantly disturbed (Atypical Situation)? **No** Is the area a potential Problem Area? **No** (If needed, explain on reverse side)	Community ID: **Upland** Transect ID: _____ Plot ID: **SP-4**

VEGETATION

Dominant Species	Stratum	Indicator	Dominant Species	Stratum	Indicator
1. *AGRREP*	Herb	FACU-	11.		
2. *POAPAL*	Herb	FAC	12.		
3. *ALOARU*	Herb	NI	13.		
4. *SCIPUN*	Herb	OBL	14.		
5. *CIRARV*	Herb	FACU+	15.		
6.			16.		
7.			17.		
8.			18.		
9.			19.		
10.			20.		
Percent of Dominant Species that are OBL, FACW, or FAC (excluding FAC-): **2** / **5** = **40**%			FAC Neutral: / = %		
Remarks: **40% hydrophytic vegetation**					

HYDROLOGY

Yes Recorded Data (Describe in Remarks): **N/A** Stream, Lake, or Tide Gauge **Yes** Aerial Photographs **N/A** Other **No** No Recorded Data	Wetland Hydrology Indicators Primary Indicators: **NO** Inundated **YES** Saturated in Upper 12 Inches **NO** Water Marks **NO** Drift Lines **NO** Sediment Deposits **NO** Drainage Patterns in Wetland
Field Observations: Depth of Surface Water **N/A** ____ (in.) Depth to Free Water in Pit **N/A** ____ (in.) Depth to Saturated Soil = **6** (in.)	Secondary Indicators (2 or more required): **NO** Oxidized Root Channels in Upper 12 inches **NO** Water-Stained Leaves **NO** Local Soil Survey Data **NO** FAC-Neutral Test **NO** Other (Explain in Remarks)
Remarks: **Soil pit located approximately 15 ft north of McKee creek channel.**	

SOILS

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

Profile Description

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Color(s) (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-6	A	10 YR 3/3	/ /	N/A N/A	Loam
6-14	A/B	10 YR 5/1	7.5 YR 4/6 /	Common Distinct	Clay Loam
		/	/ /	N/A N/A	
		/	/ /	N/A N/A	
		/	/ /	N/A N/A	

Hydric Soil Indicators:

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

Remarks: **low chroma values and mottles**

WETLAND DETERMINATION

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

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

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

Project / Site: **Jack Creek Ranch**	Date: **July 21, 2009**
Applicant / Owner: **MDT**	County: **Madison**
Investigator: **CH/PBS&J**	State: **Montana**

Do Normal Circumstances exist on the site? **Yes** Is the site significantly disturbed (Atypical Situation)? **No** Is the area a potential Problem Area? **No** (If needed, explain on reverse side)	Community ID: **Wetland** Transect ID: ____ Plot ID: **SP-5**

VEGETATION

Dominant Species	Stratum	Indicator	Dominant Species	Stratum	Indicator
1. *SCIPUN*	Herb	OBL	11.		
2. *CARAQU*	Herb	OBL	12.		
3. *GLYELA*	Herb	FACW+	13.		
4. *CARMIC*	Herb	FAC	14.		
5. *JUNBAL*	Herb	OBL	15.		
6. *CARNEB*	Herb	OBL	16.		
7. *POTANS*	Herb	OBL	17.		
8. *ALOPRA*	Herb	FACW	18.		
9. *POAPRA*	Herb	FACU+	19.		
10.			20.		

Percent of Dominant Species that are OBL, FACW, or FAC (excluding FAC-): **8** / **9** = **89**%	FAC Neutral: / = %
Remarks: **89% hydrophytic vegetation**	

HYDROLOGY

Yes Recorded Data (Describe in Remarks): **N/A** Stream, Lake, or Tide Gauge **Yes** Aerial Photographs **N/A** Other **No** No Recorded Data	Wetland Hydrology Indicators Primary Indicators: **NO** Inundated **YES** Saturated in Upper 12 Inches **NO** Water Marks **NO** Drift Lines **NO** Sediment Deposits **NO** Drainage Patterns in Wetland
Field Observations: Depth of Surface Water **N/A** ____ (in.) Depth to Free Water in Pit **N/A** ____ (in.) Depth to Saturated Soil = **0** (in.)	Secondary Indicators (2 or more required): **NO** Oxidized Root Channels in Upper 12 inches **NO** Water-Stained Leaves **NO** Local Soil Survey Data **NO** FAC-Neutral Test **NO** Other (Explain in Remarks)
Remarks: **Soil pit located approximately 50 feet south of channel. Low floodplain, soils saturated to the surface.**	

SOILS

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

Profile Description

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Color(s) (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-14	A	10 YR 5/1	7.5 YR 5/6	Common	
			/	Distinct	Clay loam
		/	/	N/A	
			/	N/A	
		/	/	N/A	
			/	N/A	
		/	/	N/A	
			/	N/A	
		/	/	N/A	
			/	N/A	

Hydric Soil Indicators:

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

Remarks: **low chroma values and at 6 inches mottles**

WETLAND DETERMINATION

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

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

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

MDT MONTANA WETLAND ASSESSMENT FORM (revised March 2008)

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

3. Evaluation Date: 7/21/09 **4. Evaluator(s):** CH (PBS&J) **5. Wetland/Site #(s):** Jack Creek Ranch

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

Approximate Stationing or Roadposts: _____

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

7. Evaluating Agency: PBS&J

Purpose of Evaluation:

- ☐ **Wetland potentially affected by MDT project**
- ☐ **Mitigation wetlands; pre-construction**
- ☒ **Mitigation wetlands; post-construction**
- ☐ **Other** _____

8. Wetland Size (acre): _____ (visually estimated)
61.7 (measured, e.g. GPS)

9. Assessment Area (AA) Size (acre): _____ (visually estimated)
(see manual for determining AA) 64.21 (measured, e.g. GPS)

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

HGM Class (Brinson)	Class (Cowardin)	Modifier (Cowardin)	Water Regime	% OF AA
Depressional	Emergent Wetland		Seasonal / Intermittent	75
Riverine	Unconsolidated Bottom	Excavated	Permanent / Perennial	20
Depressional	Scrub-Shrub Wetland		Permanent / Perennial	5

Comments: _____

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

12. GENERAL CONDITION OF AA

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

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

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

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

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

13. STRUCTURAL DIVERSITY (Based on number of "Cowardin" ***vegetated*** classes present [do not include unvegetated classes]; see #10 above.)

Existing # of "Cowardin" Vegetated Classes in AA	Initial Rating	Is current management preventing (passive) existence of additional vegetated classes?		Modified Rating
≥3 (or 2 if one is forested) classes	---	NA	NA	NA
2 (or 1 if forested) classes	mod	NA	NA	NA
1 class, but not a monoculture	---	←NO	YES→	---
1 class, monoculture (1 species comprises ≥90% of total cover)	---	NA	NA	NA

Comments: PEM, PSS and scattered cottonwood and willows. .

Wetland/Site #(s): Jack Creek Ranch

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

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

Primary or critical habitat (**list species**) ☐ D ☐ S _____
Secondary habitat (**list species**) ☐ D ☐ S _____
Incidental habitat (**list species**) ☐ D ☐ S _____
No usable habitat ☐ S

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

Highest Habitat Level	Doc/Primary	Sus/Primary	Doc/Secondary	Sus/Secondary	Doc/Incidental	Sus/Incidental	None
Functional Point/Rating	---	---	---	---	---	---	0L

Sources for documented use (e.g. observations, records): Gray wolves now delisted

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

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

Primary or critical habitat (**list species**) ☐ D ☐ S _____
Secondary habitat (**list species**) ☐ D ☒ S Peregrine falcon
Incidental habitat (**list species**) ☐ D ☒ S Arctic grayling, bald eagle (S3)
No usable habitat ☐ S

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

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

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

14C. GENERAL WILDLIFE HABITAT RATING

i. Evidence of Overall Wildlife Use in the AA: Check substantial, moderate, or low based on supporting evidence.

