MONTANA DEPARTMENT OF TRANSPORTATION
WETLAND MITIGATION MONITORING REPORT: YEAR 2008

Norem Property
Big Timber, Montana

Prepared for:

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

Prepared by:

POST, BUCKLEY, SCHUH, & JERNIGAN
801 North Last Chance Gulch, Suite 101
Helena, MT 59601-3360

December 2008

PBS&J Project No: 0B4308801.06.04

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1.0 INTRODUCTION

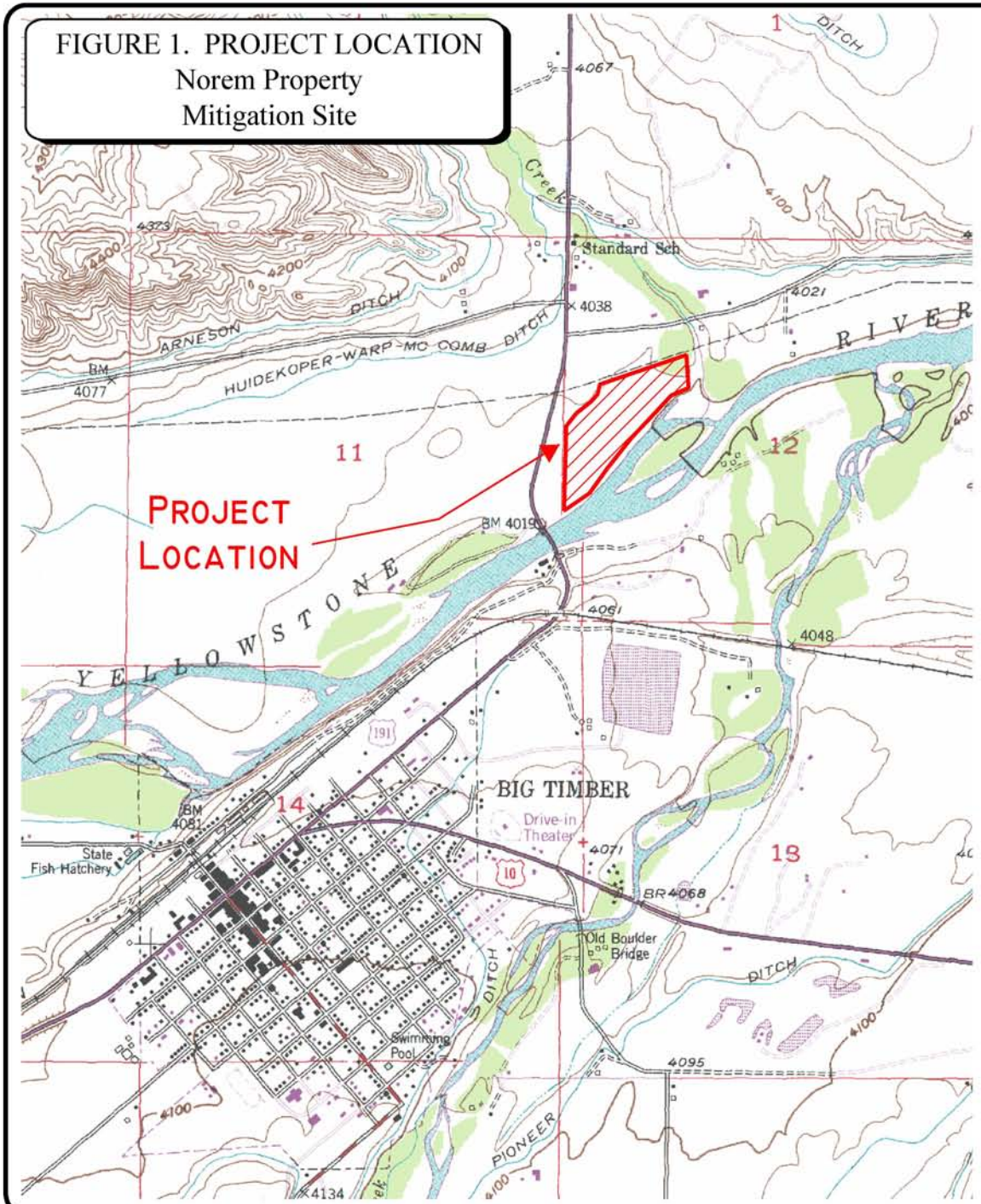
This annual report summarizes the methods and results from the 2008 (fifth year) monitoring effort at the Norem Property Wetland Mitigation Site. This project was constructed in the fall of 2002 by the landowner and Maxim Technologies, Inc. (Maxim) to provide the Montana Department of Transportation (MDT) with wetland mitigation credits that offset wetland impacts associated with proposed road and bridge reconstruction projects in the vicinity of Big Timber and the middle reaches of watershed #13 - Upper Yellowstone River Basin. The Norem wetland project site is located in Section 12, Township 1 North, Range 14 East of Sweetgrass County, approximately two miles northeast of Big Timber, Montana (**Figure 1**). Elevations within the assessment area range from approximately 4,000 to 4,018 feet above sea level. The Yellowstone River borders the southern project boundary and to the east is it bounded by Big Timber Creek. Fenced pastures delineate the western and northern project boundaries. The surrounding land uses include pastures, hay production and residential areas.

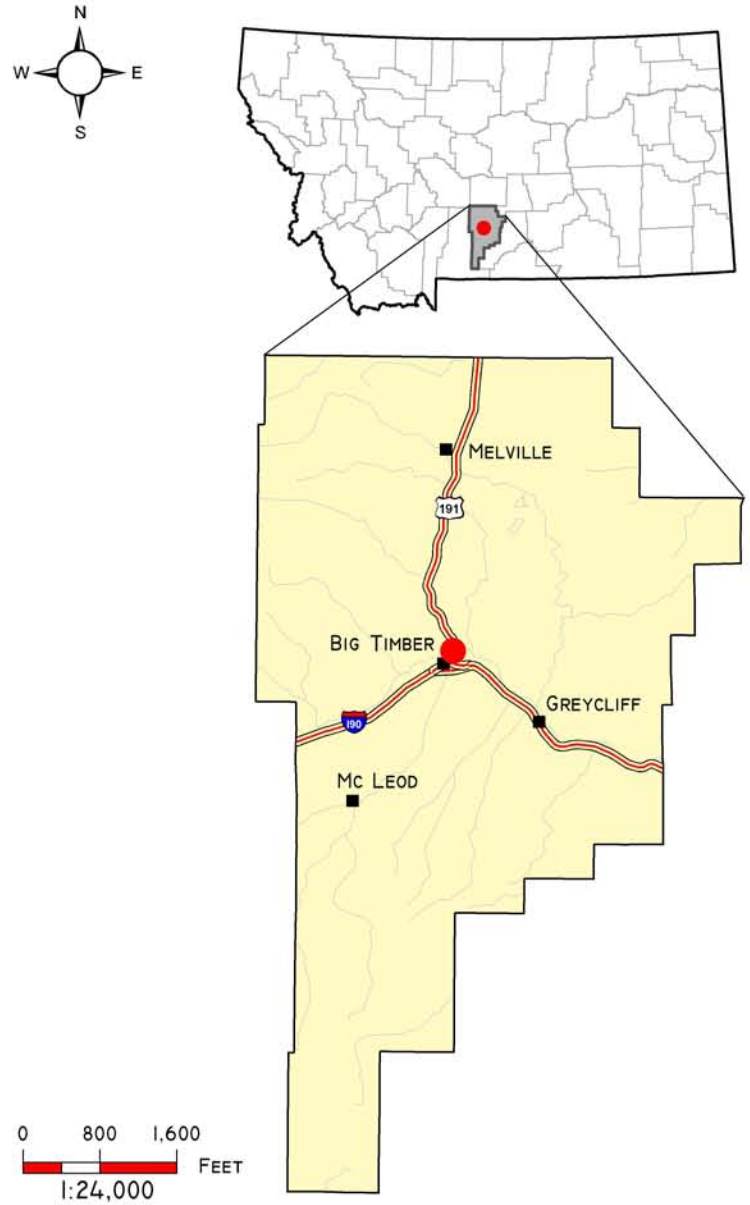
The project was intended to develop approximately 14.71 acres of wetland credit within a 26.88-acre conservation easement on property owned by Mark Norem. The site boundary is illustrated on **Figure 2** (**Appendix A**) and the original conceptual layout is provided in **Appendix D.** The overall wetland development objectives are to enhance existing wetlands, create emergent wetlands and shallow open water ponds, as well as establish a buffer zone around the majority of the project site. More specifically, primary goals are to create contiguous, palustrine emergent and shrub/scrub wetlands within the project boundaries.

Approximately 6.98 acres of pre-existing wetlands were delineated on the Norem property by Maxim Technologies, Inc. in 2001. The Corps of Engineers (COE) has approved allocation of 2.32 credit acres (3:1 ratio) for the enhancement of these existing wetlands. Enhancement is being achieved by several methods including: the removal of high impact grazing; the addition and subsequent maturation of herbaceous and woody plants to increase species diversity; and by increasing the depth and period of inundation. An additional 1.50 acres of credit was approved by the COE (2002) for the maintenance of an upland buffer zone around the perimeter of the wetlands (4:1 ratio).

The project further intends to create 9.46 acres of wetlands and 1.58 acres of shallow open water ponds (1:1 ratio approved by COE). Construction activities included the placement of a low berm in the southeast portion of the site to impound irrigation return water and groundwater in addition to the four (4) shallow open water ponds. The berm construction impacted approximately 0.15 acre of existing wetlands. An outflow culvert located through the berm in the far eastern corner of the project diverts excess water to the wetlands east of the berm. The summary table of potential wetland credits available for the Norem project is outlined in the COE 2002 letter (**Appendix G).**

FIGURE 1. PROJECT LOCATION
Norem Property
Mitigation Site





PROJECT #: 0B4308801
DATE: Nov 2008
LOCATION: SWEET GRASS CO
PROJECT MGR: J. BERGLUND
DRAWN BY: B. STEINEBACH

PBS&J
801 N. LAST CHANCE GULCH
SUITE 101
HELENA, MT 59601-3360

2.0 METHODS

2.1 Monitoring Dates and Activities

The site was visited on July 22nd to collect the primary Wetland Mitigation Monitoring Form data (**Appendix B**). Per MDT instruction, monitoring activities were limited to the major restoration and enhancement areas within the site that are projected to provide MDT with wetland credit. Activities and information conducted/collected during the monitoring event included: wetland delineation; wetland/open water boundary mapping; vegetation community mapping; vegetation transects; soils data; hydrology data; bird and general wildlife use; photograph points; macroinvertebrate sampling; GPS data points; functional assessment; and, maintenance needs of the outflow structure (non-engineering).

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 2008 were compared to the 1894-2008 average (Western Regional Climate Center [WRCC] 2008). All additional hydrologic data were recorded on the Wetland Mitigation Site Monitoring Form (**Appendix B**). The boundary between emergent vegetation and open water was mapped on the aerial photograph (**Figure 3** in **Appendix A**). Well monitoring was originally conducted by the consultant to the landowner but was terminated in 2006.

2.3 Vegetation

General vegetation types were delineated on the aerial photograph during the July site visit (**Figure 3** in **Appendix A**). Coverage of the dominant species in each community type is listed on the Wetland Mitigation Site Monitoring Form (**Appendix B**). A comprehensive plant species list for the entire site was compiled. The assessment area is fenced and woody species were planted on this site. The visual assessment included written estimates of species survival along the entire transect length (belt transect). Qualitative observations were used to assess the survival of the planted woody species in concentrated planting areas outside the transect width.

One transect was established during the 2004 monitoring event to represent the range of current vegetation conditions (**Figure 2** in **Appendix A**). This transect was re-evaluated in 2008 to reflect changes in species composition and changing wetland boundaries. Percent cover for each species was recorded on the Vegetation Transect Form (**Appendix B**). This transect is used to evaluate changes over time, especially the establishment and increase of hydrophytic vegetation. Transect ends are marked with metal fence posts and their locations recorded with a GPS unit. Photos of each transect end were taken during the July monitoring 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 COE Routine Wetland Delineation Data Forms (**Appendix B**). The most current terminology used by NRCS was used to describe hydric soils.

2.5 Wetland Delineation

Wetland delineation was conducted during the mid-season visit in accordance with the 1987 COE Wetland Delineation Manual. In July 2008, consultation with the COE (Steinle pers. comm.) confirmed 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 in 2008.

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 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 mapped on a 2008 aerial photograph and used to calculate the wetland area developed at the Norem wetland project. A pre-construction wetland map was completed by Maxim Technologies, Inc. (2004) (**Appendix D**).

2.6 Mammals, Reptiles, and Amphibians

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

2.7 Birds

Bird observations were recorded during the July 2008 site visit according to the established Bird Survey Protocol (**Appendix E**). A general, qualitative bird list has been compiled using these observations.

2.8 Macroinvertebrates

One macroinvertebrate composite sample was collected during the site visit using the Macroinvertebrate Sampling Protocol (**Appendix F**). Samples were preserved as outlined in the sampling procedure and sent to Rhithron Associates, Inc. in Missoula, Montana for analysis (**Appendix F**). The location of the macroinvertebrate sample was mapped (**Figure 2** in **Appendix A**).

2.9 Functional Assessment

Since 2001, a functional assessment for each delineated wetland was conducted using the 1999 MDT Montana Wetland Assessment Method (Berglund 1999). In 2008, the 2008 MDT Montana Wetland Assessment Method (Berglund and McEldowney 2008) was applied. Field data necessary for this assessment were collected on a condensed data sheet. The remainder of the assessment was completed in the office. Pre-construction functional assessment was completed by Maxim in 2001.

2.10 Photographs

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

During the 2004 monitoring season, each photograph point location was mapped with a resource grade 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 (**Appendix E**). Points collected included: the beginning and end locations of the vegetation transects, the wetland boundary, and the sample point (SP) locations. In addition, GPS data were collected for four landmarks recognizable on the air photo for purposes of line fitting to the topography. During the 2008 monitoring, a resource grade Magellan Mobile Mapper GPS unit was used to map wetland boundaries.

2.12 Maintenance Needs

The condition of the outflow structures and potential problematic areas (erosive, barren, or weedy areas) were evaluated. This examination did not entail an engineering-level analysis.

3.0 RESULTS

3.1 Hydrology

The majority of the project site is within the 100-year floodplain of the Yellowstone River. A historic meander channel of the Yellowstone River forms the majority of the existing wetlands on the property. Springs/seeps exist along the northern perimeter of the existing wetlands and are likely the result of irrigation water that has infiltrated at up-gradient locations and is migrating toward the Yellowstone River. Site hydrology appears strongly related to river surface and subsurface hydrology. Late in the year, a small portion of water may be irrigation influenced.