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

☐ ***Minimal:*** Based on any of the following [check].
☐ few or no wildlife observations during peak use periods
☐ little to no wildlife sign
☐ sparse adjacent upland food sources
☐ interview with local biologist with knowledge of AA

☐ ***Moderate:*** Based on any of the following [check].
☐ observations of scattered wildlife groups or individuals or relatively few species during peak periods
☐ common occurrence of wildlife sign such as scat, tracks, nest structures, game trails, etc.
☐ adequate adjacent upland food sources
☐ interview with local biologist with knowledge of the AA

ii. Wildlife Habitat Features: Working from top to bottom, check appropriate AA attributes in matrix to arrive at rating. Structural diversity is from #13. For class cover to be considered evenly distributed, the most and least prevalent **vegetated** classes must be within 20% of each other in terms of their percent composition of the AA (see #10). Abbreviations for surface water durations are as follows: P/P = permanent/perennial; S/I = seasonal/intermittent; T/E = temporary/ephemeral; and A = absent [see manual for further definitions of these terms].

Structural Diversity (see #13)	☐ **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 #12i)	---	---	---	---	---	---	---	---	E	---	---	---	---	---	---	---	---	---	---	---
☐ **Moderate Disturbance** at AA (see #12i)	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
☐ **High Disturbance** at AA (see #12i)	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

iii. Rating: Use the conclusions from i and ii above and the matrix below to select the functional point and rating.

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

Comments: .

Wetland/Site #(s): Jack Creek Ranch

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

If the AA is not used by fish, fish use is not restorable due to habitat constraints, or is not desired from a management perspective [such as fish entrapped in a canal], then check the NA box and proceed to 14E.

Assess this function if the AA is used by fish or the existing situation is "correctable" such that the AA could be used by fish [i.e., fish use is precluded by perched culvert or other barrier].

Type of Fishery: ☒ Cold Water (**CW**) ☐ Warm Water (**WW**) **Use the CW or WW guidelines in the manual to complete the matrix.**

i. Habitat Quality and Known / Suspected Fish Species in AA: Use matrix to select the functional point and rating.

Duration of Surface Water in AA	☒ **Permanent / Perennial**						☐ **Seasonal / Intermittent**						☐ **Temporary / Ephemeral**					
Aquatic Hiding / Resting / Escape Cover	☐ **Optimal**		☒ **Adequate**		☐ **Poor**		☐ **Optimal**		☐ **Adequate**		☐ **Poor**		☐ **Optimal**		☐ **Adequate**		☐ **Poor**	
Thermal Cover: optimal / suboptimal	**O**	**S**	**O**	**S**	**O**	**S**	**O**	**S**	**O**	**S**	**O**	**S**	**O**	**S**	**O**	**S**	**O**	**S**
FWP Tier I fish species	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
FWP Tier II or **Native Game** fish species	---	---	.7M	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
FWP Tier III or **Introduced Game** fish	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
FWP Non-Game Tier IV or **No** fish species	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

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

ii. Modified Rating: NOTE: Modified score cannot exceed 1.0 or be less than 0.1.

a) Is fish use of the AA significantly reduced by a culvert, dike, or other man-made structure or activity, ***or*** *is the waterbody included on the current final MDEQ list of waterbodies in need of TMDL development with listed "Probable Impaired Uses" including cold or warm water fishery or aquatic life support,* ***or*** *do aquatic nuisance plant or animal species (see* ***Appendix E****) occur in fish habitat?* ☐ **YES**, reduce score in **i** by 0.1 = __ or ☒ **N0**

b) Does the AA contain a documented spawning area or other critical habitat feature (i.e., sanctuary pool, upwelling area; specify in comments) for native fish or introduced game fish? ☐ **YES**, add to score in **i** or **iia** 0.1 = __ or ☒ **N0**

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

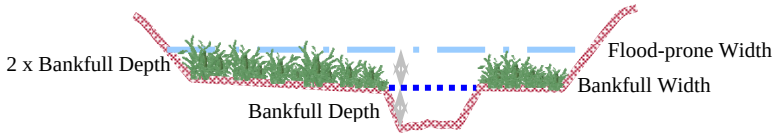
14E. FLOOD ATTENUATION ☐ **NA** (proceed to 14F)

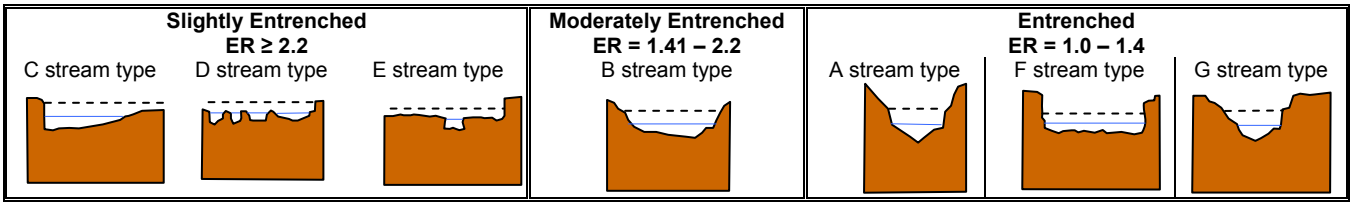
Applies only to wetlands that are subject to flooding via in-channel or overbank flow.
If wetlands in AA are not flooded from in-channel or overbank flow, check the NA box and proceed to 14F.

Entrenchment Ratio (ER) Estimation (see manual for additional guidance). Entrenchment ratio = (flood-prone width) / (bankfull width).
Flood-prone width = estimated horizontal projection of where 2 X maximum bankfull depth elevation intersects the floodplain on each side of the stream.

_____ / _____ = _____

flood prone width / bankfull width = entrenchment ratio





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

Estimated or Calculated Entrenchment (Rosgen 1994, 1996)	☒ Slightly Entrenched C, D, E stream types			☐ Moderately Entrenched B stream type			☐ Entrenched A, F, G stream types		
Percent of Flooded Wetland Classified as Forested and/or Scrub/Shrub	☐ 75%	☐ 25-75%	☒ <25%	☐ 75%	☐ 25-75%	☐ <25%	☐ 75%	☐ 25-75%	☐ <25%
AA contains **no outlet or restricted outlet**	---	---	---	---	---	---	---	---	---
AA contains **unrestricted outlet**	---	---	.5M	---	---	---	---	---	---

ii. Are ≥10 acres of wetland in the AA subject to flooding AND are man-made features which may be significantly damaged by floods located within 0.5 mile downstream of the AA? ☐ YES ☒ NO **Comments:** _____

Wetland/Site #(s): Jack Creek Ranch

14F. SHORT AND LONG TERM SURFACE WATER STORAGE ☐ **NA** (proceed to 14G)

Applies to wetlands that flood or pond from overbank or in-channel flow, precipitation, upland surface flow, or groundwater flow.
If no wetlands in the AA are subject to flooding or ponding, then check the NA box and proceed to 14G.

i. Rating: Working from top to bottom, use the matrix below to select the functional point and rating. Abbreviations for surface water durations are as follows: P/P = permanent/perennial; S/I = seasonal/intermittent; and T/E = temporary/ephemeral [see manual for further definitions of these terms].