During the July 22, 2008 monitoring visit, approximately 50% of the assessment area was inundated with 1 to 4 inches of shallow surface water. In the eastern portion of the project area, surface water across the wetlands ranged from 2 inches to 2 feet deep. All of the ponds (1, 2, 3, and 4) were bankfull. Emergent vegetation continues to colonize around the margins of the ponds (**Photograph C** in **Appendix C**). Open water pond delineations are depicted on **Figure 3** (**Appendix A**).

According to the Western Regional Climate Center (WRCC), the Big Timber weather station has calculated a mean annual precipitation of 11.34 inches from 1894 through August 2008 (last updated file). The average precipitation through the month of July for that period was 10.18 inches. For the year 2008, precipitation through July was 11.54 inches or 113% of the mean (WRCC 2008).

3.2 Vegetation

Vegetation species identified on the site are presented in **Table 1** and in the **Monitoring Forms** (**Appendix B**). In 2008 a total of seven community types were documented at the site, of this total, five are wetland community types. The community types were identified and mapped (**Figure 3, Appendix A**) as: Type 1-Mixed *Carex*, Type 2-*Carex/Juncus*; Type 3-*Bromus inermis/Festuca pratensis;* Type 4-*Populus trichocarpa/Agropyron repens;* Type 5-*Typha latifolia;* Type 6-*Salix exigua;* and Type 7-*Populus trichocarpa*/Mixed Wetland Species. There are approximately 36 wetland species that rate as FACW or OBL within the assessment area. This represents a 75% increasewhen compared to the 27 known species documented in 2004.

The Type 1 community occurs in areas of shallow standing water (1 to 4 inches deep) or saturated soils. This type is dominated by sedge (*Carex*) species. Common species include beaked sedge (*Carex utriculata*), Nebraska sedge (*C. nebrascensis*), water sedge (*C. aquatilis*) and wooly sedge (*C. lanuginosa*). The composition of the Type 2 community includes FAC to OBL species; as this wetland develops it is likely that FACW and OBL species will dominate the community. Large, irregular scattered patches of Baltic rush (*Juncus balticus*) occupy portions of this community type. In 2007, Torrey's rush (*Juncus torreyi)* co-dominated portions of this wetland community, especially around ponds 1 and 2. Redtop *(Agrostis alba*) and three-square bulrush (*Scirpus pungens*) were also noted as a minor species throughout this community type. In 2008, water sedge and wooly sedge were more abundant within this community. Type 2 is the largest wetland community type within the project area and is expanding into upland areas.

The Type 3 community occurs in uplands and consists primarily of smooth brome (*Bromus inermis*) and meadow fescue (*Festuca pratensis*). Western wheatgrass (*Agropyron smithii*) has co-dominated portions of this upland community but has a lower cover and abundance value when compared to past assessments. Tall fescue (*Festuca arundinacea*) is a common species north of the ponds, near the project boundary fence. Other common species in Type 3 include Kentucky bluegrass (*Poa pratensis*) and quackgrass (*Agropyron repens*). Species such as redtop, Baltic rush, and silverweed (*Potentilla anserina)* were noted along the wetter margins between Types 3 and 2. Alkali cordgrass (*Spartina gracilis*) was observed along the border of Types 3 and 4 in the southeastern portion of the project. Type 4 is also an upland community and occurs on the bench north of the Yellowstone River. This community type includes primarily black cottonwood (*Populus trichocarpa*), ranging from 1 to 6 feet in height with an understory of

Table 1: ***2004 to 2008 vegetation species list for the Norem Property Wetland Mitigation Site.***

Scientific Name	Region 9 (Northwest) Wetland Indicator Status [1, 2]	Scientific Name	Region 9 (Northwest) Wetland Indicator Status [1, 2]
Agropyron dasystachyum	UPL	*Grindelia squarrosa*	FACU
Agropyron repens	FAC-	*Helianthus annuus*	FACU+
Agropyron smithii	FACU	*Hordeum jubatum*	FAC+
Agropyron trachycaulum	FAC	*Juncus balticus*	OBL
Agrostis alba	FACW	***Juncus bufonius***	**FACW+**
Alisma sp.	OBL	*Juncus longistylis*	FACW
Alopecurus arundinacea	(FACW)	***Juncus tenuis***	**FAC**
Alopecurus pratensis	FACW	*Juncus torreyi*	FACW
Asclepias speciosa	FAC+	*Kochia scoparia*	FAC
Beckmannia syzigachne	OBL	*Lithosperum arvense*	(FAC)
Bromus inermis	(UPL)	*Melilotus alba*	FACU
Bromus tectorum	UPL	*Melilotus officinalis*	FACU
Cardaria draba	UPL	*Mentha arvense*	FACW-
Carex aquatilis	OBL	*Phalaris arundinacea*	FACW
Carex arcta	OBL	*Phleum pretense*	FAC-
Carex lanuginosa	OBL	*Plantago patagonica*	(FACU)
Carex lasiocarpa	OBL	*Poa palustris*	FAC
Carex nebrascensis	OBL	*Poa pratensis*	FAC
Carex utriculata	OBL	***Polygonum amphibium***	**OBL**
Centaurea maculosa	(UPL)	*Polygonum punctatum*	OBL
Cirsium arvense	FACU+	*Populus tremuloides*	FAC+
Convolvulus arvensis	(FACU)	*Populus trichocarpa*	FAC
Cornus stolonifera	FACW	*Potentilla anserina*	OBL
Crateagus douglasii	FAC	*Rumex crispus*	FACW
Crepis acuminate	(FACU)	*Sagittaria cuneata*	OBL
Deschampsia cespitosa	FACW	*Salix alba/lutea*	FACW/OBL
Distichlis spicata	FAC+	*Salix exigua*	OBL
Elaeagnus angustifolia	FAC	*Scirpus acutus*	OBL
Eleocharis palustris	FACW+	*Scirpus pungens*	OBL
Epilobium ciliatum (*watsonii*)	FACW-	*Sisymbrium altissmum*	FACU-
Equisetum arvense	FAC	*Solidago occidentalis*	FACW
Erigeron lanatus	FACU	*Spartana gracilis*	FACW
Euphorbia esula	(UPL)	*Spartana pectinata*	OBL
Festuca arundinacea	FACU-	*Taraxacum officinale*	FACU
Festuca pratensis	FACU+	*Thlaspi arvense*	(UPL)
Glyceria grandis	OBL	*Tragopogon dubius*	UPL
Glyceria striata	OBL	*Typha latifolia*	OBL
Glycyrrhiza lepidota	FAC+	*Verbascum thapsus*	(UPL)

[1] **Bolded** species indicate those documented within the analysis area for the first time in 2008.
[2] Status in parentheses are for species not included in the *National List of Plant Species that Occur in Wetlands: Northwest (Region 9)* (Reed 1988). The parenthesized status is probable and based only on the biologist's experience.

quackgrass. Sandbar willow (*Salix exigua*) seedlings were also observed along the margins of community Types 4 and 2. In 2004, yellow and white sweet clover (*Melilotus officinalis* and *M. alba*, respectively) were common species in this community type. During the 2005 and 2006 monitoring, species such as quackgrass, meadow fescue, western wheatgrass and redtop replaced the clover. In 2007, redtop was more abundant than noted in the previous years. It was found in four of the six community types and is encroaching into Community type 4 as an understory

species. In 2008, Baltic rush was more abundant than noted in the previous years and occurs in six of the seven community types.

Type 5 represents wetland vegetation growing in open and standing water. The herbaceous species noted growing along the waters edge include cattail (*Typha latifolia*), with scattered patches of hardstem bulrush (*Scirpus acutus*), creeping spikerush (*Eleocharis palustris*) and beaked sedge. Type 6-*Salix exigua* is a shrub community consisting of sandbar willows approximately 2 to 6 feet tall. This small community is located along the western edge of the access road and is expanding to the south and southwest (**Figure 3**). Type 7-*Populus trichocarpa*/Mixed Wetland Species was a new community in 2008. This community evolved from the Type 4-Upland community located in the southern portion of the project. Type 7 consists of an overstory of young black cottonwoods with a wetland understory of Baltic rush, silverweed (*Potentilla arvense*), Nebraska sedge (*Carex* nebrascensis), and reed canarygrass (*Phalaris arundinacea*).

Woody species transplanted around the pond perimeter include sandbar willow, red-osier dogwood (*Cornus stolonifera*), hawthorn (*Crateagus douglasii*), and cottonwood. Other willow species were also observed. The willows and dogwoods were transplanted as rooted cuttings in the spring of 2003. Black cottonwood and hawthorn were planted as seedlings. Volunteer native woody species were also prevalent within the buffer zone as a result of grazing exclusion. The young cottonwoods and sandbar willows were noted primarily along the southern and eastern project boundary which will develop into riparian corridor. Sandbar willows transplanted along the western edge of the access road are reaching heights of 2 to 6 feet and have formed an attractive and functional woody buffer along the eastern end of the project site.

Overall, the planted trees and shrubs around the perimeter of the ponds are doing very well. Two of the transplanted cottonwood were dead along the western side of Pond #3. No other mortality was observed on planted woody species around the ponds in 2008. The overall survival of the planted trees and shrubs ranges from 65 to 80 percent across the project site (2005 – 2008). The survival around Ponds 1 and 2 was slightly lower (65 to 70 percent) compared to Ponds 3 and 4 which ranged from 75 to 80 percent survival. However, the cover and diversity of the woody species continues to improve around Ponds 1 and 2 due to the exposed saturated soils around the pond margins. In 2007 and 2008, quaking aspen seedlings were noted growing in the saturated soils around the edge of Pond 1. Cottonwood and willow species were particularly robust and vigorous across the project site. Cottonwood seedlings along Pond 4 are an impressive height 3 to 4 feet tall with sandbar willows likely to encroach along this pond margin in the near future. Details related to the species and quantities planted around each pond are provided in the **Monitoring Form** (**Appendix B**).

The monitoring transect is located in the western half of the project site and runs from south to northwest. The vegetation transect results are detailed in the **Monitoring Form** (**Appendix B**) and are summarized in **Table 2** and **Charts 1** and **2**. The charts evaluate trends in vegetation community cover along the transect with a comparison among the past four years. The length of each community as it is encountered from the start to the end of the transect was measured (**Chart 1**). In 2004, two wetland communities were present (**Chart 1**). In 2008, four wetland communities were present (one of which is a shrub wetland) (**Chart 1**). Upland habitat within

the last half of the transect has decreased (**Chart 1**). The total length of upland, open water, and wetland along the transect was analyzed for each monitoring year (**Chart 2**). In 2004, wetland communities represented 29 percent of the transect while uplands occupied 47 percent (**Chart 2**). In 2008, 46 percent of the transect was represented by wetland communities and 32 percent by upland communities. Open water has fluctuated slightly (**Chart 2**). Overall, upland habitat has shrunk while wetland habitat has increased since 2004.

Table 2: ***2004 to 2008 Transect 1 data summary.***

Monitoring Year	2004	2005	2006	2007	2008
Transect Length (feet)	625	625	625	625	625
# Vegetation Community Transitions along Transect	6	7	7	8	9
# Vegetation Communities along Transect	3	4	4	5	6
# Hydrophytic Vegetation Communities along Transect	2	3	3	3	4
Total Vegetative Species	24	30	31	34	35
Total Hydrophytic Species	16	23	23	27	28
Total Upland Species	8	7	8	7	7
Estimated % Total Vegetative Cover	85	85	81	80	88
% Transect Length Comprised of Hydrophytic Vegetation Communities	29	41	44	45	46
% Transect Length Comprised of Upland Vegetation Communities	47	38	35	34	32
% Transect Length Comprised of Unvegetated Open Water	24	21	21	21	22
% Transect Length Comprised of Bare Substrate	0	0	0	0	0

Chart 1: ***Transect maps showing vegetation types from start of transect (0 feet) to end of transect (625 feet) for each year monitored.***

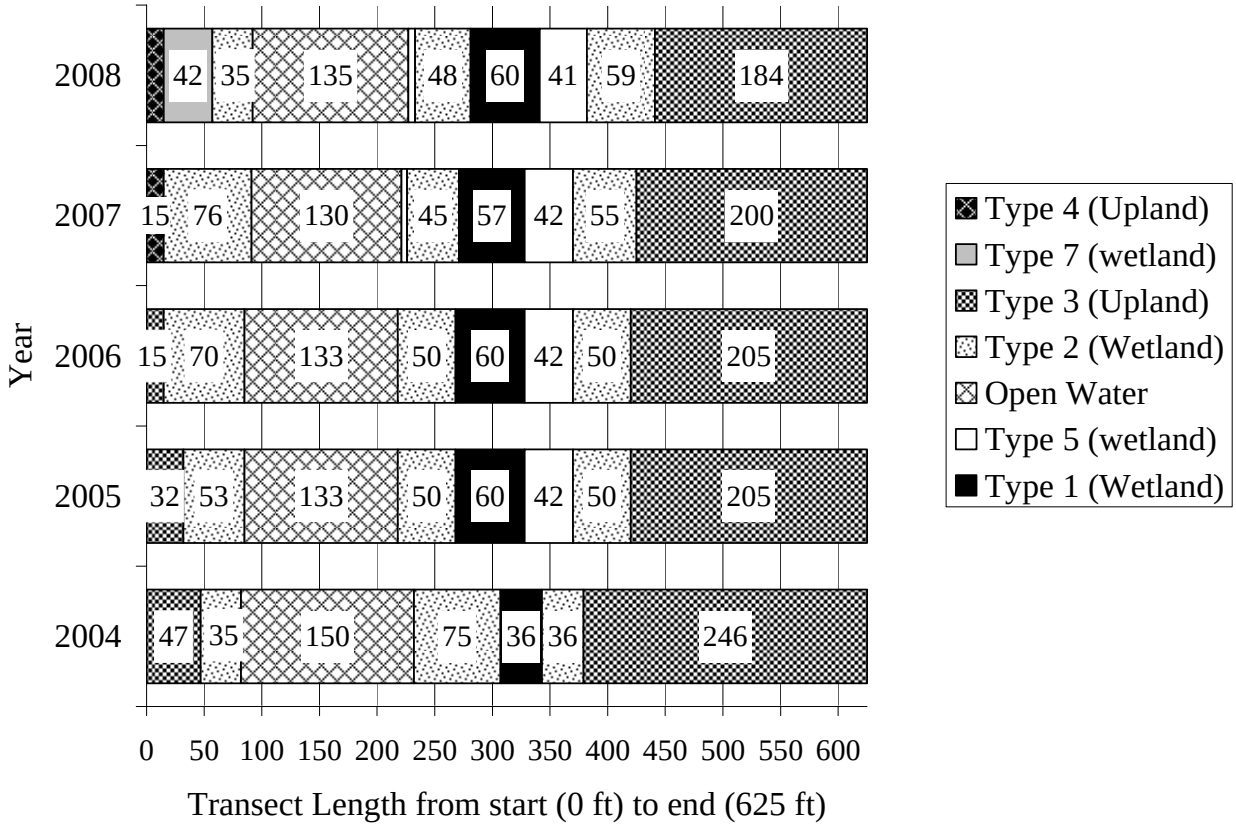
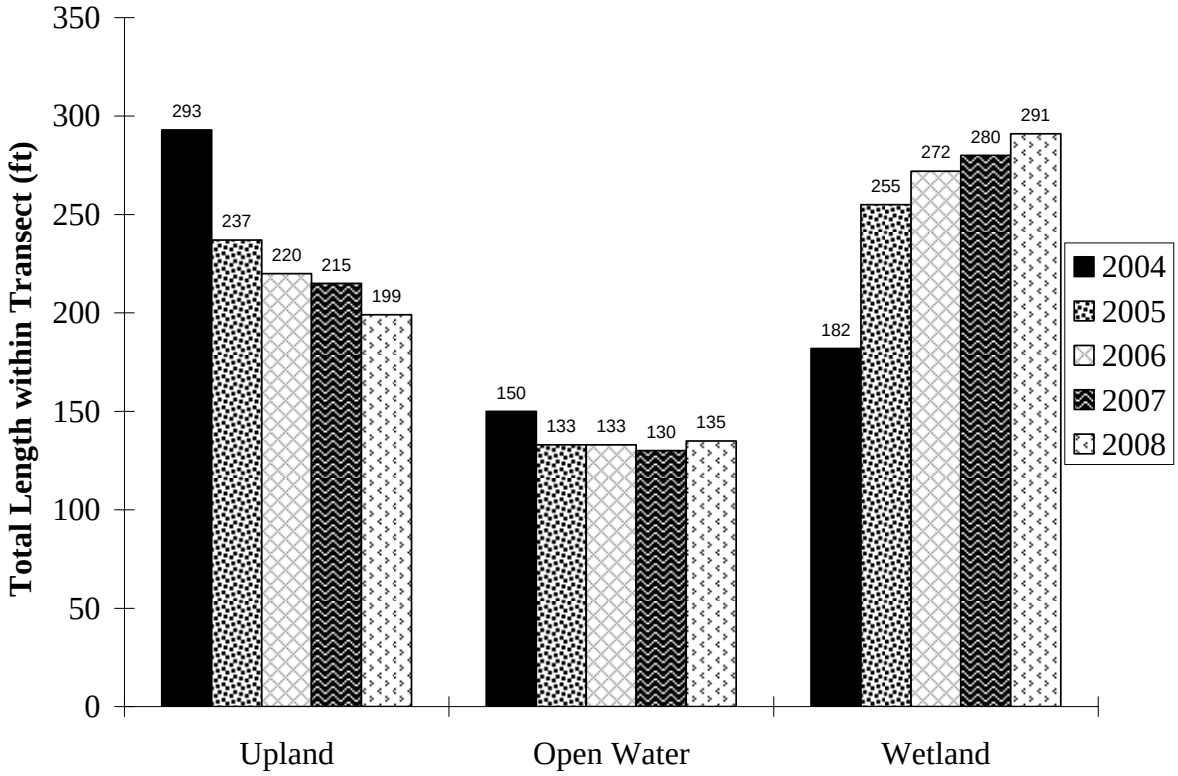


Chart 2: ***Length of vegetation communities within Transect 1 for each year monitored.***



Two species listed on the State of Montana noxious weed list were found: leafy spurge (*Euphorbia esula*) and Canada thistle (*Cirsium arvense*). Skeletons of dead spotted knapweed (*Centaurea maculosa*) plants were noted in the eastern and southern portions of the project area, but no live plants were observed during the 2008 field monitoring. Leafy spurge was noted along the margins of Pond 1; a few plants were scattered in the cottonwood communities along the southern portion of the project area. Canada thistle occurs in random patches scattered ed throughout the uplands and wetlands. Locations of the weeds were mapped onto **Figure 3**, but do not constitute discreet vegetation communities (**Appendix A**). Weed control measures have been implemented diligently by the landowner and include herbicide applications, mechanical methods, and biological control releases. Many Canada thistle plants and leafy spurge plants were dead during the July monitoring. This effective weed control has significantly lowered the size and frequency of the Canada thistle and leafy spurge infestations.

3.3 Soils

The site was mapped as part of the Sweetgrass County Soil Survey (USDA 2001). Three soil mapping units occur within the assessment area. The dominant soil on the site is mapped as Lallie silty clay (250A). This soil is hydric, poorly to very poorly drained, with a water table less than one foot from the surface during the growing season. Soils are frequently flooded and are typically found on floodplains. Lallie is a silty clay to silty loam textured soil. Nesda-McIlwaine loam (107A) is a well-drained coarse textured loam over a sandy gravelly alluvium. This soil unit borders the Yellowstone River within the assessment area. Fairway loam (135A)

occupies the western third of the assessment area. This soil is a non-hydric loamy alluvium that is somewhat poorly drained soil found on floodplains.

Soils were sampled at two (2) sample points (SP-1 and SP-2) along Transect 1. Soil samples generally matched USDA descriptions. At SP-1, soils were a very dark grayish brown (10YR 3/2) from 0 to 6 inches and dark grayish brown (10YR 4/2) from 6 to 14 inches. At SP-2, soils were a very dark gray (10YR 3/1) silty clay and saturated to the surface.

3.4 Wetland Delineation

Aquatic vegetation is developing around the edge of all four pond margins (**Figure 3** in **Appendix A; COE Forms** in **Appendix B**). The gross wetland boundary encompasses 13.17 acres, including 1.58 acres of shallow open water (less than four feet deep). However, it should be noted that this total does not include two small pre-existing wetland lobes (totaling 0.05 acre) within the easement that extend to the southeast outside of the MDT-defined monitoring area in the northeast corner of the site (**Figure 3** in **Appendix A**). Pre-existing wetland acreage totaled 6.98 acres, which did include the two wetland lobes outside of the current monitoring area. Therefore, pre-existing wetland within the current monitoring area was approximately 6.98 - 0.05 = 6.93 acres (**Figure 3** in **Appendix A**). Wetland / shallow open water acreage within the shown monitoring area has therefore increased by approximately 13.17 – 6.93 = 6.24 acres since construction (2002). Credit is assigned for enhancement of the original 6.98 wetland acres on the property, as well as the open water (1.58 acres) and wetland creation (4.66 acres) achieved within the monitoring area to date. Please see *Section 3.10* for crediting calculations.

3.5 Wildlife

Wildlife species observed on the site have been recorded since 2004 (**Table 3).** Activities and densities associated with these observations are included on the **Monitoring Form** (**Appendix B**). A total of 32 bird and four mammal species have been observed within the mitigation site. An active osprey nest is located just off the site.

Table 3: ***2004 - 2008 wildlife species observed within the Norem Property Wetland Mitigation Site[1].***

FISH, REPTILE, and AMPHIBIAN	
Western Chorus Frog (*Pseudacris triseriata*)	
BIRD	
American Kestrel (*Falco sparerius*)	**Mallard (*Anas platyrhynchos*)**
Barn Swallow (*Hirundo rustica*)	**Mourning Dove (*Zenaida macroura*)**
Blue-winged Teal (*Anas discors*)	Osprey (*Pandion haliaetus*)
Brown-headed Cowbird (*Molothrus ater*)	Red-tailed Hawk (*Buteo jamaicensis*)
Canada Goose (*Branta canadensis*)	**Red-winged Blackbird (*Agelaius phoeniceus*)**
Cedar Waxwing (*Bombycilla cedrorum*)	Sandhill Crane (*Grus canadensis*)
Common Snipe (*Gallinago gallinago*)	Savanah Sparrow (*Passerculus sandwichensis*)
Common Nighthawk (*Chordeiles minor*)	**Sora** (*Porzana Carolina*)
Common Yellowthroat (*Geothlypis trichas*)	**Spotted Sandpiper (*Actitis macularia*)**
Eastern Kingbird (*Tyrannus tyrannus*)	**Tern (unidentified) (*Sterna* sp.)**
European Starling *(Sturnus vulgaris*)	**Tree Swallow (*Tachycineta bicolor*)**
Great Blue Heron (*Ardea herodias*)	Turkey Vulture (*Cathartes aura*)
Greater Yellowlegs (*Tringa melanoleuca*)	Western Meadowlark (*Sturnella neglecta*)
Gull (unidentified species)	Wild Turkey (*Meleagris gallopavo*)
Killdeer (*Charadrius vociferous*)	Wilson's Phalarope (*Phalaropus tricolor*)
Least Sandpiper (*Calidris minitilla*)	Yellow Warbler (*Dendroica petechia*)
MAMMAL	
Mule Deer (*Odocoileus hemionus*)	Red fox (V*ulpes vulpes*)
Raccoon (*Procyon lotor*)	**White-tailed Deer (*Odocoileus virginianus*)**

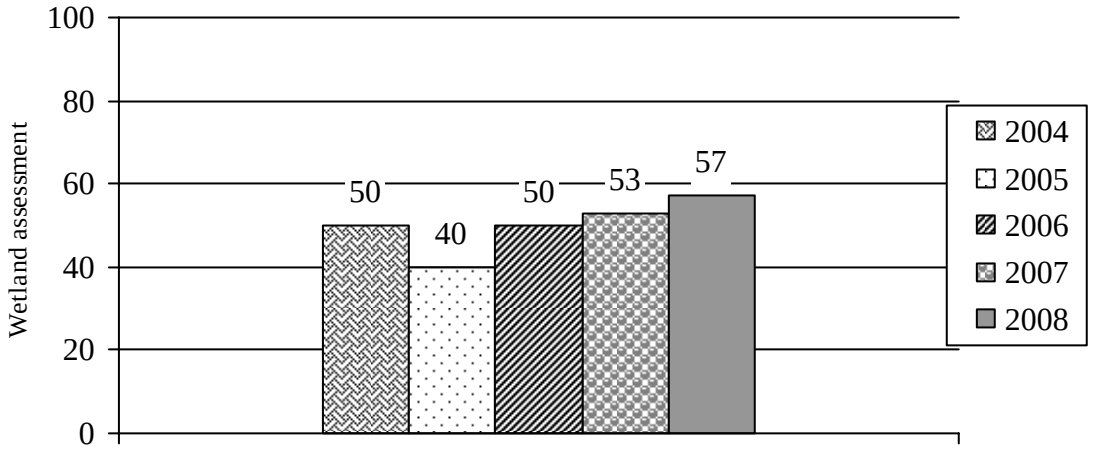
[1] **Bolded** species indicate those documented within the analysis area in 2008.

3.6 Macroinvertebrates

Macroinvertebrate sampling results are provided in **Appendix F** and were summarized by Rhithron Associates, Inc. in the italicized section below and in **Chart 3** (Bollman 2008).

> **Pond***: Low abundance continues to characterize this site, but taxa richness was higher in 2008 than in the previous year. Air-breathers (e.g. Trichocorixa sp.) and hemoglobin-bearers (e.g. Dicrotendipes sp.) were abundant, suggesting that hypoxic conditions characterized the aquatic and benthic environments. Midges in the Cricotopus (Isocladius) group were common in the 2008 assemblage, suggesting the presence of filamentous algae. Thus, there may be some improvement in habitat complexity since 2007, but macrophytes may still be limited here. Predators persist as a small but significant proportion of the functional composition. Thermal preference for this assemblage was 17.1ºC. The bioassessment index returned a score indicating sub-optimal conditions, with the score near the historic median value for statewide mitigation wetlands.*

Chart 3: ***Bioassessment scores from 2004 to 2008 for the Norem Property Wetland Mitigation Site.***



3.7 Functional Assessment

Pre-construction conditions were assessed using the 1997 MDT Montana Wetland Assessment Method (MWAM); 2002 through 2007 conditions were assessed using the 1999 MDT MWAM; and the 2008 conditions were assessed using the 2008 MDT MWAM. Although direct comparisons cannot be made, general trends in wetland development can still be determined (**Table 4**). For 2008, there is a decrease in the actual points using the new form, however, this does not mean that the functions and values of the wetlands have decreased, but rather results from modification in the structure of the 2008 form. Completed 2008 functional assessment forms are included in **Appendix B** and are summarized in **Table 4**. Pre-construction functional assessments were completed for the wetlands by Maxim (2001) (**Table 4**). The site rated as an overall Category II wetland and scores over 72 functional units. This represents an increase of approximately 39 units since 2001. Wildlife use, particularly migratory birds, will continue to increase with the expansion of the wetlands, open water features and the proliferation of the trees and shrubs.

3.8 Photographs

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

Table 4: ***Summary of the 2001 and 2008 wetland function/value ratings and functional points at the Norem Property Wetland Mitigation Project.***

Function and Value Parameters from the MDT Montana Wetland Assessment Method	Pre-construction	Post-construction
	2001[1]	2008[2]
Listed/Proposed T&E Species Habitat	Low (0.0)	Low (0.0)
MTNHP Species Habitat	Low (0.1)	Mod (0.5)
General Wildlife Habitat	Mod (0.5)	Exc (1.0)
General Fish/Aquatic Habitat	Low (0.1)	NA
Flood Attenuation	Mod (0.5)	NA
Short and Long Term Surface Water Storage	Mod (0.6)	Mod (0.6)
Sediment/Nutrient/Toxicant Removal	High (1.0)	High (0.9)
Sediment/Shoreline Stabilization	NA	NA
Production Export/Food Chain Support	Mod (0.7)	High (1.0)
Groundwater Discharge/Recharge	High (1.0)	High (1.0)
Uniqueness	Low (0.2)	Mod (0.4)
Recreation/Education Potential	Low (0.1)	Mod (0.1)
Actual Points / Possible Points	**4.8 / 11**	**5.5 / 8**
% of Possible Score Achieved	**50**	**69**
Overall Category	**III**	**II**
Total Acreage of Assessed Wetlands within Easement	**6.93**	**13.17**
Functional Units (acreage x actual points) (fu)	**33.26**	**72.43**
Net Acreage Gain	**NA**	**6.24**
Total Functional Unit Gain (fu)	**NA**	**39.18**

[1] Assessed using the 1997 MDT Montana Wetland Assessment Method (MWAM).
[2] Assessed using the 2008 MDT MWAM. The completed form is in **Appendix B**.