Estimated Maximum Acre Feet of Water Contained in Wetlands within the AA that are Subject to Periodic Flooding or Ponding	**☒ >5 acre feet**			**☐ 1.1 to 5 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**	---	.9H	---	---	---	---	---	---	---
Wetlands in AA flood or pond **< 5 out of 10 years**	---	---	---	---	---	---	---	---	---

Comments: _____

14G. SEDIMENT / NUTRIENT / TOXICANT / RETENTION AND REMOVAL ☐ **NA** (proceed to 14H)

Applies to wetland with potential to receive sediments, nutrients, or toxicants through influx of surface or ground water or direct input.
If no wetlands in the AA are subject to such input, check the NA box and proceed to 14H.

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

Sediment, Nutrient, and Toxicant Input Levels within AA	**AA receives or surrounding land use has potential to deliver sediments, nutrients, or compounds at levels such that other functions are not substantially impaired. Minor sedimentation, sources of nutrients or toxicants, or signs of eutrophication present.**				**Waterbody is on MDEQ list of waterbodies in need of TMDL development for "probable causes" related to sediment, nutrients, or toxicants or AA receives or surrounding land use has potential to deliver high levels of sediments, nutrients, or compounds such that other functions are substantially impaired. Major sedimentation, sources of nutrients or toxicants, or signs of eutrophication present.**			
% Cover of Wetland Vegetation in AA	**☒ ≥ 70%**		**☐ < 70%**		**☐ ≥ 70%**		**☐ < 70%**	
Evidence of Flooding / Ponding in AA	**☒ Yes**	**☐ No**	**☐ Yes**	**☐ No**	**☐ Yes**	**☐ No**	**☐ Yes**	**☐ No**
AA contains **no or restricted outlet**	---	---	---	---	---	---	---	---
AA contains **unrestricted outlet**	.9H	---	---	---	---	---	---	---

Comments: _____

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

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

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

Comments: Shoreline vegetation continues to become establhished.

14I. PRODUCTION EXPORT / FOOD CHAIN SUPPORT

i. Level of Biological Activity: Synthesis of wildlife and fish habitat rates (select).

General Fish Habitat Rating (14Diii)	**General Wildlife Habitat Rating (14Ciii)**		
	☒ E/H	**☐ M**	**☐ L**
☐ E/H	---	---	---
☒ M	H	---	---
☐ L	---	---	---
☐ NA	---	---	---

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

A	**☒ Vegetated Component >5 acres**						**☐ Vegetated Component 1-5 acres**						**☐ Vegetated Component <1 acre**					
B	**☐ High**		**☒ Moderate**		**☐ Low**		**☐ High**		**☐ Moderate**		**☐ Low**		**☐ High**		**☐ Moderate**		**☐ Low**	
C	**Yes**	**No**	**Yes**	**No**	**Yes**	**No**	**Yes**	**No**	**Yes**	**No**	**Yes**	**No**	**Yes**	**No**	**Yes**	**No**	**Yes**	**No**
P/P	---	---	.8H	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
S/I	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
T/E/A	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

Wetland/Site #(s): Jack Creek Ranch

14I. PRODUCTION EXPORT / FOOD CHAIN SUPPORT (continued)

iii. Modified Rating: Note: Modified score cannot exceed 1.0 or be less than 0.1.

Vegetated Upland Buffer: Area with ≥ 30% plant cover, ≤ 15% noxious weed or ANVS cover, AND that is not subjected to periodic mechanical mowing or clearing (unless for weed control).
Is there an average ≥ 50-foot wide vegetated upland buffer around ≥ 75% of the AA's perimeter? ☒ **YES**, add 0.1 to score in **ii** = 0.90 ☐ **NO**

iv. Final Score and Rating: .9H **Comments:** _____

14J. GROUNDWATER DISCHARGE / RECHARGE
Check the appropriate indicators in i and ii below.

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

ii. Recharge Indicators
- ☐ Permeable substrate present without underlying impeding layer.
- ☐ Wetland contains inlet but no outlet.
- ☐ Stream is a known 'losing' stream. Discharge volume decreases.
- ☐ Other: _____

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

Criteria	Duration of Saturation at AA Wetlands ***FROM GROUNDWATER DISCHARGE*** or ***WITH WATER THAT IS RECHARGING THE GROUNDWATER SYSTEM***			
	☒ **P/P**	☐ **S/I**	☐ **T**	☐ **None**
☒ **Groundwater Discharge or Recharge**	1H	---	---	---
☐ **Insufficient Data/Information**	---			

Comments: _____

14K. UNIQUENESS

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

Replacement Potential	**AA contains fen, bog, warm springs or mature (>80 yr-old) forested wetland** OR **plant association listed as "S1" by the MTNHP**			**AA does not contain previously cited rare types** AND **structural diversity (#13) is high** OR **contains plant association listed as "S2" by the MTNHP**			**AA does not contain previously cited rare types** OR **associations** AND **structural diversity (#13) is low-moderate**		
Estimated Relative Abundance (#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: The site currently has a low level of disturbance.

14L. RECREATION / EDUCATION POTENTIAL ☐ NA (proceed to Overall Summary and Rating page)
Affords 'bonus' points if AA provides a recreational or educational opportunity.

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

ii. Check categories that apply to the AA: ☐ Educational/Scientific Study ☒ Consumptive Recreational ☐ Non-consumptive recreational
☐ Other: _____

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

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

Comments: wetland is located within an active cattle ranch.

15. GENERAL SITE NOTES: _____

Wetland/Site #(s): Jack Creek Ranch

Function & Value Variables	Rating – Actual Functional Points	Possible Functional Points	Functional Units: Actual Points x Estimated AA Acreage	Indicate the Four Most Prominent Functions with an Asterisk
A. Listed / Proposed T&E Species Habitat	low 0.00	1.00		
B. MT Natural Heritage Program Species Habitat	mod 0.50	1.00		
C. General Wildlife Habitat	exc 1.00	1.00		*
D. General Fish Habitat	mod 0.70	1.00		
E. Flood Attenuation	mod 0.50	1.00		
F. Short and Long Term Surface Water Storage	high 0.90	1.00		*
G. Sediment / Nutrient / Toxicant Removal	high 0.90	1.00		
H. Sediment / Shoreline Stabilization	high 1.00	1.00		*
I. Production Export / Food Chain Support	high 0.90	1.00		
J. Groundwater Discharge / Recharge	high 1.00	1.00		*
K. Uniqueness	mod 0.40	1.00		
L. Recreation / Education Potential (bonus point)	mod 0.10			
Total Points	**7.9**	**11**	**507.26 Total Functional Units**	
Percent of Possible Score 72% (round to nearest whole number)				

Category I Wetland: (must satisfy **one** of the following criteria; otherwise go to Category II)
- ☐ Score of 1 functional point for Listed/Proposed Threatened or Endangered Species; **or**
- ☐ Score of 1 functional point for Uniqueness; **or**
- ☐ Score of 1 functional point for Flood Attenuation **and** answer to Question 14E.ii is "yes"; **or**
- ☐ Percent of possible score > 80% (round to nearest whole #).

Category II Wetland: (Criteria for Category I not satisfied **and** meets any **one** of the following criteria; otherwise go to Category IV)
- ☐ Score of 1 functional point for MT Natural Heritage Program Species Habitat; **or**
- ☒ Score of .9 or 1 functional point for General Wildlife Habitat; **or**
- ☐ Score of .9 or 1 functional point for General Fish Habitat; **or**
- ☐ "High" to "Exceptional" ratings for **both** General Wildlife Habitat **and** General Fish/Aquatic Habitat; **or**
- ☐ Score of .9 functional point for Uniqueness; **or**
- ☒ Percent of possible score > 65% (round to nearest whole #).

☐ **Category III Wetland:** (Criteria for Categories I, II, or IV not satisfied)

Category IV Wetland: (Criteria for Categories I or II are not satisfied and all of the following criteria are met; if not go to Category III)
- ☐ "Low" rating for Uniqueness; **and**
- ☐ Vegetated wetland component < 1 acre (do not include upland vegetated buffer); **and**
- ☐ Percent of possible score < 35% (round to nearest whole #).

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

☐ **I** ☒ **II** ☐ **III** ☐ **IV**

Appendix C

2009 REPRESENTATIVE PHOTOGRAPHS

MDT Wetland Mitigation Monitoring
Jack Creek Ranch
Ennis, Montana

JACK CREEK RANCH WETLAND MITIGATION SITE 2009



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



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



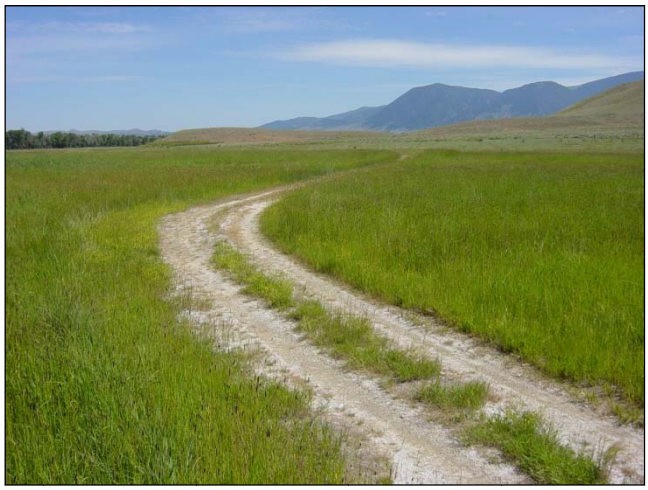
Location C: Transect 1 historic mud flat vegetated with cattails, bulrush, sedges and spikerush. **Compass Reading**: South



Location D: Community types 3 and 9. **Compass Reading**: North



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



Location F: Community type 9 on left side and community type 10 on right side of the road. **Compass Reading**: Northeast

JACK CREEK RANCH WETLAND MITIGATION SITE 2009



Location G. Remnants of a muskrat lodge in cattails /bulrush wetlands created by low head berm. **Reading**: Southeast



Location H: Pond along McKee Spring Creek**.** Water levels approximately 6 inches higher in 2008 and 2009 compared to 2007. **Compass Reading:** Southeast



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



Location J: Cottonwood seedlings spreading within the McKee Spring Creek floodplain. **Compass Reading:** South



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



Location L. Inundated uplands with cattails wetlands developing in areas. **Compass Reading**: North



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



Location N. CT 1 and healthy young trees thrive along the south side of McKee Spring Creek.
Compass Reading: Southeast



Location O. Transect 1 western stake, viewing CT 3 and CT 9. **Compass Reading**: Southeast



Location P: CT 6 and CT 8 developing in the north western portion of the Horseshoe. **Compass Reading**: North



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



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



Location S: Lower reach of the McKee Spring Creek. Photo taken at the fence. **Compass Reading**: West



Location T: Lower reach of the McKee Spring Creek. Photo taken at the bridge crossing. **Compass Reading**: East

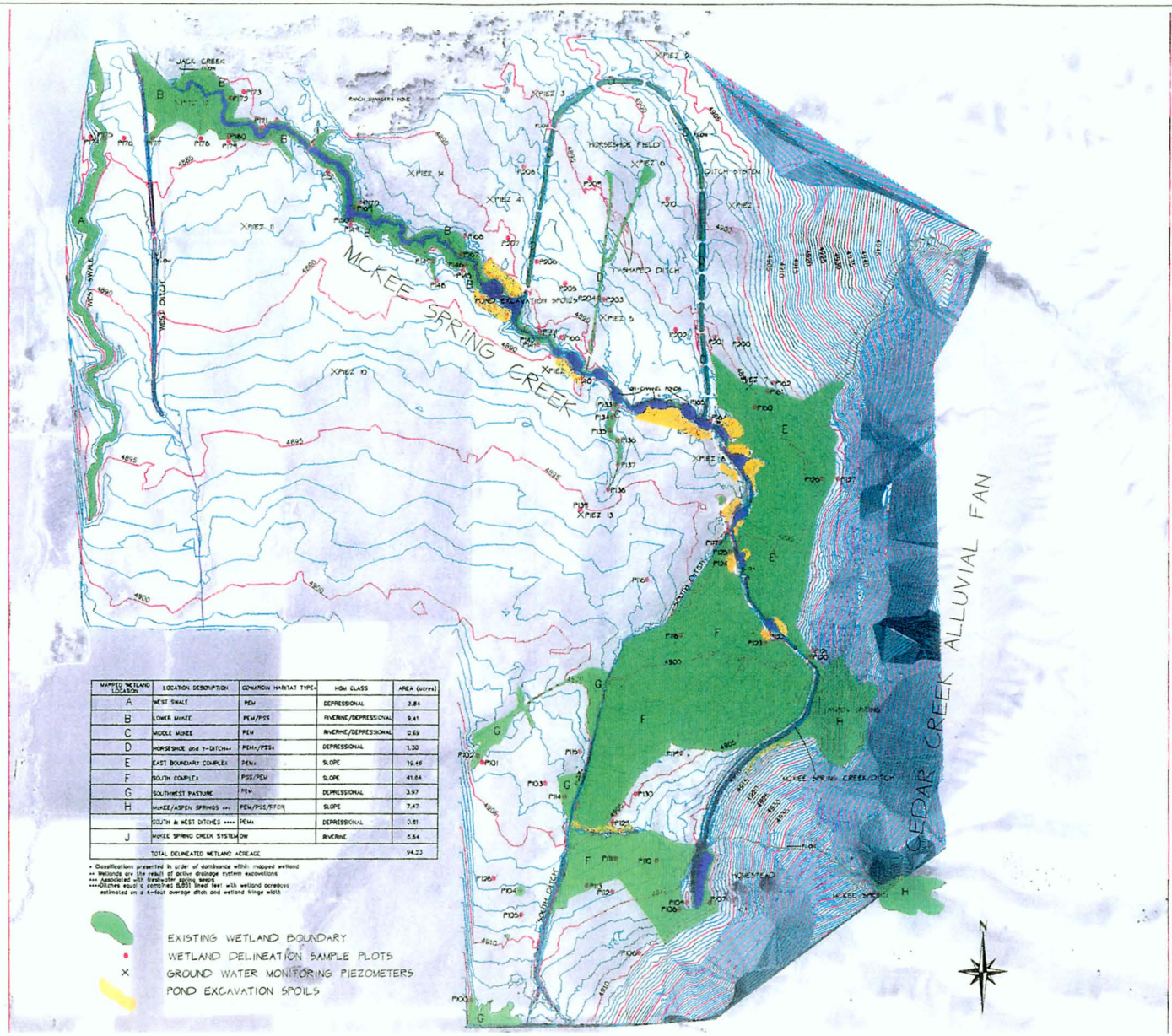


Location U: Lower reach of McKee Spring Creek. Photo taken near the Jack Creek confluence. **Compass Reading**: Southeast