3.9 Maintenance Needs/Recommendations

All outflow structures were functioning and the fence around the wetland was intact. In the continued absence of wetland development in this area, elevations in the proposed wetland creation area in the northwest corner of the site could be checked to determine whether wetland creation is still feasible in this area.

During the 2008 monitoring very few leafy spurge plants were noted. These weed species had been sprayed and many were not viable at the time of the monitoring. Leafy spurge infestations are small and located along near around Pond 1 and in the cottonwoods in the southern portion of the project area. Canada thistle is still present, typically in the transition zones between wetlands and uplands. The landowner has implemented biological, mechanical and chemical control and has significantly reduced the population of Canada thistle. Due to the difficulty in controlling this and leafy spurge, continued weed control measures are recommended.

3.10 Current Credit Summary

MDT anticipates that wetland enhancement and creation on this site will provide 14.71 acres of credit within a 26.88-acre conservation easement. A summary table from the COE of potential wetland credits allows credit for enhancement of existing wetlands (2.32 acres credit), wetland

creation (9.46 acres credit), open water creation (1.58 acres credit) and buffer zone (1.50 acres credit) (**Appendix G**). The wetland impact of 0.15 acre (due to berm construction) was subtracted from the 14.86 total, resulting in the 14.71-acre credit figure. As of 2008, the approximate assignable wetland credit at the site is 10.06 acres or 68% of the goal (**Table 5**).

Portions of the cottonwood community, adjacent to the river, have shifted from an upland understory to a wetland understory in 2008. It is likely that over time, more of the cottonwood community will shift to a wetland understory. Elevations at the proposed wetland creation area in the northwest corner of the site may be too high to achieve the desired wetlands in this area; this area will continue to be examined in subsequent monitoring years.

The net functional unit gain has increased 39 points since 2001 due to increase in wetland size and wildlife habitat. The wetland is ranked as a Category II site.

Table 5: ***2008 wetland credits and acreages for the Norem Property Wetland Mitigation Site.***

Wetland Mitigation Type	2008 Net Acre	Ratio	2008 Credit Acre	Target Credit Acre	Comment
Wetland Enhancement	6.98	3:1	2.32	2.32	Grazing removal, hydrological enhancement, and planting completed, with plants developing.
Wetland Creation	4.66	1:1	4.66	9.46	49% of the wetland creation area has been converted to wetlands.
Open Water Creation	1.58	1:1	1.58	1.58	100% of the intended open water has developed.
Buffer Zone Implementation	6.02	4:1	1.50	1.50	2008 net buffer area was assumed within easement.
Berm impact	--	--	---	-0.15	
TOTAL	**19.24**	**--**	**10.06**	**14.71**	**68% of goal**

4.0 REFERENCES

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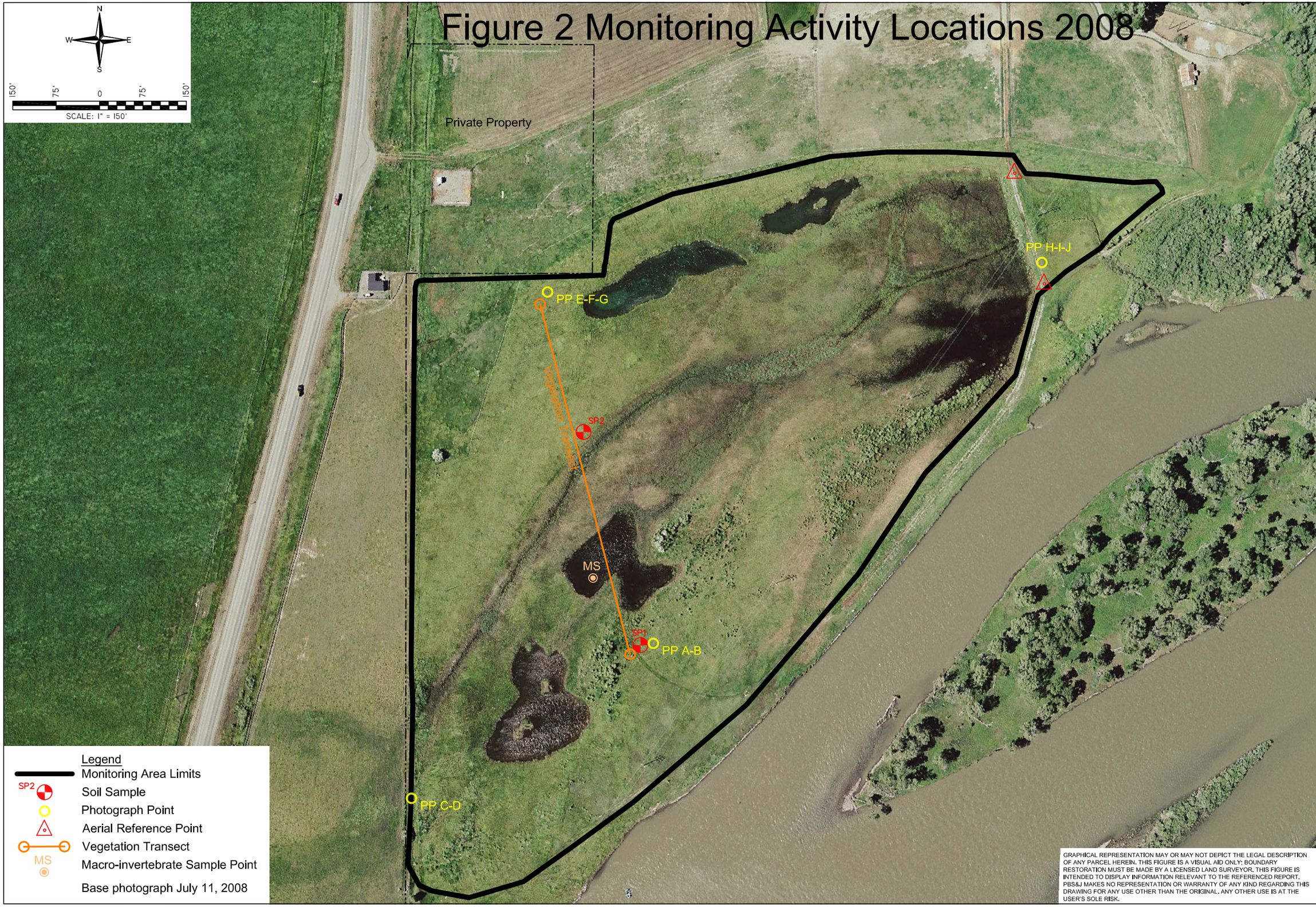
Appendix A

FIGURES 2 & 3

MDT Wetland Mitigation Monitoring
Norem Property
Big Timber, Montana

Figure 2 Monitoring Activity Locations 2008



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PROJECT NAME
MDT NOREM WETLAND MITIGATION

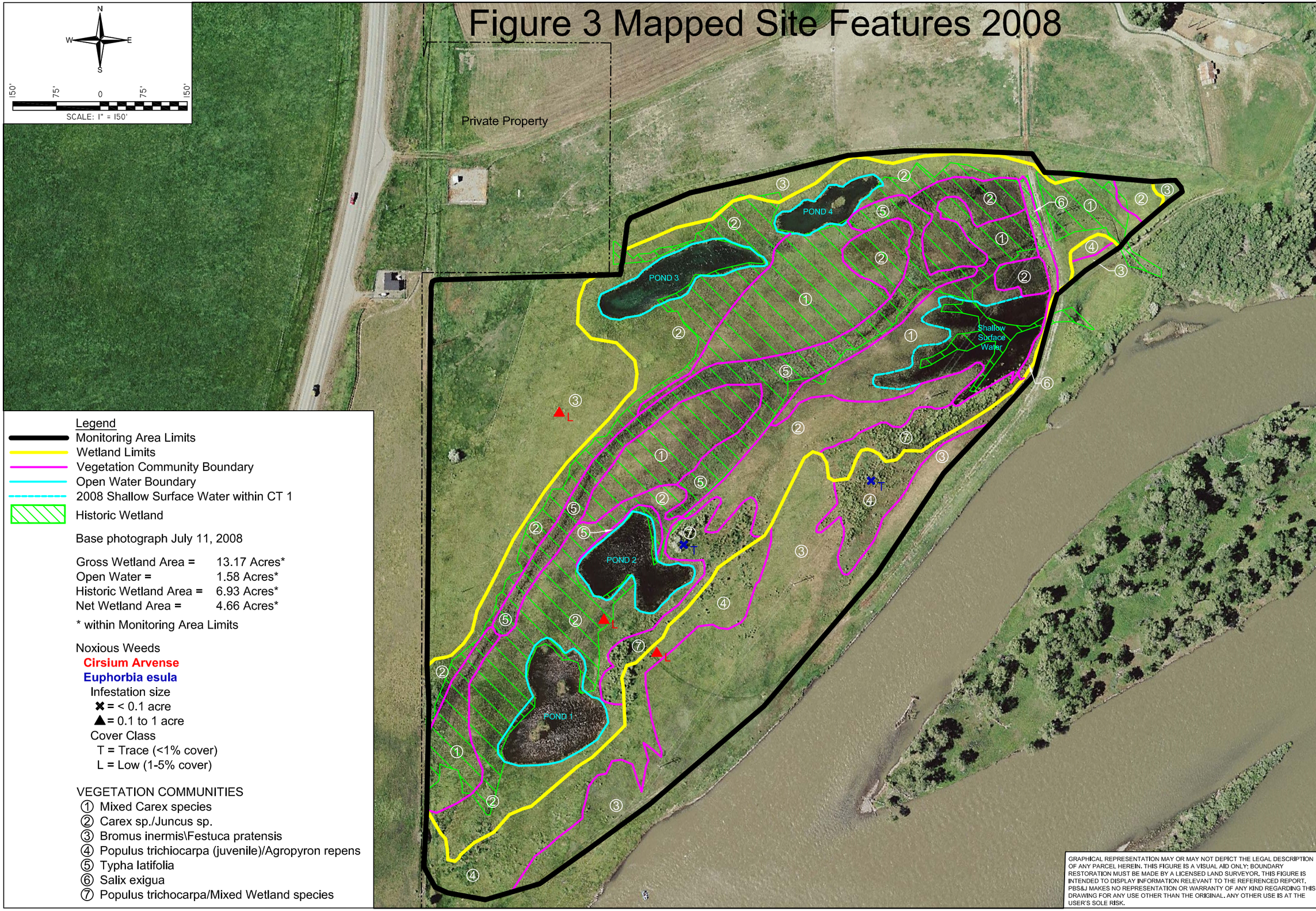
DRAWING TITLE
MONITORING ACTIVITY LOCATIONS 2008

PROJ NO: 0B4308801 06.04	DRAWN: SH/JR		
LOCATION: BIG TIMBER, MT	PROJ MGR: J. BERGLUND		
SCALE: NOTED	CHECKED: CH	APPVD: JB	
FILE NAME:			

PBSJ
3810 Valley Commons Drive
Suite 4
Bozeman, MT 59718

FIGURE
2 OF -
REV -

Figure 3 Mapped Site Features 2008



Legend

- Monitoring Area Limits
- Wetland Limits
- Vegetation Community Boundary
- Open Water Boundary
- 2008 Shallow Surface Water within CT 1
- Historic Wetland

Base photograph July 11, 2008

Gross Wetland Area =	13.17 Acres*
Open Water =	1.58 Acres*
Historic Wetland Area =	6.93 Acres*
Net Wetland Area =	4.66 Acres*

* within Monitoring Area Limits

Noxious Weeds

Cirsium Arvense

Euphorbia esula

Infestation size

✖ = < 0.1 acre

▲ = 0.1 to 1 acre

Cover Class

T = Trace (<1% cover)

L = Low (1-5% cover)

VEGETATION COMMUNITIES

① Mixed Carex species
② Carex sp./Juncus sp.
③ Bromus inermis\Festuca pratensis
④ Populus trichiocarpa (juvenile)/Agropyron repens
⑤ Typha latifolia
⑥ Salix exigua
⑦ Populus trichocarpa/Mixed Wetland species

PROJECT NAME: MDT NOREM WETLAND MITIGATION

DRAWING TITLE: MAPPED SITE FEATURES 2008

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

PROJ NO: 0B4308801 06.04 | LOCATION: BIG TIMBER, MT | SCALE: NOTED | FILE NAME:

PBSJ
3810 Valley Commons Drive
Suite 4
Bozeman, MT 59718

FIGURE 3 OF -

REV -

Appendix B

2008 WETLAND MITIGATION SITE MONITORING FORMS
2008 BIRD SURVEY FORMS
2008 COE WETLAND DELINEATION FORMS
2008 FUNCTIONAL ASSESSMENT FORMS

MDT Wetland Mitigation Monitoring
Norem Wetland Project
Big Timber, Montana

PBS&J / MDT WETLAND MITIGATION SITE MONITORING FORM

Project Name: **Norem Property** Project Number: **0B4308801-06.04**
Assessment Date: **July 22 2008** Person(s) conducting the assessment: **CH/PBSJ**
Location: **2.0 miles NE of Big Timber** MDT District: **Billings** Milepost: _____
Legal Description: T **1N** R **14E** Section **12**
Weather Conditions: **partly cloudy, calm** Time of Day: **7 AM**
Initial Evaluation Date: **August 13, 2004** Monitoring Year: **fifth** # Visits in Year: **1**
Size of evaluation area: **26.88 acres** Land use surrounding wetland: **grazing/hay/residential**

HYDROLOGY

Surface Water Source: **Groundwater and irrigation return.**
Inundation: **Present** Average Depth**: 2 inches wetland meadows, 2 feet ponds:** Range of Depths: **1-4 inches wet meadows, 1 – 3 feet ponds**
Percent of assessment area under inundation: **50%**
Depth at emergent vegetation-open water boundary: **0.5 foot**
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.):
water marks, sediment deposits

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

Well Number	Depth	Well Number	Depth	Well Number	Depth

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

COMMENTS / PROBLEMS:
Wells to be monitored by landowner / consultant.