Appendix D

PROPOSED WETLAND MITIGATION SITE MAP

MDT Wetland Mitigation Monitoring
Jack Creek Ranch
Ennis, Montana



MAPPED WETLAND LOCATION	LOCATION DESCRIPTION	COWARDIN HABITAT TYPE*	HGM CLASS	AREA (acres)
A	WEST SWALE	PEM	DEPRESSIONAL	3.84
B	LOWER MCKEE	PEM/PSS	RIVERINE/DEPRESSIONAL	9.41
C	MIDDLE MCKEE	PEM	RIVERINE/DEPRESSIONAL	0.69
D	HORSESHOE and T-DITCH***	PEM+/PSS+	DEPRESSIONAL	1.30
E	EAST BOUNDARY COMPLEX	PEM+	SLOPE	19.46
F	SOUTH COMPLEX	PSS/PEM	SLOPE	41.84
G	SOUTHWEST PASTURE	PEM	DEPRESSIONAL	3.97
H	MCKEE/ASPEN SPRINGS ***	PEM/PSS/PFO#	SLOPE	7.47
	SOUTH & WEST DITCHES ****	PEM+	DEPRESSIONAL	0.81
J	MCKEE SPRING CREEK SYSTEM	OW	RIVERINE	5.84
	TOTAL DELINEATED WETLAND ACREAGE			94.23

* Classifications presented in order of dominance within mapped wetland
** Wetlands are the result of active drainage system excavations
*** Associated with fresh-water spring seeps
****Ditches equal a combined 6,851 lineal feet with wetland acreages estimated on a 4-foot average ditch and wetland fringe width

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

ADC SERVICES inc. environmental consulting
41 North Street Island Dr.
PO Box 1066
Livingston, MT 59047
Phone 406.222.7600
Fax 406.222.7677

JACK CREEK RANCH
SITE PLAN

EXISTING CONDITIONS
WETLAND DELINEATION

REVISIONS | DATE | BY

DATE: 8/15/02
SCALE: 1" = 700'
CONTOUR INTERVAL: 5'
DRAWN BY: INC.

SHEET

Appendix E

BIRD SURVEY PROTOCOL
GPS PROTOCOL

MDT Wetland Mitigation Monitoring
Jack Creek Ranch
Ennis, Montana

BIRD SURVEY PROTOCOL

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

Survey Area

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

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

Survey Time

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

Data Recording

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

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

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

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

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

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

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

Other Fields

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

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

Date: Record the date of the bird survey.

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

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

GPS MAPPING AND AERIAL PHOTO REFERENCING PROCEDURE

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

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

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

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

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

Appendix F

2009 MACROINVERTEBRATE SAMPLING PROTOCOL AND DATA

MDT Wetland Mitigation Monitoring
Jack Creek Ranch
Ennis, Montana

AQUATIC INVERTEBRATE SAMPLING PROTOCOL

Equipment List

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

Site Selection

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

Sampling Procedure

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

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

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

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

Photograph each macroinvertebrate sampling site.

Sample Handling/Delivery

In the field, keep sample jars cool by placing in a cooler with a small amount of ice.
Deliver samples to the PBS&J office in Missoula, where they will be inventoried and delivered to Rhithron Associates, Inc.

MDT Mitigated Wetland Monitoring Project: Aquatic Invertebrate Monitoring
Summary 2001 – 2009

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

INTRODUCTION

This report summarizes data generated from eight years of mitigated wetland monitoring from sites throughout the State of Montana. A total of 229 invertebrate samples have been collected over the study period. Table 1 lists the currently monitored sites at which aquatic invertebrates were collected in 2009, and summarizes the sampling history of each.

METHODS

Sampling and Sample Processing

Aquatic invertebrate samples were collected at mitigated wetland sites in the summer months of 2001, 2002, 2003, 2004, 2005, 2006, 2007, 2008, and 2009 by personnel of PBS&J. Sampling procedures were based on the protocols developed by the Montana Department of Environmental Quality (MDEQ) for wetland sampling. Sampling consisted of D-frame net sweeps through emergent vegetation (when present), the water column, and over the water surface, and included disturbing and scraping substrates at each sampled site. These sample components were composited and preserved in ethanol at each wetland site. Samples were delivered to Rhithron Associates, Inc. for processing, taxonomic determinations, and data analysis.

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

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

Assessment

The method employed to assess these wetlands is based on an index incorporating a battery of 12 bioassessment metrics or attributes (Table 1) tested and recommended by Stribling et al. (1995) in a report to the Montana Department of Health and Environmental Science. In that study, it was determined that some of the metrics were of limited use in some geographic regions, and for some wetland types. Despite that finding, all 12 metrics are used in this evaluation of mitigated wetlands, since detailed geographic information and wetland classifications were unavailable for this report. Scoring criteria for the 12 metrics were developed specifically for this project, since mitigated wetlands were not included in original criteria development.

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

those that fell above the 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 good, sub-optimal, and poor metric performance, respectively. In this way, metric values were translated into normalized metric scores, and scores for all metrics were summed to produce a total bioassessment score, which is expressed as a percentage of the maximum possible score (60). Total bioassessment scores were classified according to a similar process, using the ranges and distributions of total scores for all sites studied between 2001 and 2007. Data from a total of 167 sites were used to develop criteria.

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

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

Bioassessment metrics - wetlands

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

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

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

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

Two trophic measures (%Collector-gatherers and %Filterers) may be helpful in expressing functional integrity of the invertebrate assemblage, which can be impacted by poor water quality or habitat degradation. High proportions of filtering organisms suggest nutrient and/or organic enrichment, while abundant collectors suggest more positive functional conditions and well-developed wetland morphology. These organisms graze periphyton growing on stable surfaces such as macrophytes.

Summary metric values and scores for the 2009 samples are given in Tables 4a-4c and 5. Thermal preference of invertebrate assemblages was calculated using Brandt 2001.

Bioassessment metrics – lotic habitats

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

1. Ephemeroptera (mayfly) taxa richness. The number of mayfly taxa declines as water quality diminishes. Impairments to water quality which have been demonstrated to adversely affect the ability of mayflies to flourish include elevated water temperatures, heavy metal contamination, increased turbidity, low or high pH, elevated specific conductance and toxic chemicals. Few mayfly species are able to tolerate certain disturbances to instream habitat, such as excessive sediment deposition.

2. Plecoptera (stonefly) taxa richness. Stoneflies are particularly susceptible to impairments that affect a stream on a reach-level scale, such as loss of riparian canopy, streambank instability, channelization, and alteration of morphological features such as pool frequency and function, riffle development and sinuosity. Just as all benthic organisms, they are also susceptible to smaller scale habitat loss, such as by sediment deposition, loss of interstitial spaces between substrate particles, or unstable substrate.

3. Trichoptera (caddisfly) taxa richness. Caddisfly taxa richness has been shown to decline when sediment deposition affects habitat. In addition, the presence of certain case-building caddisflies can indicate good retention of woody debris and lack of scouring flow conditions.

4. Number of sensitive taxa. Sensitive taxa are generally the first to disappear as anthropogenic disturbances increase. The list of sensitive taxa used here includes organisms sensitive to a wide range of disturbances, including warmer water temperatures, organic or nutrient pollution, toxic pollution, sediment deposition, substrate instability and others. Unimpaired streams of western Montana typically support at least four sensitive taxa (Bollman 1998).

5. Percent filter feeders. Filter-feeding organisms are a diverse group; they capture small particles of organic matter, or organically enriched sediment material, from the water column by means of a variety of adaptations, such as silken nets or hairy appendages. In forested montane streams, filterers are expected to occur in insignificant numbers. Their abundance increases when canopy cover is lost and when water temperatures increase and the accompanying growth of filamentous algae occurs. Some filtering organisms, specifically the Arctopsychid caddisflies (*Arctopsyche* spp. and *Parapsyche* spp.) build silken nets with large mesh sizes that capture small organisms such as chironomids and early-instar mayflies. Here they are considered predators, and, in this study, their abundance does not contribute to the percent filter feeders metric.

6. Percent tolerant taxa. Tolerant taxa are ubiquitous in stream sites, but when disturbance increases, their abundance increases proportionately. The list of taxa used here includes organisms tolerant of a wide range of disturbances, including warmer water temperatures, organic or nutrient pollution, toxic pollution, sediment deposition, substrate instability and others.

Table 1. Montana Department of Transportation Mitigated Wetlands Monitoring Project sites: sampling history. Only sites sampled in 2009 are included. An asterisk indicates lotic sites.

Site identifier	2002	2003	2004	2005	2006	2007	2008	2009
Camp Creek MS-1*	+	+	+	+	+	+	+	+
Camp Creek MS-2*					+	+	+	+
Cloud Ranch Pond			+	+	+	+	+	+
Cloud Ranch Stream (Big Timber)*			+			+	+	+
Jack Creek – McKee Spring Creek*					+	+	+	+
Jack Creek – pond			+	+	+	+	+	+
Rock Creek Ranch				+	+	+	+	+
Wagner Marsh				+	+	+	+	+
Alkali Lake 1					+	+	+	+
West Fork of Charley Creek						+	+	+
Little Muddy Creek						+	+	+
Selkirk Ranch						+	+	+
Jocko Spring Creek MS1							+	+
Jocko Spring Creek MS2							+	+
Sportsman's Campground Site #1							+	+
Sportsman's Campground Site #2							+	+
Sportsman's Campground Site #3							+	+
Lonepine #1							+	+
Lonepine #2							+	+

Table 2. Aquatic invertebrate metrics employed for wetland (lentic) invertebrate assemblages in the MDT mitigated wetlands study, 2001 – 2009.

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

RESULTS

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

Table 4a. Metric values and scores for wetland (lentic) sites in the MDT mitigated wetland study – 2009 sampling.

METRIC	Cloud Ranch Pond	Jack Creek Pond	Rock Creek Ranch	Wagner Marsh	Alkali Lake	West Fork of Charley Creek	Little Muddy Creek
Total taxa	15	11	20	18	17	7	18
POET	2	0	2	3	1	0	1
Chironomidae taxa	6	3	3	5	10	2	6
Crustacea + Mollusca	0	5	6	7	1	1	6
% Chironomidae	14.47%	66.67%	43.75%	16.07%	61.00%	2.73%	42.40%
Orthocladiinae/Chir	45.45%	20.00%	57.14%	22.22%	52.46%	0.00%	86.79%
%Amphipoda	0.00%	3.33%	0.00%	1.79%	0.00%	91.82%	4.80%
%Crustacea + %Mollusca	0.00%	23.33%	32.14%	34.82%	1.00%	91.82%	34.40%
HBI	6.026666	9	7.045045	7.981652	6	7.90909	7.448
%Dominant taxon	40.79%	53.33%	23.21%	23.21%	30.00%	91.82%	36.00%
%Collector-Gatherers	21.05%	73.33%	61.61%	43.75%	51.00%	91.82%	37.60%
%Filterers	0.00%	0.00%	7.14%	4.46%	0.00%	0.00%	4.80%
Total taxa	3	1	3	3	3	1	3
POET	1	1	1	3	1	1	1
Chironomidae taxa	3	3	3	3	5	1	3
Crustacea + Mollusca	1	3	5	5	1	1	5
% Chironomidae	5	1	1	5	1	5	1
Orthocladiinae/Chir	5	3	5	3	5	1	5
%Amphipoda	5	5	5	5	5	1	3
%Crustacea + %Mollusca	5	5	5	3	5	1	3
HBI	5	1	3	1	5	1	3
%Dominant taxon	3	1	5	5	5	1	3
%Collector-Gatherers	1	3	3	1	3	5	1
%Filterers	3	3	1	3	3	3	3
Total score	**40**	**30**	**40**	**40**	**42**	**22**	**34**
Percent of maximum score	**66.67%**	**50.00%**	**66.67%**	**66.67%**	**70.00%**	**36.67%**	**56.67%**
Impairment classification	**optimal**	**sub-optimal**	**optimal**	**optimal**	**optimal**	**poor**	**sub-optimal**

Table 4b. Metric values and scores for wetland (lentic) sites in the MDT mitigated wetland study – 2009 sampling.

METRIC	Selkirk Ranch	Sportsman's Campground Site #1	Sportsman's Campground Site #2	Sportsman's Campground Site #3	Lonepine #1	Lonepine #2
Total taxa	17	19	11	23	22	19
POET	1	1	0	2	2	3
Chironomidae taxa	6	10	8	11	11	8
Crustacea + Mollusca	6	4	2	4	4	2
% Chironomidae	27.27%	38.46%	90.00%	41.82%	67.83%	25.86%
Orthocladiinae/Chir	43.33%	37.50%	3.33%	23.91%	7.69%	16.67%
%Amphipoda	5.45%	25.96%	2.00%	4.55%	0.00%	0.00%
%Crustacea + %Mollusca	62.73%	51.92%	5.00%	50.00%	6.96%	18.10%
HBI	8.245455	6.942309	6.9	7.345455	7.196427	7.191304
%Dominant taxon	30.00%	24.04%	45.00%	27.27%	51.30%	15.52%
%Collector-Gatherers	57.27%	50.00%	91.00%	83.64%	86.09%	63.79%
%Filterers	3.64%	25.96%	18.00%	29.09%	1.74%	6.03%
Total taxa	3	3	1	5	5	3
POET	1	1	1	1	1	3
Chironomidae taxa	3	5	5	5	5	5
Crustacea + Mollusca	5	3	1	3	3	1
% Chironomidae	3	3	1	1	1	3
Orthocladiinae/Chir	3	3	1	3	1	1
%Amphipoda	3	1	5	3	5	5
%Crustacea + %Mollusca	3	3	5	3	5	5
HBI	1	3	3	3	3	3
%Dominant taxon	5	5	3	5	1	5
%Collector-Gatherers	3	3	5	5	5	3
%Filterers	3	1	1	1	3	1
Total score	**36**	**34**	**32**	**38**	**38**	**38**
Percent of maximum score	**60.00%**	**56.67%**	**53.33%**	**63.33%**	**63.33%**	**63.33%**
Impairment classification	**sub-optimal**	**sub-optimal**	**sub-optimal**	**sub-optimal**	**sub-optimal**	**sub-optimal**

Table 5. Metric values and scores for stream (lotic) sites in the MDT mitigated wetland study – 2009 sampling.