VEGETATION COMMUNITIES

Community Number: **1** Community Title (main spp): **Mixed Carex species**

Dominant Species	% Cover	Dominant Species	% Cover
Carex utriculata	3 = 11-20%	Juncus torreyi	1 = 1-5%
C. nebrascensis	3 = 11-20%	Salix exigua	1 = 1-5%
C. aquatilis	3 = 11-20%	Scirpus acutus	1 = 1-5%
C. lanuginosa	2 = 6-10%	Eleocharis palustris	1 = 1-5%
Glyceria grandis	1 = 1-5%	Scirpus pungens	1 = 1-5%
Juncus balticus	1 = 1-5%		

Comments / Problems: **In 2008, soils were inundated with surface water ranging in depth from 1 inch to 4 inches. During the July monitoring, the eastern portion of the project area near the outlet had the ponded water (see Figure 3) for the first time in 5 years. A new species (Polygonum amphibium) was noted within this area.**

Community Number: **2** Community Title (main spp): **Carex sp./Juncus sp.**

Dominant Species	% Cover	Dominant Species	% Cover
Carex nebrascensis	3 = 11-20%	Hordeum jubatum	2 = 6-10%
C. lanuginosa	2 = 6-10%	Agrostis alba	2 = 6-10%
C. aquatilis	2 = 6–10%	Scirpus pungens	2 = 6-10%
C. lasiocarpa	1 = 1-5%	Potentilla anserina	1 = 1-5%
Juncus balticus	4 = 21-50%	Spartana pectinata	1 = 1-5%
J. torreyi	1 = 1-5%	Cirsium arvense	1 = 1-5%
J. longistylis	1 = 1-5%		

Comments / Problems: **This is a large and diverse community within the project area. Agrostis alba cover is increasing along drier margins of this community. Other species noted in 2007 include Rumex crispus, Alopecurus arundinacea, Glyceria striata, Deschampsia cespitosa, Epilobium ciliatum, Poa palustris, Mentha arvensis and Polygonum punctatum. In 2008 noted an increase in Carex aquatilis and C. lanuginosa within the community as well as a significant increase in surface water across the entire community type.**

Community Number: **3** Community Title (main spp): **Bromus inermis/Festuca pratensis**

Dominant Species	% Cover	Dominant Species	% Cover
Bromus inermis	3 = 11-20%	Poa pratensis	2 = 6-10%
Festuca pratensis	3 = 11-20%	Equistem arvense	2 = 6-10%
Agropyron smithii	2 = 6-10%	Juncus balticus	2 = 6-10%
Agrostis alba	2 = 6-10%	Agropyron dasytachyum	1 = 1-5%
Agropyron repens	2 = 6-10%	Cirsium arvense	1 = 1-5%
Festuca arundinacea	2 = 6-10%	Potentilla anserina	1 = 1-5%

Comments / Problems: **Agropyron smithii co-dominants in the driest portions of the project site. Festuca arundinacea replaces F. pratensis north of the ponds. In 2008, noticed an increase in cover by Agrostis alba, Juncus balticus and Equisetum arvense along the CT3 and CT2 borders. Spartina gracilis was observed along the border of CT 3 and CT 4 in the southeast portion of the project area.**

VEGETATION COMMUNITIES (continued)

Community Number: **4** Community Title (main spp): **Populus trichocarpa/Agropyron repens**

Dominant Species	% Cover	Dominant Species	% Cover
Populus trichocarpa (6" to 7 ft)	4 = 21-50%	Poa pratensis	1 = 1-5%
Agropyron repens	3 = 11-20%	Bromus inermis	1 = 1-5%
Festuca pratensis	3 = 11-20%	Phlaris arundinacea	1 = 1-5%
Agropyron smithii	2 = 6-10%	Juncus balticus	1 = 1-5%
Salix exigua	2 = 6-10%	Alopecurus pratensis	1 = 1-5%
Agrostis alba	2 = 6-10%	Cirsium arvense	1 = 1-5%

Comments / Problems: **This riparian community type will potentially be a very valuable ecological asset to the Yellowstone River ecosystem. This buffer zone is spreading toward the river-noted root suckers closer to the trail/old road. In 2008, impressive growth and vigor of the grasses, forbs and woody plants. Sediment deposits from flood water were also noted in this community during the 2008 monitoring.**

Community Number: **5** Community Title (main spp): **Typha latifolia**

Dominant Species	% Cover	Dominant Species	% Cover
Typha latifolia	5 = > 50%	Bechmannia syzigachne	1 = 1-5%
Scipus acutus	2 = 6-10%	Carex utriculata	1 = 1-5%
Carex aquatilis	2 = 6-10%		
Eleocharis palustris	2 = 6-10%		
Scirpus pungens	1 = 1-5%		
Spartana pectinata	1 = 1-5%		

Comments / Problems: **This community represents the wettest vegetation type within the project site.**

Community Number: **6** Community Title (main spp): **Salix exigua**

Dominant Species	% Cover	Dominant Species	% Cover
Salix exigua (2 to 6 ft tall)	5=>50%	Agrostis alba	2 = 6-10%
Carex lanuginosa	2 = 6-10%	Agropyron repens	2= 6-10%
Phalaris arundinacea	2 = 6-10%	Juncus balticus	1 = 1-5%

Comments / Problems: **Salix exigua forms a narrow band west of the access road. In 2008, this band of willows continues to expand to the south, southwest.**

Community Number: **7** Community Title (main spp): **Populus trichocarpa / Mixed Wetland Species**

Dominant Species	% Cover	Dominant Species	% Cover
Populus trichocarpa	4 = 21-50%	Alopecurus pratensis	1 = 1-5%
Juncus balticus	3 = 11-20%	Salix exigua (seedlings)	1 = 1-5%
Potentilla arvense	3 = 11-20%	Phalaris arundinacea	1 = 1-5%
Carex nebrascensis	3 = 11-20%		
Agropyron repens	2 = 6–10%		
Festuca pratensis	1 = 1-5%		

Comments / Problems: **This community type evolved from CT 4.**

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	3, 4	*Juncus torreyi*	1, 2
Agropyron repens	3, 4, 6, 7	*Kochia scoparia*	3
Agropyron smithii	3, 4	*Lithosperum arvense*	3
Agropyron trachycaulum	4	*Melilotus alba*	3, 4
Agrostis alba	2, 3, 4, 6	*Melilotus officinalis*	3, 4
Alisma sp.	open water	*Mentha arvense*	1, 2
Alopecurus arundinacea	2	*Phalaris arundinacea*	2, 4, 6, 7
Alopecurus pratensis	2, 4, 7	*Phleum pratense*	4
Asclepias speciosa	2	*Plantago patagonica*	3
Beckmannia syzigachne	2, 5	*Poa palustris*	2
Bromus inermis	3, 4	*Poa pratensis*	3, 4
Bromus tectorum	4	*Polygonum amphibium*	1
Cardaria draba	4	*Polygonum punctatum*	2, 5
Carex aquatilis	1, 2, 5, 6	*Populus tremoides*	2, 4
Carex arcta	2	*Populus trichocarpa*	2, 3, 4, 7
Carex lanuginosa	1, 2, 6	*Potentilla anserina*	2, 3, 7
Carex lasiocarpa	2	*Rumex crispus*	2
Carex nebrascensis	1, 2, 7	*Sagittaria cuneata*	open water
Carex utriculata	1, 2, 5	*Salix alba (lutea)*	2
Centaurea maculosa	3, 4	*Salix exigua*	1, 2, 4, 6, 7
Cirsium arvense	2, 3, 4	*Scirpus acutus*	1, 2, 5
Convolvulus arvensis	3	*Scirpus pungens*	1, 2, 5
Cornus stolonifera	1, 2	*Sisymbrium altissmum*	3
Crataegus douglasii	1, 2	*Spartana gracilis*	3
Crepis acuminata	3, 4	*Spartana pectinata*	2, 5
Deschampsia cespitosa	2	*Solidago occidentalis*	2
Distichlis spicata	3	*Taraxacum officinale*	3
Elaeagnus angustifolia	3, 4	*Thlaspi arvense*	3
Eleocharis palustris	1, 5	*Tragopogon dubius*	3
Epilobium ciliatum (watsonii)	2	*Typha latifolia*	1, 5
Equisetum arvense	2, 3	*Verbascum thapsus*	3
Erigeron lanatus	3		
Euphorbia esula	3, 4		
Festuca arundinacea	3		
Festuca pratensis	3, 4, 7		
Glyceria grandis	1, 5		
Glyceria striata	2		
Glycyrrhiza lepidota	2, 4		
Grindelia squarrosa	3		
Hordeum jubatum	2, 4		
Helianthis annuus	3		
Juncus balticus	1, 2, 3, 4, 6, 7		
Juncus bufonius	2		
Juncus longistylis	1, 2		
Juncus tenuis	2		

Comments / Problems:

PLANTED WOODY VEGETATION SURVIVAL

Plant Species	Number Originally Planted	Mortality Causes & General Information
Pond # 1		Overall the trees and shrubs planted around the perimeter of this pond are doing well. No mortality was noted in 2008. Salix exigua is more common along the south and northeastern edges of the pond perimeter. Cornus stolonifera plants were noted in the saturated soils along the pond margins. Patches of Crateagus douglasii and Populus trichocarpa were observed during the 2008 monitoring visit. Populus tremuloides seedlings were noted this year along the edge of the saturated soils as well as Elaeagnus angustifolia seedlings. The percent survival remains at 65 to 70% (same as 2006 and 2007). The actual cover and diversity of woody species continues to improve along the pond margins due to exposed saturated soils (seed establishment), root suckers and development of planted species.
Cornus stolonifera	522	
Salix sp. (primarily exigua)	561	
Crateagus douglasii	15	
Populus trichocarpa	46	
Pond #2		In 2008 no mortality to the transplanted trees and shrubs were noted. This pond is within the transect line, Cornus stolonifera, Populus trichocarpa (2 to 3.5 feet tall), Crateagus douglasii and Salix species were noted during the 2008 monitoring. Numerous new root suckers of Salix and Populus species were noted along the SE and south portion of the pond perimeter. This may be the encroachment of species from the buffer zone or the development of transplanted species not noticed in earlier visits. The 69% survival estimate from 2006 remains the same in 2008.
Cornus stolonifera	200	
Salix sp. (primarily exigua)	314	
Crateagus douglasii	100	
Populus trichocarpa	30	
Pond #3		In 2008 two of the transplanted Populus trichocarpa were dead along the western side of the pond margin. The remaining woody species continue to thrive. Cornus stolinfera, Salix alba, S. exigua and the reamaining Populus trichocarpa are healthy and robust. Crateagus plants were observed and are healthy but with a slower growth rate. Pond margins are well vegetated, no bare or sparsely vegetated areas. The estimated 77% survival from 2006, 2007 remains the same in 2008. A few Elaeagnus angustifolia seedlings were noted around the perimeter of this pond duirng the 2008 monitoring. .
Cornus stolonifera	200	
Salix sp. (primarily exigua)	314	
Crateagus douglasii	100	
Populus trichocarpa	300	
Pond #4		In 2008 the majority of the transplanted woody species were robust and healthy along this pond. Salix sp., primarily exigua is abundant along the southern side of the pond. Most of the Populus trichocarpa and P. angustifolia transplants are thriving, two plants died back but had re-sprouted from the base. Cottonwood seedlings along the north side are healthy. Cornus stolonifera plants maintain heights similar to 2007. The estimated survival of 75 to 80% from 2006 and 2007 remains the same in 2008. As Salix exigua continues to grow and spread, it is anticipated that the overall cover by woody species will increase along this pond margin.
Cornus stolonifera	126	
Salix sp. (primarily exigua)	275	
Populus trichocarpa	70	

Comments / Problems: _____

WILDLIFE

Birds

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

Mammals and Herptiles

Mammal and Herptile Species	Number Observed	Indirect Indication of Use			
		Tracks	Scat	Burrows	Other
White-tailed deer	4	☒	☐	☐	
Crayfish	1	☐	☐	☐	
		☐	☐	☐	
		☐	☐	☐	
		☐	☐	☐	
		☐	☐	☐	
		☐	☐	☐	
		☐	☐	☐	

Additional Activities Checklist:
Yes Macroinvertebrate Sampling (if required)

Comments / Problems: Osprey nest platform just off-site was still in place, observed adults during the monitoring.

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		Southern end of transect looking NW, viewing CT 4	Northwest
B		Southern end of transect looking SW, viewing CT 3 and 4	Southwest
C		Species diversity along edge of pond 1, bankfull water levels and vegetated banks	Northwest
D		Southernwestern corner of the property	North
E		Northern end of the transect looking east, viewing community types 3, 2 and 1	East
F		Northern end of transect looking SW, viewing community type 3	Southwest
G		Northern end of transect, pond 3 bankfull	East
H		Looking SW across CT 1 and 2 (wetlands), flowing water in ditch	Southwest
I		Willow establishment along eastern road edge	North
J		Buffer between the river and wetlands	Southwest
H-1		Inundated wetland, shallow surface west of outlet	Southwest
H-2		Lady's thumb in inundated wetland, west of outlet	Southwest

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 and 2008**

FUNCTIONAL ASSESSMENT

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

Comments / Problems: **Completed the 2008 MDT Montana Wetland Assessment Method**

MAINTENANCE

Were man-made nesting structure installed at this site? **No**
If yes, do they need to be repaired? **NA**
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: _____

MDT WETLAND MONITORING – VEGETATION TRANSECT

Site: **Norem Property** Date: **July 22, 2008** Examiner: **CH/PBSJ**
Transect Number: **1** Approximate Transect Length: **625 feet** Compass Direction from Start: **0˚** Note: _____

Vegetation Type A: **CT 4 (Upland)**	
Length of transect in this type: 15 feet (sediment deposits on vegetation)	
Plant Species	**Cover**
POPTRI (6 inches to 6 feet tall)	4 = 21-50%
AGRREP	3 = 11-20%
FESPRA	3 = 11-20%
BROINE	2 = 6-10%
AGRALB	2 = 6-10%
JUNBAL	2 = 6-10%
POAPRA	1 = 1-5%
PHLARU	1 = 1-5%
CIRARV, DACGLO	1 = 1-5%
SALEXI	1 = 1-5%
CARLAN	1 = 1-5%
EQUARV	+= <1%
Total Vegetative Cover:	90%

Vegetation Type B: **CT 7 (Wetland)**	
Length of transect in this type: 42 feet	
Plant Species	**Cover**
POPTRI	3 = 11-20%
JUNBAL	4 = 21-50%
PHAARU	3 = 11-20%
AGRALB	2 = 6-10%
POTANS	2 = 6-10%
JUNLON	1 = 1-5%
HORJUB	1 = 1-5%
POAPAL	1 = 1-5%
CIRARV	1 = 1-5%
ALOPRA	1 = 1-5%
FESARU	1 = 1-5%
Total Vegetative Cover:	90%