METRIC	Camp Creek MS-1	Camp Creek MS-2	Cloud Ranch Stream	Jack Creek McKee	Jocko Spring Creek MS-1	Jocko Spring Creek MS-2
E Richness	2	4	1	1	2	1
P Richness	1	0	0	0	0	0
T Richness	2	4	4	1	3	2
Pollution Sensitive Richness	1	1	0	0	1	0
Filterer Percent	11.88%	22.02%	18.18%	25.23%	27.36%	10.91%
Pollution Tolerant Percent	13.86%	12.84%	15.15%	8.41%	12.26%	32.73%
E Richness	1	2	0	0	1	0
P Richness	1	0	0	0	0	0
T Richness	1	2	2	0	2	1
Pollution Sensitive Richness	1	1	0	0	1	0
Filterer Percent	1	1	1	0	0	1
Pollution Tolerant Percent	1	1	1	2	1	1
Total score	**6**	**7**	**4**	**2**	**5**	**3**
Percent of maximum score	**33.33%**	**38.89%**	**22.22%**	**11.11%**	**27.78%**	**16.67%**
Impairment classification	**moderate**	**moderate**	**moderate**	**severe**	**moderate**	**severe**

LITERATURE CITED

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Brandt, D. 2001. Temperature Preferences and Tolerances for 137 Common Idaho Macroinvertebrate Taxa. Report to the Idaho Department of Environmental Quality, Coeur d' Alene, Idaho.

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

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

Taxa Listing

Project ID: MDT09PBSJ
RAI No.: MDT09PBSJ005

RAI No.: MDT09PBSJ005 **Sta. Name:** Jack Creek Ranch-Horseshoe wetland
Client ID:
Date Coll.: 7/21/2009 **No. Jars:** 1 **STORET ID:**

Taxonomic Name	Count	PRA	Unique	Stage	Qualifier	BI	Function
Non-Insect							
Asellidae							
Caecidotea sp.	1	3.33%	Yes	Unknown		8	CG
Glossiphoniidae							
Glossiphoniidae	1	3.33%	Yes	Immature		9	PR
Hyalellidae							
Hyalella sp.	1	3.33%	Yes	Unknown		8	CG
Lymnaeidae							
Lymnaeidae	1	3.33%	Yes	Immature		6	SC
Physidae							
Physa sp.	3	10.00%	Yes	Unknown		8	SC
Planorbidae							
Gyraulus sp.	1	3.33%	Yes	Unknown		8	SC
Coleoptera							
Dytiscidae							
Dytiscidae	1	3.33%	Yes	Larva		5	PR
Diptera							
Ceratopogonidae							
Ceratopogoninae	1	3.33%	Yes	Larva		6	PR
Chironomidae							
Chironomidae							
Acricotopus sp.	2	6.67%	Yes	Larva		10	CG
Chironomus sp.	16	53.33%	Yes	Larva		10	CG
Psectrocladius sp.	2	6.67%	Yes	Larva		8	CG
Sample Count	**30**						

Metrics Report

Project ID: MDT09PBSJ
RAI No.: MDT09PBSJ005
Sta. Name: Jack Creek Ranch-Horseshoe wetland
Client ID:
STORET ID:
Coll. Date: 7/21/2009

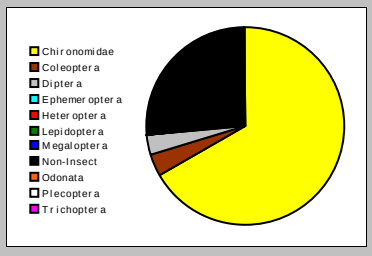
Abundance Measures

Sample Count: 30
Sample Abundance: 30.00 100.00% of sample used

Coll. Procedure:
Sample Notes:

Taxonomic Composition

Category	R	A	PRA
Non-Insect	6	8	26.67%
Odonata			
Ephemeroptera			
Plecoptera			
Heteroptera			
Megaloptera			
Trichoptera			
Lepidoptera			
Coleoptera	1	1	3.33%
Diptera	1	1	3.33%
Chironomidae	3	20	66.67%

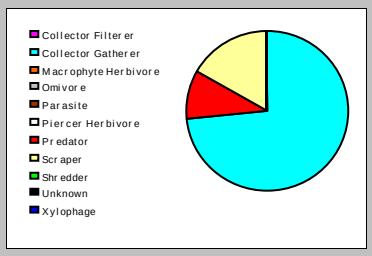


Dominant Taxa

Category	A	PRA
Chironomus	16	53.33%
Physa	3	10.00%
Psectrocladius	2	6.67%
Acricotopus	2	6.67%
Lymnaeidae	1	3.33%
Hyalella	1	3.33%
Gyraulus	1	3.33%
Glossiphoniidae	1	3.33%
Dytiscidae	1	3.33%
Ceratopogoninae	1	3.33%
Caecidotea	1	3.33%

Functional Composition

Category	R	A	PRA
Predator	3	3	10.00%
Parasite			
Collector Gatherer	5	22	73.33%
Collector Filterer			
Macrophyte Herbivore			
Piercer Herbivore			
Xylophage			
Scraper	3	5	16.67%
Shredder			
Omivore			
Unknown			

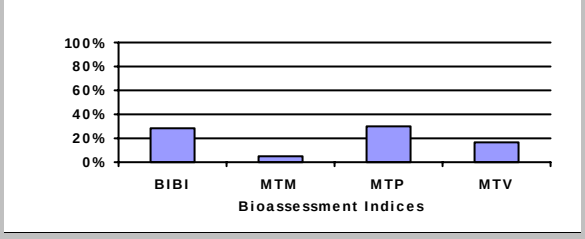


Metric Values and Scores

Metric	Value	BIBI	MTP	MTV	MTM
Composition					
Taxa Richness	11	1	0		0
Non-Insect Percent	26.67%				
E Richness	0	1		0	
P Richness	0	1		0	
T Richness	0	1		0	
EPT Richness	0		0		0
EPT Percent	0.00%		0		0
Oligochaeta+Hirudinea Percent	3.33%				
Baetidae/Ephemeroptera	0.000				
Hydropsychidae/Trichoptera	0.000				
Dominance					
Dominant Taxon Percent	53.33%		1		0
Dominant Taxa (2) Percent	63.33%				
Dominant Taxa (3) Percent	70.00%	3			
Dominant Taxa (10) Percent	96.67%				
Diversity					
Shannon H (loge)	1.720				
Shannon H (log2)	2.482		2		
Margalef D	2.940				
Simpson D	0.287				
Evenness	0.105				
Function					
Predator Richness	3		1		
Predator Percent	10.00%	3			
Filterer Richness	0				
Filterer Percent	0.00%			3	
Collector Percent	73.33%		2		1
Scraper+Shredder Percent	16.67%		2		0
Scraper/Filterer	0.000				
Scraper/Scraper+Filterer	0.000				
Habit					
Burrower Richness	2				
Burrower Percent	56.67%				
Swimmer Richness	0				
Swimmer Percent	0.00%				
Clinger Richness	0	1			
Clinger Percent	0.00%				
Characteristics					
Cold Stenotherm Richness	0				
Cold Stenotherm Percent	0.00%				
Hemoglobin Bearer Richness	2				
Hemoglobin Bearer Percent	56.67%				
Air Breather Richness	1				
Air Breather Percent	3.33%				
Voltinism					
Univoltine Richness	7				
Semivoltine Richness	1	1			
Multivoltine Percent	66.67%		1		
Tolerance					
Sediment Tolerant Richness	2				
Sediment Tolerant Percent	6.67%				
Sediment Sensitive Richness	0				
Sediment Sensitive Percent	0.00%				
Metals Tolerance Index	4.043				
Pollution Sensitive Richness	0	1		0	
Pollution Tolerant Percent	83.33%	1		0	
Hilsenhoff Biotic Index	9.000		0		0
Intolerant Percent	0.00%				
Supertolerant Percent	90.00%				
CTQa	103.500				

Bioassessment Indices

BioIndex	Description	Score	Pct	Rating
BIBI	B-IBI (Karr et al.)	14	28.00%	
MTP	Montana DEQ Plains (Bukantis 1998)	9	30.00%	Moderate
MTV	Montana Revised Valleys/Foothills (Bollman 1998)	3	16.67%	Severe
MTM	Montana DEQ Mountains (Bukantis 1998)	1	4.76%	Severe



Taxa Listing

Project ID: MDT09PBSJ
RAI No.: MDT09PBSJ006

RAI No.: MDT09PBSJ006 **Sta. Name:** Jack Creek Ranch McKee Spring
Client ID:
Date Coll.: 7/21/2009 **No. Jars:** 1 **STORET ID:**

Taxonomic Name	Count	PRA	Unique	Stage	Qualifier	BI	Function
Non-Insect							
Asellidae							
Caecidotea sp.	1	0.93%	Yes	Unknown		8	CG
Hyalellidae							
Hyalella sp.	2	1.87%	Yes	Unknown		8	CG
Physidae							
Physa sp.	2	1.87%	Yes	Unknown		8	SC
Ephemeroptera							
Baetidae							
Baetis tricaudatus	3	2.80%	Yes	Larva		4	CG
Trichoptera							
Hydroptilidae							
Hydroptila sp.	2	1.87%	Yes	Larva		6	PH
Coleoptera							
Elmidae							
Optioservus sp.	2	1.87%	No	Larva		5	SC
Optioservus sp.	2	1.87%	Yes	Adult		5	SC
Diptera							
Simuliidae							
Simuliidae	4	3.74%	No	Pupa		6	CF
Simulium sp.	23	21.50%	Yes	Larva		6	CF
Chironomidae							
Chironomidae							
Cricotopus sp.	1	0.93%	No	Pupa		7	SH
Cricotopus (Cricotopus) sp.	3	2.80%	Yes	Larva		7	SH
Eukiefferiella Claripennis Gr.	11	10.28%	Yes	Larva		8	CG
Micropsectra sp.	1	0.93%	Yes	Larva		4	CG
Orthocladius sp.	1	0.93%	Yes	Larva		6	CG
Pagastia sp.	42	39.25%	Yes	Larva		1	CG
Parametriocnemus sp.	1	0.93%	Yes	Larva		5	CG
Tvetenia sp.	1	0.93%	No	Pupa		5	CG
Tvetenia Bavarica Gr.	5	4.67%	Yes	Larva		5	CG
Sample Count	**107**						

Metrics Report

Project ID: MDT09PBSJ
RAI No.: MDT09PBSJ006
Sta. Name: Jack Creek Ranch McKee Spring
Client ID:
STORET ID:
Coll. Date: 7/21/2009

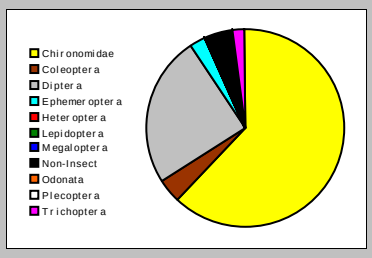
Abundance Measures

Sample Count: 107
Sample Abundance: 128.40 83.33% of sample used

Coll. Procedure:
Sample Notes:

Taxonomic Composition

Category	R	A	PRA
Non-Insect	3	5	4.67%
Odonata			
Ephemeroptera	1	3	2.80%
Plecoptera			
Heteroptera			
Megaloptera			
Trichoptera	1	2	1.87%
Lepidoptera			
Coleoptera	1	4	3.74%
Diptera	1	27	25.23%
Chironomidae	7	66	61.68%

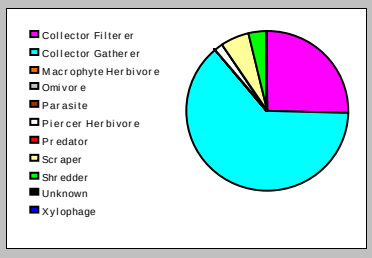


Dominant Taxa

Category	A	PRA
Pagastia	42	39.25%
Simulium	23	21.50%
Eukiefferiella Claripennis Gr.	11	10.28%
Tvetenia Bavarica Gr.	5	4.67%
Simuliidae	4	3.74%
Optioservus	4	3.74%
Cricotopus (Cricotopus)	3	2.80%
Baetis tricaudatus	3	2.80%
Physa	2	1.87%
Hydroptila	2	1.87%
Hyalella	2	1.87%
Tvetenia	1	0.93%
Micropsectra	1	0.93%
Cricotopus	1	0.93%
Caecidotea	1	0.93%

Functional Composition

Category	R	A	PRA
Predator			
Parasite			
Collector Gatherer	9	68	63.55%
Collector Filterer	1	27	25.23%
Macrophyte Herbivore			
Piercer Herbivore	1	2	1.87%
Xylophage			
Scraper	2	6	5.61%
Shredder	1	4	3.74%
Omivore			
Unknown			



Metric Values and Scores

Metric	Value	BIBI	MTP	MTV	MTM
Composition					
Taxa Richness	14	1	1		0
Non-Insect Percent	4.67%				
E Richness	1	1		0	
P Richness	0	1		0	
T Richness	1	1		0	
EPT Richness	2		0		0
EPT Percent	4.67%		0		0
Oligochaeta+Hirudinea Percent					
Baetidae/Ephemeroptera	1.000				
Hydropsychidae/Trichoptera	0.000				
Dominance					
Dominant Taxon Percent	39.25%		2		1
Dominant Taxa (2) Percent	60.75%				
Dominant Taxa (3) Percent	71.03%	3			
Dominant Taxa (10) Percent	92.52%				
Diversity					
Shannon H (loge)	1.811				
Shannon H (log2)	2.612		2		
Margalef D	2.829				
Simpson D	0.245				
Evenness	0.107				
Function					
Predator Richness	0		0		
Predator Percent	0.00%	1			
Filterer Richness	1				
Filterer Percent	25.23%			0	
Collector Percent	88.79%		1		0
Scraper+Shredder Percent	9.35%		1		0
Scraper/Filterer	0.222				
Scraper/Scraper+Filterer	0.182				
Habit					
Burrower Richness	0				
Burrower Percent	0.00%				
Swimmer Richness	1				
Swimmer Percent	2.80%				
Clinger Richness	4	1			
Clinger Percent	34.58%				
Characteristics					
Cold Stenotherm Richness	0				
Cold Stenotherm Percent	0.00%				
Hemoglobin Bearer Richness					
Hemoglobin Bearer Percent					
Air Breather Richness	0				
Air Breather Percent	0.00%				
Voltinism					
Univoltine Richness	4				
Semivoltine Richness	1	1			
Multivoltine Percent	66.36%		1		
Tolerance					
Sediment Tolerant Richness	0				
Sediment Tolerant Percent	0.00%				
Sediment Sensitive Richness	0				
Sediment Sensitive Percent	0.00%				
Metals Tolerance Index	6.951				
Pollution Sensitive Richness	0	1		0	
Pollution Tolerant Percent	8.41%	5		2	
Hilsenhoff Biotic Index	4.196		3		1
Intolerant Percent	39.25%				
Supertolerant Percent	14.95%				
CTQa	104.000				

Bioassessment Indices

BioIndex	Description	Score	Pct	Rating
BIBI	B-IBI (Karr et al.)	16	32.00%	
MTP	Montana DEQ Plains (Bukantis 1998)	11	36.67%	Moderate
MTV	Montana Revised Valleys/Foothills (Bollman 1998)	2	11.11%	Severe
MTM	Montana DEQ Mountains (Bukantis 1998)	2	9.52%	Severe