Vegetation Type C: **CT 2 (Wetland)**	
Length of transect in this type: 35 feet	
Plant Species	**Cover**
CARLAN	3 = 11-20%
CARNEB	2 = 6-10%
JUNBAL	4 = 21-50%
POTANS	3 = 11-20%
AGRALB	1 = 1-5%
HORJUB	1 = 1-5%
CIRARV	1 = 1-5%
AGRREP	1 = 1-5%
Total Vegetative Cover:	90%

Vegetation Type D: **Open Water <4 ft**	
Length of transect in this type: 135 feet	
Plant Species	**Cover**
Open water	5 = >50%
CARAQU	3 = 11-20%
TYPLAT	2 = 6-10%
JUNTOR	2 = 6-10%
ELEPAL	1 = 1-5%
JUNBAL	1 = 1-6%
SAGCUN	+ = <1%
ALIsp.	+ = <1%
Total Vegetative Cover:	30%

MDT WETLAND MONITORING – VEGETATION TRANSECT

Site: **Norem Property** Date: **July 22, 2008** Examiner: **CH/PBSJ**
Transect Number: **1** Approximate Transect Length: **625 feet** Compass Direction from Start: **0˚** Note: _____

Vegetation Type E: **CT 5 (Wetland)**	
Length of transect in this type: 6 feet	
Plant Species	**Cover**
TYPLAT	4 = 21-50%
CARAQU	3 = 11-20%
CARUTR	2 = 6-10%
SCIACU	1 = 1-5%
ELEPAL	1 = 1-5%
JUNBAL	1 = 1-5%
JUNTOR	1 = 1-5%
SPAPEC	+ = <1%
MENARV	+ = <1%
Total Vegetative Cover:	90%

Vegetation Type F: **CT 2 (Wetland)**	
Length of transect in this type: 48 feet	
Plant Species	**Cover**
CARUTR	3 = 11-20%
CARAQU	3 = 11-20%
CARLAN	2 = 6-10%
CARNEB	1 = 1-5%
JUNBAL	4 = 21-50%
HORJUB	1 = 1-5%
MENARV	1 = 1-5%
CIRARV	+ = <1%
½ inch of surface water	
Sediments deposits noted – signs of overland flow	
Litter	3 = 11-20%
Total Vegetative Cover:	80%

Vegetation Type G: **CT 1 (Wetland)**	
Length of transect in this type: 60 feet	
Plant Species	**Cover**
CARUTR	4 = 21-50%
CARAQU	3 = 11-20%
CARLAS	2 = 6-10%
CARNEB	1 = 1-5%
SCIACU	2 = 6-10%
GLYGRA	1 = 1-5%
JUNBAL	1 = 1-5%
SCIPUN	1 = 1-5%
JUNLON	+ = <1%
TYPLAT	+ = <1%
Total Vegetative Cover:	90%

Vegetation Type H: **CT 5 (Wetland)**	
Length of transect in this type: 41 feet	
Plant Species	**Cover**
TYPLAT	4 = 21-50%
CARUTR	4 = 21-50%
CARAQU	2 = 6-10%
CARLAN	1 = 6-10%
Flowing water (~2 ft deep)	
Total Vegetative Cover:	90%

Site: **Norem Property** Date: **July 22, 2008** Examiner: **CH/PBSJ**
Transect Number: **1** Approximate Transect Length: **625 feet** Compass Direction from Start: **0˚** Note: _____

Vegetation Type I: **CT 2 (Wetland)**	
Length of transect in this type: 59 feet	
Plant Species	**Cover**
CARLAN	3 = 11-20%
CARNEB	1 = 1-5%
JUNBAL	4 = 21-50%
EQUARV	2 = 6-10%
AGRALB	2 = 6-10%
POAPAL	1 = 1-5%
FESPRA	1 = 1-5%
JUNLON	1 = 1-5%
Total Vegetative Cover:	85%

Vegetation Type J: **CT 3 (Upland)**	
Length of transect in this type: 184 feet	
Plant Species	**Cover**
FESPRA	3 = 11-20%
BROINE	2 = 6-10%
AGRREP	3 = 11-20%
AGRSMI	2 = 6-10%
AGRDAS	1 = 1-5%
JUNBAL	1 = 1-5%
AGRALB	1 = 1-5%
CIRAVR	1 = 1-5%
POAPAL	1 = 1-5%
Total Vegetative Cover:	85%

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

Vegetation Type L:	
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

Site: **Norem Property** Date: **7/22/08**
Survey Time: **7AM** to **9AM**

Bird Species	#	Behavior	Habitat	Bird Species	#	Behavior	Habitat
Eastern Kingbird	1	F	MA				
Mallard	1	Flushed	MA				
Mourning Dove	2	Flushed	MA				
Red-winged Blackbird	10	F BD	UP MA				
Sora	1	BD	MA				
Spotted Sandpiper	1	FO	MA UP				
Tree Swallow	2	F	MA				
Unidentified Tern*	1	F	MA				
Wilson's Snipe	4	Flushed	MA				

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

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

Weather: **clear, 70-80 degrees**

Notes: In May 08 an Unidentified Tern was observed from road while driving north on highway.

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

Project / Site: **Norem Property**	Date: **July 22, 2008**
Applicant / Owner: **MDT**	County: **Sweetgrass**
Investigator: **CH/PBSJ**	State: **Montana**

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

VEGETATION

Dominant Species	Stratum	Indicator	Dominant Species	Stratum	Indicator
1. *POPTRI*	Tree	FAC	11.		
2. *FESPRA*	Herb	FACU+	12.		
3. *AGRREP*	Herb	FACU	13.		
4. *BROINE*	Herb	NI	14.		
5. *POAPRA*	Herb	FACU+	15.		
6. *JUNBAL*	Herb	OBL	16.		
7. *PHAARU*	Herb	FACW	17.		
8.			18.		
9.			19.		
10.			20.		
Percent of Dominant Species that are OBL, FACW, or FAC (excluding FAC-): **3** / **7** = **43**%			FAC Neutral: / = %		
Remarks: **43 percent hydrophytic vegetation**					

HYDROLOGY

Yes Recorded Data (Describe in Remarks): **N/A** Stream, Lake, or Tide Gauge **Yes** Aerial Photographs **N/A** Other **No** No Recorded Data	Wetland Hydrology Indicators Primary Indicators: **NO** Inundated **NO** Saturated in Upper 12 Inches **NO** Water Marks **NO** Drift Lines **YES** Sediment Deposits **NO** Drainage Patterns in Wetland
Field Observations: Depth of Surface Water **None** ____ (in.) Depth to Free Water in Pit **None** ____ (in.) Depth to Saturated Soil > **14** (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 were moist but not saturated in the upper 12 inches, however sediment deposits were evident from spring flooding (primary hydrologic indicators).**	

SOILS

Map Unit Name (Series and Phase): **Nesda-McIlwaine loams**
Map Symbol: **107A** Drainage Class: **well-drained** Mapped Hydric Inclusion? _
Taxonomy (Subgroup): **Fine sandy loam** 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 3/2	/ /	N/A N/A	Sandy Loam
6-14	B	10 YR 4/2	7.5 YR 4/4 /	Common Distinct	Silt Loam (w sand lense)
		/	/ /	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: **Hydric soil indicators were present.**

WETLAND DETERMINATION

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

Remarks: **Cottonwoods continue to expand in cover and height along the southern project boundary. The understory consists of a mix of hydrophytic and upland species. This site does not meet the hydrophytic vegetation criteria - area needs more time and hydrology to develop.**

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

Project / Site: **Norem Property**	Date: **July 22, 2008**
Applicant / Owner: **MDT**	County: **Sweetgrass**
Investigator: **CH/PBSJ**	State: **Montana**

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

VEGETATION

Dominant Species	Stratum	Indicator	Dominant Species	Stratum	Indicator
1. *JUNBAL*	Herb	OBL	11.		
2. *EQUARV*	Herb	FAC	12.		
3. *POAPAL*	Herb	FAC	13.		
4. *JUNLON*	Herb	FACW	14.		
5. *AGRREP*	Herb	FACU	15.		
6. *AGRALB*	Herb	FACW	16.		
7. *FESPRA*	Herb	FACU+	17.		
8.			18.		
9.			19.		
10.			20.		

Percent of Dominant Species that are OBL, FACW, or FAC (excluding FAC-): **5** / **7** = **71**%	FAC Neutral: / = %

Remarks: **71% hydrophytic vegetation - starting to see Juncus, Equistem, and Agrostis encroach into the uplands**

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 > **14** (in.) Depth to Saturated Soil = **0** (in.)	Secondary Indicators (2 or more required): **NO** Oxidized Root Channels in Upper 12 inches **NO** Water-Stained Leaves **NO** Local Soil Survey Data **NO** FAC-Neutral Test **NO** Other (Explain in Remarks)

Remarks: **Soils saturated to the surface**

SOILS

Map Unit Name (Series and Phase): **Lallie family**
Map Symbol: **250A** Drainage Class: **poorly-drained** Mapped Hydric Inclusion? _
Taxonomy (Subgroup): **Silty clay** Field Observations confirm Mapped Type? **Yes**

Profile Description

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Color(s) (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-12	A/B	10 YR 3/1	/ /	N/A N/A	Silty Clay
		/	/ /	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
- **NO** Reducing Conditions
- **YES** Gleyed or Low-Chroma Colors
- **NO** Concretions
- **NO** High Organic Content in Surface Layer in Sandy Soils
- **NO** Organic Streaking in Sandy Soils
- **NO** Listed on Local Hydric Soils List
- **NO** Listed on National Hydric Soils List
- **NO** Other (Explain in Remarks)

Remarks: **Hydric soil indicators include low chroma values.**

WETLAND DETERMINATION

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

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

Remarks: **Sample point meets all three wetland criteria**

MDT MONTANA WETLAND ASSESSMENT FORM (revised March 2008)

1. Project Name: Norem Property Wetland Mitigation Site **2. MDT Project #:** STPX49(20) **3. Control #:** 5190

3. Evaluation Date: 7/22/2008 **4. Evaluator(s):** CH (PBS&J) **5. Wetland/Site #(s):** Norem Property

6. Wetland Location(s): Township 1 N, Range 14 E, Section 12; Township ___ N, Range ___ E, Section _____

Approximate Stationing or Roadposts: _____

Watershed: 13 - Upper Yellowstone **County:** _ _ Sweet Grass _

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)
11.59 (measured, e.g. GPS)

9. Assessment Area (AA) Size (acre): _____ (visually estimated)
(see manual for determining AA) 13.17 (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
Riverine	Emergent Wetland	Impounded	Seasonal / Intermittent	85
Riverine	Unconsolidated Bottom	Excavated	Permanent / Perennial	10
Depressional	Scrub-Shrub Wetland	Impounded	Seasonal / Intermittent	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.)**:** Low disturbance includes a road/berm.

ii. Prominent noxious, aquatic nuisance, and other exotic vegetation species: A few Russian olive occurs within the uplands and around pond 3. Herbaceous species include patches of Canada thistle in the uplands and wetlands. Leafy spurge was noted near Pond 1 and in the cottonwood buffer.

iii. Provide brief descriptive summary of AA and surrounding land use/habitat: Emergent marsh surrounded by grazing agricultural and residential. 0.05 ac of wetlands and AA listed in #8 and #9 above occur outside the current official monitoring limits, but were included in the assessment.

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: A small Saiix exigua community was added during the 2007 monitoring. In 2008 another wetland shrub community was added. Structural diversity will continue to improve in the future with the establishment and growth of the woody species..

Wetland/Site #(s): Norem Property

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): _____

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 Bald eagle
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): _____

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): Norem Property

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	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
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: _____

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:** _____

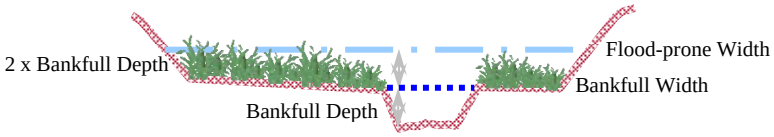
14E. FLOOD ATTENUATION ☒ **NA** (proceed to 14F)

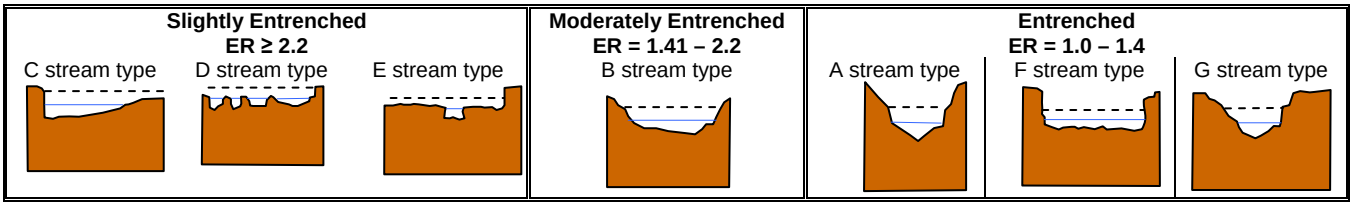
Applies only to wetlands that are subject to flooding via in-channel or overbank flow.
If wetlands in AA are not flooded from in-channel or overbank flow, check the NA box and proceed to 14F.

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**	---	---	---	---	---	---	---	---	---

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): Norem Property

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**	---	---	---	---	.6M	---	---	---	---
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%**	---	---	---
☐ **35-64%**	---	---	---
☐ **< 35%**	---	---	---

Comments: _____

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**	---	---	---
☐ **L**	---	---	---
☒ **NA**	H	---	---

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	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
S/I	.9H	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
T/E/A	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

Wetland/Site #(s): Norem Property

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** = 1.0 ☐ **NO**

iv. Final Score and Rating: 1H **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: As the wetland features expand and develop, this area will provide excellent recreation and education opportunities.

15. GENERAL SITE NOTES: _____

Wetland/Site #(s): Norem Property

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	NA	---		
E. Flood Attenuation	NA	---		
F. Short and Long Term Surface Water Storage	mod 0.60	1.00		
G. Sediment / Nutrient / Toxicant Removal	high 0.90	1.00		*
H. Sediment / Shoreline Stabilization	NA	---		
I. Production Export / Food Chain Support	high 1.00	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	**5.5**	**8**	**72 Total Functional Units**	
Percent of Possible Score 69% (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

2008 REPRESENTATIVE PHOTOGRAPHS

MDT Wetland Mitigation Monitoring
Norem Property
Big Timber, Montana

NOREM PROPERTY WETLAND MITIGATION SITE 2008

Location A: Transect 1 Southern end**.** Viewing community type 4. **Compass Reading**: Northwest

Location B: Transect 1 Southern end. Viewing community types 3 and 4. **Compass Reading**: Southwest

Location C: Species diversity along edge of pond 1. Note bankfull water levels and vegetated banks. **Compass Reading:** Northwest

Location D: Southwest wetland corner. **Compass Read**: North

Location E: Transect 1 northern end**.** Viewing community types 3, 2 and 1. **Compass Reading:** East

Location F: Transect 1 northern end. Viewing community type 3. **Compass Reading**: Southwest

Location G: Transect 1 northern end. Pond 3 bankfull. **Compass Reading**: East

Location H: Viewing community types 1 and 2. Flowing water in ditch and inundated wetlands. **Compass Reading:** Southwest

Location I: Willow establishment along the eastern road edge. **Compass Reading**: North

Location J: Buffer between the Yellowstone River and the wetlands. **Compass Reading:** Southwest

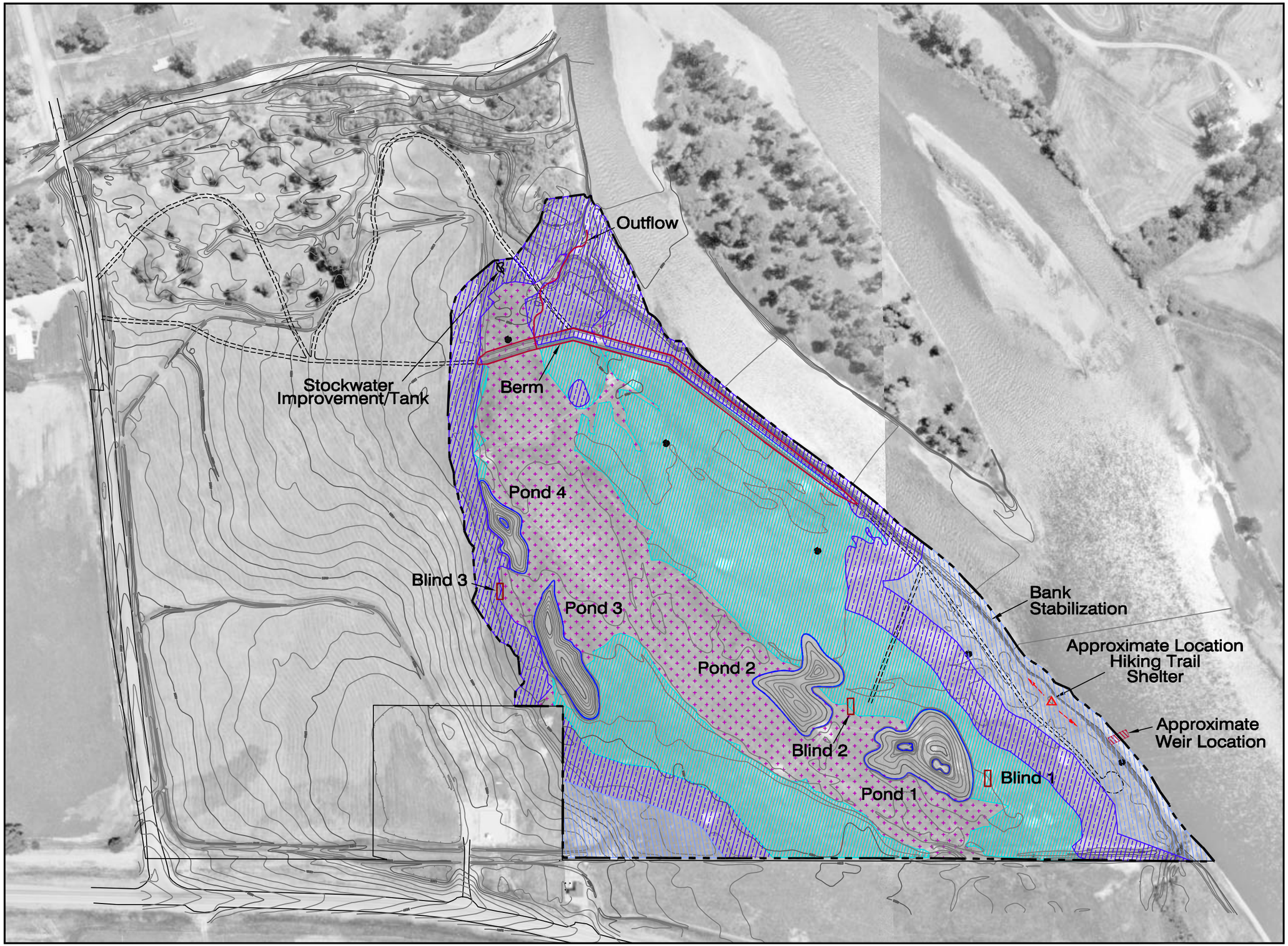
Location H-1: Inundated wetland west of outlet. **Compass Reading**: Southwest

Location H-2: Lady's thumb growing in the inundated wetland west of outlet. **Compass Reading**: Southwest

Appendix D

PROPOSED WETLAND MITIGATION SITE MAP (MAXIM TECHNOLOGIES INC.)

MDT Wetland Mitigation Monitoring
Norem Property
Big Timber, Montana



WETLAND PRESERVATION/
CONSERVATION EASEMENT

EXHIBIT A

==== Road/Trail
Stockwater Improvement/Tank
Powerline Pole
Bird Blind
Hiking/Trail Shelter

Easement Area (26.88 acres)
Existing Wetlands (6.98 acres)
Wetland Acres Resulting from Berm Placement (9.46 acres)
Created Open Water Wetland Areas (1.58 acres)
Buffer Zone (6.02 acres)
Stranded Acres (2.84 acres)

N

0 Feet 200

MAXIM TECHNOLOGIES INC®
P.O. Box 7777
Boise, Idaho

PREPARED FOR:

Norem Farm
Wetland Project

Big Timber, Montana

DESIGNED BY: MLG	DETAILED BY: MLG	CHECKED BY: WBV
DATE: February 2004	ACAD FILE: projects\bozeman\bigtimber\20040201	
PROJECT NO.: 1660117.200	PLOT SCALE: 1:1	
FIGURE: Exhibit A	REVISION:	SHEET:

Appendix E

BIRD SURVEY PROTOCOL
GPS PROTOCOL

MDT Wetland Mitigation Monitoring
Norem Property
Big Timber, 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

2008 MACROINVERTEBRATE SAMPLING PROTOCOL AND DATA

MDT Wetland Mitigation Monitoring
Norem Property
Big Timber, 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 – 2008

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. Over all years of sampling, a total of 210 invertebrate samples have been collected. Table 1 lists the currently monitored sites at which aquatic invertebrates were collected in 2008, and summarizes the sampling history of each.

METHODS

Sample processing

Aquatic invertebrate samples were collected at mitigated wetland sites in the summer months of 2001, 2002, 2003, 2004, 2005, 2006, 2007, and 2008 by personnel of PBS&J (Table 1). 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 2) tested and recommended by Stribling et al. (1995) in a report to the Montana Department of Health and Environmental Science. In that study, it was determined that some of the metrics were of limited use in some geographic regions, and for some wetland types. Despite that finding, all 12 metrics are used in this evaluation of mitigated wetlands, since detailed geographic information and wetland classifications were unavailable. Scoring criteria for the 12 metrics were developed specifically for this project, since mitigated wetlands were not included in original criteria development.

Scoring criteria for wetland metrics were developed by generally following the tactic used by Stribling et al. (1995). Boxplots were generated using a statistical software package (Statistica™), and distributions, median values, ranges, and quartiles for each metric were examined. For the wetland sites, “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 in all years. Data from a total of 167 samples 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 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 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 2008 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 is described below.

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

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

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

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

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

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

Table 1. Montana Department of Transportation Mitigated Wetlands Monitoring Project sites: sampling history. Only those sites sampled in 2008 are included. An asterisk indicates lotic sites.

Site Identifier	2001	2002	2003	2004	2005	2006	2007	2008
Roundup	+	+	+	+	+	+	+	+
Hoskins Landing MS-1		+	+	+	+	+	+	+
Peterson Ranch Pond 2		+		+	+	+	+	+
Peterson Ranch Pond 4		+	+	+	+	+	+	+
Perry Ranch		+			+			+
Camp Creek MS-1*		+	+	+	+	+	+	+
Camp Creek MS-2*						+	+	+
Cloud Ranch Pond				+	+		+	+
Cloud Ranch Stream*				+			+	+
Jack Creek – Pond				+	+	+	+	+
Jack Creek – McKee*							+	+
Norem				+	+	+	+	+
Rock Creek Ranch					+	+	+	+
Wagner Marsh					+	+	+	+
Alkali Lake 1						+	+	+
West Fork of Charley Creek							+	+
Woodson Pond MI 1							+	+
Woodson Stream MI 2*							+	+
Little Muddy Creek							+	+
Selkirk Ranch							+	+
DH Ranch							+	+
Jocko Spring Creek MS-1								+
Jocko Spring Creek MS-2								+
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 – 2008.

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 – 2008 sampling.

METRIC	Roundup	Hoskins Landing MS 1	Peterson Ranch Pond 2	Peterson Ranch Pond 4	Perry Ranch	Cloud Ranch Pond	Jack Creek Pond	Norem
Total taxa	9	18	13	25	11	27	21	14
POET	0	2	1	3	0	5	2	0
Chironomidae taxa	4	5	3	6	5	14	7	6
Crustacea + Mollusca	3	6	3	5	2	4	6	2
% Chironomidae	80.37%	17.00%	3.70%	13.21%	88.79%	49.53%	42.86%	34.69%
Orthocladiinae/Chir	0.63	0.18	1.50	0.21	0.82	0.66	0.40	0.53
% Amphipoda	0.00%	8.00%	0.00%	0.00%	0.00%	6.54%	15.24%	0.00%
% Crustacea + % Mollusca	15.89%	48.00%	86.11%	43.40%	6.54%	10.28%	30.48%	26.53%
HBI	8.01	7.62	7.85	7.40	7.37	5.94	8.17	7.61
% Dominant taxon	50.47%	27.00%	84.26%	25.47%	62.62%	13.08%	19.05%	26.53%
% Collector-Gatherers	31.78%	54.00%	87.96%	20.75%	20.56%	56.07%	65.71%	44.90%
% Filterers	2.80%	10.00%	0.00%	1.89%	0.00%	3.74%	1.90%	0.00%
Total taxa	1	3	1	5	1	5	5	1
POET	1	1	1	3	1	5	1	1
Chironomidae taxa	3	3	3	3	3	5	5	3
Crustacea + Mollusca	1	5	1	3	1	3	5	1
% Chironomidae	1	5	5	5	1	1	1	3
Orthocladiinae/Chir	5	1	5	3	5	5	3	5
% Amphipoda	5	3	5	5	5	3	3	5
% Crustacea + % Mollusca	5	3	1	3	5	5	5	5
HBI	1	1	1	3	3	5	1	1
% Dominant taxon	1	5	1	5	1	5	5	5
% Collector-Gatherers	1	3	5	1	1	3	3	1
% Filterers	3	1	3	3	3	3	3	3
Total Score	**28**	**34**	**32**	**42**	**30**	**48**	**40**	**34**
Percent of Maximum Score	**46.67%**	**56.67%**	**53.33%**	**70.00%**	**50.00%**	**80.00%**	**66.67%**	**56.67%**
Impairment Classification	**poor**	**sub-optimal**	**sub-optimal**	**good**	**poor**	**good**	**sub-optimal**	**sub-optimal**

Table 4b. Metric values and scores for wetland (lentic) sites in the MDT mitigated wetland study – 2008 sampling.

METRIC	Rock Creek Ranch	Wagner Marsh	Alkali Lake	West Fork of Charley Creek	Woodson Pond	Woodson Stream	Little Muddy Creek	Selkirk Ranch
Total taxa	23	11	10	9	13	7	14	17
POET	1	4	0	0	1	3	1	1
Chironomidae taxa	5	2	2	1	7	0	2	8
Crustacea + Mollusca	5	2	3	3	2	2	3	5
% Chironomidae	28.97%	2.83%	5.41%	0.91%	60.00%	0.00%	55.00%	23.38%
Orthocladiinae/Chir	0.97	0.00	0.00	0.00	0.52	0	0.64	0.33
% Amphipoda	0.00%	0.00%	0.00%	67.27%	0.00%	7.69%	0.00%	5.19%
% Crustacea + % Mollusca	28.97%	39.62%	32.43%	70.91%	25.45%	15.38%	17.00%	48.05%
HBI	6.91	7.45	8.57	8.19	8.14	4.62	6.97	7.76
% Dominant taxon	22.43%	48.11%	48.65%	67.27%	25.45%	30.77%	35.00%	32.47%
% Collector-Gatherers	30.84%	52.83%	21.62%	68.18%	86.36%	23.08%	29.00%	16.88%
% Filterers	1.87%	0.00%	0.00%	0.00%	0.00%	30.77%	0.00%	32.47%
Total taxa	5	1	1	1	1	1	1	3
POET	1	5	1	1	1	3	1	1
Chironomidae taxa	3	1	1	1	5	1	1	5
Crustacea + Mollusca	3	1	1	1	1	1	1	3
% Chironomidae	3	5	5	5	1	5	1	3
Orthocladiinae/Chir	5	1	1	1	5	Not Scored	5	3
% Amphipoda	5	5	5	1	5	3	5	3
% Crustacea + % Mollusca	5	3	5	1	5	5	5	3
HBI	3	3	1	1	1	5	3	1
% Dominant taxon	5	3	3	1	5	5	3	5
% Collector-Gatherers	1	3	1	3	5	1	1	1
% Filterers	3	3	3	3	3	1	3	1
Total Score	**42**	**34**	**28**	**20**	**38**	**31**	**30**	**32**
Percent of Maximum Score	**70.00%**	**56.67%**	**46.67%**	**33.33%**	**63.33%**	**56.36%**	**50.00%**	**53.33%**
Impairment Classification	**good**	**sub-optimal**	**poor**	**poor**	**sub-optimal**	**sub-optimal**	**poor**	**sub-optimal**

Table 4c. Metric values and scores for wetland (lentic) sites in the MDT mitigated wetland study – 2008 sampling.

METRIC	DH Ranch	Sportsman's Campground Site # 1	Sportsman's Campground Site # 2	Sportsman's Campground Site # 3	Lonepine # 1	Lonepine # 2
Total taxa	15	16	9	12	18	4
POET	1	1	0	0	2	0
Chironomidae taxa	6	6	3	7	12	3
Crustacea + Mollusca	2	5	3	4	1	1
% Chironomidae	52.29%	10.91%	41.18%	69.09%	81.82%	57.14%
Orthocladiinae/Chir	0.09	0.17	0.00	0.25	0.13	0.00
% Amphipoda	0.00%	24.55%	5.88%	27.27%	0.00%	0.00%
% Crustacea + % Mollusca	30.28%	83.64%	23.53%	29.09%	7.27%	42.86%
HBI	7.33	7.55	8.76	7.55	7.60	8.14
% Dominant taxon	33.03%	56.36%	29.41%	25.45%	25.45%	42.86%
% Collector-Gatherers	49.54%	20.91%	11.76%	57.27%	55.45%	28.57%
% Filterers	0.92%	63.64%	11.76%	25.45%	22.73%	42.86%
Total taxa	3	3	1	1	3	1
POET	1	1	1	1	1	1
Chironomidae taxa	3	3	3	5	5	3
Crustacea + Mollusca	1	3	1	3	1	1
% Chironomidae	1	5	3	1	1	1
Orthocladiinae/Chir	1	1	1	3	1	1
% Amphipoda	5	1	3	1	5	5
% Crustacea + % Mollusca	5	1	5	5	5	3
HBI	3	3	1	3	3	1
% Dominant taxon	5	1	5	5	5	3
% Collector-Gatherers	3	1	1	3	3	1
% Filterers	3	1	1	1	1	1
Total Score	**34**	**24**	**26**	**32**	**34**	**22**
Percent of Maximum Score	**56.67%**	**40.00%**	**43.33%**	**53.33%**	**56.67%**	**36.67%**
Impairment Classification	**sub-optimal**	**poor**	**poor**	**sub-optimal**	**sub-optimal**	**poor**

Table 5. Metric values and scores for stream (lotic) sites in the MDT mitigated wetland study – 2008 sampling.

METRIC	Camp Creek MS-1	Camp Creek MS-2	Cloud Ranch Stream	Jack Creek – McKee Spring	Jocko Spring Creek MS-1	Jocko Spring Creek MS-2
E Richness	7	5	4	1	0	1
P Richness	2	2	0	0	0	1
T Richness	4	6	5	3	2	5
Pollution Sensitive Richness	0	1	0	0	0	0
Filterer Percent	29.00%	37.00%	5.00%	40.00%	15.00%	11.00%
Pollution Tolerant Percent	5.00%	3.00%	28.00%	1.00%	62.00%	15.00%
E Richness	3	2	2	0	0	0
P Richness	2	2	0	0	0	1
T Richness	2	3	3	2	1	3
Pollution Sensitive Richness	0	1	0	0	0	0
Filterer Percent	1	0	3	0	1	1
Pollution Tolerant Percent	3	3	0	3	0	1
Total score	**11**	**11**	**8**	**5**	**2**	**6**
Percent of maximum score	**61%**	**61%**	**44%**	**28%**	**11%**	**33%**
Impairment classification	**slight**	**slight**	**moderate**	**moderate**	**severe**	**moderate**

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Taxa Listing

Project ID: MDT08PBSJ
RAI No.: MDT08PBSJ011

RAI No.: MDT08PBSJ011 **Sta. Name:** Norem Ranch
Client ID:
Date Coll.: 7/25/2008 **No. Jars:** 1 **STORET ID:**

Taxonomic Name	Count	PRA	Unique	Stage	Qualifier	BI	Function
Non-Insect							
Lymnaeidae							
Lymnaeidae	3	6.12%	Yes	Immature		6	SC
Naididae							
Naididae (Tubificinae) - without capillary setae	1	2.04%	Yes	Immature		11	CG
Nais sp.	13	26.53%	Yes	Unknown		8	CG
Planorbidae							
Gyraulus sp.	10	20.41%	Yes	Unknown		8	SC
Heteroptera							
Corixidae							
Corixidae	1	2.04%	No	Larva		10	PH
Trichocorixa sp.	1	2.04%	Yes	Adult		11	PR
Notonectidae							
Notonectidae	1	2.04%	Yes	Larva		10	PR
Coleoptera							
Dytiscidae							
Dytiscidae	1	2.04%	Yes	Adult	Damaged	5	PR
Haliplidae							
Haliplus sp.	1	2.04%	Yes	Larva		5	PH
Chironomidae							
Chironomidae							
Acricotopus sp.	1	2.04%	Yes	Larva		10	CG
Apedilum sp.	1	2.04%	Yes	Larva		11	CG
Cladotanytarsus sp.	2	4.08%	Yes	Larva		7	CG
Cricotopus (Isocladius) sp.	8	16.33%	Yes	Larva		7	SH
Dicrotendipes sp.	4	8.16%	Yes	Larva		8	CG
Polypedilum sp.	1	2.04%	Yes	Larva		6	SH
Sample Count	**49**						

Metrics Report

Project ID: MDT08PBSJ
RAI No.: MDT08PBSJ011
Sta. Name: Norem Ranch
Client ID:
STORET ID:
Coll. Date: 7/25/2008

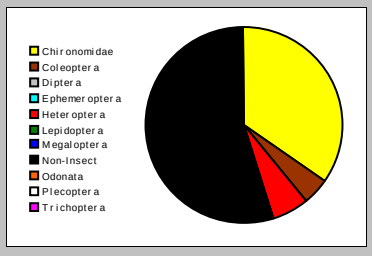
Abundance Measures

Sample Count: 49
Sample Abundance: 49.00 100.00% of sample used

Coll. Procedure:
Sample Notes:

Taxonomic Composition

Category	R	A	PRA
Non-Insect	4	27	55.10%
Odonata			
Ephemeroptera			
Plecoptera			
Heteroptera	2	3	6.12%
Megaloptera			
Trichoptera			
Lepidoptera			
Coleoptera	2	2	4.08%
Diptera			
Chironomidae	6	17	34.69%

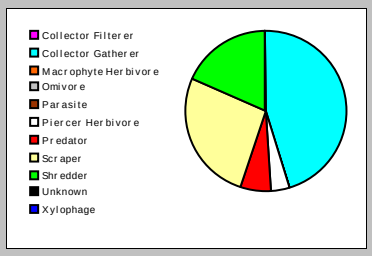


Dominant Taxa

Category	A	PRA
Nais	13	26.53%
Gyraulus	10	20.41%
Cricotopus (Isocladius)	8	16.33%
Dicrotendipes	4	8.16%
Lymnaeidae	3	6.12%
Cladotanytarsus	2	4.08%
Trichocorixa	1	2.04%
Polypedilum	1	2.04%
Notonectidae	1	2.04%
Naididae (Tubificinae) - without c	1	2.04%
Haliplus	1	2.04%
Dytiscidae	1	2.04%
Corixidae	1	2.04%
Apedilum	1	2.04%
Acricotopus	1	2.04%

Functional Composition

Category	R	A	PRA
Predator	3	3	6.12%
Parasite			
Collector Gatherer	6	22	44.90%
Collector Filterer			
Macrophyte Herbivore			
Piercer Herbivore	1	2	4.08%
Xylophage			
Scraper	2	13	26.53%
Shredder	2	9	18.37%
Omivore			
Unknown			

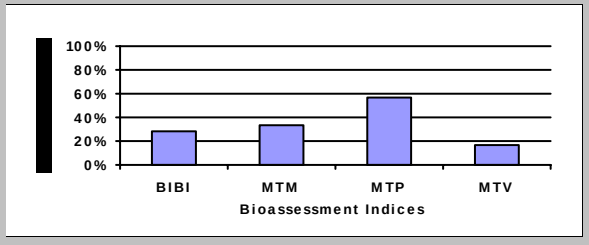


Metric Values and Scores

Metric	Value	BIBI	MTP	MTV	MTM
Composition					
Taxa Richness	14	1	1		0
Non-Insect Percent	55.10%				
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	28.57%				
Baetidae/Ephemeroptera	0.000				
Hydropsychidae/Trichoptera	0.000				
Dominance					
Dominant Taxon Percent	26.53%		3		2
Dominant Taxa (2) Percent	46.94%				
Dominant Taxa (3) Percent	63.27%	3			
Dominant Taxa (10) Percent	89.80%				
Diversity					
Shannon H (loge)	2.137				
Shannon H (log2)	3.083		3		
Margalef D	3.358				
Simpson D	0.143				
Evenness	0.099				
Function					
Predator Richness	3		1		
Predator Percent	6.12%	1			
Filterer Richness	0				
Filterer Percent	0.00%			3	
Collector Percent	44.90%		3		3
Scraper+Shredder Percent	44.90%		3		2
Scraper/Filterer	0.000				
Scraper/Scraper+Filterer	0.000				
Habit					
Burrower Richness	1				
Burrower Percent	8.16%				
Swimmer Richness	2				
Swimmer Percent	6.12%				
Clinger Richness	2	1			
Clinger Percent	18.37%				
Characteristics					
Cold Stenotherm Richness	0				
Cold Stenotherm Percent	0.00%				
Hemoglobin Bearer Richness	5				
Hemoglobin Bearer Percent	34.69%				
Air Breather Richness	1				
Air Breather Percent	2.04%				
Voltinism					
Univoltine Richness	5				
Semivoltine Richness	2	1			
Multivoltine Percent	34.69%		3		
Tolerance					
Sediment Tolerant Richness	2				
Sediment Tolerant Percent	26.53%				
Sediment Sensitive Richness	0				
Sediment Sensitive Percent	0.00%				
Metals Tolerance Index	3.682				
Pollution Sensitive Richness	0	1		0	
Pollution Tolerant Percent	42.86%	3		0	
Hilsenhoff Biotic Index	7.609		0		0
Intolerant Percent	0.00%				
Supertolerant Percent	61.22%				
CTQa	99.000				

Bioassessment Indices

BioIndex	Description	Score	Pct	Rating
BIBI	B-IBI (Karr et al.)	14	28.00%	
MTP	Montana DEQ Plains (Bukantis 1998)	17	56.67%	Slight
MTV	Montana Revised Valleys/Foothills (Bollman 1998)	3	16.67%	Severe
MTM	Montana DEQ Mountains (Bukantis 1998)	7	33.33%	Moderate



Appendix G

NOREM PROPERTY WETLAND CREDIT ASSESSMENT LETTER (COE 2002)

MDT Wetland Mitigation Monitoring
Norem Property
Big Timber, Montana

U.S. ARMY CORPS OF ENGINEERS
HELENA REGULATORY OFFICE
10 WEST 15TH STREET, SUITE 2200
HELENA, MONTANA 59626

REPLY TO ATTENTION OF:

August 2, 2002

Helena Regulatory Office
Phone (406) 441-1375
Fax (406) 441-1380

Subject: Corps File Number 2002-90-260
Norem Property Wetland Project
Preliminary Wetland Credit Assessment

Mr. Mark Norem
116 West Second
PO Box 1285
Big Timber, Montana 59011

Dear Mr. Norem:

This letter is a response to a request that the US Army Corps of Engineers (Corps) estimate the amount of wetland mitigation credit that could be generated by the proposed work on your property adjacent to the Yellowstone River. The project is located near the community of Big Timber in Section 12, Township 1 North, Range 14 East, Sweetgrass County, Montana.

It is your intention to develop and enhance wetlands at the site to provide compensatory wetland mitigation credit to the Montana Department of Transportation. It is required that all creditable areas be protected by a perpetual conservation easement or other encumbrance that ensures the continued existence of the aquatic lands developed at the site. The following table summarizes the amount and type of wetland credit that the Corps will commit to, assuming that the site develops as presented in the April 2002 Conceptual Wetland Development Plan and in the subsequent application for Section 404 authorization:

Enhancement of Existing Wetland, 3:1 ratio	6.98 acres enhanced	2.32 acres credit
Creation of wetlands resulting from berm construction, 1:1 ratio	9.46 acres created	9.46 acres credit
Open water/shallow ponds created in upland, 1:1 ratio	1.58 acres new shallow ponds	1.58 acres credit
Allowable Buffer Zone, 4:1 ratio	6.02 acres buffer	1.50 acres credit
Area of existing wetland filled by berm, 1:1 ratio	-0.15 acres impacted	-0.15 acres credit
Low Impact Buffer	0.64 acres	N/A
Summary of Potential Wetland Credit Available:	-	**14.7 acres credit**

You will note that the amount of credit agreed to at this time was determined using ratios of compensation to impact rather than functional assessment. It was determined that slightly more creditable acreage could be calculated using ratios. This will also allow for straightforward adjustment of the final credit totals determined upon completion of the monitoring period. If

necessary, the Corps will adjust the amount of acreage available for use as mitigation credit by the Montana Department of Transportation after the monitoring period.

The monitoring period for this project will be five complete growing seasons after completion of construction and planting. If there are no appreciable changes expected after the fourth year of monitoring, the Corps might waive the fifth year. Monitoring must be done in accordance with the protocols established under the MDT Wetland Mitigation Monitoring Program, with annual reports supplied to this office either as part of that program or as stand-alone submittals.

At this time, there is no crediting mechanism available for the remaining upland parts of the property that will be protected by a permanent protective easement. It is recognized, however, that the creation, enhancement, and protection of areas such as the riparian cottonwood galleries along the Yellowstone River has great ecological benefit. As the Corps moves forward with watershed-based mitigation principles, it is likely that compensatory mitigation for impacts to riverine ecosystems will be required. As that need arises, the Corps will evaluate the area in question, and may allow up to 2 acres of additional credit for the upland riparian cottonwood area at that time. This credit would be used to offset similar impacts to river systems in the watershed, and would not be available to offset wetland impacts.

In closing, the requested Department of Army authorization for constructing this wetland project is still pending. Individual Section 401 Water Quality Certification for this project has been requested from the Montana Department of Environmental Quality, and Department of Army authorization can be provided after that certification has been issued.

Todd Tillinger of this office is the Corps' project manager. He may be reached by phone at (406) 441-1375 or by e-mail at todd.n.tillinger@usace.army.mil. Please reference Corps File Number 2002-90-260.

Sincerely,

Allan Steinle

Allan Steinle
Montana Program Manager

CC: Walt Vering, MAXIM Technologies, Inc.
Gordon Stockstad, Montana Department of Transportation - Environmental Services